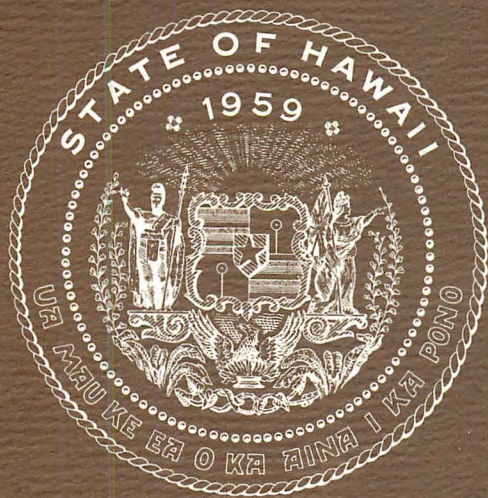


INDUSTRIAL FORESTRY FOR HAWAII



PROCEEDINGS OF

THE 18TH ANNUAL HAWAII FORESTRY CONFERENCE

HELD NOVEMBER 18-19, 1976, IN HONOLULU



INDUSTRIAL FORESTRY FOR HAWAII

**Proceedings
of the**

18th ANNUAL HAWAII FORESTRY CONFERENCE

November 18-19, 1976 - Honolulu, Hawaii

Conference Theme:

**TIMBER INDUSTRY POTENTIALS IN HAWAII:
NOW IS THE TIME TO ACT**

Conference Sponsors:

Chamber of Commerce of Hawaii
Hawaii Section, Society of American Foresters
United States Forest Service
State Department of Land and Natural Resources
State Department of Planning and Economic Development

Published by the

**DEPARTMENT OF PLANNING AND ECONOMIC DEVELOPMENT
STATE OF HAWAII**

December, 1976

Conference Participants:

Keynote Speaker: George R. Ariyoshi
Governor
State of Hawaii

Guest Speakers: Robert Z. Callaham, Director
Pacific Southwest Forest and Range Experiment Station
Berkeley, California

Hideto Kono, Director
Department of Planning and Economic Development
State of Hawaii

Program Chairman: David K. Rinell
Manager-Special Products
Honolulu Wood Treating Company

Clint Hallsted, President
Forest Resources Hawaii, Inc.

Robert Hobdy, Forester
Forestry Division
Department of Land and Natural Resources
State of Hawaii

Charles S. Hodges, Research Plant Pathologist
Institute of Pacific Islands Forestry
U.S. Forest Service

Randal Jackson, Planner
Planning Office
Department of Land and Natural Resources
State of Hawaii

Hisa Kimura, Head Agronomist
Parker Ranch
Kamuela, Hawaii

Harold P. Luscomb, Vice President
Property Planning and Control Department
Hawaiiana Investment Co. Inc.
Subsidiary of C. Brewer & Co., Ltd.

Virginia Macdonald, Planner
Planning Division
Department of Planning and Economic Development
State of Hawaii

Robert E. Nelson, Director
Institute of Pacific Islands Forestry
U. S. Forest Service

Edwin Petteys, Timber Survey Forester
Forestry Division
Department of Land and Natural Resources
State of Hawaii

William H. Sager, Protection and Development Forester
Forestry Division
Department of Land and Natural Resources
State of Hawaii

Roger G. Skolmen, Research Forester
Institute of Pacific Islands Forestry
U. S. Forest Service

Myron B. Thompson, Trustee
The Kamehameha Schools/
Bernice P. Bishop Estate

Ronald L. Walker, Chief-Wildlife Branch
Fish and Game Division
Department of Land and Natural Resources
State of Hawaii

Gerald A. Walters, Research Forester
Institute of Pacific Islands Forestry
U. S. Forest Service

Hulton B. Wood, Research Forester
Institute of Pacific Islands Forestry
U. S. Forest Service

Contents	Page
Keynote Address George R. Ariyoshi Governor, State of Hawaii	5
Hawaii's Forest Products Industry Roger G. Skolmen	8
The Timber Resources Edwin Petteys	10
Panel on the Impacts of Timber Industry on other Forest Values	
Introduction: Robert E. Nelson	12
Water and Soil: Hulton B. Wood	13
Wildlife Resources: Ronald L. Walker	15
Hawaiian Ecosystems: Robert Hobdy	17
Recreation: Randal Jackson	19
Protection: Charles S. Hodges	22
Research: Gerald A. Walters	24
The Economics of Timber in Hawaii Hideto Kono	26
Panel on Landowner Commitments to Timber - The Potential and the Problems	
Commercial Timber: Harold P. Luscomb	30
Koa - Potentials and Problems: Myron B. Thompson	32
Cattle and Timber: Hisa Kimura	34
Timber on Maui: Clint Hallsted	35
State Commitment: William Sager	38
World Forestry Robert Z. Callaham (Informal remarks: Text unavailable)	
Field Trip Summary Virginia Macdonald	40

KEYNOTE ADDRESS

by

George R. Ariyoshi
Governor, State of Hawaii

Keynote Address

by
GEORGE R. ARIYOSHI, Governor
State of Hawaii

I am very pleased to be with you today for this 18th Annual Hawaii Forestry Conference, and I thank you for the invitation.

Our nation and our State have just completed a very intense national and local election. During that period we heard the words, again and again, "we must serve the people..." "we must have programs for the people..."

Certainly the careful, thoughtful use of Hawaii's lands and our forest heritage is one of the finest and most vital services anyone can provide for our people. And you foresters and others here today who have been involved in this quiet, steady work of preserving and developing our Island forests must be considered foremost contributors to the welfare of our people, both of this generation and the generations to come.

The early Polynesians grew to understand nature's ways in our Islands. They used and protected the resources vital to them, in harmony with the land. But the foreign introduction of goats, cattle, disease, and new land uses brought devastation to the system and early death to hundreds of thousands of Hawaiians. What disease did to the people, goats and cattle did to their land. In a short time, many native forests were destroyed and soil was washing into the ocean. Devastation by overgrazing, fire, and land clearing was particularly severe in dry lands and in koa forests.

Our forester-historians tell us that by the mid-1800's, water shortages were severe, flash floods were causing problems, and fish ponds were filled with mud. It became obvious the watershed damage must be corrected. In 1846, King Kamehameha III signed Act No. 2 proclaiming, "the forests and timber growing therein shall be considered government property and under the special care of the Minister of the Interior...." A German forester was hired and plantings began in the barren Nuuanu Valley. Many of the forests we enjoy today are the man-made heritage of those early plantings.

Tree planting continued into the early 1900's. Sugar plantations gave strong support to the forestation program and planted much of their mauka lands to restore the watershed and to provide firewood. The first formal government forestry organization was established when the Hawaiian legislature created a Commission of Agriculture and Forestry in January, 1893, earlier than in the United States.

From those early foresters we inherited the Forest Reserves, which today are the nucleus of our conservation districts. Control of grazing and fire within the Forest Reserves preserved the native forest ecosystems, which will be the core of our Natural Area Reserves System. Forest recreation trails and facilities, built on Forest Reserve lands during the Civilian Conservation Corps years and before, were the basis for the establishment of our State Parks system. Early tree planting gave us the basis for much of our present forest products industry.

This is our heritage from previous generations.

Unprecedented growth after World War II created pressures for the use of our land beyond the wildest imagination of early conservationists. Ranchers, hunters, hikers, botanists, loggers, farmers, homebuilders, and many more voiced their demands to use the land of Hawaii.

To guide the expanding development, Hawaii in 1957 passed Act 234, establishing forest and water reserve zones, and then Act 187 in 1961, the first comprehensive land use law in the nation. These laws reflected a changing public opinion. They changed our land use concept from preservation of the forest reserve to use of the land in Conservation Districts. The land use law has been very effective in controlling land use pressures on agricultural and forest lands. But it does permit multiple use of forest lands, rather than simply preservation.

Today we must emphasize a relatively new term in Hawaii: the industrial forest. An industrial forest has definite advantages to the people of our State. Timber resources can provide jobs in rural areas and can maintain both open space—very valuable for our tourism industry—and a quality watershed. In a State that can grow many trees faster than most places on earth, it makes good sense to build a forest industry for our children. But it won't be easy; it will require a long-term commitment and a great deal of hard work.

The economic study recently conducted by the State titled "Forestry Potentials for Hawaii" presents three alternative programs and recommends a target program of 200,000 acres of industrial forest. The report indicates this level of forestation can be accomplished with minimum impact on other forest uses and values, and wood resources provided will be adequate to support a meaningful

forest industry. This recommendation has considerable merit. I favor the development of a viable wood products industry in Hawaii, and will work toward that end.

Building such an industry will require the cooperation of public agencies and private landowners. We expect the Department of Land and Natural Resources to identify State lands which are good sites for commercial timber production. A substantial part of the 200,000 acres can come from conservation district lands which are both public property and privately owned. However, I am particularly concerned that we also identify marginal agricultural lands that are more suitable for tree farming than for crops or grazing.

Our Department of Land and Natural Resources should take a particularly close look at State lands outside the conservation districts that might be dedicated to tree farming. Establishment of tree farms on marginal agricultural land has many advantages: For example, forestation does not require conversion of our native forest. It is cheaper and easier on lands already cleared. Noxious weed plants can be controlled through tree farming. And tree farms can restore good watershed conditions on marginal ag lands. The Department of Land and Natural Resources obviously must also work closely with private landowners to identify lands with tree farm potential, to provide technical assistance and encouragement, and to identify economic incentives and financial assistance available to help accomplish forestation projects.

When the best tree-farm sites, both public and private, have been identified, the State can lead the way to prove a wood products industry has an important place in our economy. After the State develops the resource base, private industry will follow—when it can be reasonably sure of profit.

Today, we are going to look at our degree of commitment to tree farming and to a wood products industry. We will look at the potentials and at some of the problems. We must identify our potential industrial forest lands and we must proceed fully aware of the problems we face. We must understand, through science, the nature of the resources with which we work. Forest scientists are working now to provide answers about our forest environment. We already have a great deal of information, and are working steadily to answer current problems.

Landowners proposing a tree-farm project must understand the limits of our knowledge and the inevitable risk associated with a long-term commitment to grow trees. Tree farming is not a place for the quick-buck speculator. Most of the return will be realized by our children. Our investment now is an investment in their future and in investment to our State. We have an obligation in conscience to take those steps that will leave them with the most possible options, just as our forefathers left a heritage to us. I feel all of us have an obligation to leave Hawaii better than we found it, and growing trees certainly is a beautiful way to do it.

Take a look at the world today. We know petroleum will continue to become both scarcer and more expensive. Wood is a renewable resource which can provide fuel. A substantial part of the Big Island's electricity is currently generated using a combination of bagasse and wood chips. Fuel wood is a renewable resource that can reduce our dependence on oil.

Look also at the worldwide expanded use of paper. We know there will be an expanding market for paper pulp. Even now, Japan has supertankers plying the oceans carrying, not oil, but wood chips. One of their ports of call is our own Kawaihae Harbor.

Again, we can look at the worldwide demand for high quality hardwoods and the projected world shortages of wood, and forecast that quality woods will become far more expensive and difficult to obtain.

Hawaii will never be self-sufficient in timber. We will probably export chips and quality hardwoods and import construction lumber. But I am told that a modest timber industry, based on a 200,000-acre industrial forest, could create 800 jobs in rural areas and provide a net cash flow to the landowners of the State of \$4 million annually. By expanding our options, we can provide alternatives to people who want to live away from the pressures of the city and close to the land.

The open friendliness—aloha spirit—of our people is famous throughout the world. The aloha spirit feels the pressure of crowding, of housing too expensive for most to afford, of the hectic effort to earn a living wage. A viable economy with good jobs and a life style free of frustrations can help us retain our aloha for our neighbors and our visitors. A forest industry can be part of our overall effort to diversify our economy, to protect our agricultural lands and life style, and to provide alternatives to city work and living for our people.

I see a Hawaii of varied opportunities, a Hawaii of aloha, beauty, and of respect for our heritage. I see a Hawaii where all its citizens are proud to be called Hawaiians or Hawaiian at heart. We can achieve that vision. To do so, we must protect what we have and use it wisely to provide opportunities for all our people.

God gave us the bounty of the earth to care for and to use. I pray He grants us the wisdom and courage to use our forests wisely and to pass on our heritage—enhanced and increased—to our children, to their children, and to all who follow.

Mahalo and aloha.

Hawaii's Forest Products Industry

by

Roger G. Skolmen

Today we are going to be talking about the effects of enlarging our forest industry's resource base. Sometimes in discussing this subject we get carried away and speak as though a forest industry is something new for Hawaii. We tend to ignore the fact that there already is a forest products industry here—in fact, there always has been.

Everyone is familiar with the early sandalwood industry, so I won't go back that far. But we know that there were sawmills operating in Hawaii by 1850 because there is koa furniture around that dates to that period that has the marks of circular saw teeth on the hidden surfaces. Iolani Palace, built in 1882, has some interior paneling of koa and kamani and some ohia floors that were obviously produced in Hawaii. Lahaina Courthouse which dates from 1863, has ohia stairs and floors in one part of the building. So we know lumber was being produced, but we don't know exactly where.

In the mid to late 1800's there was a mill cutting koa near Makawao, Maui. Another mill was located on the land of Waipunalei just north of the land of Laupahoehoe on the Hamakua Coast. This sawmill logged a forest back in the 1800's that today most people think is virgin and untouched. Evidently, most sugar mills had their own sawmills because there is occasional reference in the old literature to ohia paving blocks, railroad ties, and insulator pins as well as to koa for furniture. Mr. Watt, the manager of Olaa Sugar Company in 1904 wrote that ohia ties had been found to rot quickly in his railroad tracks and were all being replaced with imported wood. This would indicate a mill having been in Puna at least by 1890.

But it was in the early 1900's that industry really got going.

Later, today, we are going to hear about Bishop Estate's land of Keauhou. Well back in 1906 the Hawaiian Mahogany Lumber Company was established to log Keauhou. A mill was built there in 1907 and a railroad was put in from Olaa. Logging was done by uprooting the trees using a donkey engine driven cable system—this saved the valuable wood in the butt logs. This koa operation was soon suspended however, when the same company contracted with Santa Fe Railroad in late 1907 to supply 90 million board-feet of ohia railroad ties over a 5-year period. This was to be at a rate of 500,000 ties per year. The first ohia ties were cut at Keauhou in 1907 when 13,000 were shipped to San Francisco.

There was another logging company at this time, a California-owned company called the American-Hawaiian Mahogany Company which operated on the land of Papa in South Kona. No sawmilling was involved. Logs were cut in the forest and then hauled by wagon to Hoopuloa where they were floated out to schooners and shipped to the company mill in Petaluma, California. Thirty thousand feet of logs were shipped in 1907.

Pahoa Mill — The Hawaiian Mahogany Company erected this large mill at Pahoa, Puna in 1908 and sent its first tie shipment of 20,000 ties in December. They also sent 15,000 feet of lumber to be tested for other uses. They discontinued the Keauhou operation during this period.

Pahoa Mill — Another shot of the mill showing the log deck. In January 1910, the Hawaiian Mahogany Company became the Pahoa Lumber Mill and obtained cutting rights to 12,000 acres of Territorial Forest in Puna. This, the first government timber sale in Hawaii set a price of \$5 per acre for any land cut over for a 10-year period.

Donkey Engine — Here was how logging in Puna looked, it was all by cable and steam donkeys. During 1909 to 1910, the company cut at a rate of 500 acres per year. All the land was clear felled and converted to cane so like almost all other timber operations we have ever had here; it was not forestry, but simply land conversion—there was no second crop of trees intended.

Rail Cars — Here are ohia logs on rail cars which were dumped on this deck —

Log Deck — which gives you a better idea of the large size of this mill.

There was another mill—Cant & Bolte Ltd.—operating in Puna in 1910 on private timber. This company took over the American-Hawaiian operation in South Kona that year and built a sawmill on the land of Papa.

The Pahoa mill kept going strong until 1913 when it burned down. But it was rebuilt in 40 days and operated again until 1917. By this time results had begun to come from two test miles of ohia tie track Santa Fe had installed in 1908 which indicated that even in the dry Southwest untreated ohia only lasted a little over 9 years. So Santa Fe lost interest.

Band Mill — This very fuzzy picture is the interior of a steam driven band mill installed in 1914 by a German whose name is unknown, on what is now Honomalino Ranch in South Kona.

Band Mill Ruin — Here is the mill as it looks today, you can see the band saw wheel.

NOTE: Slide presentation accompanied text.

Logging Operation — This is the logging operation for this mill when it was purchased by a Chinese hui called by the unoriginal name Hawaiian Mahogany Company.

Large Koa Log — They had tractors by this time to haul the large koa logs.

Hawaiian Mahogany — The company was headquartered at Queen and Ward Streets. It became the C.Q. Yee Hop Company in 1925, and in this shop.

Interior — Continued operations making furniture, ukuleles and other koa items until after World War II. Many of you probably remember the C.Q. Yee Hop Building at Queen and Ward with the embossed letters “Koa and Ohia” on the front. Sometime about 1930 a Mr. Takimoto began producing koa and ohia in South Kona, gradually taking over from C.Q. Yee Hop.

Glover Mill — I am told that this is the headrig of the second largest sawmill ever in Hawaii. This was the James W. Glover mill in Ka’u erected just post-war and powered by an old destroyer power plant big enough to light up half the island. The mill cut koa and ohia, but despite heavy advertising on the mainland was unable to build a market and quit about 1950.

Blair Mill — This Corley portable mill was purchased by Mr. Takimoto in 1952. Takimoto had taken over the C.Q. Yee Hop Mill and wore it out. He operated the new mill in South Kona until 1958 when he sold out to Blair, Ltd. Blair, who has now the distinction of having survived in the koa business longer than anyone else in history, moved the mill to Keauhou in 1960.

Mill Tail — Here is lumber being piled at the mill. This was a land clearing operation to produce pasture for Hawaiian Agricultural Company. The logging just made the job of land clearing easier and gave a small extra income to Bishop Estate the landowners.

Wold Mill — One of the principal figures in Island sawmilling in the 50’s and early 60’s was Myron Wold. This is his mill cutting koa in 1964. Wold’s Hawaiian Fern Wood Company essentially invented the use of tree fern as a horticultural planting medium. As the fern fiber business grew, Wold became more and more interested in producing lumber from exotic trees and did a great deal of experimentation with them. He gradually converted his company to a lumber company and in so doing went broke. Most of you know this sad story. Myron died early this year. I hope he will be remembered as the pioneer he was in Hawaiian forestry.

The mill was purchased by Blair in 1966 and is still in operation. It was originally brought in by the Army in 1942 and has been cutting lumber ever since at a rate of about half a million board-feet a year.

Dawson Mill — Don Dawson started this mill in 1967 after operating a smaller mill for about 1 year. This band mill and resaw —

Resaw — now owned by Campbell-Burns was designed to be capable of cutting 8 million board-feet per year on a single shift. It used to hit this rate occasionally when owned by Dawson. This would be 24 million board-feet a year on a three-shift basis which is more than the allowable cut for the island. Operated at this rate, the mill could cut all the timber on Hawaii in about 8 years.

Forrest Mill — Here is another little mill operated by Bob Forrest in 1966-67. He managed to clear about \$100 per day for himself sawing robusta and employed two other men. So sawmilling can perhaps also be small. This mill was put together from three others Forrest bought on the Big Island—so a lot of others have also produced lumber.

Plywood Mill — As you probably know, in 1969 and 1970, we had a veneer and plywood company at Kawaihae. This company, owned by Harold Jones, managed to cut one million board-feet of Norfolk pine and another million of albizzia during its brief operation. It also produced robusta, bluegum, and koa plywood which Dave Rinell will tell you were quite saleable. They ran out of working capital and quit and after very careful review decided not to start up again.

Campbell Mill — This little mighty-mite mill was operated for about a year at Keauhou by Paul Campbell before he purchased the Dawson Mill. It is typical of the sort of mill that could be a family operation on Molokai or Kauai.

Helle Mill — Here is the interior of Harley Helle’s Maui Hardwoods Mill which started up in 1969 with a 5 million board-foot/year capacity and is still operating—sawing robusta and bluegum.

Chipper — And this, the Capitol Chip Company chipper which began operation about 3 years ago.

So now we are down to the present. Our industry right now consists of three sawmills — Campbell-Burns, Blair, and Maui Hardwoods with an annual production of about 4 million board-feet of koa, robusta, saligna and bluegum, and a small amount of ohia. It also consists of Capitol Chip Company which produces a chip tonnage equivalent to about 12 million board-feet per year. Actually, this industry, if it were operating at full capacity, would require much more than Hawaii’s presently available forest resources can handle on a sustained basis.

So obviously, if we are going to expand the industry we are going to have to enlarge the resource. Even the present industry, if it were able to find the markets to increase its production, could easily cut more wood than is being grown each year in Hawaii.

The Timber Sources

by

Edwin Petteys

Believe it or not, just less than half of Hawaii's land area is considered to be forested. What do we mean by that? In forest survey, we say forest land is:

Lands stocked to a prescribed level with trees of any size, or lands with trees removed for whatever the reason to less than that stocking level, but not developed to other uses, or shrub or brushy areas whose vegetation covers more than 50 percent of the ground.

We have almost 2 million acres of land that fall within these criteria.

Within the forest land designation, there are lands that can and cannot grow crops of what we call industrial wood—all roundwood products except fuelwood and fence posts. Those lands incapable of growing industrial wood are called non-commercial forest lands. Some of this area is so because of adverse growing conditions—low rainfall, steep slopes, etc. Other areas are non-commercial forest land because of some statute or law—such as national parks and restricted watershed areas. These lands may be very productive, but their designation prohibits such uses.

Commercial forest lands are those lands that either have crops of industrial wood growing on them or have the potential to grow these crops. The latter point is important. Commercial forest land then may have industrial wood now or just be brush or grass covered. The key is potential. If it has that, it qualifies.

Of the commercial forest land, less than 1/3 of it is considered to presently be producing industrial wood. This is in both planted stands, plantations, and native and naturalized stands. The rest—more than 2/3rds of the area—664,000 acres—is covered by brush, grass, or non-commercial trees. An intensification of the forestry effort in Hawaii would use some of these lands as well as marginal grazing and agricultural lands.

Interestingly, large amounts of commercial forest land are privately owned—the majority of the lands outside the forest reserve, which is expected, but would you believe well over a third of the commercial forest land inside the reserves is privately owned as well? The private landowners are, then, a very important factor in forestry programs.

In terms of existing timber volume, those plantations that account for only 5 percent of the state's commercial forest land area account for 1/3 of the timber volume—69 million cubic feet. The native and naturalized volume—141 million cubic feet—exists only on Hawaii Island. Plantation stands statewide average 1,500 cubic feet per acre while the native and naturalized stands average only 255.

The ohia timber volume is roughly evenly split between public and private owners (54 to 46 percent). The koa volume, however, is concentrated on private holdings, 73 percent of it being privately owned. In the plantations, public holdings account for the majority of the eucalypt, other hardwood, and conifer volumes.

Looking at growth, ohia types at the time of our last survey in 1970 were doing all right in that we could determine there was positive growth—rates of growth were exceeding rates of death and decay. This situation could certainly be different today with the progression of the ohia forest decline. In the koa, rates of decay exceed growth rates. The koa resource is rotting away faster than it is growing. Perhaps by careful management of the koa forests we might be able to reverse this trend. The plantations exhibit tremendous growth potential. Figures for these vary by species and site, but we feel intensive management practices could promise very good yields—10 or more tons/acre/year of fiber or over 300 cubic feet per acre per year of timber.

Where do we go from here?

Our next job is the selection of specific areas for intensive forest management. These will be drawn from commercial forest lands with non-commercial forest types, as well as marginal agricultural and pasture lands.

That's all I have. I hope this brief overview has given you a perspective that you can use throughout the talks that follow.

NOTE: Slide presentation accompanied text.

PANEL

Impacts of Timber Industry on Other Forest Values

Introduction:	Robert E. Nelson
Water and Soil:	Hulton B. Wood
Wildlife Resources:	Ronald L. Walker
Hawaiian Ecosystems:	Robert Hobdy
Recreation:	Randal Jackson
Protection:	Charles S. Hodges
Research:	Gerald A. Walters

Introduction

by

Robert E. Nelson

Last year, at a major Resource Conservation and Development Conference on Maui, I addressed the topic of "Why Commercial Forestry Is Not Now a Major Activity in Hawaii." My presentation, of course, discussed many facets of the situation. But among these was the important topic of commitment. It is a fact that in the past there had been no major commitment to commercial forestry in Hawaii. There had been no major commitment, public or private, toward managing native forests for their renewable wood resources or of committing major areas of land to the development of timber crops. Nor has there been a significant commitment by major wood products dealers in support of processing and marketing local woods.

Today we are learning that there will be significant commitment toward commercial forestry in the islands.

But we will also see that timber production cannot be dissociated from other forest resource values. Many of our previous forestry conferences have dwelt extensively on these other resource topics. It is obvious that the forest resources and values are extremely complex. The biological and physical aspects of forest resource management are also complex and difficult. Added to this is the complication of satisfying conflicting demands of people and projecting those demands into the future. Forest resource management does require long range planning and long range commitments. It is what we do today that determines the forest values of the future.

During the 1969 forestry conference I recall that I tried to emphasize the strong but diverse public interest in the forest resources. The public as a whole looks on the forest resource as a "commons." But often, and probably too often, certain individuals or groups view the forest resource as **singularly theirs** although pragmatically the multiplicity of forest resources must be viewed as being **plurally ours**.

What then are the interrelationships, the negative and positive impacts of commercial forestry and other forest related resources? The resource experts on this panel will address these relationships.

Water And Soil

by

Hulton B. Wood

Good morning! My task today is to outline the impacts, both positive and negative, that might be incurred on the water and soil resources, as a result of the implementation of Program B as proposed in the document: "Forestry Potentials for Hawaii." Program B, in essence, is a proposal for intensively managing some 200,000 acres for commercial timber production.

My approach will be to present a brief overview of Hawaii's water and soil resources. Most of you are familiar with the complexity and uniqueness of Hawaii's water and soils—my purpose is only to stress and highlight the variability of these two resources. I'll then outline the **impacts** on soil and water.

Without knowing exactly what areas are under consideration for intensive timber management, the job is more difficult—much of what I have to say will therefore be in general terms.

Water is Hawaii's most important natural resource. Our forested mountain lands receive by far, the greatest amount of rainfall of any other land areas in the State. The condition of the forested lands determines, to a large extent, the amount of water that can be developed, the quality of water, and the amount lost as flood runoff.

Variability in Hawaii's rainfall is rather staggering! ...from less than 10 inches per year to over 450 inches per year. Median annual rainfall is estimated at 73 inches, giving us an annual gallonage of some 8 trillion gallons. A whale of lot of water, one may say!, but hardly enough to become complacent about. Misuse or mismanagement of these critical water producing forest lands cannot be tolerated.

Droughts occur with all too frequent regularity. While drought conditions exist on one side of an island, the other side may be having floods.

Little is known about the actual amounts of rainfall, temperature, solar radiation, evapotranspiration in most of our mountain forest lands in the State.

Like the complex nature of water in Hawaii, its soils are equally, if not more complex. Most of the soils are volcanic in origin. There are nearly 200 different soil series. Hawaii has been the forerunner in many areas of tropical soils investigations—research on soil chemistry, soil fertility, soil water, genesis and morphology—essentially all of this work has been done only in agricultural soils. On the other hand, our base of knowledge of Hawaii's forested soils is not as complete. We do know there is great spatial variability; where there is tree cover there is little evidence of erosion, and infiltration capacities are high compared to the non-forested soils.

But let's get closer to the question facing us today: What **are** some of the possible impacts on water and soil?

Even though we don't know specifically what areas, on what soils, and in what rainfall zones the forest plantings will be, we can outline some of the expected benefits and hazards. The beneficial impacts on soil and water of lands under intensive forest management are many:

A forest provides the maximum natural protection against surface water runoff from flood producing rainfall. Interception of water by the tree's canopy, increasing the infiltration of the soil and increasing the soil-water storage capacity are some of the ways surface water runoff is controlled under a forest.

A forest is generally resistant to soil erosion.

A forest increases infiltration capacity of the soil.

I have been talking about forests in general without regard to species. Unfortunately, one of the things we do not know, and we have been asked many times, is: What tree species uses the least amount of water? Research in Hawaii, and for that matter, research elsewhere around the world has not answered that question satisfactorily.

Generally speaking, grasses use less water than trees because of the shallower rooting habits of grass. Evapotranspiration between different tree species growing on the same site appears to be minimal in the higher rainfall areas. Evapotranspiration varies with stand density and vegetative height, slope, and aspect. But the effect of these factors on the evapotranspiration process changes as soil, vegetative and atmospheric conditions change.

Regardless of the species planted, there is little question that forests are the most important natural system for providing high quality water and soil protection. However, the **caution flag** must be raised. There **are** potential adverse impacts to water and soil resources in any commercial forestry program such as that proposed for Program B.

NOTE: Slide presentation accompanied text.

For example, minimizing surface water runoff, erosion and sediment during and after harvesting can only be done by the proper selection and design of harvesting systems, access roads and skid trails. Post-harvesting land treatment is a must. Road construction should be kept at a minimum—soil type and steepness of slope have to be considered. Weather is also very important in the planting and harvesting operation. Like sugarcane culture, planting and harvesting are weather dependent, one reason being the minimization of water runoff and soil erosion.

Let me show a few slides to illustrate some of the beneficial and negative impacts I've been talking about:

1. **ERODED ROAD CUT**

The silviculturists will hate me for saying this—but getting the trees in the ground and growing them is only half the battle. If trees are to be grown and harvested on a commercial scale, then every safeguard in road design and construction must be taken to prevent water runoff and soil erosion. This is actually a road cut in a forested area here on Oahu—not for tree planting, but for house construction. Noted on the border of this slide is my comment that an estimated 17 tons of soil per acre were lost from this 3-acre site in a 24-hour period.

2. **WATER REPELLENT SOILS**

Water repellent soils do occur in Hawaii. This is a soil condition where water cannot penetrate the soil, but merely rests on the surface, or rolls right off the surface. We have a fair idea where they exist, but we do not know under what vegetation or tree species. Serious flooding and erosion can occur on these soils.

3. **ERODED GRAZED FOREST**

Eroded areas such as this over-grazed forest woodland on Kauai would certainly benefit from a good cover of trees.

4. **SUGARCANE RUNOFF**

Sediment-laden runoff water is common on steep agricultural lands after the crop has been harvested.

5. **PASTURE WATER RUNOFF**

Many once forested lands are now in pasture. In high rainfall areas these pasture lands often contribute large quantities of surface water runoff. Benefits of tree planting, and cattle exclusion, on abandoned pasture lands are obvious!

6. **AGGREGATE SIZES**

As well as having a good litter cover to protect the soil against raindrop impact, we have found in Hawaii that forested soils have larger aggregates than non-forested soils and are less erodible. Here, for example, is a visual comparison of soil aggregate sizes from one of our research plots. Note the amount of fine material under pineapple as compared to the forest.

7. **INFILTRATION RATES**

In Hawaii, striking differences in infiltration rates were found between forested and non-forested soils. Pictured here are average infiltration rates obtained under four different land uses on many different soil and site conditions. Under forest cover infiltration rates are extremely higher when compared to other land uses.

8. **FOG DRIP**

Additional water can be obtained from clouds or fog. Trees are collectors of this fog—adding to our ground water supplies.

Before I conclude there is another aspect of **impact** I believe should be mentioned. This is The Federal Water Pollution Control Act Amendments commonly known as Public Law 92-500. Passed by Congress in 1972, this law is probably the most comprehensive and complex piece of environmental legislation ever passed by Congress.

Although I am by no means acquainted with all the ramifications of the law and its numerous sections, the intent of Congress was that **development**, including forestry activities, in all areas of every state should be reviewed **and** managed in the context of water pollution control.

You may be asking yourselves, "What does this law have to do with the Forestry Program we are discussing today?" Public Law 92-500 places the pollution control burden on the permittee, in this case the Division of Forestry and the private landowners, who are contemplating increasing Hawaii's commercial timber base. Will there be non-point source pollution problems? How much and what kinds? Answers to these questions will have to be found!

In conclusion, it is my belief that Program B—managing some 200,000 acres for commercial timber production—is consistent with National and State forest management policies on lands of all ownerships. Program B should, but only with stringent environmental safeguards, meet the State's objective of "Protect and improve the condition of vegetative cover and soil, to retard rapid runoff of storm flows, prevent soil erosion, and help insure water yields of the quality and quantity needed."

Wildlife Resources

by

Ronald L. Walker

Your publication "Forestry Potentials in Hawaii" makes statements relative to timber planting and wildlife which need to be considered. The accelerated timber program calls for:

1. Clearing selected parcels of native forest and planting with commercially valuable exotic timber trees.
2. Re-forestation of former koa lands which have been thinned or cleared.
3. Re-habilitating "decadent" koa forests by selective harvesting, controlling exotic weeds (banana poka) and re-planting or allowing natural re-generation of koa.
4. Clearing weedy brushlands and exotic trees such as guava and re-planting with exotic timber species.

It states that:

1. More intensive timber management may benefit wildlife including endangered species through rehabilitation of decadent koa forests or planting koa on pasture lands.
2. Replacing dense brushlands consisting of exotic weed species or staghorn fern with commercial timber species will benefit public hunting (and by implication game wildlife).
3. Accelerated timber management could result in habitat improvement for both game and non-game wildlife.

In the E.I.S. prepared for a reforestation project in the Waiakea, Upper Waiakea and Olaa Forest Reserves on the Island of Hawaii it is stated that:

1. While wildlife will be disturbed, as most species are mobile, they will merely move to adjacent areas or adjust to the new conditions.
2. Although some permanent damage will occur to the wildlife habitat, no species will be eliminated as a result of the reforestation.
3. Although the number of native birds which use the site may be reduced, the common species are adaptable to change and even use exotic timber species for feeding purposes.
4. Areas consisting of fairly healthy native forest supporting native birds will be avoided and will remain untouched for their use.

The Animal Species Advisory Commission in its "Reviews of the Five Year Forest Planting Plan, 1972-1976 and the Attendant Environmental Impact Statement, Department of Land and Natural Resources," among other things, recommended:

1. A moratorium on clearing native forests and planting exotic timber species until the impact on native ecosystems can be determined.
2. That continuous stands of commercial timber species be avoided in favor of an interrupted pattern to provide habitat for game birds and mammals.

Let me try to get you thinking about birds and bees rather than words about trees.

Although forest birds are mobile, this doesn't necessarily mean they will "move over" into adjacent areas if a portion of the native forest in which they live is eliminated. In a climax forest the carrying capacity for animals has been reached and the habitat will not support any more birds than already exist due to life requirements of food, cover, competition balances and space. Some species of Hawaiian honeycreepers have disparate breeding and non-breeding ranges and the adverse impact is magnified if a significant portion of either of these habitats is altered or eliminated. There is some evidence that native insectivorous and nectivorous forest birds feed on exotic timber trees, but no evidence that these birds display to their mates, nest, rear young and feed in them. Their value is marginal and certainly no substitution for native forests which provide all the necessities for completing the life cycle. There are some indications that logged over areas in the Kilauea Forest Reserve on Hawaii support greater numbers of the native, endangered Akepa than the adjacent unlogged native forest. But the opposite seems to be true for the other native forest birds which prefer the closed forest. The rehabilitation of "decadent" koa forests may well benefit some species of native birds. But other species thrive in such habitats, such as those that feed on insects associated with decaying trees or enjoy the openings created. Also, relatively few endangered forest birds use homogeneous koa forests—ohia or ohia-koa forests generally support a greater diversity of species. Eliminating portions of ohia forests for replanting with exotic timber trees would not be offset, bird for bird, by planting or rehabilitating koa elsewhere.

Although it is recognized that from a cost benefit standpoint, most timber stands need to be planted to a single species over a large area, spaced as close together as is consistent with good growth, the benefit for wildlife when the plantation matures is almost negligible. The resulting forest often becomes a faunal desert. Contrast this with a natural, native forest consisting of some open areas, seedlings, saplings, mature trees and dying trees which provides a complexity of nesting sites, and a varied food supply for several species of birds. Native forests as well as exotic brushlands and mixed native/introduced forests can provide a diversity of plant and animal food organisms and breeding sites for the higher forms of wildlife. The opposite may be true of continuous stands of commercial timber, depending on the species planted. Re-planting pasture lands to koa may very well provide additional habitat for native wildlife, but at the same time it may destroy prime pheasant country. In recent years, new game birds such as the Erckel's francolin have adapted well to exotic scrub-forest and brushlands on many islands. Replacement with pine or eucalyptus could very well destroy the value of these areas to them in terms of food supply and cover. There might also be a negative impact on feral pig populations in these areas for the same reasons.

The replacement of exotic, noxious brushlands with timber plantations may initially attract wild birds and mammals during the planting and sapling phases, but once the overstory develops, the attraction diminishes. Blacktail deer and game birds thrived to begin with on such areas in the Puu Ka Pele Forest Reserve on Kauai, but they are now essentially, beasts of passage.

If replanting native forests is preceded by clearing or smashing in place tree fern, the value to feral pigs that feed on hapuu might be diminished. Even the dreaded uluhe fern slope provides habitat for a threatened seabird (the Newell's shearwater) in some areas on Kauai, and perhaps other islands. Elimination of this plant in some areas for commercial timber planting may not be all that innocuous from a wildlife standpoint.

Here are some considerations and recommendations to guide you in assessing the ramifications of an accelerated timber management program on wildlife in Hawaii.

1. **Site Selection.** Clearing and planting 500 acres of scrub ohia in the Waianaes on Oahu may have a minimal impact on native forest birds. Eliminating 500 acres of mature ohia in the Ka'u forest reserve on Hawaii may mean the loss of habitat for hundreds of endangered forest birds of several species. Replacing mixed grassland areas inhabited by pheasants with pine trees would be less desirable than planting in an area choked with guinea grass devoid of ground nesting birds. This calls for a more precise inventory of potential timber lands with respect to plant composition and wildlife species present. Your own plans make this recommendation.
2. **Area by Area Evaluation.** No generalized precautions can be advanced for all potential timber lands in Hawaii with respect to wildlife. Depending on the homogeneity of the flora and fauna, each Island, working circle, forest reserve, plot or acre must be considered separately. The E.I.S. process may be costly and painful, but it does provide a mechanism for looking into timber-wildlife relationships.
3. **Planting Design.** If true benefits to wildlife are to accrue when planting timber species, economy of plantation must be sacrificed. Alternating rows, blocks, or irregular spacing will result in maximum edge effect which will in turn result in wildlife diversity and abundance.
4. **Harvesting Techniques.** Controlled harvesting is the key to optimizing benefits to wildlife. Slick and clean harvesting eliminates edge effect, although eventually re-growth or new plantings will be attractive to ground oriented wildlife (game birds, pigs, deer). Selective harvesting, leaving patches of mature trees, openings and slash would be more beneficial to a variety of species.

I do not believe that a moratorium on timber planting in native forests until complete ecosystem analyses are complete is necessary if a cautious site by site review of the potential impact on wildlife is made.

Many of the statements made in your plans for the development of a timber industry relative to wildlife are general and a bit idealistic. We must get specific about potential problems before decisions are made to roll those terrible bulldozers.

It is possible to expand timber plantations in Hawaii without irreversible adverse impacts on native and exotic wildlife species and their habitats if it is carried out judiciously. If the planting is done proceeding first with sites of little or marginal value to native and introduced animals and progressing to sites which can be designed to mitigate or minimize adverse impacts and stopping short of prime native forests and critical habitats, I believe your grandiose scheme is feasible.

Hawaiian Ecosystems

by

Robert Hobdy

We have before us today the topic of the creation of a timber industry in Hawaii. Certainly there is a need. We also have before us, however, another topic of much concern in recent years, that of the protection of our native biota so unique to the world in terms of its evolutionary diversity and educational potential. I speak of our native plant life from algae to composites, of our forest and sea birds, of our insects, our mollusks, our marine plants and animals and others.

Both a timber industry and the native life forms have certain requirements that must be met to insure their viability and success. Are they compatible? How will each affect the other? Can we have both?

In order to establish a timber industry we must establish a timber resource. This requires a commitment, a commitment of money, of manpower, and of land. A similar commitment is required if we are to adequately protect our native plants and animals. It comes down to land. How much? Where?

It should be obvious that we are talking about different acres. Native ecosystems are not compatible with land clearing and tree planting, certainly not on the same acreage and usually not even on adjacent acres. An acre committed to tree planting usually undergoes clearing by bulldozer and planting with an exotic timber species. It requires an access road to permit the usual management functions of replanting, weeding, pruning, thinning and harvesting and such associated functions as patrol, fire prevention, and fence maintenance. Environmental effects are the destruction of existing vegetative cover, a certain amount of siltation from the clearing and roads, and the introduction of exotic plant species whether accidental or intentional.

The destruction of the existing vegetation may have drastic results if there are rare species in the area. For species of limited distribution and number the destruction of even a portion of their habitat may hamper their reproductive ability by reducing their effective range, decreasing their gene pool or by cutting down on their food supply in the case of animals. Siltation of streams can result in damage to various aquatic life forms and the delicate stream bank environment.

Of greater importance is the effect of exotic plants spreading into the forests. Aggressive exotic weeds will take over much of the cleared areas. Some of these will spread to the adjacent forests via streams, game trails or even by their own sheer competitiveness. As a result the net affected area can be considerably larger than the cleared area. Examples of some of the species that have invaded forest lands are the strawberry guava, waiowi, hau, bamboo, Ardisia, Melastoma, Rhodomyrtus, Clidemia, Fire tree and the Manuka or New Zealand tea. These species are capable of converting a diverse and balanced forest ecosystem into essentially a crowded single species cover that is incapable of supporting our host specific native insects and our native birds. We must not allow lands containing critical habitats to be invaded by such aggressive species by thoughtlessly opening them up when it is within our power to prevent it.

The questions then are what endangered species are we concerned about and on what lands? These are the questions we must not only satisfactorily answer, but agree upon as well.

In 1973 the United States Congress passed Public Law 93-205 title the Endangered Species Act. This law designed to protect rare and threatened flora and fauna throughout the country called for far reaching restrictions on the management of public lands. It also called for the establishment of lists of endangered and threatened plants and animals along with supportive data that would be used as both an information bank and a starting point for the implementation and enforcement of the law.

The steps that must be taken to meet the requirements of the Endangered Species Act are:

1. To determine what species are endangered and what species are threatened by reviewing each with regards to its range, frequency, reproductive performance and other problems.
2. To determine for those species listed the critical habitats required for the satisfactory natural continuation of the species.
3. To adjust the management plans for government lands to provide adequate critical habitat lands for each species.

The strength and far reaching nature of this law lies in the fact that these requirements are to take priority over other land uses, which will then be apportioned and programmed only after the requirements of the Endangered Species Act have been met.

In states where only five, ten or twenty species of plants and wildlife have been determined to be endangered and threatened management plans can easily absorb these requirements. However, in states such as Hawaii, where the number is much higher the effect could be highly restrictive on all other land uses.

Of approximately 1,700 species of plants published in a nationwide list proposed by the Smithsonian Institution, 895 or approximately 52 percent of the species are from the State of Hawaii alone. This points up the magnitude of the destructive forces to which our flora has been subjected, and it points up the magnitude of the management commitment we must make in order to adequately protect these species in compliance with the intent of the Endangered Species Act.

And yet the list is not complete. The situation with our forest birds, our native insects, our land snails to mention some others is similar; and as Otto Degener has pointed out the lower plant forms of algae, lichens, liverworts, fungi and mosses have not yet been considered. The list will grow.

This list, however, is as yet only tentative as well as being incomplete and much work remains to be done before it can be accepted and the law implemented. First there must be some agreement on what species are to be considered as endangered and threatened. Uniform and acceptable criteria must be used. There has been some conflict and disagreement on the criteria and their application that must be resolved.

Second, the critical habitat for each species selected must be determined and delineated on a map. And finally, a composite map showing all the critical habitats must be compiled. The overall critical habitat boundary then would represent the total area that would be set aside for the management of endangered and threatened plant and animal species.

How many acres are to be involved and where? Everyone is concerned with this question. Some fear that too much land will be set aside leaving little or no forest land for commercially planted forests, hunting, recreation and other uses. Others fear that the acreage will be too small thereby compromising our unique flora and fauna. Whatever the area comes to, it will probably be extensive. It is possible that it will include most of the native forests that are in pristine or only slightly altered composition. This, however, is merely conjectural at this point.

In the wake of the Endangered Species Act of 1973 local concern stimulated legislative activity on the subject and in May 1975, Act 65 relating to the conservation, management and protection of endangered or threatened wildlife or plants became law. This law authorizes the Department of Land and Natural Resources to conduct investigations on any species of wildlife or plants in order to develop information relating to their biology, ecology, population, status, distribution, habitat needs and other limiting factors to determine conservation measures necessary for their continued ability to sustain themselves successfully. Towards this end the State Forester has converted a professional forester position into a botanist position in order that this work be competently pursued.

Now let us return to our proposed timber industry to see where we stand. In a departmental publication entitled "Forestry Potentials for Hawaii" three sample programs were outlined. I will have picked Program B which is the intermediate program in size and consequent environmental effect. It calls for 200,000 acres of commercial forest statewide. A breakdown reveals that 46,000 acres are presently in commercial forest already so 54,000 acres would need to be planted. Lands determined to be physically capable of producing timber crops amount to 948,000 acres. A 200,000-acre program amounts to only 21 percent of this total. Certainly the capacity is there. The question is can we find 154,000 acres of suitable commercial forest lands that will not have critical habitat status? Yes, we can. There are many areas in the fringes of the forest reserves that have been converted primarily to the exotic weed species mentioned above. These areas hold little in the way of native types and only in remnant stages. Outside the forest reserves are large amounts of private land of even greater suitability. There are abandoned agricultural lands, marginal pasture lands and just plain idle lands that have better soil, more economic accessibility, gentler topography and larger continuous acreages than our more rugged forest lands. As Cooperative Forest Management efforts and "show me" educational demonstrations take effect, I envision private landowners committing substantial acreages to the planting of timber crops. This may be some time in coming but it will come. I believe that with a government planting program on carefully selected lands balanced with an initially modest private land involvement, we could fulfill the acreage requirements of Program B without compromising the critical habitats of our native flora and fauna.

We of the Forestry Division are aware of the problems facing our native flora and fauna and we are very concerned lest they suffer further demise through ignorance or poor management. We are also aware of the need for locally grown forest products in these isolated and overly resource dependent islands. We must seek solutions for each problem without forgetting the other. There is a balance. We will find it.

Recreation Resource and Intensive Tree Plantings

by

Randal Jackson

Inland Based Resource Oriented Recreation accounts for approximately 30 percent of the participation rate for outdoor recreation activities by the residents of Hawaii. This proportionately high use of Inland Based Natural Resources for recreation makes it essential that at least three questions be addressed when altering existing land use for long-term commitment in intensive tree plantings.

1. What constitutes recreation resources and what relationship is there to recreation activities?
2. What existing recreation resources will be affected by intensive silviculture?
3. How can new recreation resources and potential recreation experiences be developed by strategic use of intensive silviculture?

Recreation Natural Resources

The Recreation Resource is the base element of the recreation experience or activity. By definition, Recreation Resource is any natural asset that someone **values** for diversion or play. The emphasis on the resource is its value. The value, of course, varies from user to user, depending upon the special interest or preception of the recreation experience. But by defining the spectrum and mix of recreation opportunities and their resource composition, a basic understanding of resource value and its dependent relationship can be established.

For the purpose of this writing, we are limiting our discussion to inland and inland water types of recreation (Assuming that the majority of the proposed silviculture sites will be located inland from coastal areas). As an outline, the following comprise a partial list of the recreation activities and experiences that occur within these areas:

1. Hiking
2. Back Packing
3. Camping
4. Group Camping
5. Off-Road Vehicular Recreation
6. Environmental Education
7. Natural Appreciation
8. Historic Appreciation
9. Gathering
10. Sight-seeing
11. Freshwater Fishing
12. Freshwater Swimming
13. Freshwater Boating
14. Hunting

Each of these activities have a limited number of resource relationship that is essential for their existence.

For simplicity, we group them into resource categories:

1. Physiographic Features (Visual geologic features)
2. Landscape Character (Urban, crop, open water and wildlands)
3. Land Ecological System
4. Habitat Range (Native and game fauna)
5. Aquatic ecosystems
6. Gathering Area (Activity area)
7. Historic Sites
8. Legendary Sites
9. Water Condition (Streams and reservoirs)
10. Climatic Condition (Rainfall, temperature and wind)
11. Area Condition

By developing a matrix with resources on the horizontal and recreational activity on the vertical, some base-line resource dependency can be established.

In addition, this process offers a preliminary evaluation of recreation-activity compatibility solely based on resource dependency.

In essence, this evaluation of recreation activity verse resource dependency offers some guideline in defining both the effect of resource modification and the potential for effectuating recreation activities and experiences, but it should be noted that there are no two areas in Hawaii that have identical resource. Therefore, there is a need to conduct a site by site inventory.

The Effect of Intensive Silviculture on Recreation

The resource activity matrix defines some criteria for evaluation of change in resource character and its effect on recreation activity. As the resource is altered, the quality of the recreation activity will be changed. If the essential resources are eliminated, the value of the site for a specific type of recreation will be marginal.

It is of value to emphasize those resources that are extremely sensitive to change.

Water Quality

Both the quantity and quality of water runoff have a major effect on resources and dependent recreation. The altering of lands adjacent to streams and water bodies can modify P. H., increase turbidity, increase water quantity and increase occurrence of flash flooding. This in turn can modify the stream ecosystem reducing fishing and devaluating the site as a natural area. In addition, the change in water quantity and quality can make an area unsafe for swimming and boating.

Land Ecosystem

Elimination of specific land ecosystems through the introduction of exotic plant material can alter the range of both native and exotic fauna devaluating the site for hunting and natural appreciation.

Area

The encroachment of critical area and setting requirements of certain types of recreation, specifically, wilderness back packing, camping, natural appreciation and, to a lesser degree, historic sites and sight-seeing, can reduce the value of the area for recreation experience.

Effectuating New Recreation Site Through Strategic Use of Silviculture

The use of replanted areas for specific or concentrated types of recreation has the following values:

1. It allows for intense limited resource development to enhance the recreation experience;
2. It can provide suitable areas for intensive types of recreation which may be detrimental to other resource areas; and
3. It offers an interim use and potential return on the land during years prior to harvest.

Of specific interest are the following:

Hunting Areas

Currently the demand for large game hunting, deer and sheep is not being met. As an example, of the 1,800 sheep permits requested, only 1,000 were issued last year, and for Mauna Kea, only 1 in 3 achieved their bag limit. The development of a put and take hunting operation is plausible based on fee hunting. The resource requirement would consist of a minimum of 1,000 acres fenced off with a supportive grazing range established. Such an operation would only be possible during the early growth years, of the tree plantation, a maximum of 4 to 5 years.

Freshwater Fishing

Freshwater game fishing is a relatively new experience in Hawaii. Presently, there are only the intensively managed areas at Kokee, Wahiawa and Nuuanu Reservoir. Since most crop lands, that have potential for plantations, at one time had irrigation, there is a potential for stocking of these reservoirs and ditches for intensive fishing.

The minimum area required is 4 acres for fishing and 40 acres for boating. Habitat requirements are a minimum of 18" of stabilized water year round and an established food chain.

Off-Road Vehicles

Motorcycling comprises about 1 percent of the outdoor recreation experience. The pressure by the user for this type of recreation is increasing while at the same time the resource manager is decreasing the opportunity by restricting many of the existing use sites. Destruction to the environment, noise and incompatibility to other recreation activities are the prime reason for restricting motorcycling use areas.

Motorcycling could be compatible with tree planting areas if the following were provided:

1. Restricted Use Areas
2. Machinery Standards
3. Regulated Times and Use Restrictions

Miscellaneous

1. Hiking -- Hiking comprises 2 percent of all recreation. Currently, there is a need for new trial experiences on most islands. Tree planting areas offer an excellent opportunity for access to upland areas in coordinating service roads location with the district forestry trail developments.
2. Gathering Areas — Tree planting areas in close to populated areas, offer potentials for consumptive types of recreation such as fruit picking, pine cone collecting and christmas tree cutting.
3. Group Camping — Group camping is extremely compatible with tree plantings because of:
 - a. Intensive recreation programs which does not affect or modify resource; and
 - b. Responsible party.

Liability

The major limitation of the opening of private lands for recreation has been the assumption of liability. To assist the private landowner, the Legislature, under Chapter 250, encourages owners of land to make land and water areas available to the public for recreational purposes by limiting their liability toward persons entering thereon for such purposes.

It is hoped that more private landowners will take advantage of this law to make more lands available for recreation use.

In closing, it needs to be re-emphasized that recreation is one of Hawaii's major products both to facilitate a tourist industry and to enhance the lives of the residents of Hawaii. Therefore, there needs to be a conscience effort to protect recreation resources that currently exist and an active program to develop new recreation experiences to meet the needs of the future.

Protection Problems Related to Intensively Managed Forest Stands

by

Charles S. Hodges

My presentation will be in a somewhat different vein from the preceding speakers who have addressed themselves to the impact of the proposed expanded forestry program on various non-timber forestry values such as soil, water, wildlife, endangered species, and recreation. I will be speaking to some of the potential protection problems one confronts with the establishment of large-scale commercial forest plantations.

The forest manager is faced with a number of risks from the time of plantation establishment through final harvest. One of the most feared of these is wildfire. Forest stands may be completely destroyed by a single fire if conditions are favorable, resulting in loss of the entire investment expended in establishing the stand. Some species of exotics, such as *Eucalyptus grandis* and *Eucalyptus saligna*, are especially susceptible to fire because of their thin bark. Others, like pine species and *Eucalyptus robusta*, are more resistant, at least the older trees. In general, the risk of fire in intensively managed stands is greater than would be expected in native stands, mainly because of the greater management activity and the easier access by the public because of more roads. On the other hand, the increased accessibility should increase the chances for early detection and suppression. The roads themselves will also serve as firebreaks.

A large number of feral animals, mainly pigs, goats, and sheep, but also cattle inhabit many forested areas throughout the Islands. Unless they are excluded or controlled, they can cause considerable damage, especially in young plantations where they browse the seedlings, and in the case of pigs, root out the seedlings completely. Pigs also cause indirect damage by spreading pathogenic soil fungi and seeds of noxious weeds like banana poka.

Cows and sometimes rats damage young koa trees by stripping the bark near the base of the tree. Some trees are killed if they are completely girdled and others are attacked by pathogenic fungi or insects, which invade through the wounds. Increased damage by rats might be expected in plantations of koa because of more grass cover.

Numerous plant species have been introduced into the Islands since their discovery. Some of these, like banana poka, Koster's Curse, blackberry, melastoma, firetree, and others are aggressive invaders and often take over areas opened up by fire, grazing, logging or other disturbance. Because the establishment of forest plantations usually require land clearing, it is to be expected that one or more of these weed species will rapidly colonize the area and thus compete with the planted seedlings, either by direct competition for water and nutrients or in the case of vines such as morning glory, lilikoi, and banana poka, by shading out or strangulation. Successful seedling establishment may require costly preplanting chemical or mechanical weed control and post planting cleanings until the trees are large enough to overtop the weeds and eventually shade them out. Some plants like banana poka may continue to be a pest throughout the life of the stand because of their ability to grow into the crown of even large trees.

Insect and disease attack is a probable risk factor in any forestry operation, but is generally considered to be greater in plantations than in native mixed forests. In fact, large scale plantings of single species, or monocultures, are widely condemned for this very reason. However, this is not because such forests are innately more susceptible, but since they consist of only one tree species, attack by a single insect or disease organism could result in the loss of a substantial portion of the stand. It might be well to point out here that unlike most tropical forests, Hawaii's commercial forests consist primarily of only two species, ohia and koa. Ohia especially occurs in practically pure stands over large areas, and in this respect somewhat resembles man-made forests. The epidemic decline of ohia now present on the Big Island is a good example that such native ecosystems are not immune from serious problems.

The State's Program B calls for the establishment of an additional 150,000 acres of plantations during the next 30 years to meet the total program goal of 200,000 acres. The largest portion of these plantations will be made up of exotic species, primarily eucalyptus, pine, toon, and Queensland maple. The only native species likely to be utilized will be koa.

When exotic species are introduced, they are subject to insect and disease attack from two sources. One of these sources of infestation is local, where insects and disease organisms found on

native plants may attack the introduced tree species, either immediately or after some period of adaptation. A good example of this is some of the native insects of koa which have attacked the related introduced black wattle. For the most part, however, the species of exotics most likely to be planted under Program B have not been seriously damaged up to now by endemic insects and disease organisms, even though some of them, like *Eucalyptus*, have been planted here for more than 100 years. This is not to say, however, that eventually losses will not occur.

Accidentally introduced insects and disease organisms are another problem. In general, introduced pests, especially insects, become more damaging in their new home because they have left all or most of their natural enemies behind. Over the years, numerous insects and disease organisms which attack trees have been introduced into the Islands, but few of these have developed into major problems on forest trees. Some examples would be the European pine aphid and a needle disease fungus which are attacking several pine species on Maui and Molokai, and the black twig borer which is present in all the Islands and which attacks a large number of ornamental plants and some timber trees, including eucalyptus. Because little work has been done on diseases and insect pests in the Islands, there are probably other organisms that are as yet undiscovered.

There is no denying that the introduction of an aggressive insect or disease organism to the Islands could cause extensive damage to plantations of both native and exotic tree species. It should be remembered, however, that the introduction *per se* of an insect or disease-causing agent does not necessarily mean it will become damaging. It must not only find a highly susceptible host in large numbers, but also suitable environmental conditions for reproduction and development as well as an absence of natural enemies. These factors, coupled with the active quarantine program present in the Islands, considerably reduces the risk of introduction of a pest or pests which would seriously impact the plantation program using the taxonomically divergent species planned to implement Program B.

The potential problems of koa when used as a plantation tree may be somewhat greater. More than 40 species of insects and mites and several fungi attack this tree species. In the native forests, where koa is often mixed with ohia and a few other species, these pests are currently causing little damage. Under plantation conditions, however, one or more of them could become a serious problem.

What can be done to control diseases and insect pests in plantations? Direct control with pesticides is often difficult logistically, generally not economical, and almost always detrimental to the general environment. In certain cases pesticides have been used with some success, like for example, the control of a needle disease of Monterey pine in New Zealand. In that particular case, knowledge of the life cycle of the pathogen discovered through an intensive research effort permitted the control of the disease through limited and economical applications of fungicides. Generally, however, the best control for insects and diseases is host resistance. Resistance is usually much easier to find in tree genera like *Eucalyptus* and *Pinus* which have a large number of diverse species as well as certain species which have a wide geographic range made up of different ecotypes. Among these, one can often find a particular species or ecotype which is resistant to certain insects and diseases but which still meet the needed utilization and growth requirements. A good example of this was an experience I recently had in Brazil where I worked principally on diseases of eucalyptus. There I found a canker disease of unknown origin causing serious damage to *Eucalyptus saligna* and *grandis*, the most common species planted in the more tropical areas of the country. On the basis of observations of naturally infected trees made in species and provenance trials, and on artificial inoculation studies, I found an ecotype of *E. grandis* and a previously little-used species, *E. urophylla*, which were highly resistant to the disease and which also met the desired requirements for wood quality and growth rate. These are now being widely planted in areas where the disease is likely to be a problem. This might be a good place to stress the importance of species and provenance trials in relation to insect and disease attack. These plantings can be used to monitor the presence of insects and disease agents and serve as a basis for selection of resistant individuals, provenances or species.

One final point I would like to make is the relationship of insect and disease attack to tree stress. There are a number of insects and disease agents that can and do attack vigorously growing healthy trees. On the other hand, there are many that attack only weakened trees. It is of the utmost importance, therefore, to plant trees only in areas where the site and climatic conditions are suitable for good tree development.

In closing, I would like to stress that although the problems and risks associated with intensive plantation management are many, they are by no means insurmountable. Fire and noxious weeds can be prevented and/or controlled, feral animals can be excluded, and insects and diseases can be regulated through resistance, biological control, silvicultural practices, or, as a final recourse, the use of pesticides. The increased protection costs related to intensively managed plantations in most cases will be more than offset by the increased returns from such stands.

Forest Research

by

Gerald A. Walters

As with the other forest values discussed this morning, a timber industry as described in Program B of the publication "Forestry Potentials for Hawaii" would have a great impact on forestry research. Under such a program there would be an increased need for information about all facets of forestry—timber, water, wildlife and recreation habitat, forage, and protection. The most immediate need is for timber management information because this information is required for dollar and cents decisions.

Program B calls for putting 200,000 acres or about 10 percent of Hawaii's forest land under intensive timber management. Under such management, substantially more volume of forest products can be grown than we presently import. The material harvested from the 200,000 acres could support a diversified basic forest industry. Hundreds of new jobs would be generated and the net annual return to landowners would be between 3 and 4 million dollars.

In order to intensively manage a long-term crop like timber, decisions must be based on the best ecological, social, and economic data available. The data base, however, on which to make timber management decisions is limited. This is not surprising because timber management research has been underway in Hawaii only since about 1961. Fifteen years is a short time in terms of most forest crops which take 8 to 10 years for pulpwood and 30 to 40 years for sawtimber. And it is a short time in terms of the vast amount of information about species, site productivity, site preparation, seedling production and field planting, and/or natural reproduction, thinning, pruning, protection, and harvesting that is required. And it is a short time to gather information about the interrelationships of timber, water, wildlife and recreation habitat, and forage that is required for the management of these resources.

Because this conference is looking at the timber potential in Hawaii, I will only discuss timber management research. In doing this I will review a spacing study, intensive tree culture research, tree improvement research, and plantation establishment research.

The objective of the *Eucalyptus saligna* spacing study is to determine at what spacing to plant seedlings with sawtimber as the final crop. We recently made the 15-year measurements of this study which is located on the Hana coast of Maui. The average diameter of the dominant and codominant trees ranged from 12.8 inches for those in the 8- by 8-foot spacing to 15.6 inches for those in the 14- by 14-foot spacings. Dominant and codominant trees averaged about 130 feet tall. The largest tree was 162 feet tall and 24.4 inches in diameter. These trees are growing at a rate of about 500 cubic feet per acre per year. We do have a tremendous potential in Hawaii for producing timber.

But what is the maximum growth potential and how can it be realized? *Saligna* trees in the spacing study were not intensively managed. In other words, they were planted and allowed to grow. No special site preparation, maintenance, fertilizer, or thinning operations were conducted to maximize growth. The objective of intensive tree culture research is to determine maximum tree growth potential on commercial forest land and on marginal pasture and cane land using the various cultural techniques just mentioned. Intensive cultural techniques for eucalyptus and other fast growing trees must be developed for each site because soil, light, temperature, wind, and vegetation are all site specific.

As part of this intensive culture effort, a fertilizer study was established on C. Brewer land on the Big Island. Each fertilized *Eucalyptus saligna* seedling was given about 3 cents worth of nitrogen, phosphorous, and potassium fertilizer at the time of planting. Four months later, these trees averaged 5 feet tall, some were 7 feet tall. Unfertilized trees were only about 1.5 feet tall. In other words fertilized trees grow on the average three times faster than unfertilized trees. This indicates what can result from improving our cultural techniques.

We have been working on koa tree improvement for about 3 years now. The purpose of this research is to produce genetically improved koa trees. We see "improved" as meaning improved for timber production.

Through the selection process we would like to reproduce tall, straight, unfluted stems in rapidly growing trees. We have selected 46 trees on Hawaii and Kauai that have the desired characteristics. We have been trying to propagate these trees vegetatively while awaiting a good seed crop—which we haven't had now for 3 years.

We have been propagating or cloning these trees by air layering, by rooting cuttings under mist, and by tissue culture. Tissue culture is an exciting new technique by which we are now producing cloned trees in the laboratory. Here is a clone of 5 trees propagated by tissue culture.

We are now as far along with this tissue culture technique as anyone else in the world who is also working with trees.

When the superior trees produce seed, we plan mass seeding and planting followed by selection to produce seed orchards of improved stock. As our cloning techniques improve, we will also examine heritability by clonal progeny tests.

Hopefully, this work will lead to improved stock for planting in marginal pasture land, as called for in the proposal for an expanded timber industry.

We also seek to improve the sawtimber potential of *Eucalyptus saligna* and *E. grandis* by obtaining seed from trees which display low growth stress. High growth stress is a major problem in the use of eucalypts for lumber. It is the cause of log end splitting, spring in sawing, and brittleheart. If we reduce growth stress, then Eucalyptus can be used for products which have a higher value than pulpwood.

A major research topic is plantation establishment. The scope of this research is from seed in the nursery to established tree in the forest. Plantation establishment is that critical first step in timber management. If the plantation establishment effort results in poor stocking, then the rest of that rotation, whether for pulpwood or sawtimber, is affected. The return on the whole forest management investment will probably be much lower than the potential return.

We have broken plantation establishment research down into three phases—nursery, transport, and field. In each phase we are interested in both the biological and technological aspects. In other words, we not only need to know **what** to do to obtain seedlings which have a high survival and growth potential in the field, we also need to know **how** to do it on a practical basis.

In the nursery, we are trying to determine what characteristics indicate high seedling survival and growth potential. The characteristics may include stem height and diameter, leaf number and area, shoot-root ratio, and/or stem hardness. We are trying to determine how to obtain the desired characteristics through manipulating water, light, fertilizer, temperature, planting medium, and seed cover.

Ultimately, we will produce a Nurseryman's Manual to include the what and how to do it for the primary species used in reforestation.

We are growing seedlings in rather small single-cell containers. These containers and racks are very important to the whole plantation establishment effort. The container called the "Hawaii Dibbling Tube" was designed for plant production. For example, it has four vertical ridges on the inside which prevent root spiralling. Because each tube and rack have dimensional uniformity, nursery operations of filling the tubes with planting medium, sowing and covering seeds can be mechanized.

Seedlings of most species require about 4 months in the nursery before they are ready for outplanting. This brings us to the transport phase. We have found that we can remove the seedlings from the tube and pack them horizontally in wax-lined boxes. Filled boxes can be palletized for efficient handling. Boxes of seedlings are shipped by truck or air freight.

In the field, we are trying to determine the what and how of site preparation, tree planting, and post-planting care. Site preparation, depending on the site and management objectives, may be accomplished by machetes, bulldozers, and/or herbicides. Once site preparation is completed, boxes of seedlings are brought to the field. The packing boxes are easily converted to seedling carrying boxes.

Tree seedlings grown in the dibbling tubes are planted using a "dibble." When inserted into the soil, the dibble makes a hole the same size and shape as the seedling root system. The planter drops the seedling roots into the hole, presses it down, and that's all. He is then off to plant the next seedling. This planting method is fast and it insures uniform, high quality planting.

To insure high seedling survival and rapid initial growth, post planting care may be required. Post planting care may be in the form of fertilizers and/or weed control. What fertilizer and what method of weed control, and how to apply or accomplish it are the questions we need to answer.

I do want to emphasize that the studies that I have mentioned represent only a part of the timber management research effort. And that the timber management research effort is only a part of the total forestry research effort that is being conducted by the Forest Service, the University and the Bishop Museum.

We have the potential in Hawaii to manage our forest resources for greater productivity. The new revenue and the new jobs that will result from the creation of a diversified timber industry will benefit all Hawaii. In the long run it will benefit those in areas which now supply timber products for Hawaii because their forest resources can be more readily managed on a sustained yield basis. Other forest resources of water, wildlife and recreation habitat, and forage also have greater potential than now realized. If we are to realize the full potential from Hawaii's forests, we must make management decisions based on the best information possible. This information can only be obtained through research. And this research must be based on sound scientific procedures.

The Economics of Timber in Hawaii

by

Hideto Kono

I'm greatly honored to have been asked to participate once again in the formal proceedings of the 18th Annual Hawaii Forestry Conference.

Having attended your conference for the first time last year in Hilo, I was greatly impressed by the vast store of knowledge on Hawaii's forestry that has been accumulated over the years by those of you who are specialists in the field of research and development of Hawaii's forests and forest Products.

At the conference last year, I was repeatedly reminded of the tremendous benefits well developed and managed forest lands would give to ourselves and our future generations by way of improved and enlarged water, recreation, wildlife forage and timber resources, and that we were only at the threshold of the development potential. The challenges were there. With such a great potential, it would have been natural to expect the sounds of the trumpet to be heard throughout the conference.

But the sounds that I heard were mostly that of the bassoon. Much subdued—and like something emanating from deep in the wilderness.

I found myself, a fledgling bureaucrat charged with the job of seeking out avenues for Hawaii's economic development, fully convinced of the benefits we would all gain from an accelerated and imaginative program of forestation. And not having experienced the many sounds of static that might have stifled past clarion calls for forestation, I blew the trumpet as loudly as I could.

The response to the note I sounded was swift and most encouraging. Mr. Robert W. Harris, former Director of the Pacific Southwest Forest and Range Expansion Station, U.S. Forest Service, the luncheon speaker at the conference, offered the services of his agency, and within two weeks he sent a team to work with the State Forester of the Department of Land and Natural Resources and members of my staff. The meeting culminated in a cooperatively prepared report entitled **Forestry Potentials for Hawaii**, 1976, which explored the economic and environmental cost/benefits of three alternative forestation programs—86,000-acre, 200,000-acre, and 410,000-acre land-base programs.

I believe we have made some meaningful progress since the Hilo conference. Our Governor has clearly established the forestation goal for all of us to strive for: a 200,000-acre commercial timber program to be realized within 30-40 years. This is not an easy goal to achieve, but not a formidable one either. The assignment of 200,000 acres for a tree farm is not an unbalanced allocation. More than 200,000 acres is currently in sugar cane production, and 238,000 acres of our lands are dedicated to national parks. Besides, we all recognize that a well developed and managed forestation program allows for the same land to serve as a water recharge area, recreation site, wildlife and forage resource area. In this respect, we should be encouraged thru this morning's contribution by our state guardians of our soil and water resources, wildlife and endangered flora and fauna—Hutch Wood, Ron Walker, Bob Hobdy, Chuck Hodges and others. While providing specific points of caution in their specialized areas, they are taking a positive, realistic attitude toward the need for, and the practicability of achieving the 200,000 acres of commercial forestation in Hawaii.

Action to implement the goals is beginning to materialize through active private and public cooperation. We may hear this afternoon some of these proposed implementing actions.

Now, at this stage, let me read you a quotation:

“We are on the threshold of Hawaii's timber development program. The door has been opened. Before us extends a vista of great potential—a potential for increasing the present and future economic base of our state and the well-being of our citizens. Whether the door will remain open or be slammed shut in our face is entirely dependent on how wisely we plan our future and remove present obstacles to effective accomplishments of such plans.”

This statement appears to fit in exactly with the present state of our forestation program. The fact is, it is a statement made more than 13 years ago by a distinguished island forester, Myron L. Wold, at a timber development conference meeting at the Hilo Yacht Club in January of 1963.

I wanted to introduce the statement to indicate that the program which is very promising just now may again be set back without the determination, imagination and the persistence it takes to make it succeed.

I believe we all agree that the goals are reasonable and the benefits are truly worthy for all of us to dedicate our skills and energies to our fullest capacities.

I believe we also recognize that part of the obstacles for achieving the goal is that, examined purely from the traditional way of calculating the rate of return to a company, the profitability of a forestation project is very low. Especially under a discounted cash flow calculation, there appears no way that a manager can justify a forestation project before a board of directors intent on securing maximum annual profit yields. But I believe the enlightened business executive is responsible not only for annual profits but for long-term profitability of a business enterprise. And as a good citizen of the community, his concern should be in the factoring in, as much as practicable, of the social and environmental costs and benefits of his business decisions.

I believe it's important that two more basic ideas related to forestry development be kept in mind.

The first is that private industry needs the help of government and scientists to keep private industry's costs low. There are many ways this can be achieved. Our public programs of research and development can be geared to specific private projects without, of course, violating any laws or ethical considerations. And government can bring together agencies such as a forestry company, and say, senior Boy Scout and Girl Scout troops for a combination of enthusiastic manpower and training and experience. There is no need, in other words, to consider that we must always use highly paid labor forces for programs of forestation, planting, and clearing, when volunteers can benefit from such work and make the financial burden of the entrepreneur easier. Our union people should be the first to recognize the validity of this special treatment for companies willing to make long-range commitments.

The second idea, related to the first, is that we should consider reforestation as monument-building. When we plant thousands of trees in Hawaii, we are building a living monument to the past—meaning our generation—and a usable, very valuable resource for the future—meaning our children. In the process, many groups can join in the building of that monument, making personal financial gain secondary to the nobility of the project itself. Pride in the monument, pride in its purposes and objectives, pride in the work and in the accomplishment—all these can be called valuable economic resources available to us as we seek to help private industry implement a marginally profitable or long-range enterprise.

I leave you now with that challenge: To find the ways and means to get forestry moving in these islands; to get trees planted by the thousands; to clear the land, put in the seedlings, and build the living monument to our generation.

Thank you.....

PANEL

Landowner Commitments To Timber - The Potential And The Problems

Commercial Timber:	Harold P. Luscomb
Koa - Potentials and Problems:	Myron B. Thompson
Cattle and Timber: Timber Industry	Hisa Kimura
on Maui:	Clint Hallsted
State Commitment:	William Sager

Commercial Timber

by

Harold P. Luscomb

Mr. Chairman, fellow panelists, ladies and gentlemen, I want to thank you on behalf of Mr. John W. A. Buyers, President, and Mr. Robert H. Hughes, Senior Vice President of Hawaii Operations, of C. Brewer and Company, Limited, for allowing a representative of C. Brewer to be with you this afternoon. I would also like to offer my personal thanks. It has been my pleasure to attend your sessions in the past and they have always been very enjoyable. In the short time I have been attending these sessions each one is bigger and better than the one before. I look forward to next year.

I'd like to lay a basis for the comments I am about to make by reviewing very briefly the history of our Company—C. Brewer and Company, Limited. I use that term, C. Brewer and Company, Limited, for the entire family of Brewer companies. Brewer was founded in 1826 by Charles Hunnewell. He came here via Cape Horn on a trip which took 276 days in a 49-foot sailing vessel. Mr. Hunnewell was the captain of the vessel, and rather than accepting pay, he brought with him 40 barrels of goods for trading. Mr. Charles Brewer joined Captain Hunnewell and eventually purchased the Company and gave his name to it. In 1850, over 100 years ago, Brewer first became involved in sugar.

Today Brewer is an internationally diversified agri-business producing and distributing a variety of food products and services. Our 1975 annual report shows we have assets of approximately \$300 million. Our total revenues for 1975 were \$296 million. Today Hawaii is home base for our operations on the mainland U.S.A., Central and South America, Africa, the Middle East, Southeast Asia, South Pacific Islands, and other areas around the world. We employ approximately 6,000 people.

What do we see as our mission at Brewer? Let me state that this is my personal view and is something that I have put together out of my own 28 years of experience in this Company. Brewer has some 4,000 individual stockholders. They have provided our Company with capital through their investments which has made it possible for us to accumulate the \$300 million in assets. As managers we must employ those assets to the fullest extent consistent with prudent business judgment in the best interest of our shareholders, our employees and the communities in which we are corporate citizens. Land is one of our assets and may well be one of our most valuable one. An asset that never appears on a balance sheet is our employee group. The 6,000 people we have in Brewer are truly a valuable asset. I think it's amazing for a Company our age, 150 years, to have people retiring after 50 years of service. Let me try to give you a little different view of 50 years of service—someone who has worked for us for 50 years has worked 25 percent of the entire lifetime of our nation, or another way would be to say he worked 1/3 the lifetime of our Company. Fifty years is a long time and we at Brewer are very proud of our employees.

An example of our corporate attitude toward the employment of our land assets can be seen in our recent announcement about the lands we recently re-acquired at Kilauea. We studied the lands for a year to determine what course of action would be best for our shareholders, our employees, and communities in which we operate. That is why we announced a return to agriculture in Kilauea.

Usually when I make a talk about Brewer and the fact that we are an old Company and a big company and that we own or operate 142,000 acres of land in the State people are impressed. On the panel today I see representatives of landowners who own considerably more land than Brewer, and I strongly suspect that there is at least one organization represented that has been in Hawaii longer than Brewer. That is a very unique situation.

With this background, then, what is Brewer's commitment to timbering? As I said, Brewer owns and operates a total of 142,000 acres throughout the State. They own in fee 100,000 acres. Of the 100,000 acres, we have 33,000 acres in the production of sugar cane. We have another 19,000 acres employed as pasture land; some in our dairy operations, others leased out. We have 3,000 acres of land committed to orchards. We are the leading producers of macadamia nuts throughout the world. One thousand acres of our land is committed to recreational facilities, golf courses, housing and industrial use. In total land we have actively employed 56,000 acres out of a total of 100,000 acres.

What of the remaining 44,000 acres? I think it will help to tell you where those 44,000 acres are located—24,000 acres are on the Island of Hawaii; 17,000 acres on the Island of Maui; and approximately 3,000 acres on the Island of Kauai. Those of you who are familiar with the Island of Hawaii will recognize some of the lands lie from Kaumana to Piihonua. In the Ka'u area much of the land is in the hills above Ka'u Sugar Company. On Maui our land extends from Waikapu north to Waihee.

Over the years, C. Brewer and Company, Limited has made many studies on the potential of forestry on our lands. Most recently we completed a study with the assistance of the Department of Land and Natural Resources. I would like to thank Tom Tagawa, Bill Sager and Carl Masaki very much for the assistance they gave us. We supplied them very meager basic data about Brewer's land holdings. They converted that data into an inventory of commercial timber lands that our Company has. The results of the study indicates that we have approximately 12,000 acres that could be called commercial timber. You may ask that if we have such an asset as this 12,000 acres of land, why don't we start planting trees right away? It is a matter of economics. During my 28 years with Brewer, we have made many studies on how to put our land to productive use and to date the economics have never come out.

As someone said, "you must be patient." Well, as the world's leading grower of macadamia nuts, I guarantee you we are patient. Macadamia nuts take 7 years before you get any appreciable production, and between 12 and 15 years before you get a positive cash flow. I can guarantee you that in Brewer we do try to have patience.

In companies such as ours, there is always a great deal of competition for capital funds. These are the funds that our managers use to expand our operations, to improve our operations and to seek out new activities for our company. In years such as 1976 when the price of sugar is disastrously low, competition of these funds is intense and use of these funds is subject to very critical review by management. But, how do we view timber? Our interest in commercial timbering is strong—not just in the short range, but in periods that could well extend beyond the lifetime of those involved in management in our Company today. In spite of low rates of return we have a strong interest in timbering. In years when our cash flow will permit, we are prepared to commit to a planting program for commercial timber. Again, let me repeat, in years when our cash flow permits, we will commit to the planting of commercial forests. We do have a responsibility to our shareholders, our employees and communities in which we operate to do the best job we can. I think it will not be long before the economics of commercial forestry in Hawaii become attractive because of what's happening in the OPEC nations—Oil Producing and Exporting Countries throughout the world. There is a meeting of this group scheduled in December and they are talking of increasing the price of oil by 15 percent to 25 percent. Everyone in this room can appreciate what will happen. It wasn't too long ago when we were buying gasoline for 39¢-40¢ per gallon—now it's 68¢-70¢. I think these increases in prices are going to make the biomass as an alternate source of energy for Hawaii very important.

In summary, what is our position on commercial timbering in Brewer? We have a strong interest in commercial timbering as a means of better employing certain of our land assets. We shall continue to study the opportunities that commercial timbering may provide. We shall continue to work very closely with the State and Federal forestry people in seeking solutions to the commercial timbering problems.

Thank you very much.

Koa - Potentials and Problems

by

Myron B. Thompson

The Trustees of the Kamehameha Schools/Bernice Pauahi Bishop Estate quite likely had the earliest and have maintained the most extensive, and I might say expensive, interest in forestry in Hawaii of any private landowner. As early as 1900 the Trustees sent a Mr. Dodge to Kona, Hawaii with instructions to lay out division fences for various forest lands. Again in 1922, 1923, 1926 and 1957 other efforts in improving the forestry potential on the Big Island were pursued. From 1958 to 1969 almost 2,000 acres were planted with about 100,000 trees at a cost to the schools/estate of over \$125,000. In addition, our long-time representative in Kona, Mr. Norman Carlson spent a great deal of time and budget on the forestry problem.

From the point of view of the money involved, this quite likely has been the most unprofitable exercise in business that the trustees have ever undertaken and maintained, but they have done so for a number of reasons. First, it was always held that possibly some day in the future it might be possible to harvest timber in sufficient quantities as to return the outlay of monies expended on these projects. Second, it was recognized that there was considerable public interest in the forestry lands. And finally, of course, there is no doubt that the schools/estate was and is a major owner of forest land. The schools/estate now owns over 85,000 acres of land classified as forest, with more than half of this being on the Big Island of Hawaii.

Our current renewal of active interest and operation relative to forestry land stems back to some developments which took place in 1974. In that year a private organization with a mainland headquarters offered to buy from the schools some 3,000 acres which constitute the Kilauea Forest. The temptation to sell was, frankly, very great for there is little reason to believe that the schools/estate will receive any sizeable income from this forest reserve for years and years if at all. And certainly, the money we were offered, even though it was not a high price, would have returned, if invested in securities, a great deal more than the schools are receiving in lease rents.

But the trustees decided that before taking such a step a complete exploration of what might be possible in this area would be in order. Thus, on January 6, 7 and 8, 1975 a group of those who were concerned with the Kilauea-Keauhou forestry area were assembled to discuss the possibility. These included, in addition to representatives of the Kamehameha Schools/Bishop Estate, representatives of the United States Forest Service, the Hawaii Division of Forestry, the University of Hawaii and the United States Bureau of Sports Fisheries and Wildlife.

From this conference there was developed a proposal to establish the Kilauea-Keauhou Forestry Center which would encompass the 3,000 acres of the Kilauea Forest, the Keauhou Ranch area mauka of the 5,000 feet level about 2,500 acres and some adjacent acreage owned by the State and administered by the Department of Social Services and Housing.

The purposes of this center were stated in that document as follows:

- A. To provide useful and needed educational and vocational opportunities primarily, although not exclusively, for the students of the Kamehameha Schools.
- B. To develop through research, knowledge which will improve the state of the art vis-a-vis the growth and prudent utilization of forest resources in Hawaii.
- C. To develop base-line data for research in native species silviculture and related areas.
- D. To restructure the dynamics of the Kilauea-Keauhou ecosystem.
- E. To perpetuate the procreational and maintenance area for native fauna and flora.
- F. To produce historical research relative to traditional Hawaiian forestry activities and practices.
- G. To project the economic feasibility of a sustaining hardwood forestry industry in Hawaii.
- H. To examine the possibility of limited logging without negating other values involved.
- I. To provide for the dissemination of research results, technological developments and cultural findings to all appropriate audiences.

To achieve these purposes there was to be established an overall coordinating committee and three sub-committees—one on educational, vocational and cultural affairs, a second on developmental potential and a third sub-committee on research.

Subsequent to the development of this original document there were a number of other meetings designed to refine and develop plans for the implementation of this proposal. One of the interesting developments of the result of this was a statement, broader in scope, of the mission of the Kilauea-Keauhou Forestry Center. This was described in the following words: "The mission can be stated simply. It is nothing less than to plan and utilize the Koa forests located in these islands to improve the cultural and economic lives of the citizens of Hawaii."

But the troublesome fact remained that there was not, among the various participating agencies, any single entity which could draw this all together, develop focus and begin to move forward. Thus the decision was made to see whether or not the Governor's Office might be interested in playing a more central role than had been envisioned originally.

And here I should like to pay tribute to Governor George Ariyoshi. He quickly saw the importance and merit of an entity which would draw together the resources, the expertise, the talent of government, of education—both public and private—of scholars and of the private sector. The Governor immediately approved the idea and asked that the plan be re-drafted to take cognizance of both the voluntary, cooperative nature of the agreement as well as the leadership role of the State Administration. He designated Mr. Hideto Kono, Director of the Department of Planning and Economic Development, as the member of his administration who will play the coordinating role.

And there is movement. There have been a number of meetings and we are prepared to start the first project immediately. This will involve extensive experiment in the planting and rejuvenation of koa in the mauka Keauhou area. Fencing will be done to keep out destructive animals, new trees will be planted, plots will be scarified.

Three final observations:

1. In my experience in State government this is among the fastest and most decisive actions on an important matter that I have seen taken by a State Administration.

2. For the first time I see a real potential for bringing Hawaii's forests into being as a real asset for the citizens of Hawaii.

3. This approach has so much merit that I am hopeful that consideration will be given to its application to other areas of concern within Hawaii.

For the land indeed is preserved in righteousness, but its utilization in the interest of all our citizens is advanced by the cooperation of the private and public sectors.

Cattle and Timber

by

Hisa Kimura

The subject "Cattle and Timber" instantaneously brings to our mind the era of unrestricted cattle grazing our lands beginning in the year 1794 and through the mid-1800's. No doubt, cattle have been the great factor in affecting the native forests.

May I quote the late C. S. Judd's report on "Natural Resources of the Hawaiian Forest Regions and their Conservation" which was written in 1926.....

Quote: "In discussing the natural resources of the Hawaiian forest regions and their conservation it is convenient to divide comparatively recent times in Hawaii into four periods. 1) The Prediscovery Period; 2) the Sandalwood Period; 3) the Cattle Period; and 4) the Water Conservation Period. We have **almost** emerged from the Third and are now valiantly entering upon the Fourth Period. Throughout all of these periods, water has run as the outstanding resource, taken for granted in the earlier periods as inexhaustible, but realized in the last period as a distinct resource of great value, demanding conservation in order to safeguard the continued prosperity of the Land." Unquote.

Today, perhaps it is safe to state that we have emerged from the Fourth period and are confronting the present—the 5th stage...“Timber Industry Potential in Hawaii.”

May I reflect our thoughts and look back to the 3rd period, the beginning of domesticated cattle and eventually one of the major industries of Hawaii. The stakes were high, as grazing lands were needed, timber was extensively used as the only source of fuel, saw-timber was used to build homes, and miles of fencing were constructed of wooden posts. All of these were depended necessities; the rule of moral conduct being that the "greatest good for the greatest number prevailed."

However, the most reassuring and heartening event is the fact that our reforestation program has come about through democratic process. As people gathered, living in small homesteads, trees and shrubs became abundant and an integral part of our lives with soil, water, animals and food. A Tree Nursery was established at Parker Ranch and eventually recorded with the U.S. Department of Agriculture—City landscape trees, windbreak and timber trees were introduced.

The Parker Ranch reforestation program began in 1900. Prime grazing lands were planted with variable objectives—namely...

- 1) Tree Plots located sporadically for fence posts
- 2) Windbreaks for conservation purposes
- 3) Boundary planting for pasture subdivision

Initial species introduced were: Monterey, Cypress and Eucalyptus, and more recently various varieties of Conifers.

With the advent of high grain prices, the cattle ranchers today are facing a serious cost/price squeeze. With the cost of feed doubled during recent years, and with only 6 percent increase on price of beef, ranchers will need to look for more efficient use of its land—any additive income certainly will be a definite help to support the cattle industry. We are in cooperative agreement with U.S. Forestry Service in releasing 2 to 3 5-acre parcels for research on timber tree.

The Parker Ranch timber survey conducted by Ernest Pung reveals that there are approximately 20 to 30 million board feet available as timber and woodchip quality. The survey also furnished a very interesting factor that trees planted in rows of 4 to 8 as windbreak have about a 90 percent dominant rate. In comparison, trees in forest have about 35 percent, with 65 percent suppression caused by lack of side sunlight and other factors.

Speaking for private landowners, our commitment to potential timber industry will definitely be determined by several advancements by the State.

Some pertinent issues we need to know are:

- 1) Who will initiate and encourage timber as an industry to promote the economy of the islands?
- 2) What direction should landowners take: Sawmill Timber or Woodchips?
- 3) Will the State be a competitor to private landowners?
- 4) Will the State cooperate with landowners for access to State Forest for transporting logs out of private lands? Also access through State lands for additional planting.
- 5) Should the State initiate greater Federal funding for encouraging and promoting reforestation programs for the timber industry? Forest Incentive Program.

Timber Industry on Maui

by

Clint Hallsted

First, I certainly want to congratulate Roger Skolmen on his excellent slide show regarding the past and present of the timber industry in Hawaii. I surely did not realize the industry had been as active as it was. That was an excellent presentation, Roger.

Next I was heartened to hear Governor Ariyoshi express the thought that the State would take a leading role in the development of a viable forest industry and Mr. Kono's remarks were encouraging.

I note the afternoon session is devoted to "Landowner Commitments to Timber—The Potential and the Problems."

The title of my talk has been given as "Timber Industry on Maui" and it should be kept in mind that since we are not landowners nor are we in the timber business on Maui, these comments are purely some reflections on what we think the timber industry could be.

First, I want to say that Forest Resources Hawaii, Inc. is a Hawaii corporation registered a year and a half ago to do business in the State for the purpose of forestry management and services including the care, management, growth, planting production, processing and sale of forest resources. As far as I know it is the only forest management company in the islands.

Our personnel structuring is such that we have professional foresters, ecologists, and engineers to do the best job we know of in managing forest lands. Jim Culver, who attended a couple of these meetings and whom many of you know, is our resource manager. Jim is a partner and forester in the SWA group which is a nationally known land management and consulting group of scientists headquartered in Sausalito, California. Jim could not be here to talk with you so I shall try to fill in for him.

Bob Kohn who is presently the President of Continental Forest Products, Co. in Ashland, Wisconsin will be our General Manager. Bob has spent his whole life in the wood products field, managing timberlands and utilization and processing plants, mainly in California.

When you think of timber in Hawaii you normally think of the Big Island. Many have asked why our people were interested in Maui as a source of raw material and it is a good question. In short, after studying all aspects of the situation, we believe Maui has excellent potential for the growth of multiple species which can lend themselves eventually to production of construction lumber which is so badly needed locally and to the growth of high-grade hardwoods for export.

I am not going to burden you with statistics because Ed Petteys covered this nicely this morning, but over one half of Maui is in forest lands with about 120,000 acres of commercial forest and about 143,000 acres of non-commercial forests.

The objective is to put into use those lands which are now idle and to establish a forest management program for multiple land use of existing properties which includes as number one watershed protection, then wildlife management, recreational uses, and timber stand utilization and improvement.

You have heard from Bob Nelson's panel of experts this morning on the impacts of a timber industry on other forest values. The subjects of soil and water, wildlife, endangered species, recreation, protection, and research were well covered and I shall not get into a duplication of their thoughts but all of these factors have been cranked into our program.

You ask then, how can our objective be accomplished? First by careful planning with a team of specialists and then by slowly putting the plan into operation.

The plan must take into account the biological factors involved such as non-disturbance of the habitat, soils, wildlife, and other various ecosystems in the forest.

It must relate itself to the human factors of environment and must not pollute or be in conflict to the best interests of the populace.

To carry out this plan there must be funds and where do they come from? Our plan is a self-funding operation in that Maui has an abundance of good wood fibre in the form of eucalyptus robusta and bluegum. It is estimated that there are 110 million feet of sawtimber size fibre and approximately the same amount growing.

I hate to mention it because it is a dirty word in some circles but these eucalypti make excellent fibre for wood pulp. Wood chips are the source from which we can generate the necessary finances to grow the species of timber which will some day end up as studs and rafters in your home or, perhaps, a piece of fine hardwood furniture. I say "your" home—it will more likely be your grandchildren's or great grandchildren's.

Our studies indicate that taking the cooperative land potential of public and private lands as now exist, a small wood fibre and wood products operation is feasible.

Let us look at species. Eucalyptus robusta is the dominate commercial species on Maui. It grows fast enough to regenerate itself into wood fibre for chips in 6 to 8 years and into sawtimber in less than 20 years. There is available enough saw timber to operate a small sawmill indefinitely. An integrated operation with high grade outside cuts could be utilized for furniture, flooring, and finish lumber while the rest of the log goes into chips.

I do not mean to be critical when I say that the sawmill operations on the Big Island and on Maui have been somewhat less than successful because they have been working with a most difficult species. I want to especially commend Gene Helle, Maui Hardwoods, who has dedicated all his energies and resources to develop a viable profitable wood industry on Maui. The problem is that the production of robusta has ended up with a low-grade low-priced product. One that would not bring the necessary cash for a reasonable return on investment. We believe there is a market for high grade, well manufactured, kiln dried, milled, and grademarked material. Robusta is a colorful wood and no doubt uses can be found which are not now apparent as long as the product is high-class. Marketing would be in the hands of those who have made hardwoods their life's work.

After studies show which species are best suited for each location, plantings will be done of more valuable and usable species. It is expected that commercial softwoods such as the pines which grow so well in the Southern States, Central and South America can be grown and utilized for housing and other construction in the islands where now approximately 100% is imported from the mainland. For example, taking softwoods for construction lumber, it is estimated that 100 million feet may be used in Hawaii annually. These figures are high now with the slowdown in housing but if this amount were used, the savings in freight alone would be 5 million dollars. Think what the economy to the state would be if all this were produced here, with wages, salaries, goods, and services going into the island economy instead of the mainland. Now I'm not trying to say that the needs would be satisfied locally but even if 30% or 20% or 10% were produced here it would help. Commercial high quality hardwoods would be planted.

The State Division of Forestry and the Pacific Southwest Forest and Range Experiment Station of the U.S. Forest Service has invaluable information in regards species and they have been very cooperative and helpful. We shall continue to seek their assistance and guidance.

With eucalyptus then, carrying the load for income in the initial years in the form of chips and with landowners and industry sharing in the costs of reforestation and new plantings, a program for developing a real integrated timber industry on Maui can be evolved.

I have read with interest the booklet, Forestry Potentials for Hawaii, and the suggested programs A, B, & C. They are well proposed plans and convey practically the same thoughts as our group. Program B, a modest plan, seems to appropriately fit into our scheme of things.

Now the \$64,000 question—How do we get started to do the job that is necessary. We find that owners of private timberlands and potential timber producing lands, are very cooperative and anxious to get started on a program. We have discussed our position with Mr. Kono and his people who are very receptive as is Mr. Farias of the Agricultural Department. A year ago we outlined our program to the Department of Land and Natural Resources and hope that there will be some action taken.

One thing I learned when I first came to Hawaii was the apparent distrust for outsiders and particularly mainlanders who had fast talk but little else to offer. In the forestry business these people have been recognized as the "cut out and get out" element. This obstacle often stands in the way of progress. The key is to be able to recognize these "wheelers and dealers" and to insist on guidelines which must first include a comprehensive feasibility study and plan of action. This is a laborious and expensive operation but it must be done by professionals. The plan must include a multiple use concept, sustained yield, and a sound program of development and planting with environmental problems foremost in mind.

As we see it, the development of a multiple-use forest land resource program for Maui must be a cooperative effort of private and public landowners brought together by a team of professionals who have the expertise, far-sightedness, will, and means to do the job.

Now ladies and gentlemen, to digress a moment from forestry in the State of Hawaii I should like to bring you up to date on the national scene.

I have just returned from the semi annual meeting of the National Forest Products Assn. which is based in Washington, D.C. The NFPA is an association of 28 different federated associations having to do with wood and wood products. It is the spokesman for the wood industry in Washington. I am a Director of it due to our affiliation in the American Wood Preservers Institute.

There was much joy at this meeting because Congress had passed and President Ford had just signed into law the new National Forest Management Act and also the Federal Land Policy Management Act of 1976. These two bills will assure a steady stream of federal timber resources into the production of wood products.

At this meeting, the directors passed a resolution urging the President to appoint an Assistant Secretary for Forestry in the Department of Agriculture.

Thank you very much.

State Commitment

by

William Sager

We heard a great deal about the potential of timber in Hawaii. We have heard that we can grow wood as fast as any place on earth, we have heard some of the economic problems which have to be overcome and we have discussed some of the other resource considerations which must be resolved in order to implement a commercial forest industry.

But what of the State commitment? What can we do to make State land more productive for the people of Hawaii? There are two things the State can do to help develop a forest industry:

1. Encourage private tree farming.
2. Set an example on suitable State owned sites.

Let's look first at State potentials. You have heard some general references to the publication "Forestry Potentials for Hawaii." Let's get site specific. These maps show the potential commercial forest areas in the State. Level "B" is a middle of the road program. A program which will provide the wood resource for an economically viable timber industry and still have a minimum impact on other forest resources.

When you look at these maps, remember no detailed site analysis has been made. We are saying this area is generally suitable for establishing a commercial forest. We are not saying every acre of this area should be planted or even that all of the area is suitable for planting. There are too many other factors which must be considered and conflicts which must be resolved. Still at the broad level of general planning, let's look at some of the factors to be considered.

These are the A, B, and C Timber Alternative Plans for Maui. Let's look at some of the factors which must be considered in making a final decision.

First, let's look at overall timber potential from the standpoint of sight quality. As you can see Plan "A" uses most of the prime forest sites. Plan "B" moves on to our average sites. The prime sites are just that an effort to show the very best. Average sites still have very respectable growth potential.

Mr. Walker discussed wildlife habitat and the effect of a commercial forest program on wildlife. He pointed out that the effect can vary with the species and with the silviculture methods used. Where important wildlife ranges overlap timber potential, we need to analyze the relationship and the degree of conflict. Sometimes the conflict can be resolved. At other times, a choice must be made.

Unique features such as outstanding scenery or areas with high archaeological potential are other factors influencing both recreation potential and need for protection. Again, overlap will point a red flag at areas where conflict must be resolved.

This map uses an ecosystem approach to native plants. We tried to define those forest ecosystems which are basically native and in which significant changes in native plant composition have not occurred.

These undisturbed native forests are the most fragile from a management standpoint. Where protection of a native forest ecosystem is a primary consideration, commercial forest management is clearly a non-compatible use. Fortunately, areas of direct conflict are minimal. Where conflict occurs, we will have to look at the remaining native ecosystem and the need for additional wood resources and make a choice.

The Planning process as presented here gives us an indication of both potential and problems. It also allows us to look at our resource in an overall picture and to evaluate the effect of a proposed action on the total resource. It helps focus our attention on specific problems and to define priority areas for action. A great deal of detailed planning is needed before we make a site specific proposal. Environmental assessments must be an integral part of the planning process. So to, public opinion and scientific expertise from many disciplines must be part of the planning process. And finally, when we have all available information, when we have a cross section of public opinion, then the final decision can be made by the Board of Land and Natural Resources.

The State Division of Forestry has the "Forestry Potentials" plans which provides an overview and a five year planting plan with specific proposals. We have studied other resources and conflicting uses. We have even made some attempts to prepare environmental impact statements. But, we have not gotten our act together to finalize our plans and present our proposals for Board action. It is time we focus on developing a reliable timber resource. The State must set an example for industry to follow. The State must show a forest industry can be a viable part of Hawaii's economy.

What can we do to help private industry put their lands into timber production? One of the most important things is to be able to demonstrate success and to provide reliable cost figures.

We have a Service Forester Program, two Foresters whose job is to provide technical information and advice to private landowners on any aspect of forestry from establishing a windbreak to managing a tree farm. We have a forest nursery which provides tree seedlings at nominal cost to individuals who want to establish a plantation or a windbreak.

Now, if you can stay with me for a couple more minutes, let's take a look at Oahu and what we will be looking at tomorrow.

This is the A, B and C plans as proposed for Oahu. Wildlife, unique features which provide recreation destination areas and quality native ecosystems.

Tomorrow, we're going to the Peacock Flat area of Mokuleia Forest Reserve. We'll take a hike through this area of native forest and look into Makua Valley which is currently a serious fire problem and a center of controversy due to demands for native claims. We'll see comparison of land use between ranch lands and forest reserves and some of the area which has been designated as prime forest lands.

The area is one of tremendous land use potential and extreme conflicts in potential land uses. Come with us to visit the Mokuleia Forest Reserve. See the potentials and form some opinion about how you think the area should be developed.

But, take care not to form opinions too quickly. The area is complex, opinions on how the area should be used will be varied. There will undoubtedly be controversy. Final land use recommendation must be based on a careful evaluation of the natural resource and how they can best serve the people of Hawaii.

Field Trip Summary

by
Virginia Macdonald

Guides:

William Gorst	Division of State Parks, Department of Land and Natural Resources
Craig Whitesell	Institute of Pacific Islands Forestry, U.S. Forest Service
William Sager	Division of Forestry, Department of Land and Natural Resources
Herbert Kikukawa	District Forester, Oahu, Department of Land and Natural Resources
Dr. Charles Lamoureux	Plant Botanist and Taxonomist, University of Hawaii
Lorin Gill	Sierra Club

Nearly 50 of the Forestry Conference participants huddled under jackets, raincoats, and umbrellas to listen as the six speakers described the potential of this Mokuleia Forest Reserve (known as a "dryland forest") for park use, forestry research, commercial timber, recreational trails, and preservation of native and endemic species.

The first stop was in an area of eucalyptus saligna. The potential for growing commercial timber was well illustrated by these trees whose straight trunks have developed from seedlings to 60-foot trees in the short span of 16 years. William Sager explained that the word "potential" meant that conditions of slope, elevation, soil productivity and rainfall were all suitable for commercial timber production.

The next speaker, William Gorst, pointed out that the area was also a prime candidate for State Park use. The large area of State-owned land, beautiful views, potential for equestrian trails, and good conditions for hiking and camping, all of these conditions provided the "potential" for an excellent State park.

Craig Whitesell explained some of the research projects which are being carried out in the area and pointed out that it is advantageous to have such a site on the same Island as the Forestry Office.

The next two speakers led the group along a trail toward the ridge of the Waianae, stopping at intervals to point out examples of native species and of the damage by cattle, drought and fire. Lorin Gill pointed out a **lama** tree, (*Diospyros*). **Lama**, native to Hawaii, is increasingly rare on Oahu. It is a medium-sized tree whose wood is very hard, close grained, and of a rich reddish brown color when old. **Lama** wood was used in the construction of religious temples and a block of **lama** wrapped in choice yellow **tapa** and scented with tumeric was always placed on the altar of **Laka**, goddess of the sacred **hula**.

Another use of **lama** was for a **kapu** enclosure, **palama**, within which an **alii** chiefess was consecrated, where she awaited the **alii** chief chosen as her first mate, and where the royal child was conceived.

The word **ma-lamalama** refers to the **lama** tree, and occurs in the motto of the University of Hawaii, referring to a state of enlightenment.

Dr. Lamoureux identified an '**Ahakea** tree for the group. The Hawaiians, through long experience, knew the characteristics of the various plants which were available to them. The '**ahakea** (bobeia) is a tree about 30-feet tall in the Mokuleia Forest. Being a very hard, durable wood, the '**ahakea** was utilized for canoe gunwales. To this day canoe gunwales, whatever the material, are painted yellow to imitate the typically yellowish color of the '**ahakea**.

Near the upper end of the trail there were several examples of '**ohia ha**, whose bright red fruit on the trail alerted the group to the tall forest monarchs forming a canopy above.

At one point, Mr. Gill pointed to the side of the trail where the ground was carpeted with ferns and numerous native Hawaiian trees and shrubs...**kopiko**, '**ie'ie**, **hale pepe**, **ala he'e**, and others which, in spite of the impact of cattle grazing and fire and other impacts of man, survived to create a Hawaiian garden. On the other side of the trail, cattle damage and drought combined to wipe out almost all of the native plants, leaving in their place exotic weeds of no value, such as fire weed, palm grass and Custer's curse.

When the conference participants returned to the cars an hour later they were dramatically aware of the conflicting demands for the use of this Forest Reserve area on Oahu. "All of these uses" they were told, "commercial timber, recreation, protection of native species, they are all desirable, all are needed, but the area is not large enough for all of them to be encouraged in one place at one time. Difficult choices must be made."

