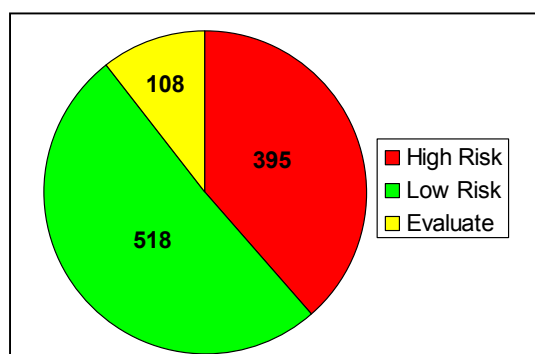


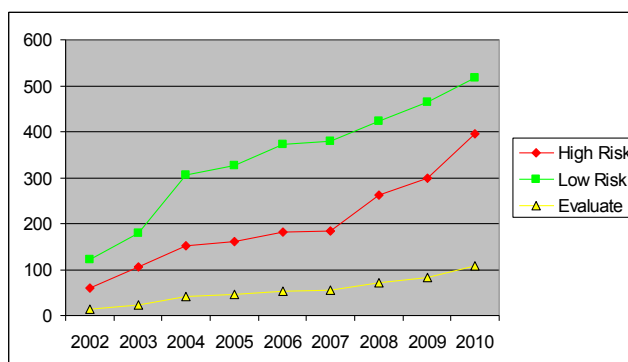
HAWAII-PACIFIC WEED RISK ASSESSMENT (HPWRA)

Two continuing objectives of the HISC Strategic Plan for 2008-2013, highlighted in previous HPWRA legislative reports, are to (1) “develop a comprehensive ‘approved planting list’ to ensure that invasive species are not being planted in State projects or by any state contractors, e.g. screened by the Weed Risk Assessment protocol” and (2) to “develop collaborative industry guidelines and codes of conduct, which minimize or eliminate unintentional introductions.” In accordance with these objectives, two Weed Risk Assessment Specialists are presently employed through funding provided by the Hawaii Invasive Species Council. Charles Chimera, based in the Maui Invasive Species Committee (MISC) office on the island of Maui, has been employed in that capacity from September 2007 to present. Patricia Clifford, stationed at the Bishop Museum on the island of Oahu, has been employed as a WRA Specialist from August 2008 to present.

The primary focus of the WRA specialists is to complete new assessments and update previously completed assessments with current information, both for the 10,000+ species already present in the Hawaiian Islands, as well as for new species introductions. As of September 2010, 1021 assessments, assigned to categories of “High Risk”, “Low Risk”, or “Evaluate”, have been completed. A continually revised, and updated list of completed assessments, as well as individual assessment reports, are available upon submitting a request to hpwra@yahoo.com.



1021 assessments by risk category



Cumulative assessment total by year and risk category

The following is a list of highlights and accomplishments from the period of September 2009 through September 2010:

WEED RISK ASSESSMENT DATABASE

In 2008, a research and technology grant was awarded to and administered by Sky Harrison, Pacific Basin Information Node (PBIN) Content Manager, to develop a database for the Hawaii Pacific Weed Risk Assessment System. The database was considered necessary for a reorganization and systemization of the data gathered in the

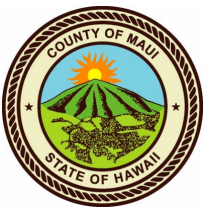
The screenshot displays the 'Weed Risk Assessment' software interface. The top section shows 'Assessment Details' with fields for Questionnaire, Assessor, Data Entry Person, HPWRA Designation, Status, Assessment Date, Request Date, and Multiplier. Below this is a 'Questions' window with a 'Go To Assessment Questions' button and a list of questions. The first question is '101-Is the species highly domesticated? (y=3, n=0)'. The 'Question Answers' section shows the answer 'n' and 'Answer Value: 0'. There are also buttons for 'Edit Assessment', 'View Answer Sources', and 'View All Questions'.

WRA database user interface

process of undertaking weed risk assessments, as well as to facilitate more consistent data collection, and improve the management of the process. In fulfillment of this contract, Sam Aruch, database designer, worked on its development from October 2009 through March 2010, in close collaboration with WRA specialists Clifford and Chimera, who provided input and feedback on design, database structure, and technical issues that have arisen throughout the development process. To facilitate the project, Chimera also participated in the RCUH tuition reimbursement program by completing a course at Maui Community College (ICS 360: Database Application & Design) during the Fall 2009 semester. Formerly, each risk assessment had been stored in a separate spreadsheet, which made retrieval of specific information tedious and time consuming. As of March 2010, however, new assessments are being entered into the database, which will ultimately provide easier access to data content and allow for trait and question-specific queries previously unavailable in the spreadsheet-based format.

WEED RISK ASSESSMENT REQUESTS BY AGENCY AND ORGANIZATION

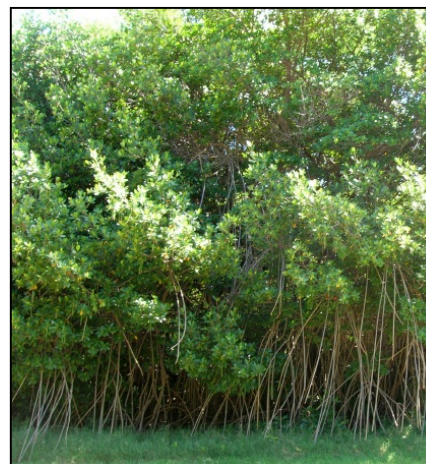
Maui County Planting Plan, County of Maui



In an effort to promote the use of low risk, or non-invasive plants in county landscaping projects, and to avoid planting of high risk, or invasive species, the county government, under the guidance of the Maui County Arborist Advisory Committee, has adopted information and followed guidelines provided by the Hawaii-Pacific Weed Risk Assessment system. In coordination with Ernest Rezens, retired Maui Community College Professor of Agriculture and planting plan project coordinator, WRA specialists have provided numerous new assessments, including 36 in 2010, for the revised Maui County Planting Plan, last updated in 1994. Using the revised plan, the County of Maui hopes to lead by example in their efforts to encourage responsible planting of non-invasive species in both public, and private landscaping projects, as primarily identified by the weed risk assessment screening system. The new planting plan is expected to be ready in late 2010 or early 2011.

Island Invasive Species Committees (ISCs)

WRA Specialists continue to screen requests from Oahu (OISC), Kaua'i (KISC), Maui (MISC) and the Big Island (BIISC) Invasive Species Committees to aid in early detection and prioritization for control of potential invasive plants. Assessments provide a concise and consolidated source of current references useful in implementing management decisions. As an example, early detection botanist James Parker requested an assessment for *Rhizophora mangle*, Red mangrove, in support of control efforts on the island of Hawaii. An assessment for *Macaranga tanarius* (WRA Score = 12), completed upon request for BIISC early detection efforts, also the target of control efforts by MISC staff on East Maui.



is

Red Mangrove (F. & K. Starr photo)
WRA Score = 8 (High Risk)

Early Detection and Rapid Response Team – Bishop Museum

HPWRA continues to be an integral part of plant species prioritizing efforts by the Early Detection team of the Bishop Museum and of the Big Island Invasive Species Committee and has provided assessments on requests from Oahu, Maui and Big Island early detection staff. Several of the completed assessments include such high risk species as *Flueggea virosa* (WRA = 7), *Linaria dalmatica* (WRA = 17), *Melochia umbellata* (WRA = 7), *Tithonia diversifolia* (WRA = 17) and *Tradescantia fluminensis* (WRA = 16) on Maui, *Ficus religiosa* (WRA = 7), *Chrysobalanus icaco* (WRA = 12), and *Setaria italica*



Anredera cordifolia (Starr photo)
WRA Score = 19 (High Risk)

(WRA = 9) on Oahu, and *Euphorbia tirucalli* (WRA = 11), *Jatropha multifida* (WRA = 8), *Piper auritum* (WRA = 15), *Hoya australis* (WRA = 8), *Gmelina asiatica* (WRA = 13), *Cestrum aurantiacum* (WRA = 15), *Anredera cordifolia* (WRA = 19), *Arenga pinnata* (WRA = 7), *Banksia integrifolia* (WRA = 5), *Boehmeria nivea* (WRA = 12), and *Morella cerifera* (WRA = 19) on the island of Hawaii.

Federal & State Agencies

Assessments have been completed and technical information provided for federal government agencies including the US Fish and Wildlife Service, the US Forest Service, the National Park Service, the Pōhakuloa Training Area Ecosystem Management Program, and from the state of Hawaii's Division of Forestry and Wildlife. Of particular interest were requests submitted by and completed for Heather Eijzenga, Landscape/Fauna Research Workgroup Facilitator, in support of a weed management plan for Kalaupapa National Historical Park on the island of Molokai. Several assessment requests were submitted by Jason Hanley, U.S. FWS Invasive Strike Team Leader to prioritize species' control and to support the implementation of the Laysan Island Ecosystem Restoration Plan.

Other Public and Private Organizations, Individual Plant Growers, and Landscape Professionals

The HPWRA program receives information and screening requests from plant growers, landscape professionals, and both public and private individuals and institutions including several requests from Kauai Nursery and Landscaping, Honolulu Botanical Gardens, the Nature Conservancy of Hawaii, University of Hawaii faculty and students, and others to assess individual species as well as new development planting lists for known or potentially invasive plant species. Of interest was a request submitted on behalf of a private landscaping contractor who believed a client's property was being invaded by an ornamental cactus. Research during the assessment process identified the true culprit as the pencil tree, in the Euphorbiaceae (*Euphorbia tirucalli*, WRA = 11), and the misidentified look-alike as the currently lower risk mistletoe cactus, *Rhipsalis baccifera* (WRA = 0).

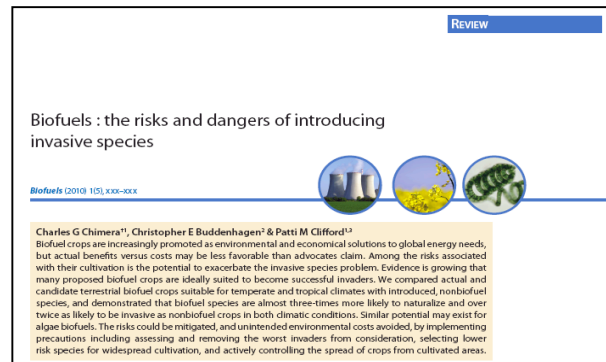


Euphorbia tirucalli (Starr photo)
WRA Score = 11 (High Risk)

BIOFUELS ASSESSMENTS & PUBLICATIONS

The Weed Risk Assessment system is utilized as an objective tool to identify both low and high risk crops proposed for biofuel development in the Hawaiian Islands and other tropical and temperate island ecosystems. WRA Specialists are actively involved in providing updated information to the public, industry and conservation agencies on the results of biofuel risk assessments and other findings.

As a result of these efforts, Charles Chimera, Chris Buddenhagen and Patti Clifford were invited to write a review on the risks of biofuel crop invasiveness, which includes a comprehensive analysis of biofuel crop species appropriate for tropical and temperate regions, for a forthcoming (2010) issue of the international, peer-reviewed journal *Biofuels* (Citation: Chimera CG, Buddenhagen CE and Clifford PM (2010). *Biofuels : the risks and dangers of introducing invasive species*. *Biofuels* 1(5): 785-796). As stated on the publication website, the journal “provides a forum for all stakeholders in the bioenergy sector, featuring review articles, original research, commentaries, news, research and development spotlights, interviews with key opinion leaders and much more, with a view to establishing an international community of bioenergy communication” (<http://www.future-science.com/loi/bfs>). In addition to biofuel proponents in Hawaii, this publication also has the potential to reach and positively influence a much broader national and international audience concerned with invasive species use in biofuel development.



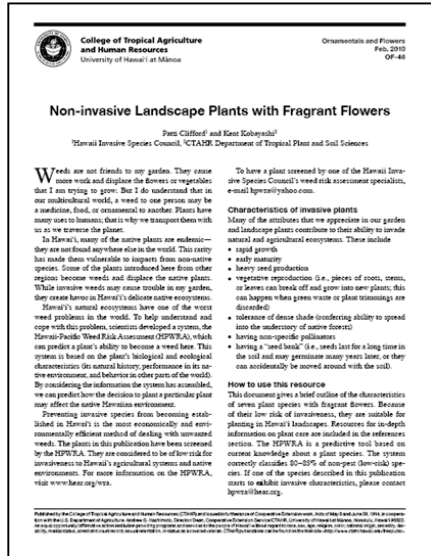
HPWRA OUTREACH

To continue to promote awareness and encourage adoption of the HPWRA system, WRA Specialists have been involved in additional outreach activities with partner agencies, signatories of the Codes of Conduct and other interested parties. As one example of a recent outreach tool, a new Facebook page was created in 2010 to convey the results of current assessments to a broader target audience. The following highlights additional outreach activities and efforts in greater detail.

LICH Newsletter: Jackie Kozak, HISC public relations and outreach specialist, featured and promoted use of the weed risk assessment program in an article written for the March-April 2010 issue of the Landscape Industry Council of Hawaii (LICH) newsletter. Kozak's regularly scheduled articles have and will continue to feature landscape and horticultural plants identified as low risk by the HPWRA, particularly those included in Patti Clifford's series of publications for the College of Tropical Agriculture and Human Resources (CTAHR).

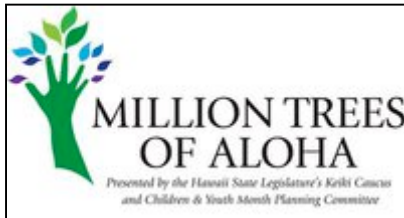


CTAHR Publications: To facilitate communication between HISC and the College of Tropical Agriculture and Human Resources (CTAHR), Clifford



participated in the RCUH tuition reimbursement program by completing a course at the University of Hawaii Manoa (TPSS654: Communications in the Sciences) during the Fall 2009 semester. As a result of this course, Patti Clifford and Dr. Kobayashi, CTAHR are collaborating to develop publications promoting the use of plant species that have received a low risk rating from the HPWRA. The publications describe the HPWRA system, characteristics of invasive plant species, and promote species that are low risk for invasiveness. The first publication highlights fragrant flowers (available at <http://www.ctahr.hawaii.edu/Site/Info.aspx>) and the second publication focuses on fruit trees (in press).

Million Trees of Aloha:



The Million Trees of Aloha project was launched in April 2010 by the Keiki Caucus of the Hawai'i State Legislature and the Children and Youth Month Planning Committee. The goal of the project is to plant one million native, non-invasive or fruit bearing trees by October 2010. Patti Clifford joined the efforts in March 2010 to promote the use of non-invasive tree species. She introduced the group to the HPWRA process and continues

to communicate to members of the group and the public on the usefulness of the HPWRA to encourage responsible planting of tree species in Hawaii.

OTHER TECHNICAL AND PROFESSIONAL CONTRIBUTIONS

In addition to fulfilling assessment requests, both WRA specialists continue to provide on-call technical information and advice on invasive plant species to both members of the conservation community and the general public. Patti Clifford has been utilizing her extensive technical expertise and knowledge of global positioning systems and GIS in the development of a training manual for both Bishop Museum and USFWS staff on the island of Oahu. She has also provided field training and has accompanied members of each organization on field work and training excursions in the Koolau Mountains, and in particular, has supported USFWS staff in botanical monitoring of the Oahu Forest National Wildlife Refuge (NWR). She also co-developed a field guide to assist in the identification of rare, threatened, endangered, and invasive plant species in the Oahu Forest NWR.



Charles Chimera fields calls to the Maui Invasive Species Committee office from members of the general public requesting information on plant identification and weed control strategies. He has also contributed to the development of a native plant demonstration garden and has provided native and non-native plant identification training to members of the MISC staff. In addition, he has served as a consultant for the East Maui Watershed Partnership to screen entrants for their annual conservation art exhibit to ensure that contributors do not submit work featuring non-native species.

After attending the second International Weed Risk Assessment Workshop (IWRAW) in Perth, Australia in 2007, Chimera contributed to standardized protocols for answering the 49 weed risk assessment questions. The results of that process were published in 2010 in *Plant Protection Quarterly* (PPQ), an Australian journal with an international circulation that publishes original papers on all aspects of plant protection (Citation: Gordon DR, Mitterdorfer B, Pheloung P, Ansari S, Buddenhagen C, Chimera C, *et al.* (2010) Guidance for addressing the Australian Weed Risk Assessment questions. *Plant Protection Quarterly* 25(2): 56-74). He also reviewed a manuscript on invasive geophytes submitted to PPQ and published original research on germination of weed seeds in a forthcoming issue (Citation: Chimera, CG, Drake DR (2010) Effects of pulp removal on seed germination of five invasive plants in Hawaii. *Plant Protection Quarterly* 25(3): 137-140).

In 2010, Chimera was invited to review research papers submitted to the journals *Plant Ecology*, the *European Journal of Wildlife Research*, and *Biological Invasions*, and has submitted or published papers featuring research on the invasive tree *Bocconia frutescens* (an assessment request from Pōhakuloa Training Area staff) for the journals *Biotropica* and *Biological Invasions* (Citations: Chimera CG, Drake, DR (2010) Patterns of seed dispersal and dispersal failure in a Hawaiian dry forest having only introduced birds. *Biotropica* 42(4): 493-502 and Chimera CG, Drake, DR (In Review) Could Poor Seed Dispersal Contribute to Predation by Introduced Rodents in a Hawaiian Dry Forest? *Biological Invasions*).

Lastly, using data collected during weed management trips supporting NPS and MISC staff in Haleakala National Park, Chimera presented a talk on reduction of native epiphytes on invasive *Psidium cattleianum* trees at the 2010 Hawaii Conservation Conference (Citation: Chimera, C (2010) Where Have All the Epiphytes Gone? Epiphyte decline on *Psidium cattleianum* in two Hawaiian wet forests. 2010 Hawaii Conservation Conference. August 4-6, 2010, Honolulu, HI).

CURRENT AND FUTURE WORKLOAD

Most of the individuals, agencies and programs previously mentioned submit plant species for screening on a regular basis, and the WRA specialists continue to produce new assessments, work on publications, and answer technical questions relating to particular species and their invasive potential. WRA specialists also directly provide recommendations on utilization of low risk alternatives to invasive plants in both public and private landscape and horticultural projects. In addition, there are over 700 assessments previously completed using the old spreadsheet format which will be entered into the new database as time permits. Both older, as well as future assessments, will be utilized in support of the new “Plant Pono” website currently under development. This website is a HISC Public Outreach Working Group priority

for FY10-11 and will incorporate and is dependant upon WRA-generated content in order to promote low-risk alternatives to the horticultural and landscaping industries, as well as to the general public.

Due to continuing budget restrictions and economic concerns, only one WRA position has been funded beyond December 2010. WRA collaborators and staff are actively pursuing additional sources of funding so that core productivity is maintained at current levels. Other avenues and alternative, non-HISC sources of funding continue to be sought.