



Renewable Resources Extension

# Hawai'i Forestry News



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## A Note from our Extension Forester

### YEAR OF THE HAWAIIAN FOREST

The year 2003 marks the centennial of the establishment of the Forest Reserve System in Hawai'i and has been declared the Year of the Hawaiian Forest. The focus is on the value of the forest in protecting our essential watersheds and in harboring our unique native plant and animal species. The Division of Forestry and Wildlife has set up a special website ([www.dofaw.net](http://www.dofaw.net)) with information on forestry and conservation events throughout 2003. Help celebrate the Year of the Hawaiian Forest by taking a friend for a walk in the woods.

While no one denies the overwhelming value of the forest in protecting Hawaii's watersheds, timber harvested both from native forest and planted stands is also valuable both economically and culturally. Dr. John Yanagida, Dr. Richard Bowen, Quincy Edwards, and I are working on a more detailed update of the 1993 forest industry survey which found that the final value of the Hawaiian forestry and woodworking industries was \$29 million annually. If you have received a copy of this year's survey, please take the time to fill it in and return it!

Sincerely,

J. B. Friday

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*Participants in the 2002 mycorrhizal inoculation workshop learn about inoculating koa seedlings.*

### Workshop on Mycorrhizal Inoculation Hilo, July 18th, 2003

Mycorrhizal fungi in the soil play an important role in helping plants take up nutrients and resist disease and may help drought resistance. While most plants in native ecosystems associate with mycorrhizal fungi naturally, the fungi may be sparse in disturbed sites and inoculating seedlings may be a powerful way to give them a head start. This workshop is intended for nursery operators, organic farmers, foresters, and those working in habitat restoration and in the propagation of native plant species. Participants will learn why mycorrhizal fungi are important and how to produce and apply mycorrhizal inoculum. The text for the workshop is "Arbuscular Mycorrhizas: Producing and Applying Arbuscular Mycorrhizal Inoculum", by Dr. Mitiku Habte and N. W. Osorio, which is available for sale from the CTAHR Publications office, 3050 Maile Way Room 119, Honolulu, HI 96822. The text will be included the registration for the workshop. If ordered separately the price is \$7.00 plus \$3.00 shipping and handling. Order forms may be downloaded from the Web at <http://www.ctahr.hawaii.edu/forsalepubs>.

### *Workshop on Mycorrhizal Inoculation (cont.)*

Instructors for the Hilo workshop will be Dr. Mitiku Habte and Dr. Susan Miyasaka, who have been working on the use of mycorrhizal inoculation for early establishment of native tree species, including koa. For more information on the research, see the "current forestry research projects" page on the forestry extension website (<http://www2.ctahr.hawaii.edu/forestry/Data/researchProjects.html>).

Additional information on the workshop will be posted at our CTAHR Forestry Extension Website which you can check up updates (<http://www2.ctahr.hawaii.edu/forestry/Data/Workshops/ArbuscularMycorrhizal/ArbuscularMycorrhizal.html>).

### **Weed Control Publication**

*Herbicide Weed Control Methods for Pasture and Natural Areas of Hawai'i*, by Philip Motooka, Lincoln Ching, and Guy Nagai. Nov. 2002, 35 pp. CTAHR free publication WC-8. Website: <http://www2.ctahr.hawaii.edu/oc/freepubs/pdf/WC-8.pdf>; to download the publication you need Adobe Acrobat Reader.

The publication reviews different methods of weed control, and then concentrates on herbicide use. "How-to" instructions are given for foliar sprays, drizzle application, and cut-surface methods. Examples of calculations for mixing and spraying herbicides are given, along with many recommendations and tips gleaned from the authors' long experience with weed control in Hawai'i. An appendix lists herbicides currently registered for use in pastures natural areas of Hawai'i and on which weeds they have proven to be effective. *Always read the label on the herbicide and follow the directions. Some herbicides may be labeled for use in pastures, others in natural areas, others for tree farms, others for use on certain species of trees only.* The publication is currently available on-line. Printed copies will be available from Cooperative Extension Service offices statewide in April. Other CTAHR publications on weed control are available for downloading from our website: <http://www.ctahr.hawaii.edu/freepubs>

### **Forestry Extension Website Updates**

We continue to add new information, photographs, new links, and notices of upcoming events to the CTAHR forestry extension website. We have recently added summaries of thirteen forestry research projects at CTHAR and a bibliography of CTAHR forestry publications for the past decade. The "links" page is a useful first stop for people searching for forestry information for Hawai'i on the internet. Our address is: <http://www2.ctahr.hawaii.edu/forestry>.



### **Native Plants in Public Places Workshop Kahului, April 5<sup>th</sup>, 2003**

8:30 AM - 4:00 PM

Kalama 103, Maui Community College  
310 West Ka'ahumanu Avenue, Kahului, Maui

The demand for native Hawaiian plants in commercial, residential, and public landscaping is growing and shows promise of becoming an up and coming industry. Beautiful and distinctive native species are being used as signature plants in parks, gardens, home landscapes, and ecosystem restoration efforts. Federal and state laws that require the use of these plants are driving new opportunities to select and grow these unique plants. Many native plants are remarkably easy to grow and tolerant of climatic challenges. Others require some understanding of their unique needs. Our state is home to 282 endangered and 10 threatened native Hawaiian plant species listed under the US Endangered Species Act. Our reputation as being "the extinction capital of the world" gives added urgency to the need to embrace, use and preserve these native plants – Hawai'i's unique botanical heritage.

#### Who should attend?

- Nursery Owners and Staff
- Landscape Contractors
- Landscape Architects
- Governmental Agencies
- Arborists
- Planners
- Developers
- Interested Individuals

See the program and download a registration form from the forestry extension website (<http://www2.ctahr.hawaii.edu/forestry/Data/Workshops.html>) or contact Jay Deputy at (808) 956-2150 or by email at [deputy@hawaii.edu](mailto:deputy@hawaii.edu).

## Forests Protect Our Watersheds

One of the great success stories of Hawaiian forestry is the reforestation some of the state's critical watersheds. With today's demands on the forest, from commercial timber to native species protection, it's worthwhile to take a look at the role Hawaii's forests play in protecting our watersheds.

The upper slopes above the towns of Honolulu and Lahaina were cleared of forest by the late 1800s. The trees had been cut for timber or for fuelwood for the whaling industry and local manufacturing. While the forest might have been able to recover from logging alone, it was not able to regenerate because feral animals devoured any regrowth. Overgrazing by cattle, sheep, and goats led to soil compaction and increased runoff and erosion.

Both public and private landowners worked together to restore the watersheds, as water supply was critical for both agriculture and the towns. Foresters first fenced the forest reserves, then eliminated feral animals. Plantation workers, territorial foresters, workers from the CCC, and volunteers worked to plant trees. Most of the forest visible above Honolulu consists of planted trees or their wild descendants.

Trees help prevent erosion not so much by intercepting rainfall directly as by laying down a thick mat of litter that protects the soil surface. In a mature forest, tree crowns are high enough above the soil surface that drops falling from the leaves can actually cause as much erosion as rainfall in the open. (You can see this sometimes in teak plantations where the leaf litter has been burned away and gullies have formed between the trees.) The forest leaf litter and understory plants actually do the job of breaking the force of the falling rain and protecting the soil. Undisturbed forest plantations typically show low rates of erosion. Other types of vegetation, such as orchards with groundcovers, agroforests, and well-established turf, can protect the soil as well as forests.

Over time, forests can also improve soil conditions, especially in overworked pasture or agricultural soils. Increased

organic matter in the soil improves soil structure, which increases infiltration and decreases the amount of water running over the surface after heavy rainfall. Infiltration may also be improved by increased earthworm activity and the development of root channels as trees grow. Overgrazing with the concurrent soil compaction and row crops where the soil is frequently bare are more likely to lead to serious erosion, especially in susceptible soils. A plow pan of compacted soil below the plow layer may form in clay or loamy soils after years of mechanized agriculture. Plow pans significantly reduce infiltration and increase surface runoff, thereby increasing the potential for erosion and nutrient loss. In cases where site preparation for forestry breaks up plow pans, such as along the Hamakua coast and along the north shore of Kaua'i, infiltration increases and runoff and erosion decrease following the establishment of forest plantations. In some parts of Hawai'i, of course, the hydrology is determined by the underlying rock. On the Big Island where the underlying substrate is pahoehoe lava, infiltration will be low and runoff will be high no matter what the vegetation. Conversely, soils on 'a'a lava rock will not be susceptible to compaction even if they are heavily used. On most of Mauna Loa, there are no perennial streams because all precipitation seeps into the underlying lava rock and into the aquifer directly.

What effects does harvesting have on forested watersheds? Trees, especially fast-growing ones, use a lot of water. Evaporation and transpiration from a tropical wet forest is typically 50 to 60 inches per year. Stream flow usually increases after a forested watershed is cut because the water the trees were using now seeps into the soil and eventually into the stream. Harvesting machinery may also compact the soil in places and increase surface runoff. As the trees regrow or are replanted, stream flow returns to pre-harvest levels in a few years. Of course, if only a small area of a watershed is cut at any one time, downstream effects will be minimal. One instance where trees increase rather than decrease stream flow is in high elevation cloud forests. Here trees intercept clouds directly and moisture condensed on the leaves and branches drips onto the soil. One study on Lana'i showed 60% greater precipitation under a Norfolk Island pine than out in the open.



*Rain falls on the Kohala forest reserve above Waimea.*

Harvesting both removes forest cover and disturbs the soil. Most erosion during logging occurs along roads, skid trails, and landings. Here the soil is compacted and the rainfall is unable to sink in. Loggers and foresters minimize erosion during harvests by constructing culverts and drainage ditches to disperse water before it erodes the soil, locating

### *Forests Protect Our Watersheds (cont.)*

roads where they will not become streambeds during heavy rainfall, leaving buffer strips along streams, and using other management practices to protect the land. The state Division of Forestry and Wildlife has developed a set of Best Management Practices for forestry which all forest landowners are encouraged to follow and which are required for forestry projects on state lands or for projects which receive cost-share assistance.

Alien invasive species in some cases threaten our watersheds. *Miconia* shades out understory plants and leaves the soil under its canopy exposed to erosion. Fountain grass encourages wildfires which kill the native vegetation protecting dryland soils.

Forests, whether planted or natural, can protect watersheds, but they need to be carefully managed. Careful management does not exclude harvesting in all cases, and does not mean that we can only plant native species. Foresters and managers must understand how forests work to protect the watersheds so that they can protect the forest.

### **Tree Farming Symposium Proceedings Available**

CTAHR has published the proceedings of the 2001 Hawai'i Forest Industry Association Symposium "Growing Working Forests for Hawaii's Future." The 100 page book includes articles on:

- Site selection
- Seed and seedlings
- Tree species selection
- Plantation establishment
- Financial analysis
- Windbreaks
- Site preparation
- Fertilization
- Thinning and pruning
- Diseases, insects, and weeds
- Property taxes
- Fire protection
- Invasive species
- Koa silviculture
- Cost-share programs

In short, everything a beginning tree farmer needs to know and much that will be useful to experienced growers. Copies of the proceedings are available from the Cooperative Extension Service in Hilo. Proceedings from the 1996 HFIA symposium "Koa: A Decade of Growth" and the 1998 HFIA symposium "Harvest to Market: Adding Value to Hawaii's Woods" are also available.

### **Koa wilt and the black twig borer**

Koa wilt is a deadly disease of koa caused by the vascular wilt fungus *Fusarium oxysporum* f. sp. *koa*. The disease often affects koa planted at low elevations. Entire branches of affected trees will turn brown and die as the vascular tissue is blocked by the fungus, and mortality often follows in a few weeks. Affected koa trees have also been observed to be riddled by holes of the black twig borer (*Xylosandrus compactus*), leading to speculation that the black twig borer carried the disease.

A new study by Dr. Curtis Daehler of the UH Manoa Department of Botany and Nicklos Dudley of the Hawaii Agriculture Research Center has shown that the black twig borer carries another species of fungus, *Fusarium solani*, which is not pathogenic to koa. The twig borers themselves may kill seedlings and small saplings by physically damaging a small stem, and they may damage larger trees. Most likely the twig borers observed in stands of diseased trees are attracted by the stressed trees rather than transmitting the disease themselves.

Daehler, CD and Dudley N. 2002. Impact of the black twig borer, and introduced insect pest, on *Acacia koa*, in the Hawaiian Islands. *Micronesica* suppl. 6:35-53.

For more information on the black twig borer, see the CTHAR Extension Entomology Knowledge Master database: <http://www.extento.hawaii.edu/kbase/default.htm>

For an article on koa wilt, see the Dr. Don Gardner's article on the UH Botany site:

[http://www.botany.hawaii.edu/faculty/gardner/diseases/Koa%20dieback/koa\\_wilt.htm](http://www.botany.hawaii.edu/faculty/gardner/diseases/Koa%20dieback/koa_wilt.htm)

For an article on koa dieback in native forests, see:

Anderson, RC; D. Gardner, C. Daehler, and F. Meinzer. 2002. Dieback of *Acacia koa* in Hawaii: ecological and pathological characteristics of affected stands. *Forest Ecology and Management* 162: 273-286.



*Branch infected with koa wilt (*Fusarium oxysporum*) showing dead zone, infected wood, and healthy wood.*

## Hawai'i Forests and Forestry Information Directory Published

Creation of a database and directory of sources of information on forests and forestry was one of the goals of the Forestry 2010 conference and the Hawai'i Forestry and Communities Initiative. The resulting directory contains entries for people planting trees, managing native forests, wanting a course of study, or who are simply interested in forestry. The people and organizations listed within the database have voluntarily agreed to participate as sources of expertise. While some people listed in the directory are extension professionals, others are researchers or private educators who have agreed to share their knowledge. All are with government or non-profit organizations. Printed copies of the Directory are available from the Cooperative Extension Service in Hilo. A searchable on-line version is in the works; please check for updates on the forestry extension web site (<http://www2.ctahr.hawaii.edu/forestry>).

For a directory of forestry businesses (Woodworkers, Manufacturers, Sawmill Suppliers, Arborists, Nurseries, Consultant/Management, Landowners, and Retail/Galleries) see the Resource Guide published by the Hawai'i Forest Industry Association, on line at <http://www.hawaii-forest.org> or available from the Association at PO Box 10216, Hilo, HI 96721. While landowners can find much valuable information through public sources, there is no substitute to working with a professional forestry consultant to create a unique and comprehensive land management plan for your property.

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## Cover Crop and Green Manure Database

The Cover Crop and Green Manure database describes the cultivation of 26 green manures and cover crops useful in tropical Pacific islands. The database includes color photos of the plants in cultivation in Hawaii. The database is available on line at <http://www2.ctahr.hawaii.edu/sustainag/SustainableAg/Database.asp>. Many of the plants are also described in leaflets which may be individually downloaded (you need Adobe Acrobat Reader) from the CTAHR publications site: <http://www.ctahr.hawaii.edu/ctahr2001/PIO/FreePubs/FreePubs09.asp#sustainableAg>

The publications are a part of the CTAHR Sustainable Agriculture program. For more information on the program see: <http://www2.ctahr.hawaii.edu/sustainag/SustainableAg/index.asp>

While cover crops are not generally used in forestry, they have promise here in Hawai'i, since we have such extreme weed problems and high establishment costs. I would be eager to hear success stories of landowners using cover crops to aid in plantation establishment.

## Tax Tips

Tax season is here again. Did you know that as long as you held your timber for more than a year, income from timber sales is treated as capital gain, not regular income? This information and more is available from the USDA Forest Service on the Timber Tax website ([www.timbertax.org](http://www.timbertax.org)). Larry Bishop of the Forest Service also annually publishes a two-page update in the tax laws, "Tax Tips for Forest Landowners", which may be downloaded from the Timber Tax website and is included with this newsletter. A longer discussion of income taxes for forest landowners is in the book "Legal Aspects of Owning and Managing Woodlands" by Thom J. McEvoy (1998, Island Press, Washington DC.) Thom presented a session on forestry taxation in last spring's Logger Education course and opened a few eyes.

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The object of forestry is to discover and apply the principles according to which forests are best managed...The forest is the most highly organized portion of the vegetable world. It takes its importance less from the individual trees which help to form it than from the qualities which belong to it as a whole. Although it is composed of trees, the forest is far more than a collection of trees standing in one place. It has a population of animals and plants peculiar to itself, a soil largely of its own making, and a climate different in many ways from that of the open country. Its influence upon the streams alone makes farming possible in many regions, and everywhere it tends to prevent floods and drought. It supplies fuel, one of the first necessities of life, and lumber, the raw material, without which cities, railroads, and all the great achievements of material progress would have been either long delayed or wholly impossible.

- Gifford Pinchot, first Chief, USDA Forest Service, Founder, Yale School of Forestry

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**College of Tropical Agriculture  
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Samir A. El-Swaify, RRE Coordinator  
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