Hawaii-Pacific Weed Risk Assessment

Hawaii Invasive Species Council
May 2012 Update

Chuck Chimera & Patti Clifford
Weed Risk Assessment Specialists
Alien species: plants or animals that were brought to a place by humans or through human activity.
Are all aliens bad?
Are all aliens bad?

No!
Not all alien species are ‘bad’.
...but we should be concerned if the alien species are **INVASIVE**.

**Invasive species:** alien plants or animals that don’t stay put; they reproduce quickly, spread easily, take over and cause harm

**Invasive = pest = nuisance species**
Invasion Process

transport from abroad
release
establishment

“ten’s rule”

spread

pest / impacts

ecological
economic
human health
Plant invasion pathways and problem

Many of the plants that are now invading the forests started as ornamentals in yards and gardens.
Plant invasion pathways and problems

- **Federal noxious weed list**
  - temperate species
  - 104 spp. or varieties
- **Hawaii noxious weed list**
  - mainly crop weeds
  - accidental introductions
  - 95 spp. or varieties
- > 8000 introduced plants
- New species each year

Smith 1985
It is LEGAL to import into Hawaii >99% of the plants that exist on Earth, no questions asked.
Getting Ahead of the Problem

1. Assessing the potential for a plant species to be invasive in Hawaii PRIOR to introduction.

2. Identifying and promoting non-invasive plants should be a priority.

3. The people working in the forest and the people working in the ornamental plant industry need to work together to educate each other and the PUBLIC.
Getting Ahead of the Problem

A Weed Risk Assessment (WRA) System is a proactive tool used to identify plants that pose a high risk of causing ecological or economic harm.
Developing the WRA system for Hawai‘i

• Several systems were examined for use in Hawai‘i

• The Australian AQIS system was most promising after simple modifications¹

History of the Australian WRA system

1994 Developed & tested in Australia
1995 Modified & tested in New Zealand
(currently used in both countries)
1998 Modified & tested for use in Hawai‘i
2001-2002 Further testing for use in Hawai‘i & other Pacific Islands
2002-present Voluntary compliance in Hawai‘i

¹Daehler and Carino 2000
Hawai‘i Weed Risk Assessment

Assign species score based on 49 questions

Score > 6 ➔ High Risk
Score 1-6 ➔ Evaluate Further
Score < 1 ➔ Low Risk

Example: WRA for *Miconia calvescens*

Score: 14
Decision: PEST

Risk factors

- Environmental weed of Tahiti
- Broad range (0-6000 ft elevation)
- Shade-tolerance
- Re-growth after mutilation
Example: WRA for *Miconia calvescens*

Score: 14
Decision: PEST

Risk factors

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

Photo by Forest & Kim Starr
Example WRA for *Plumeria rubra* (frangipani)

WRA Score: -5
Decision: NOT A PEST

Risk factors

- toxic/allergenic sap
- tolerates a wide range of soil conditions
Example WRA for *Plumeria rubra* (frangipani)

WRA Score: -5
Decision: NOT A PEST

Risk-reducing factors

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

Photo by Forest & Kim Starr
Uses of the WRA system in Hawai‘i

Species not yet in Hawai‘i
• assist with importation decisions

Species already in Hawai‘i
• allow informed planting decisions for nursery growers, architects, landscapers, foresters, land managers, ranchers, public
Characteristics of the Hawaii Pacific Weed Risk Assessment (HPWRA) System

- Objective
- Science-based
- Repeatable
- Transparent
- Reliable

Flora Practical Jokes
WRA Highlights: May 2011 - May 2012

- 1278 species screened (79 in 2012)
  - 528 High Risk (41.3%)
  - 593 Low Risk (46.4%)
  - 157 Evaluate (12.3%)

- Information used by government, public, industry & conservation groups statewide & internationally

- *Rubus Natchez* (High Risk)
- *Canavalia ensiformis* (Low Risk)
Landscaping / Horticultural Industry

SUSTAINABILITY ISSUE

HAWAI'I LANDSCAPE
The Voice of Hawai'i's Green Industry 2011

GOING NATIVE
LICN native plant initiative seeks to reverse the decline of native plants

OFFICIAL PROCLAMATION
Governor Neil Abercrombie proclaims July LICN Water Conservation Month

Non-invasive Landscape Plants with Fragrant Flowers

Pats Clifford* and Hao Kobayashi*
*Hawaii Invasive Species Council, CTAHR Department of Tropical Plant and Soil Sciences

Weeds are not friends to any garden. They cause more work and displace the flowers or vegetables that I am trying to grow. But I do understand that in our multicultural world, a weed to one person may be a medicine, food, or ornamental to another. Plants have many uses to humans; that is why we transport them with us as we traverse the planet.

In Hawaii, many of the native plants are endemics—they are not found anywhere else in the world. This rarity has made them vulnerable to imports from nonnative species. Some of the plants introduced here from other regions become weeds and displace the native plants. While invasive weeds may cause trouble in any garden, they create havoc in Hawaii’s delicate native ecosystems.

Hawaii’s natural ecosystems have one of the worst weed problems in the world. To help understand and cope with this problem, scientists developed a system, the Hawaii-Pacific Weed Risk Assessment (HPWRA), which can predict a plant’s ability to become a weed here. This system is based on the plant’s biological and ecological characteristics (its natural history, performance in its native environment, and behavior in other parts of the world).

By considering the information the system has assembled, we can predict how the decision to plant a particular plant may affect the native Hawaiian environment.

Preventing invasive species from becoming established in Hawaii is the most economically and environmentally efficient method of dealing with unwanted weeds. The plants in this publication have been assessed by the HPWRA. They are considered to be of low risk for invasiveness to Hawaii’s agricultural systems and native environments. For more information on the HPWRA, visit www.hear.org/ara.

To have a plant screened by one of the Hawaii Invasive Species Council’s weed risk assessment specialists, e-mail hpsrc@yahoo.com

Characteristics of invasive plants
Many of the attributes that we appreciate in our garden and landscape plants contribute to their ability to invade natural and agricultural ecosystems. These include:
- rapid growth
- easily maturing
- heavy seed production
- regenerative reproduction (i.e., pieces of roots, stems, or leaves can break off and grow into new plants; this can happen when green waste or plant trimmings are discarded)
- tolerance of dense shade (conferring ability to spread into the understory of native forests)
- having non-specific pollinators
- having a “seedbank” (i.e., seeds last for a long time in the soil and may germinate many years later, or they can accidentally be moved around with the soil)

How to use this resource
This document gives a brief outline of the characteristics of several plant species with fragrant flowers. Because of their low risk of invasiveness, they are suitable for planting in Hawaii’s landscapes. Resources for in-depth information on plant care are included in the references section. The HPWRA is a predictive tool based on current knowledge about a plant species. The system correctly classifies 80-85% of non-weed low-risk species. If one of the species described in this publication starts to exhibit invasive characteristics, please contact hpsrc@yahoo.com

Published by the College of Tropical Agriculture and Human Resources (CTAHR) and funded through Cooperative Extension Work Acts of May 31, 1914, and February 15, 1921, Cooperative Extension Service, U.S. Department of Agriculture. Authors: Pats Clifford, Hao Kobayashi, Cooperative Extension Service/CTAHR, University of Hawaii at Manoa, Honolulu, Hawaii 96822, and University of Hawaii Cooperative Extension, College of Tropical Agriculture and Human Resources, University of Hawaii at Manoa, Honolulu, Hawaii 96822. Additional funding through an established program for habitat enhancement and reintroduction of indigenous species in Hawaii. Copyright 2011, Cooperative Extension Service, U.S. Department of Agriculture. Results and conclusions are those of the author(s) and are not necessarily endorsed by the U.S. Department of Agriculture. Use of tradenames or commercial products is for reader information and does not imply endorsement. CTAHR functions can be found through the World Wide Web at www.ctahr.hawaii.edu/CTAHR.
“This tool has proven invaluable for evaluating new landscaping plants before introducing them.”

“The great thing about it is that anyone can submit plants for evaluation or check the website for plants they are considering before planting to see how invasive they might be.”

– Lelan Nishek, owner, Kauai Nursery and Landscaping quoted in Hawaii Landscape, April-May 2012 Issue
First Wind: Kaheawa Wind project

Non-invasive planting recommendations for revegetation projects
General Public

• Recent assessments for Miracle berry & others

Miracle Berry = -3 (Low Risk)
County Government

MAUI COUNTY PLANTING PLAN

Mountain rose = -5 (Low Risk)

Ashoka Tree = 0 (Low Risk)
State Government

- IHOP Promotion
- Local Christmas Tree Industry
Invasive Species Committees

- Early detection
- Target species prioritization

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• New *Leucaena* cultivars for cattle fodder
  – “I greatly appreciate the information, it's very timely that the two hybrids were recently run. Your response will be good guidance for our agency in general, as well as this specific project.”
    • Mike Constantinides - NRCS, Honolulu
  – “Thanks much for the thorough and fair weed risk assessments for *Leucaena KX2* and *Leucaena ‘Wondergraze’*. Your explanation and the full risk assessments are very helpful. I realize everyone is busy and I appreciate the fact that you were able to do this so quickly.”
    • Robert Joy – NRCS, Honolulu
Biofuels Assessments

Assessing Biofuel Crop Invasiveness: A Case Study
Christopher Buddenhagen, Charles Chimera, Patti Clifford

Abstract
Background: There is widespread interest in biofuel crops as a solution to the world’s energy needs, particularly in light of the concerns over greenhouse gas emissions. Despite recommendations about their adverse environmental impacts, it is important that biofuel crops be introduced into Hawaii on an appropriate regional or international scale and that their planting continue to be largely unregulated.

Methodology/Principal Findings: Using a widely accepted weed risk assessment system, we analyzed a comprehensive list of 40 commercially viable biofuel crops to show that seventy percent have a high risk of invading, moving, and/or spreading to a region of interest in Hawaii or in other locations with a similar climate. Although the current Hawaii Pacific Weed Risk Assessment (HPWRA) system is comprised of twenty-six criteria, our research has shown that there are twelve key criteria that are most likely to result in widespread and damaging invasions. This research provides a valuable tool for assessing the invasiveness of proposed biofuel crops at an appropriate regional or international scale, and their planting continues to be largely unregulated.

Conclusions/Significance: Because of climatic and ecological similarities, predictions of biofuel crop invasiveness in Hawaii are applicable to other vulnerable island and subtropical ecosystems worldwide. We demonstrate the utility of an accessible and easily compiled database and a prioritized list of the twelve most critical factors for assessing the invasiveness of potential biofuel crops. The HPWRA system is the first of its kind in the world to make widespread population and adoption of the “polluter/pays” principle.

Assessing Biofuel Crop Invasiveness For Hawaii: A Comprehensive Case Study
Christopher Buddenhagen, Charles Chimera and Patti Clifford

Background: There is widespread interest in biofuel crops as a solution to the world’s energy needs, particularly in light of the concerns over greenhouse gas emissions. Despite reservations about their adverse environmental impacts, no previous attempt has been made to quantify actual, relative or potential invasiveness of terrestrial biofuel crops at an appropriate regional or international scale, and their planting continues to be largely unregulated.

Methodology/Principal Findings: Using the Hawaii-Pacific Weed Risk Assessment (HPWRA) system, we analyzed a comprehensive list of 40 commercially viable biofuel crops (see images) to show that seventy percent have a high risk of becoming invasive versus one quarter of non-biofuel plant species (Table 1). The HPWRA system is the first of its kind in the world to make widespread and damaging invasions.

Conclusions/Significance: Because of climatic and ecological similarities, predictions of biofuel crop invasiveness in Hawaii are applicable to other vulnerable island and subtropical ecosystems worldwide. We demonstrate the utility of an accessible and easily compiled database and a prioritized list of the twelve most critical factors for assessing the invasiveness of potential biofuel crops. The HPWRA system is the first of its kind in the world to make widespread population and adoption of the “polluter/pays” principle.


Biofuels: The risks and dangers of introducing invasive species

Biofuels 1(5): 2010

2009 Hawaii Conservation Conference WRA Poster
Applications of the WRA Worldwide

• Australia
  • Evaluation
  • Regulatory implementation
• New Zealand
  • Regulatory implementation
• Czech Republic
  • Evaluation
• Bonin Islands (Japan)
  • Evaluation
• New York State
  • Regulatory implementation
• Florida, Texas, Canada
  • Evaluation
• Hawaii and Pacific
  • Voluntary implementation (Codes of Conduct)
  • Educational Tool
  • Evaluation
International Uses

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“We use the WRAs as both a technical and educational tool.”

“It may well be that the Hawai`i WRAs are not be the most suitable for other Pacific countries and territories, but at the moment they are the most valuable tool we have.”

– Bill Nagle, Project Coordinator, Pacific Invasives Initiative
Welcome to the Hawai‘i Pacific Weed Risk Assessment Site—49 questions about a plant

- What is the Hawai‘i Pacific Weed Risk Assessment (HPWRA)? It is a screening tool to ask “background questions” about a plant before it is imported or widely planted in Hawai‘i.

- How does the HPWRA work? HPWRA botanists look up published and on-line information to answer 49 questions about a plant’s biology, ecology & invasive tendencies elsewhere. The answers result in a score that predicts whether a plant is likely to be invasive in Hawai‘i or other tropical Pacific islands sharing a similar climate.

- How accurate is the HPWRA? The HPWRA is 95% accurate in catching the would-be invasive plants and 85% accurate at identifying non-pests.

- Does it cost anything to use? No. This is a FREE service to anyone that imports, grows, or sells plants or is otherwise curious about the potential behavior of particular plant.

- Am I required to use it? No. The HPWRA is voluntary for people who want to avoid planting or growing potentially invasive species.
Visitors Overview

Feb 8, 2012 - May 7, 2012

466 people visited this site

Visits: 732
Unique Visitors: 466
Pageviews: 2,149
Pages/Visit: 2.94
Avg. Visit Duration: 00:03:08
Bounce Rate: 54.51%
% New Visits: 63.25%

63.39% New Visitor
464 Visits
36.61% Returning Visitor
268 Visits
WRA Future Goals

- Continue timely update of completed assessments
- Continue assessments
- Update Excel-based assessments into database
- Collaborate on development of a web-based database
- Public Outreach
- Continue to provide content for Plant Pono
Conclusions

- The WRA system is an objective, effective, transparent AND economical tool for identifying and screening out pest plants.

- If WRA ratings were used for importation and planting decisions, Hawai‘i’s invasive plant problems and the associated costs could be greatly reduced.

"We never should have waited this long... Now the weeds have completely taken over."