

IFAS Assessment – Predictive Tool

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This document describes the use of the Australian Weed Risk Assessment (WRA) system as the predictive tool required by the IFAS Assessment of Non-Native Plants in Florida's Natural Areas.

Within the IFAS Assessment system, the Status Assessment is not a predictive instrument but is intended ONLY for plants that currently occur within Florida. It is not intended to provide evaluations of species¹ that have not yet been introduced to the State. However, if species have not escaped into Florida's natural areas but are either recent arrivals to the state or are known to cause problems in areas with similar habitats and climate to Florida, or if there is a proposed or new use for a species that would result in higher propagule pressure² in Florida (e.g., cultivation of ≥ 2 contiguous ac of a species for bioenergy (corresponding to DPI biofuel rule), or commercial cultivation of a species present in Florida for a new use, or increase in acreage cultivated from 1-10 ac to 10 times that acreage (10-100 ac), 10-100 ac to 5 times that acreage (50 to 500 ac), or >100 ac to 2.5 times that acreage), then the Status Assessment directs the use of a predictive tool. The Australian Weed Risk Assessment system has been adapted for use in Florida to complete the assessment of such species.

Originally developed in Australia (Pheloung *et al.*, 1999), this Weed Risk Assessment (WRA) forms the basis for phytosanitary regulations in Australia (<http://www.daff.gov.au/ba/reviews/weeds>) and New Zealand (Williams and West, 2000). This WRA has been modified for testing and application in various other parts of the world (see Gordon *et al.*, 2008a). It was adapted and tested for Florida (Gordon *et al.*, 2008b) and was adopted as the predictive tool called for in the Status Assessment on December 14, 2007 by the IFAS Invasive Plants Working Group (http://plants.ifas.ufl.edu/assessment/invasive_plants_working_group.html).

As used in Australia, the WRA system consists of 49 questions about the history of use and weediness, distribution, climate requirements, biology, and ecology of the plant species being proposed for importation. Depending on the answer, each question is awarded between -3 and 5 points (most -1 to 1), and the final point total leads to one of three outcomes: *accept* the species for importation (<1 point), *reject* the species (>6 points), or hold the species to *evaluate further* its invasive potential (1-6 points). Cutoff points were assigned by the WRA developers at levels that would have precluded the introduction of historically serious invaders, limited the rejection of non-invaders to 10%, and limited the species that would require further evaluation to 30% (Pheloung *et al.*, 1999).

Species with the *evaluate further* outcome are analyzed further with the Pacific Second Screening ([Figure 1](#)) developed by Daehler *et al.* (2004).

¹ The Status Assessment is generally applied at the species level. It is only applied independently to infraspecific taxa (e.g., cultivars, varieties, or sub-species) if these taxa can be clearly distinguished in the field and are not likely to revert. (Throughout the Status Assessment and this document, reference to the species under consideration could also refer to such distinct infraspecific taxa.)

² Propagule pressure incorporates both the frequency and number of propagules introduced. Propagule pressure is increasingly understood to influence the probability that a species will become invasive (Lockwood *et al.* 2005, Mack 2008, Reaser *et al.* 2008).

For use as a part of the process for assessing non-native plants in Florida's natural areas, we have modified some of the questions to be appropriate for Florida's climate and environment ([Table 1](#)). The scoring system (including a look-up table for certain questions) has not been changed but we have adapted the outcomes to match the conclusions of the Status Assessment.

Conclusions:

1. WRA "accept" outcome = "not a problem species, may be recommended" (Reevaluate in 10 years using the Status Assessment, which may or may not direct the use of the WRA)
2. WRA "evaluate further" outcome = "Caution: may be recommended but manage to prevent escape" (Reevaluate in 2 years using the Status Assessment, which may or may not direct the use of the WRA. If the species has moved into natural area(s), retain the "Caution" conclusion for at least 10 years from the most recent predictive conclusion if the Status Assessment conclusion is "not a problem species, may be recommended" because the species is clearly spreading in Florida. Subsequently adopt the conclusion suggested by the Status Assessment).
3. WRA "reject" outcome = "Predicted to be invasive: recommend only under specific management practices that have been approved by the IFAS Invasive Plant Working Group" (reevaluate in 2 years using the Status Assessment. If the species still requires a predictive assessment, update the WRA result with any new information. However, if the species has moved into natural area(s), retain the "Predicted to be invasive: not recommended" conclusion for woody species for 20 years and for herbaceous species for 10 years from the most recent predictive conclusion regardless of current status in natural area(s) because the species is clearly spreading in Florida.)

Species will be evaluated using the WRA by IFAS Assessment staff that will use all available sources of information. Typically, the WRA has been applied at the national or state level (see Gordon *et al.*, 2008a) and most questions relate to characteristics of the species or its global distribution independently of local geography. Because the Status Assessment is applied separately to three zones within Florida, in this application of the WRA we make the following adjustments if zonal differences in invasive potential seem likely.

Zones:

Any "accept" or "reject" WRA outcome should be recorded for a species similarly across all zones *unless* the outcome would clearly vary across the zones because the species would be intolerant of environmental conditions in other zones. For example, if a species is "rejected" but known to be frost intolerant and therefore could not persist in north Florida plant hardiness zones, the conclusion would be "Invasive, not recommended" in south and central Florida but would be "accepted" in north Florida. Similar decisions could be made if the species could only persist on particular soil types found only in some zone(s) in Florida or under other ranges constraining conditions.

An "evaluate further" WRA outcome will automatically result in reevaluation of the species by zone.

Zone-specific conclusions should be the consensus decision of three people with expertise on the species, and supported by an absence of herbarium and/or other distribution records for the species in the zone(s) determined not to support naturalization.

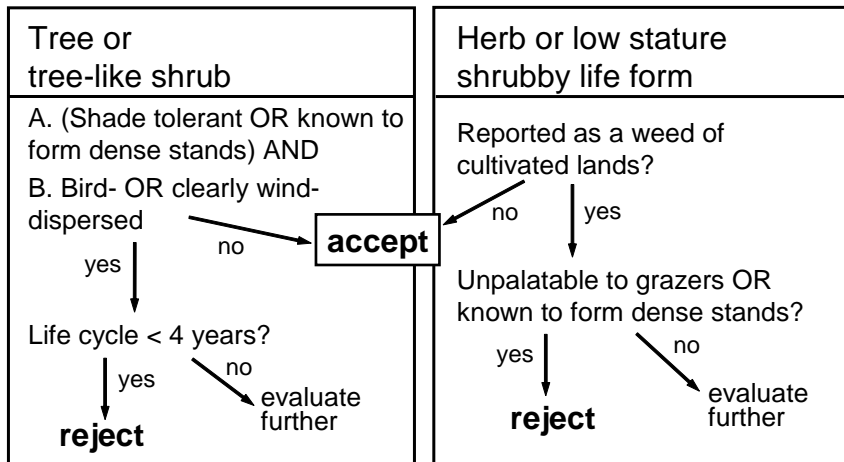
Data availability for infraspecific taxa:

If the use of a predictive tool has been directed for an infraspecific taxon after evaluation using the Intraspecific Taxon Protocol (<http://plants.ifas.ufl.edu/assessment/infra.html>), then the WRA is applied, if possible, to the infraspecific taxon. However, in the absence of specific data from the infraspecific taxon, use data from the resident species.

Figure 1. Pacific Second Screening

Pacific second screening: decision rules for species with WRA scores between 1 and 6

(from Daehler *et al.* 2004)



Vines must pass both tests

Table 1. Australian Weed Risk Assessment's 49 questions modified from Pheloung *et al.* (1999) for Florida's climate and environment, and for the zones of the Status Assessment:

Answer *yes* or *no*, or leave blank, unless otherwise indicated

Botanical name:		Outcome:		Response ?	Score	
Common Name:		Score:			N	Y
Biogeography/historical						
A C C	1 <i>Domestication/ cultivation</i>	1.01	Is the species highly domesticated?		0	-3
		1.02	Has the species become naturalized where grown?		-1	1
		1.03	Does the species have weedy races?		-1	1
C C C	2 <i>Climate and Distribution</i>	2.01	Species suited to Florida's USDA climate zones (0-low; 1-intermediate; 2-high) ² North Zone: suited to Zones 8, 9 Central Zone: suited to Zones 9, 10 South Zone: suited to Zone 10, 11			
		2.02	Quality of climate match data (0-low; 1-intermediate; 2-high)			
	2.03	Broad climate suitability (environmental versatility)		0	1	
	2.04	Native or naturalized in habitats with periodic inundation ³ North Zone: mean annual precipitation 50-70 inches Central Zone: mean annual precipitation 40-60 inches South Zone: mean annual precipitation 40-60 inches		0	1	
	2.05	Does the species have a history of repeated introductions outside its natural range?				
C E A E	3 <i>Weed Elsewhere</i>	3.01	Naturalized beyond native range			
		3.02	Garden/amenity/disturbance weed			
		3.03	Weed of agriculture			
		3.04	Environmental weed			
		3.05	Congeneric weed			
Biology/Ecology						
A C C A C C C E E E E E E	4 <i>Undesirable traits</i>	4.01	Produces spines, thorns or burrs		0	1
		4.02	Allelopathic		0	1
		4.03	Parasitic		0	1
		4.04	Unpalatable to grazing animals		-1	1
		4.05	Toxic to animals		0	1
		4.06	Host for recognized pests and pathogens		0	1
		4.07	Causes allergies or is otherwise toxic to humans		0	1
		4.08	Creates a fire hazard in natural ecosystems		0	1
		4.09	Is a shade tolerant plant at some stage of its life cycle		0	1
		4.10	Grows on infertile soils (oligotrophic, limerock, or excessively draining soils) ⁴ North Zone: infertile soils Central Zone: infertile soils South Zone: shallow limerock or Histisols		0	1
		4.11	Climbing or smothering growth habit		0	1
		4.12	Forms dense thickets		0	1
E	5 <i>Plant type</i>	5.01	Aquatic		0	5

Locate value of inputs and lookup output for each question, Section 3. ⁵											
Yes to questions 3.01 – 3.05										default	
Inputs	2.01	0	0	0	1	1	1	2	2	2	2
	2.02	0	1	2	0	1	2	0	1	2	2
Results	3.01	2	1	1	2	2	1	2	2	2	2
	3.02	2	1	1	2	2	1	2	2	2	2
	3.03	4	2	1	4	3	2	4	4	4	4
	3.04	4	2	1	4	3	2	4	4	4	4
	3.05	2	1	1	2	2	1	2	2	2	2
No to questions 3.01 – 3.05											
Input	2.05	?	N	Y							
Results	3.01	-1	0	-2							
	3.02–3.05	0	0	0							

C		5.02	Grass		0	1
E		5.03	Nitrogen fixing woody plant		0	1
C		5.04	Geophyte		0	1
C	6	<i>Reproduction</i>	6.01	Evidence of substantial reproductive failure in native habitat	0	1
C			6.02	Produces viable seed	-1	1
C			6.03	Hybridizes naturally	-1	1
C			6.04	Self-compatible or apomictic	-1	1
C			6.05	Requires specialist pollinators	0	-1
C			6.06	Reproduction by vegetative fragmentation	-1	1
C			6.07	Minimum generative time (years)		
A	7	<i>Dispersal mechanisms</i>	7.01	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	-1	1
C			7.02	Propagules dispersed intentionally by people	-1	1
A			7.03	Propagules likely to disperse as a produce contaminant	-1	1
C			7.04	Propagules adapted to wind dispersal	-1	1
E			7.05	Propagules water dispersed	-1	1
E			7.06	Propagules bird dispersed	-1	1
C			7.07	Propagules dispersed by other animals (externally)	-1	1
C			7.08	Propagules dispersed by other animals (internally)	-1	1
C	8	<i>Persistence attributes</i>	8.01	Prolific seed production	-1	1
A			8.02	Evidence that a persistent propagule bank is formed (>1 yr)	-1	1
A			8.03	Well controlled by herbicides	1	-1
A			8.04	Tolerates, or benefits from, mutilation or cultivation	-1	1
E			8.05	Effective natural enemies present in Florida, or east of the continental divide ⁵ Same for all zones	1	-1
					total score	
					outcome	

years	1	2-3	4+
score	1	0	-1

section	# questions answered	satisfy minimum?
A		
B		
C		
total		

¹A = agricultural, E = environmental, C = combined

²Data from http://www.nappfast.org/Plant_hardiness/ph_index.htm for 2005: Although the full Status Assessment has not yet been updated to the 2006 plant hardiness zones, we suggest using the 2006 zones for the predictive assessment as they may be more accurate for current and future conditions.

³Data from: <http://www.nationalatlas.gov/natlas/Natlasstart.asp> and Henry *et al.* (1994).

⁴Data from: <http://soils.usda.gov/use/worldsoils/mapindex/order.html>. The original full question for Australia in the WRA reads: Grows on infertile soils. This approach seemed appropriate for the central and north zones and was left unchanged.

⁵As natural enemies are likely to move across zone boundaries, presence anywhere in the state appears sufficient to allow scoring of this question. However, experience with the WRA suggests that we will rarely find data that support a positive or negative answer to this question.

⁶Lookup table from Gordon *et al.* (2008c).

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