PROCEEDINGS

December 7-8, 2001

From Urban Landscapes to Native Forests: Invasive Species in Hawaii

Sponsored by
DLNR Division of Forestry & Life
USDA Forest Service
Kaulunani Urban Forestry Program

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An extraordinary two-day invasive species workshop was held December 7-8, 2001 on the island of Hawai`i. It's purpose was to create a setting in which diverse interests might meet to jointly discuss ways to stem the inflow of terrestrial invasive species into Hawai`i while maintaining an economically viable landscape industry.

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Guiding Principle

Recognizing both the disastrous impact of invasive species upon the biodiversity, economy and culture of Hawai`i, and recognizing the important economic and aesthetic contributions of nonnative species to Hawai`i—we seek to work with existing initiatives to develop and implement new practical tools, policies and processes to tackle existing problems, minimize the risks of introducing new invasive taxa and to balance conservation, economic and horticultural needs.

SUMMARY

From Urban Landscapes to Native Forests: Invasive Species In Hawai`i

The Problem
Hawaii is in the midst of an unprecedented extinction crisis. Hawaii's "wonders of creation" are in the process of being displaced by biological invasions - including Miconia, Australian tree fern, strawberry guava, and many other horticultural plant introductions. New weedy invaders are being introduced continually, with virtually no safeguards. These invaders threaten not only Hawaii's natural heritage but also its essential watersheds.

It is important to remember that the multi-million dollar control effort against miconia (*Miconia calvescens*) was necessitated by the actions of only one or a few individuals who decided to introduce this invasive pest to Hawaii.

Urban Forest Position
The landscape profession requires choice and diversity in the plants that it uses to create beautiful and interesting projects that serve many purposes. The landscape industry's survival depends on being able to design with new trees, new plants, new techniques and creating new effects. Constantly being one step ahead is a necessity to staying in business. The search for middle ground between the needs of the landscape professionals and environmental concerns requires the cooperation of the urban forestry industry and the industry directly involved with invasive species.

The Solution
Australia is one of the cleanest countries in the world and has always been proactive in the area of quarantine. Western Australia (WA) uses their isolation to their advantage and industries in WA are supportive of efforts to retain pest free status. Can Hawaii follow suit and adopt some of the processes effective in WA? Hawaii has many similarities to WA. Both have the advantage of geographic isolation. Both have good communications and are isolated, with highly developed state-of-the-art industries. There is no reason why Hawaii can't do the same thing as WA. The only apparent quarantine is when you're leaving Hawaii to go to the mainland. Who is looking after Hawaii?

No system is perfect. But if the *Weed Risk Assessment* process was adopted in Hawaii many invasive problems could be averted. The assessment could be used for making decisions on importing species, planting of questionable species and prioritizing species of concern.

Bottom Line – The prudent choice for the responsible horticulturist is to avoid invasive plants and instead, landscape or garden with either natives or non-invasive alien plants.

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Speaker: Lloyd Loope, *Research Scientist, U.S. Geological Survey*
Title: *Invasive Plant Impact on Hawaiian Ecosytems*

The Hawaiian honeycreepers, silverswords and many other groups of our islands provide some of the most spectacular examples in the world of evolutionary adaptive radiation in isolation over many millions of years. These groups and their fellow creatures comprise an essential component of the beauty and wonder of Hawaii.

Hawaii is in the midst of an unprecedented extinction crisis. Hawaii's "wonders of creation" are in the process of being displaced by biological invasions - including Miconia, Australian tree fern, strawberry guava, and many other horticultural plant introductions. New weedy invaders are being introduced continually, with virtually no safeguards. These invaders threaten not only Hawaii's natural heritage but also its essential watersheds. Several million dollars have been spent to date on Miconia containment alone, with no end in sight.

The costs are outrageous and the impacts immeasurable.

Speaker: Fred Kraus, *Research Biologist, Bishop Museum*
Title*: What are Invasive Plants? How Do They Get Here and Why are They a Problem? A Link Between Urban Landscapes and the Impact on Native Forest Ecosystem.*

Alien Species are being established outside their native range by the acts or means of humans. This does not mean that human mediated dispersal of species is inherently unnatural. But what it does do is recognize that humans are homogenizing the earth biota by moving these species around at a rate that is unprecedented in the earth's evolutionary history. What we see is a serious rate effect and in biology and scale, rate, difference, geographical range differences are everything.

Determining Plant Invasiveness

Plant invasiveness can be determined in either of two manners. First, we may rely on local evidence of invasiveness, typically indicated by a plant showing numerical dominance, physical dominance, alteration of nutrient or water cycling regimes, or alteration of disturbance regimes in an area. This is the most direct means of demonstrating invasiveness, but reliance on this method is of limited usefulness in protecting Hawaii because by the time evidence of invasiveness is locally available it is typically too late to effectively control the problem.

Secondly, one may rely on evidence of the behavior of particular plant species in similar habitats elsewhere. For example, if a particular plant has been shown to be invasive in Fiji for example, it is likely to be invasive in Hawaii as well because of the similar habitats in the two archipelagos. This method does not guarantee that a particular plant will be invasive in Hawaii but it does make it quite likely to be so. The strength of this line of reasoning is that it can be used proactively to entirely avoid introducing destructive plants to Hawaii or can be used to remove them at an early stage in the invasion process. For example, cogon grass (*Imperata cylindrica*) is widely destructive throughout the Old World tropics and in Florida and, consequently, is banned from importation into Hawaii. Similarly, Chinese privet (*Ligustrum sinense*) is highly invasive in the southeastern United States and in Australia, has started to form dense thickets in a small area of Kauai, and is, consequently, the target of a campaign to remove it from Kauai before it causes lasting damage.

How do invasive species get here?

Alien species came into the state accidentally - hitchhikers in one-way or another. The largest pathway is through ornamental materials - 36%, and crop plants, human food crops, forage crops for cattle, and timber forestry trees.

What attributes of a plant make it invasive?

How do the seeds get around? How a plant propagates (seeds or spores) is dispersed by animals or wind.

Because plants do not invade native ecosystems by simply pulling up their roots and moving there, it should be clear that plants disperse to new areas via movement of their seeds and spores. These propagules can disperse by a variety of mechanisms, but those propagules that are spread by animals or wind can most easily move long distances. Because of this trait alone, many plants that have animal - or wind-dispersed propagules have high potential to be invasive in Hawaii.

Wind-dispersed seeds can be identified by the structural features on the seeds that allow them to be carried long distances on light currents. These structures typically consist of either clusters of long hairs (such as seen in the milkweeds and asters) or wings (such as seen in hiptage or the maples).

Animal-dispersed seeds are typically fleshy berries, relatively small in size, and variously colored red, orange, yellow, black, or bluish-black. The dispersers of greatest importance in Hawaii (as elsewhere) are fruit-eating birds, but some mammals, such as pigs, are also important dispersers of some alien plant fruits.

An additional attribute making some of these plants even worse is that those species capable of growing vegetatively by cuttings also tend to be especially invasive. This is because of their ability to rapidly spread in thick mats and the ease with which new populations are accidentally started by humans disposing of unwanted garden waste. Many of the most invasive plants in Hawaii and other oceanic islands can reproduce vegetatively as well as by seed.

High fecundity

All else being equal, plants that produce many seeds per plant each year are far more capable of quickly invading native ecosystems than are those that produce relatively few seeds per year. For example, miconia (*Miconia calvescens*), which is the subject of a multi-year control effort by State, Federal, and private organizations, is capable of producing several million seeds per year per plant, making its rate of population increase explosive and partially accounting for the great threat it poses to Hawaii's forests.

Speaker: Lelan Nishek, *Owner, Kauai Nursery and Landscaping, Inc.*
Title: *The Day-to-Day Truths About the Urban Forest*

The truth is that there are many urban trees on any of a number of lists. However, salt sprays, high winds, drought conditions, compressed roots, highly compacted soils, sidewalk/curb retrofitting, utilities and branch height clearance reduce your selection appreciably. There are not as many trees as you think that can survive the average 8-10 year life span of an urban tree.

Not to mention that native plants are hard to get. Botanical garden and state nurseries collect seeds, but don't disperse them to nurseries to grow, resulting in few native nurseries. From a nursery standpoint there is little demand and it would be difficult to survive by growing natives.

In doing business landscape architects make commitments without checking with contractors. If native plants are called for in the plans, they seldom work and few plants survive beyond two to three years. Native gardens are difficult to maintain and from a nursery perspective there isn't a future right now in going native.

For example, at one project the proposed plants would not tolerate the brackish water. Since Kauai Nursery had to guarantee the plants, we asked for a change in the plant palette. Different locations require different plant. Nurseries look for new plants with minimum maintenance requirements that are disease resistant.

The nurseries say that meeting the client's needs and preferences is a major consideration. Survival in the nursery business depends on being able to design with new trees, new plants, new techniques and creating new effects. Constantly being one step ahead is a necessity to staying in business.

Speaker: Alan Fujimori, VP Planning/Landscape Architect, R. M. Towill
Topic: *An Appreciation of the Built Landscape*

Ultimately it is the client that drives the landscaping process, because the client has the final authority over the project. Surprisingly, the largest clients and consumers of the landscaping services are notably absent from this workshop and not represented here today.

Why do we need nature in the urban landscape? The more built up and developed our environments become, the more we need the natural abstract in the urban landscape. Landscape architecture acknowledges the beauty of the natural landscape, presents it in a controlled way within the human environment, the built environment in which we live on a daily basis.

Landscaping incorporates physical, functional and cultural factors, and historical references for perspective. An example of this process is presented in former president Jimmy Carter's boyhood farm. The project was a total preservation project that started from scratch (demolished home structure). Plant materials were researched in order to accurately restore the farm to a specific period in time. Historical documents and archived photos served as aides in the re-creation of a period in American life that had long since vanished.

One trend in landscaping is an increase in corporate projects that have a spillover effect into the public sector. An example provided is the new Disneyland entryway, though sponsored by the *Disney Corporation* that served to beautify surrounding streets in Anaheim with floral embankments, palm trees and street signs.

Climate and location are important design factors that affect the choices available to the landscape professional. For the Arizona canal bank project the cities of Phoenix and Scottsdale used water and shade trees to create an environment that will produce beneficial evaporative cooling that will prove beneficial to future inhabitants.

The image a corporation wishes to project often influences the landscape design selected. An example of a corporate image is the *Silicon Graphic Industry* (SGI) corporate headquarters. A youthful, dynamic, corporate image was expressed in the landscape design. The *Nike* headquarters in Beaverton, Oregon chose to express a strong corporate presence with an environmental ethos. The site was well incorporated into the natural surroundings, a wetland nearby was preserved and improved for wildlife benefits.

Landscaping also serves a powerful cultural purpose. At the Oklahoma Federal Building memorial, symbolism is presented throughout the planned design. An American elm in the courtyard stands as a resolute image of American strength and endurance. A reflecting pool is lined with fruit trees that represent the children lost in the attack.

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Plants serve special functions in our landscapes. They can serve as gates creating defined spaces that are differentiated from the entryway. Plants can remind us of home. For many residents home is a traditional backyard with a mango tree and a hedge. Poinciana trees provide vibrant color that stands out from the green foliage. Parking lots benefit from the shade that spreading trees provide.

Streets, parks, and open spaces serve to define a city or place by making the surroundings unique. Think of Union Square in San Francisco, Central Park in New York, and the Potomac River Pathway in Washington D.C. These are all places that are immediately identifiable by the distinct landscapes that their creators provided. In Honolulu the Monkeypod trees that line Kapiolani Street set the framework and create the backdrop of the setting that makes the city memorable.

The landscape profession requires choice and diversity in the plants that it can use to create beautiful and interesting projects that serve many purposes. The search for middle ground between the needs of landscape professionals and environmental concerns requires the cooperation of the various participants represented at this workshop.

Speaker: Rob Randall, Plant Profiler, Dept. of Agriculture, Western Australia
Title: *Plant Scoring in Australia - The Australian Experience*

Australia has a long history of quarantine. It's always relied on prohibition. Things aren't allowed in. Most quarantine systems rely on prohibiting plants, which only work some of the time. Batches of Canola seed, grown in New Zealand in the off season, and imported into Australia in 1996 were found to be contaminated with a host of weed species that were not on the prohibited list. Resulting in a tremendous expenditure for the removal of the weeds.

In Western Australia, state and federal laws have been instituted to prevent the spread of invasive weeds. All mail parcels are screened except the envelope itself. Checkpoints are set up on the major roads into the state to detect and prevent problem species. The quarantine system is very methodical.

How the Weed List Was Developed

Over 1000 importers who had imported plants into Western Australia in the last five years were consulted. The process involved collating the stock lists, (9,000 taxa), of the 125 responders and cross checking them against a list of known quarantine weeds. Few importers were inconvenienced. Each was sent a personalized letter indicating how much of their stock list was clean, prohibited and needing further study.

Following the list creation, the weed assessment phase was started. It took three months to screen the species. The permitted list was instigated by legislation. A base line data for assessments was established. It was essential to determine just what species were present in their state or region of concern. Information on native and naturalized species was obtained from herbarium and botanical gardens.

Now, the vast majority of time is spent looking at about 20 plant species or contaminants brought in per week. Nurseries and seed dealers bring in most species and fewer than 10% of the plants proposed for import are rejected.

Western Australia quarantine has two tiers.

- Dept of Agriculture is responsible for the provision of quarantine and inspection services at both a national and state level.
- Inspectors working for the Department of Agriculture administer both restrictions.

Assessment Times

Normally an assessment takes a few days. If the department is given a long list of plants to go through it can take up to a week. Compliance with the permitted list is only one requirement. Plants must also comply with a range of phytosanitary requirements; dips and sprays may be necessary for certain species. WA has many quarantine requirements that vary from species to species. As an importer you must have a lot on the ball. No second hand packing or tin packing materials are allowed.

Labels
Labels are not currently required for plants but might be in the future. Nurseries and consumers want to know the correct botanical name as a way of determining if they are getting the correct plant. The single biggest concern for some businesses is not knowing
botanical names of plants. Confusion often occurs with cultivar names of species and not understanding the relationship between varieties and subspecies within the species themselves. With hybrids it isn't always clear what the parent species of the hybrids are and it is very important. Parentage may include some weedy characteristics and the offspring may have some of those characteristics.

Because mistakes do occur, communications are vital in maintaining trust between the regulators and the business community. Many export nurseries now have quality compliance agreements with regulators and the state quarantine system, which speeds the import process. Some nursery owners have downloaded the permitted/prohibited list and have incorporated it into their stocklist.

Nationwide Ban on Sale of Species
The nursery and garden industry of Australia is backing a nationwide ban on the sale of 52 species from a proposed list of 100 environmental weeds. The *Nursery and Garden Industry Association of Victoria* is proposing to ban a list of 200 environmental weeds and the association in Western Australia is asking to ban a list of 190 weeds. State nursery associations are proposing even more. At a national level, in conjunction with these bans, they are developing campaigns that offer replacement species. As a marketing strategy, the nurseries are looking to make money by marketing replacements for the invasive species.

Marketing efforts have included national campaigns to raise public awareness. The media is very much on their side. The participation of major gardening magazines have brought additional attention to the invasive issue through weed warnings issued in publications.

Can Hawaii Follow Suit?
Australia has always been proactive in the area of quarantine. Western Australia (WA) uses their isolation to their advantage. Industries in WA are supportive of efforts to retain pest free status. Australia is one of the cleanest countries in the world.

Can Hawaii follow suit and adopt some of the processes like WA? Hawaii has many similarities to WA. Both have the advantage of geographic isolation. Both have good communications and are isolated, with highly developed state-of-the-art industries. There is no reason why Hawaii can't do the same thing as WA. The only apparent quarantine is when you're leaving Hawaii to go to the mainland. Who is looking after Hawaii?

Bottom line – No one went out of business as a result of the permitted list.

Additional information from Rod Randall

Attributes of a Weed Risk Assessor

A background in weed biology /ecology and an ability to work under pressure from numerous lobby groups and to be politically neutral. Must be consistent in your approach.

Software Tools

Climate matching programs are useful if not essential. A weed assessment spreadsheet – based on excel is used in WA. Internet access is critical for access to numerous online databases and information sources, like *Tropicos* (Missouri Botanical Database), *USDA Plant Database*, and the *Hawaii Ecosystems A Risk (HEAR*) site. Data must be assessable immediately.

Full Weed Assessment Layout

- Listing of all synonyms and common names
- Background to the report
- Biology and ecology of the plant
- Weed status elsewhere in the world
- Weed status in Australia including weed assessment score
- Climate profile indicating potential range
- Discussion and recommendations

Assessor Contact List

- Industry deal with a range of groups
- Agricultural and other researchers
- Botanic gardens
- Government agencies
- Horticultural societies – (garden clubs)
- Horticulturists in general
- Nurseries
- Seed dealers
- Specialist collectors (orchids, cacti, bromeliads)
- Revegetation specialists
- Zoological gardens

Speaker: Curtis Daehler, Associate Professor, Dept. of Botany, UH-Manoa
Title: *Plant Scoring: A Viable Solution for Hawaii*

Estimates on the direct costs of invasive species range from 3.5 to 5 billion dollars, with indirect costs of 7.4 billion. The year 2000 estimate placed costs up to 34 billion dollars. The non-monetary costs include the loss of native species and ecosystem services. For example, South Africa is experiencing fresh water shortages due in part to species invasion.

The Federal *Noxious Weed Act* lists 93 prohibited weeds, mainly identified as agricultural weeds. However, natural invaders and agricultural weeds are largely exclusive, with some overlap. The state of Hawaii noxious weed list includes 78 species, two-thirds of which are herbs, most of which are already present in Hawaii, and agricultural weeds. The biggest threats are from purposeful introductions, either crop or ornamental species, not accidental introductions.

Scoring
Hawaii must implement a scoring systems to identify natural area invaders. A switch from a dirty list approach to a clean list approach is recommended.

The *Weed Risk Assessment* (WRA) system used in Australia and New Zealand proved effective in identifying aggressive invasive species with 91% effectiveness. The system did not accept any species from the known invasive species list.

The WRA system has 49 questions including: domestication, climate/distribution, evidence that the species is a weed elsewhere, and undesirable traits. The process produces a numeric score <0 gives an accept label, 1-3 an evaluate label, 4+ a reject label. The risk assessment results completed were compared with opinions of agriculturalists, conservationists and botanists. There was a 60-70% agreement between the assessment and the opinions. The variation among professionals was found to be much larger than that of the scoring system.

The *Weed Risk Assessment* system will be used in Hawaii to score invasive horticultural plants. Specifically species that may be widely invasive in Hawaii but not widely established on all islands, and species that are not yet widespread or a serious problem in Hawaii but are beginning to show invasive tendencies.

The assessment process takes approximately 6 hours per species, and requires access to a library like that found at the University of Hawaii, Manoa and the internet.

Conclusion
No system is perfect. But if the assessment process was adopted many invasive problems could be averted. The assessment could be used for making decisions on importing species, planting of questionable species and prioritizing species of concern.

AFTERNOON BRAINSTORMING SESSION

The participants broke up into three smaller groups: *Invasive Species, Industry Compliance and Education* to brainstorm ideas, goals, and concerns. A representative from each group presented their prioritized goals.

Invasive species Presentation

1. Use Forest Service funds to hire researchers at the University to score species.
2. Use Kaulunani funds for the next workshop that will review the results of the scoring process.
3. Develop a clean, dirty and requiring further study plant list.
4. Establish a list of landscaping plant alternatives using the *Maui County Planting Plan* list as a cross-reference
5. Continue to score plants to clear the 4-5 year backlog.
6. Conduct a non-biased review of quarantine and noxious species law.

Industry Presentation Summary

1. Establish trust and ownership. (*The industry is very concerned about sharing information if it may jeopardize their position. There is an apprehension about the decisions the environmentalists will make.)*
2. Find ways to alleviate the apprehension concerning invasive species legislation, policy, and the prohibited list.
3. Identify what can be done with the industry's existing inventory.
4. Include the urban forestry industry in the banned/prohibited list creation process.
5. Draft a code of ethics that can be adopted by all parties.
6. Steps by the Hawai`i State Department of Agriculture to follow up on opportunities that may exist to move Hawai`i toward adopting some of Western Australia's administrative procedures for making regulatory decisions regarding what can and can't enter Hawai`i.

Education Presentation

1. Develop media strategies that will target broad public support, once the priority list of species is created. The message shall be positive, unified, and consistent with industry buy-in.
2. Address the negative labels associated with non-invasive alien species.
3. Provide more positive associations or labels for species that are benign although they are non-native.

Comprehensive List of Ideas Generated by Each Group

Invasive Species

- Funding is a big concern
- Develop a clean list
- Provide access to questionnaire assessment
- Information should be transparent, useable and understandable
- Avoid duplication of lists
- Identify technical resources
- Commonly used plants
- Provide alternatives to landscape industry
- Create a list of what's here
- list of what's coming
- Create a grassroots education campaign
- Partner with agencies not here i.e. Military, Department of Transportation, large landowners, Fish and Wildlife
- Economic incentives tax break
- Recognition for quality projects
- Buy-in by all
- Develop a cultural use list
- Public relations and media on invasive species
- Find out the needs and comments of those not represented here
- Provide a list of high value hardwoods that are acceptable
- Identify sources of approved plants
- Develop a non-biased review of quarantine and noxious species laws
- Consensus mechanism
- Master database of imports
- Process/length of time for change
- Accessible website for concerns and info
- Human and economic factor
- Grandfather clause
- Alerting system interagency
- Designated paid leader
- Monitoring voluntary compliance
- Tax incentive for voluntary cleanup
- Review risk assessment process
- Management plan for fallow land
- Prohibit the give-away of free inappropriate trees
- Authority for implementation
- Stop the duplication of state and federal actions
- Keep abreast of what is happening in other places

- Develop a link between industry and research information flow
- Fill urban forestry position at UH CTAHR horticulture
- Evaluate new crop introductions

Industry Compliance

- Develop an annual award recognition with cash prize
- Foster ownership
- Develop trust
- Identify efficient compliance
- Provide reasonable incentives
- Public/botanic gardens to distribute seeds for alternative
- Develop value for native plants
- Develop pest-free certification for retailers
- Develop ideas on how to comply for industry
- Code of ethics use Missouri consensus as guideline
- Ideas on how to involve industry
- Define industry i.e. mainland firm military
- Establish demonstration plots to showcase use
- New cultivar center to test new "nursery friendly"
- Speed up process
- Develop compliance agreements
- Develop new vision for landscape designers
- Allow flexibility based on environment
- Quick analysis
- Target mainland importers - seed companies and large retailers
- Develop a marketing incentive program for replacements
- Create a public information center for alternatives
- Develop an alternative species list
- Board of water supply various quality of water availability and plant selection
- Industry should lobby the government
- State owned land uses win/win and private land uses
- Adjust species lists in planting plans
- Botanical gardens collection review for positive/negative
- Identify what needs to be fixed quickly (obstacles for those) = process change
- Develop a mechanism for non-compliance
- Peer pressure voluntary
- Conduct a cost-benefit analysis
- Create targeted marketing to encourage alternatives
- Look to acquiring a federal grant that will identify how to make money from invasive species
- Explore how to increase the use of native plants

Education

- create packet of workshop information
- statewide marketing with catchy phrases
- dictatorship vs. facilitator - attitude
- Copy Australian marketing effort and media campaign
- Message can affect how we see others, "alien" "invasive" "native" words we use
- Airport messages
- Clearinghouse for information
- Media
- Multi-lingual literature
- Mass use of media
- Integrated into education curriculum
- Top ten most desired to keep out species
- Use existing publication
- Integrate in university curriculum
- Determine all audiences for greatest impact
- Spread word of today's work immediately
- Send press release to participants
- Tell 3 people next week
- All organization do press releases
- Media representatives on board
- Media strategies
- Education lacking to industry to include scoring sheet
- Identify actual examples of where invasive species are happening
- Develop images for public understanding
- Develop youth education
- Lobbying efforts
- Need urban forestry landscape architecture school
- Identify strategic locations for demonstration plots, i.e. airport

From Urban Landscapes to Native Forests: Invasive Species in Hawaii

Websites to learn more about invasive species.

http://aliens.bishopmuseum.org/

www.hear.org

www.hear.org/pier/

www.state.hi.us/dlnr/dofaw/hortweeds/

www.invasivespecies.gov/

Attendee List

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