Evaluation of Exotic Plants in Hawai'i:
Where we are. Where we could go.

Julie S. Denslow
USDA Forest Service
Institute of Pacific Islands Forestry

and

Curtis Daehler
Department of Botany
University of Hawai'i at Manoa

(submitted for online posting 19FEB2004)

PDF version: http://www.hear.org/wra/hpwra/evalofexplihi.pdf
HTML version: http://www.hear.org/wra/hpwra/evalofexplinhi.htm

The Need

Hawai'i counts in its flora over 1000 species of exotic plants that have naturalized, meaning that they are reproducing and spreading on their own outside of human cultivation. Some of these species cause considerable ecological damage to Hawai'i's remaining natural areas, speed the disappearance of rare and endangered species, reduce the carrying capacity of pastures, increase the maintenance costs of croplands, and interfere with our enjoyment of the outdoors.

The challenge is recognizing which introduced species incur ecological and economic costs and which simply become part of Hawai'i's tropical landscape and cause no real harm. While a number of lists of invasive plant species are in circulation, criteria used in these listings often are not documented clearly. The Hawai'i/Pacific Weed Risk Assessment and the Hawai'i Exotic Plant Evaluation Protocol are attempts to define a listing process that is clear, science-based, and documented, thus raising confidence of all users that the information provided is reliable.

Hawai'i/Pacific Weed Risk Assessment

Background. A research collaboration between the University of Hawai'i and the US Forest Service developed and evaluated an adaptation of the Australian/New Zealand Weed Risk Assessment protocol for use in Hawaii and other high Pacific islands. A summary of what adaptations were made, what additional screening was added, and how the results of the HPWRA compared with expert opinion can be found at http://www.botany.hawaii.edu/faculty/daehler/wra.

The analyses for over 360 species are posted at the same site together with documentation of the information on which each evaluation is based.

Future HPWRA Evaluations. The evaluations are being conducted under the supervision of Professor Curt Daehler, Dept. of Botany, University of Hawaii, with the assistance of botany graduate students and currently supported by funding through the Kaulunani Urban Forestry Program of DOFAW through at least December 2004. Continuation of species screening using this process will depend on the availability of funding and graduate students interested in conducting the library research behind the evaluations. The priority list of new species to be evaluated over the next year is taken from the recently published book: Rauch and Weissich. 2000. *Plants for tropical landscapes*. University of Hawai'i Press.

Additional requests for screenings can be made by submitting species names to Teresa Trueman-

Madriaga (Kaulunani Urban Forestry Program, ttm@hawaii.rr.com). Short lists (<5 species) will be compiled and screened with a turn around time of approximately 2 months. Longer lists will be reviewed by the Kaulunani Advisory Board before they are considered.

Exotic Plants in the Trade. The original protocol, developed by Paul Pheluong, was designed to screen plants proposed as new introductions into Australia and New Zealand. While the HPWRA could be used to screen new introductions, Hawai'i does not currently require that new imports be so evaluated. Thus there is also no straightforward way to know what species are being brought into the state. Instead, the HPWRA is being used to evaluate species already used in landscaping, gardening and forestry. Surveys have shown that more than half of exotic plant species currently spreading naturally were intentionally introduced, and that most of the exotic species that endanger Hawai'i's native ecosystems were first introduced for horticultural purposes.

Thus reducing the intentional use of high-risk exotic plants could reduce the spread and impact of invasive plants in the State. The HPWRA places species into two categories: 1) Plants that are likely to be pests in Hawai'i or other Pacific Islands, and 2) Plants that pose a low risk of being a pest in Hawai'i or other Pacific Islands. These ratings are based of species traits, species origin, behavior of the species elsewhere, and published information on species behavior in Hawai'i. A few species are also rated as "evaluate further".

The HPWRA can be used as a proactive tool for reducing the use of pest plants in landscaping or horticulture. Our results indicate that choosing to avoid predicted pests, as identified by the HPWRA, will reduce the use of about 95% of major plant pests. But this leaves some pest plants that are missed by the HPWRA. At the same time, the HPWRA rates roughly 15% of current non-pests as "pests". These species are "high risk" based on the HPWRA, but they do not yet exhibit invasive behavior in Hawai'i. Some of these species may not have had opportunities to spread into areas where they could become pests. Others may never become pests for a number of reasons, but only time will tell. While no risk assessment system can predict with 100% accuracy, making planting choices based on the HPWRA classifications will go a long way towards curbing invasive plant problems in Hawai'i and other Pacific Islands.

Hawai'i Exotic Plant Evaluation Protocol

An Additional Level of Screening. The HPWRA provides a powerful tool for predicting whether exotic plant species are likely to become invasive (having adverse ecological or economic impacts); however, in our testing the HPWRA failed to identify roughly 5% of major pest species in Hawai'i. One reason for the HPWRA's failure to identify these pests is that unpublished local information was not used in the HPWRA. To improve the reliability of lists of invasive species, we are developing a system that combines predictions based on the HPWRA with expert information on the behavior of species in Hawai'i. This approach will identify any serious pests among plants that were initially classified as "ok" by the HPWRA.

Furthermore, the HPWRA alone does not distinguish between current pests and plants that are likely to become pests over time. Among species rated as "pest" by the HPWRA, the new system under development will use field-based information from Hawai'i to determine which species currently incur high ecological and economic costs and which species have not yet demonstrated such high costs but pose risks for the future.

A group, tentatively called the Hawaii Exotic Plant Evaluation Committee (HEPEC), has been meeting under the auspices of the Hawaii Conservation Alliance to discuss how such an evaluation process might be constructed. Models for such a process have been developed by the California Invasive Plant Council, the California Nature Conservancy, and the University of Florida. The Hawai'i Exotic Plant Evaluation Protocol will incorporate the predictive capacity of the HPWRA and will assess exotic plants for their

economic as well as their ecological impacts.

Participants in the discussions include Pat Conant (HDOA), Nilton Matayoshi (HDOA), Robert Hobdy (DOFAW (ret)), Curt Daehler (UHM Botany), Rich Criley (UHM CTAHR), Lelan Nishek (Kauai Landscape and Nursery), and Linda Pratt (USGS-BRD). In addition we have had guidance from John Randall (California Nature Conservancy), who was instrumental in developing exotic plant evaluation protocols for California. Some of the issues being discussed include how to evaluate the impact of exotic species on native and managed ecosystems, what roles the actual and potential ranges should play in the evaluation, how to incorporate economic impacts, and what kinds of natural, novel and managed ecosystems should be of concern.

Development Plan and Timeline. Our plan is to develop a draft evaluation protocol for presentation at a June, 2004 Hawai'i Conservation Conference workshop. At that time we expect to make the draft widely available for public comment, including posting it on the HEAR website's weed risk assessment section (http://www.hear.org/wra) and circulating it to all agencies and committees involved in invasive species management. We will take comments and suggestions received at that time into consideration when producing a revision. Ideally the next steps will involve trial implementation, that is, using the system to flag current pests that were rated as "OK" by HPWRA while also evaluating current ecological and/or economic impacts of a suite of species that the HPWRA has predicted to be pests. The purpose is to differentiate between those species that currently cause significant impact and those that are "high risk" but have not yet demonstrated significant impacts. Because the reliable evaluation of impacts is necessarily information intensive, assessment of more than a handful of species will require the services of a technician or assistant to gather background data.

Three Lists. As currently envisioned, this evaluation process will incorporate information from the HPWRA and expert observations of plant behavior in Hawai'i to produce reliable, documented evaluations of plants in the nursery trade. The evaluations will allow plants already present in Hawai'i to be separated into at least three distinct groups 1) low risk species not known or predicted to cause significant ecological or economic harm, 2) predicted pests of natural and managed plant communities, but not currently observed to cause significant harm, and 3) documented pests that have already caused significant economic and/or ecological harm in the State.

Information Value. These determinations will be for information only; the committee has no official standing and, with the exception of plants on the Hawaii List of Noxious Weeds, no State or Federal regulations require that this information be taken into account when selling or planting exotic species. Nevertheless, it should provide a reliable source of information for nurseries, landscapers, gardeners, and public agencies seeking to take risk of invasiveness into account when choosing species to plant. It should encourage the search for non-invasive alternatives and raise public awareness of species that pose a threat to adjacent natural areas.

The envisioned HEPEC process does not replace the HPWRA, rather it reviews the list of species rated as "OK" by HPWRA to screen out current serious pests in Hawai'i, and it uses unpublished expert information about the current behavior of species in Hawaii to separate "PESTS" identified by the HPWRA into those species that have already caused significant ecological and economic harm and those that are high risks but have not yet caused significant impacts in Hawaii.

Note that this process will not produce recommendations on when or if certain species should be used. That determination will be up to individuals and agencies as meets their individual needs. Clearly reduction in spread of pest species through reduction in their use is the long term goal of this effort. None-the-less, we also recognize that many factors go into planting decisions. Safe alternatives to risky species may not exist and plantings in some settings pose a lower risk than in others.

What to Use in the Meantime

Unfortunately, development of a reliable system for assessing current field behavior and documenting impacts takes time and resources. It is gratifying that the demand for information on plant invasiveness is high, but frustrating that, under current staffing, we are unable to satisfy the information demand. How can we make the most informed decisions about plant selection while waiting for all of this to take place? The short answer is to use the best information currently available for each species.

1) *Results of the HPWRA.* When species have been screened through the HPWRA, the results are posted at www.botany.hawaii.edu/faculty/daehler/wra/. As the evaluations of more species are completed they will be posted there. Users should recognize that this is a predictive tool and experience in Hawai'i at this time may be at variance with some predictions. We welcome information on individual species where your experience suggests that the plant behaves differently in Hawai'i than predicted by the HPWRA. When HPWRA's are updated with new information, the assessment may change. Please recognize that in order to keep the HPWRA an objective assessment, we favor using documented facts and attempt to avoid anecdotal observations.

2) *Information on plant behavior elsewhere.* One of the strongest single predictors of invasiveness among exotic plants is the behavior of a species where it has been introduced elsewhere. If similar environmental conditions exist in Hawaii, the probability is high that the species will be invasive here if it is observed to be invasive elsewhere in its introduced range. Information on the behavior of species throughout their ranges can be obtained by checking sources provided on the HEAR (http://www.hear.org) and PIER (http://www.hear.org/pier) web pages. The HPWRA generally makes use of this information in making its predictions. But if the observations of invasiveness elsewhere appeared to be anecdotal or if few details were available, the information might not have been used for the HPWRA. A proactive approach to preventing invasions would be to avoid using any species that has been suggested to be a potential pest elsewhere. Nevertheless, not all pests in Hawaii are recognized as pests elsewhere, and the HPWRA identified some major pests that would not have been recognized based only on pest status elsewhere.