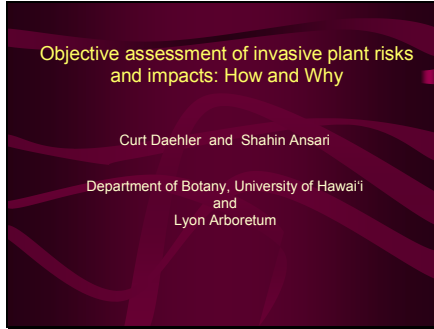
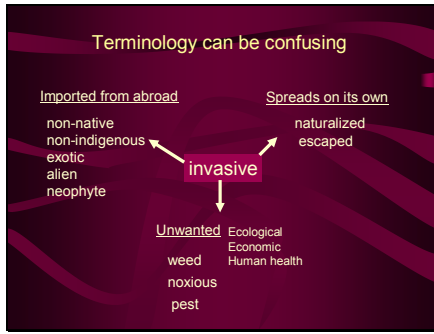


Slide 1



Slide 2

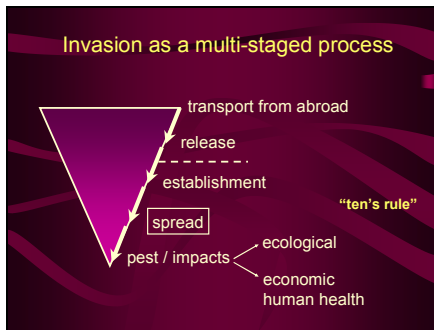


There are 3 elements to a species being invasive:

1. That it is an alien or an exotic – that is imported from abroad
2. That it spreads on its own without the help of humans.
3. Unwanted – either for ecological, economic or because it negatively affects human health

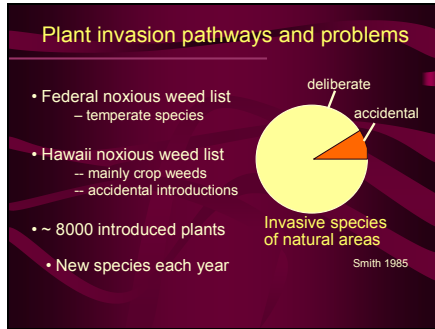
Abroad and spreading are not so difficult to determine. However, unwanted is more subjective because the assessment can depend on individual viewpoints.

Slide 3



Invasion is a multistage process and not all introductions becomes invasive. Perhaps only about 10% of the species that are introduced or released become established and only 10% of those spread and become pests that have negative ecological or economic impacts.

Slide 4




if we look at invasive plants in natural areas, 91% were deliberately imported, and most of them are not crop weeds. So the noxious weed list has not been effective at excluding natural area invaders. If your objective is to conserve native ecosystems or maintain high productivity by keeping out weeds, then this should be a concern, but even if you simply work with new plants or recommend growing certain plants to clients, the issue might become of interest from a legal perspective.

Slide 5

Invasive species problems

Liability and compliance issues



Executive order 13112

federal agencies shall "not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species... unless the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm... and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions.

e

Slide 6

Invasive species problems

Liability and compliance issues

What are "feasible and prudent measures to minimize risk"?

Quote is from Executive order, but the idea applies more broadly, since taking these measures would simultaneously reduce invasive species problems and reduce liability, if any exists.

Slide 7

Objective: Risk minimization

Develop a weed risk assessment (WRA) that identifies plants likely to become invasive pests

- Species not yet present
 - assist with importation choices
- Species already present
 - allow informed planting decisions
 - assist in prioritizing control targets

Control targets among the many incipients

Slide 8

Developing a WRA

Characteristics of an ideal WRA system

- objective
- transparent
- science-based
- repeatable / reliable
- accurate

Anyone who spends time around plants develops personal opinions whether certain plants are desirable or not. These opinions differ widely depending on personal experiences and can generate much disagreement.

Minimize the use of personal opinions
Transparent – easy to see why a plant has been assigned a high or low risk
Science based -- the components of the assessment are built on principles or empirical trends identified in the scientific literature on invasions
Repeatable – if different people are asked to complete the assessment, we should get the same answers
And Reliable – we want the assessment to be accurate most of the time

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Developing a WRA for Hawai'i (H-WRA)

Examined several systems

- North America
- South Africa
- Australia

• The Australian WRA system was most promising after simple modifications

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Developing a WRA for Hawai'i (H-WRA)

History of the Australian WRA system

- 1984 Developed and tested in Australia
- 1995 Modified and tested in New Zealand
- 1998 Modified and tested for use in Hawai'i
- 2001-2004 Further testing for use in Hawai'i and other Pacific Islands

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Hawaii -Weed Risk Assessment System
(base on Australia/New Zealand)

49 questions

- climate/distribution
- domestication
- weed elsewhere
- undesirable traits
- plant type
- reproduction
- dispersal
- persistence attributes

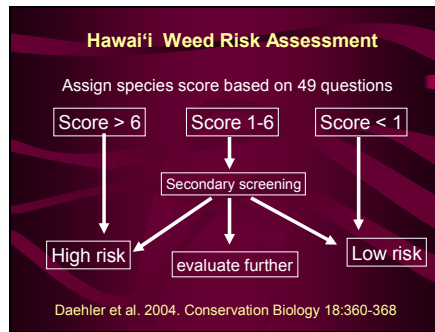
Assessment

Score < 1 low risk
1-6 evaluate (?)
> 6 high risk

(Many ways to be high risk)

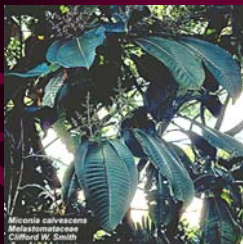
Objectivity is maintained because –
The same set of questions are answered for each species.
Consistent and predetermined criteria are established for determining when a question should be answered yes or no.
3. For each answer the source was recorded allowing anyone to evaluate the source of information used in an assessment.
Anecdotal information or information appearing to be derived from personal opinion was avoided during the assessment process. Answers most commonly came from scientific journal articles, reference books, electronic databases and the internet.
There is no one set of traits that defines all invaders.
Designed to work with a broad group of plants from herbs to trees

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Example: WRA for *Miconia calvescens*



Score: 14
Decision: High Risk


Risk factors

- Environmental weed of Tahiti
- Broad range (0-6000 ft elevation)
- Shade-tolerance
- Re-growth after mutilation

Miconia calvescens
Miconiaceae
Clifford W. Smith

Slide 14

Example: WRA for *Miconia calvescens*



Score: 14
Decision: High Risk

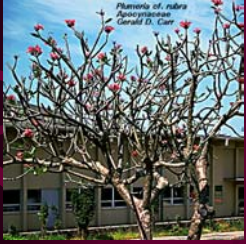
Risk factors

- Self-compatible
- > 1000 seeds per m²
- Bird-dispersed
- Easy accidental dispersal by humans

Miconia calvescens
Miconiaceae
Clifford W. Smith

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Example WRA for *Plumeria rubra* (frangipani)



Plumeria of rubra
Apocynaceae
Gerrald D. Carr


WRA Score: -5
Decision: Low Risk

Risk-reducing factors

- not a recognized pest elsewhere
- poor shade tolerance
- does not form dense thickets
- specialist pollinator
- lacking natural vegetative spread

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Example WRA for *Plumeria rubra* (frangipani)



Plumeria of rubra
Apocynaceae
Gerrald D. Carr

WRA Score: -5
Decision: Low Risk

Risk factors

- toxic/allergenic sap
- tolerates a wide range of soil conditions

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Features: Hawai'i Weed Risk Assessment System

- Designed to identify all types of pest plants
 - grasses, herbs, woody plants
 - invaders of natural areas
 - weeds of agriculture and forestry
 - nuisance species
- Don't need to answer all 49 questions
- Assessment can be done quickly (within a day)
- The WRA system is NOT a field evaluation of current distribution and current impact

Rather, it uses information on the biology and behavior of the species obtained from scientific literature and other documented sources to identify likely pest plants in Hawai'i.

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Goal and Purpose
Provide best available information

Issues for plants already in Hawaii

- H-WRA misses a few major pests (~ 5%)
- H-WRA rates some non-pests as 'low risk' (~ 20%)
- H-WRA still rates some species as "evaluate" (~15%)

Daehler et al. 2004. Conservation Biology 18:360-368

Slide 19

Reducing error rates for species already present

H-WRA Results plus

- How long has it been grown?
- How widely is it grown?
- What are its current impact in the field?

Hawaii Exotic Plant Evaluation Protocol (HEPEP)

For species in Hawaii - In order minimize the error by scoring and to further improve the system – it was supplemented by practical field information regarding the species behavior in Hawaii.

That is – how long it has been etc

To do this a special committee of various interest groups was set up to work out a practical protocol for providing evaluations based on the best available information.

The goal of this HEPEP is to supplement the HPWRA with unpublished, expert field observations from Hawaii

If it hasn't been widely planted it may not have had an opportunity to invade The committee consists of various interest groups to work out a practical protocol for providing evaluations based on the best available information.

Supplement the HPWRA with unpublished, expert field observations from Hawaii

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HEPEP V8 Draft Score Sheet

Species name: *Caesalpinia decapetala* HPWRA score

Evaluator: Forest Starr & Kim Starr Date: March 23, 2005

BACKGROUND INFORMATION

All entries in this form should be supported by documentation as described in Appendix I.


I. Current naturalization status priority natural and agricultural/forestry areas.

YES NO

If NO then no further evaluation is necessary. Go to **Committee Action**.

II -> Current Impacts, Natural Communities. See text for description of criteria and documentation requirements. Mark H or M; otherwise leave blank.

	Wet/moist <3000 ft elev.	Dry >3000 ft elev.	Montane >3000 ft elev.
i. Ecosystem processes			
ii. T&E or Rare Native Species			
iii. Native Vegetation	HIGH (1)		
iv. Community Structure			
v. Hybridizes w/ rh native sp.			
vi. Hybridizes with pine sp.			




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II-b. Current Impacts, Agricultural and Forestry Communities. See text for description of criteria and documentation requirements. Mark H or M; otherwise leave blank.

	Wet/moist <3000 ft elev.	Dry >3000 ft elev.	Montane >3000 ft elev.
i. Ecosystem processes			
ii. Control Levels			
iii. Production	HIGH (2)		
iv. Pests and Pathogens			
v. Hybridization			
vi. Toxicity			

II-c. Quality-of-life impacts. See text for description of criteria and documentation. H or M; otherwise leave blank.

i. Noxious plants in areas frequented by humans	HIGH (3)
ii. Vaginally toxic	
iii. Produces allergens	
iv. Resources expended for control in public areas	



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III. Potential for expansion of range. H, M, L

a. Native habitats	HIGH (4)
b. Agriculture and Forestry habitats	HIGH (5)
c. Observed rate of spread	HIGH (6)

IV. Difficulty of Management. H; otherwise leave blank.


i. No treatments available	
ii. Control causes significant damage to natives	
iii. Costs of known control are high	HIGH (7)
iv. Frequent retreatment required	HIGH (8)
v. Accessibility to control area is poor	HIGH (9)

COMMITTEE ACTION

Species Status: Based on information in Section II (Impacts). Indicate one:
 Documented invasive species in Hawaii
 Predicted to be invasive, but current evidence insufficient
 No evidence of invasiveness.

Significant Findings: Based on information in Sections II-IV

(1) *C. decapetala* has invaded about 150 acres of remnant lowland native mesic / wet forest in Halehale Gulch near Hahaione where it reaches densities over 75% from the ground to the canopy. *C. decapetala* can be found along the Hahaione Hwy. at Halehale Gulch, close to sea level. Average annual rainfall in this area is 60-80 in (152- 203 cm) (Froh and Ivick 1998). The yellow flowered vines can be seen growing on the walls and flat surfaces of the valley. The greatest density is found near the bridge on Hahaione highway. The density drops off on either side, but *C. decapetala* can be found all the way to the ocean and almost a mile uplope of the Hahaione highway. The upper extent in the gulch is



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Status of H-WRA

- Over 600 species have been screened
- Complete evaluation of these species can be downloaded from the Botany Dept website:

<http://www.botany.hawaii.edu/faculty/daehler/wra/default2.htm>

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Weed Risk Assessments for Hawaii and Pacific Islands

Hawaii-Pacific Weed Risk Assessment (HPWRA) is a research project by [Curt Daehler](#) (University of Hawaii) and [Julie Dunning](#) (USDA Forest Service) that has been supported by funding from the USDA Forest Service and from the Hawaii Division of Forestry and Wildlife, Urban and Community Forestry program. The WRA scoring system was originally developed in Australia and New Zealand for the evaluation of plants being imported. The aim of the HPWRA research project is to identify plants that pose a high weed risk in Hawaii and other Pacific Islands.

The HP-WRA score does not measure actual invasiveness or economic or ecological harm in the field. Rather, a designation of HPWRA is a prediction that a species will become invasive. The HP-WRA does not measure species benefits in terms of economic, ecological, public health, medicinal, historic, community, cultural, tourism, and aesthetic value; nor does it determine if a suitable alternative species exists.

The HP-WRA only considers published information on invasiveness in Hawaii or elsewhere and it does not include an actual "in-the-field" evaluation of current impacts in Hawaii. Another evaluation protocol called the [Hawaii-Pacific Plant Evaluation Protocol](#) (HPPEP) is being developed to provide a current field evaluation of species that have been designated HPWRA.

The HP-WRA ratings have no regulatory authority and the HP-WRA "list" is not an official State list of invasive plants. By statute, the Hawaii Department of Agriculture is solely responsible for determining which plant and animal species are prohibited or permitted into the State (Hawaii Administrative Rules 488-1 - "Noxious Weed Rules"). To determine which species are prohibited in Hawaii, please consult the official [State of Hawaii List of Plant Species Designated as Noxious Weeds](#).

WRA designation	Meaning
L	Not currently recognized as invasive in Hawaii, and not likely to have major ecological or economic impacts on other Pacific Islands, Hawaii, or the US.
LOW	Not currently recognized as invasive in Hawaii based on a track record of not becoming naturalized despite being widely planted in Hawaii for at least 45 years.
HPWRA	At risk to the islands of Hawaii and other Pacific Islands as determined by the hazard or published sources describing species biology and behavior in Hawaii and/or other parts of the world.
HIGH	Species that have caused significant ecological or economic harm in Hawaii. An abbreviated form of published information on the species' current impacts in Hawaii.
EVALUATE	The species has been identified using the HPWRA system; however, no assessment of risk can be provided at this time because 1) important information is missing from the assessment or 2) the species possesses a combination of traits and characteristics that make its risk biological difficult to assess using the HPWRA system.

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To download the **full assessment** for any species, please use our [search interface](#).
Completed assessments sorted by Genus

Family	Preferred species name	Common name	WRA score	WRA designation
Caprifoliaceae	<i>Abelia x grandiflora</i>	glossy Abelia	-13	L
Fabaceae	<i>Acacia auriculiformis</i>	Darwin Black Wattle	13	H (HPWRA)
Fabaceae	<i>Acacia confusa</i>	Formosan lca	10	H (HPWRA)
Fabaceae	<i>Acacia cassiarpa</i>	northern wattle	7	H (HPWRA)
Fabaceae	<i>Acacia farnesiana</i>	sweet acacia	14	H (HPWRA)
Fabaceae	<i>Acacia longifolia</i>	Sidney golden wattle	10	H (HPWRA)
Fabaceae	<i>Acacia mearnsii</i>	Australian acacia	15	H (HPWRA)
Fabaceae	<i>Acacia melanocorylon</i>	Australian blackwood	12	H (HPWRA)
Fabaceae	<i>Acacia nilotica</i>	gum arabic tree	14	H (HPWRA)
Fabaceae	<i>Acacia parameitensis</i>	Flammatta green wattle	9	H (HPWRA)
Euphorbiaceae	<i>Acalypha godeffiana</i>	Acalypha	-7	L
Euphorbiaceae	<i>Acalypha hispida</i>	chenille plant	2	L
Euphorbiaceae	<i>Acalypha wilkesiana</i>	beefsteak plant	-2	L
Arecaceae	<i>Acrostrochloa wrightii</i>	everglades palm	2	EVALUATE

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Current Status of H-WRA

- State has funded a 1-year position to make additional assessments
- Species are being screened at Lyon Arboretum
 - Focusing on species suggested by growers, importers and other plant professionals
 - Species suggested by Island Invasive Species Councils (ISCs)

shahin@hawaii.edu

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Current Status of HEPEP

- 69 species rated as "high risk" by H-WRA have been evaluated
 - 43 species categorized as "Documented Invasive"
 - Public release of findings pending review by HEPEP committee

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Acknowledgements

Funding from:



The slide features two logos side-by-side. On the left is the Kaulaunani logo, which includes a stylized tree and the text 'KAULANANI'. On the right is the UAS logo, which is a shield-shaped emblem with 'UAS' in large letters and 'UNIVERSITY OF HAWAII' below it.