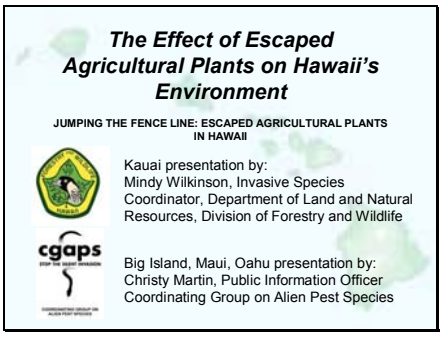
"Effect of Escaped Agricultural Plants on Hawaii's Environment"

Dr. Mindy Wilkinson, Invasive Species Coordinator, DLNR
Christy Martin, Public Information Officer, CGAPS

October 27, 2006

Slide 1



This talk is intended as an overview of the issue of escaped agricultural plants in Hawaii. We will start by reviewing the natural history of Hawaii, pre-human contact through today, with a few recommendations for the future.

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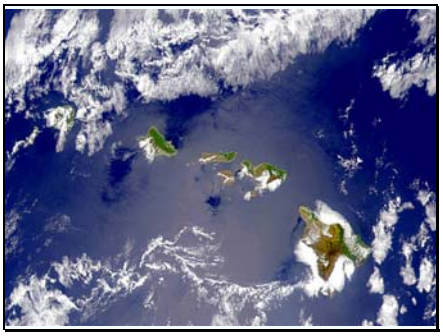

The Hawaiian Islands are the most isolated islands on Earth. For millions of years, the Pacific ocean has functioned like a moat, surrounding the islands, ensuring that only a few species arrived prior to the arrival of people.

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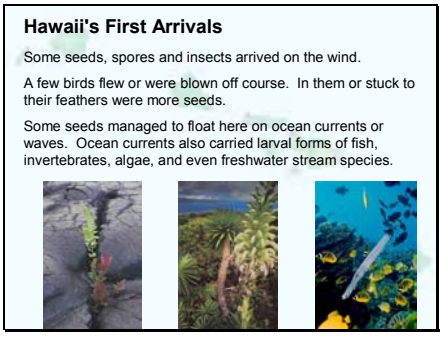

Some seeds, spores and insects arrived on the wind.

A few birds flew or were blown off course. In them or stuck to their feathers were more seeds.

Some seeds managed to float here on ocean currents or waves. Ocean currents also carried larval forms of fish, invertebrates, algae, and even our freshwater stream species.

It is believed that these were infrequent occurrences--perhaps one insect or plant, or animal arrived in a hospitable location and was able to reproduce successfully, only once every 35,000 years.

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The extreme isolation of the islands + a wide variety of environments + very slow change = native species (and astounding levels of endemism – today about 39% of all species found are endemic, found nowhere else in the world).

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Polynesian settlers brought a suite of extremely practical species as well as some probably unintentional species with them (including Polynesian rats and geckos). Of the approximately 34 species introduced by Polynesians, 24 were plants with high value as food, medicine or textile fiber. Most of these plant species did not spread or form reproducing populations outside of cultivation, although a few (6) did.

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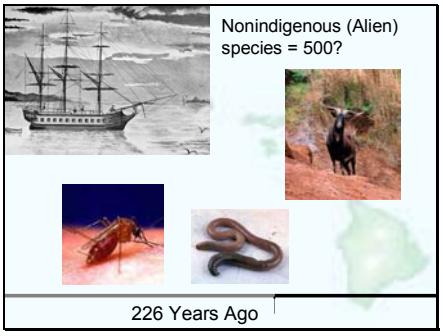

Captain Cook's arrival was the starting point for the introduction of a familiar suite of species that traveled with European settlers worldwide. The most ecosystem influencing introductions were ungulates (goats, boars, cattle, horses, donkeys, sheep), earthworms, domestic cats, and many of the familiar bird species (house sparrows and finches, rock doves, as well as several species of popular Chinese caged bird species). Unintentional introductions include the black and ship rats, mosquitoes, termites, and slugs. Plants introduced in the early part of this time period were primarily food crops.

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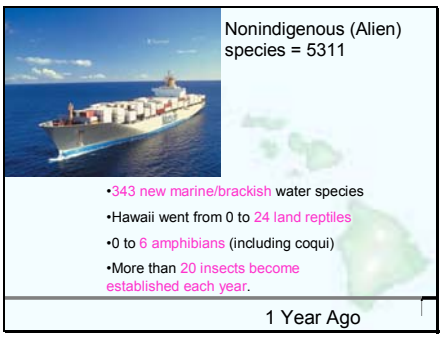

Today, we have larger, faster, more frequent modes of transport.

Photo: Matson lines MV R. J. Pfieffer

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A recent estimate was that over 10,000 plant species have been planted in Hawaii and that many of these have not yet filled their potential to become ecosystem modifying pests.

Photo: Tibouchina herbacea (state noxious weed)

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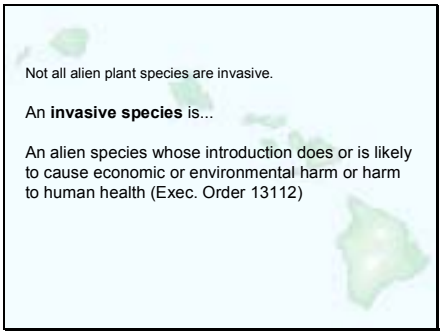

Not all alien (introduced) species are invasive. Exec. Order 13112 (from the Federal Executive Order that established the National Invasive Species Council) lays out an official definition.

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Today, native Hawaiian ecosystems are so fragmented that it is not feasible to remove all invasive species. The majority of the ecosystems that surround residential areas are composed of introduced species that most people recognize as part of the Hawaiian landscape. These communities serve functions such as the watershed for Honolulu and habitat for the more flexible native species.

However, we must identify the most damaging species--the ones that threaten rare species, ecosystems and natural resources.
We must also recognize that invasive plants continue to be imported and planted and that these may cause further damage.

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Effects of Invasive Plants

Exclude other plants by resource competition: space, sunlight, water, nutrients

Exclude other plants by chemical competition

Change watershed recharge/water cycle

Change soil stability

Change fire regime

Change/reduce habitat and resources for other species

Support/promote other invasive species

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Fence Jumping Plants

Introduction reasons vary:

Ornamental uses
Agricultural uses
Utilitarian

Many invasive plants are helpful in some areas even while damaging other areas.

People intentionally introduce plants for a variety of reasons.

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Cattle were protected for years following their introduction by a Hawaiian kapu that banned hunting them to allow them to multiply. Over time much of forest that was cleared for expanding cattle ranches became open savanna land under grazing pressure coupled with burning and the introduction of old world bunch grasses. The fire cycle fueled by the grasses has replaced native woody ecosystems partly due to the fire-intolerance of many Hawaiian species, and thick growth of grasses also keeps native plants from germinating or flourishing.

Photo L: Auwahi Exclosure at Leeward Haleakala, surrounded by cattle-grazed grasslands at Ulupalakua Ranch.
Photo R: Kikuyu grass introduced as pasture grass.

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A number of plants were introduced as food crops, and a few got away.
Photo L: Strawberry guava was introduced in the early 1800's and is one of the major pests of native forests.
Photo bottom R: Several species of Rubus (raspberries and blackberries) were introduced; now spread by birds and other animals.
Photo top R: Ivy gourd was probably introduced as a backyard crop that has escaped

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Years of damage to watershed forests and hillsides due to wild cattle and other feral ungulates, along with logging for sandalwood and other species led to a massive reforestation effort. Species like alien Acacias, Eucalyptus and Ficus were chosen because they grow quickly and spread on their own.
Photo L: Black wattle, reforestation tree and ornamental tree
Photo R: Formosan koa, reforestation tree and ornamental tree

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Others were planted for industry such as several species of eucalyptus

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Two of the worst environmental weeds were introduced intentionally via horticulture. One of the highest profile plant pests in Hawaii is Miconia (Miconia calvescens). Introduced to Oahu in 1957 and now infests 111,000 acres on the Big Island and 25,000 acres on Maui. Smaller populations on Oahu and Kauai are present but the high growth rate and numerous berries with high densities of frugiverous birds makes continued and expanding surveys necessary. Inspiring continued efforts Tahiti, who's similar climate and geology make their experience of having over 70% of their native forests replaced by Miconia reason enough to keep looking for ways to control this species. Fountain grass has a similar history and this showy plant is still commonly sold outside Hawaii as an ornamental. It has an elevational range from sea level to 9000 feet, is unpalatable to grazing animals, promotes fire and manages to replace existing vegetation even will a low documented seed set.

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Fountain grass has a similar history and this showy plant is still commonly sold outside Hawaii as an ornamental. It has an elevational range from sea level to 9000 feet, is unpalatable to grazing animals, promotes fire and manages to replace existing vegetation even with a low documented seed set.

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Australian tree ferns are grown as a substitute for the slower growing hapuu. Unfortunately they also spread to the forests where they occupy the space formerly available to the native species. This is an imperfect replacement as the trunk of the introduced tree fern does not nurture the same suite of epiphytic plants or act as a nurse plant to the native canopy trees.

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Gorse was introduced as a "living fence", but spread through pastures instead

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Accidental introductions

There are also a few examples of accidental introductions, these two came in as seeds. Fireweed (left), bush beardgrass (right).

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Surveying for Plants: Playing Catch-up

From: Roadside Survey and Expert Interviews for Selected Plant Species on Maui

(Forest Starr, Kim Starr of PCSU; Lloyd Loope of USGS PIERC)

Compiled a list of **126 invasive plants** known to be invasive AND cultivated on Maui.

Drove 1,246 miles of roads at 5-10 mph to survey for and map these plants; collected additional location info from interviews, etc.

A USGS BRD project to survey for invasive plants used two trained botanists to drive 1,246 miles of roads on Maui, at 5-10 mph to survey for and map 126 invasive plants.

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Surveying for Plants: Playing Catch-up

44% were widespread (+50 locations)
27% were medium distribution (10-50 locations)
23% were limited distribution (-10 locations)
6% were not found...and...

10 species showed range extensions

11 new state records

29 new island records

The results showed that many invasive plants were widespread or spreading, and that there were new invasive plants showing up on Maui/in the state.

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Surveying for Plants: Playing Catch-up

Of the 126+ invasive plants in the survey, less than 5% were unintentional introductions.

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Addressing the Problem

Ongoing control of invasive plants via field crews and biocontrol

Planting with native plants (or at the very least, non-invasive plants)

How do we address the invasive plant problem? We need to conduct ongoing control of the worst invasive plants using field crews and biocontrol. And we need to start planting non-invasive plants!

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Getting Ahead of the Problem

There are an estimated 250,000 plants in the world. Identifying the species that could pose a high risk to Hawaii before introducing it

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

Identifying and promoting non-invasive plants is a priority.

Of the 10,000 species of plants introduced to Hawaii perhaps a couple hundred are damaging. There are an estimated 250,000 plants in the world. Identifying the species that pose a high risk to Hawaii's environment and economy before introduction seems reasonable. And we have the tools to be able to do this.

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Moving towards a more proactive system

December 2001 meeting between plant industry and conservation groups organized by the Kaulunani Urban Forestry Program

Agreement: Dr. Curt Daehler of the University of Hawaii at Manoa and Dr. Julie Denslow of the U.S. Forest Service Institute of Pacific Islands Forestry would look at adapting and testing the **Hawaii-Pacific Weed Risk Assessment system** which was modified from Weed Risk Assessment systems used by New Zealand and Australia

The WRA system requires a "plant screener" to use published data to answer 49 questions about a plant's biology, ecosystem requirements and invasive history elsewhere

We should at the very least, ask questions about a plant's natural history before we import and plant it. The Hawaii-Pacific Weed Risk Assessment system is a good tool for doing this, and it would show us the potential of a plant to be invasive (or not likely to invade) if planted in Hawaii. 49 questions about a plant.

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Codes of Conduct

Hawaii Goals: 3 main points

1. Have new plant introductions screened for their potential to be invasive (the Weed Risk Assessment sys).
2. Work with natural resource/conservation groups to identify some incipient (not widespread) invasive plants and agree to discontinue use/sale.
3. Identify non-invasive alternatives and help promote the use of non-invasives.

The problem is that we are all used to bringing in and selling whatever we want. So we are asking the plant industry (including nurseries, landscape architects, garden marts, botanical gardens and arboreta) to work with us on a project called the "Codes of Conduct". This Codes project has three main goals--we are asking plant industry to (1,2,3)

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It just makes more sense to prevent new invasions, or to nip incipient (newly escaped) plants before they become widespread, than to spend our money and resources looking for the next ornamental that has jumped the fence.

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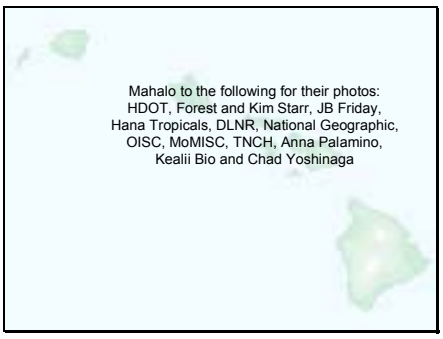

Mahalo.