

A DEPARTMENT OF LAND AND NATURAL RESOURCES PUBLICATION





### FEBRUARY 2012



By the Numbers: Facts about groundwater, pigs and forests



### Q&A: William Aila Jr. DLNR chief chats about why

watersheds matter

## From Hawaii's Forests

Key Forestry managers are making watersheds a priority



### **How We Get Water**

Pull-out chart on how Hawaii collects and maintains its fresh water



### ▶Island Alliances A look at three partnerships focused

on protecting watershed areas



### From the Capitol

Sen. Dela Cruz and Rep. Chang on legislative support for watershed areas

### **End Users**

common?

## What do a chef, a farmer and

a marine biologist have in

### Wai Magazine

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## The Rain Follows the Forest

Airing throughout the month of February on "Outside Hawaii" on channel OC16.

For a full schedule visit the DLNR website at www.hawaii.gov/dlnr/rain





## Take Action Now

In November 2011, Gov. Neil Abercrombie unveiled a new plan, **"The Rain Follows the Forest: A Plan to Replenish Hawaii's Source of Water."** The governor shares his thoughts on what he has tagged as a priority for his administration – protecting the state's watershed areas.

### The best time to start protecting our mauka watersheds was decades ago. The second best time is now.

USTAINING DUR WATER is not a new issue. I first got elected back in 1974 to the state House of Representatives on ideas from what was then the beginnings of the environmental movement – a message I believe

resonated with voters. At that time, it was assumed we had an endless supply of water. We did not take into account invasive species, human activity and other threats that we know now to our forests, the producers of our water.

Our watersheds are in trouble. Only a tenth of priority watershed is protected and that has taken us 40 years to accomplish. Protecting our watershed forests is the most cost-effective and cost-efficient way to produce water. Harsher, drier times are ahead of us. Let us operate on the conservative side and take action now for the long term future for water.

### Water is key to planning and policy-making.

Energy independence, environmental sustainability, food sustainability – they all come back to water. We as a state need to know where we're going on food production, biofuels, urbanization and more. Water is key in our decisionmaking.

We also cannot keep pouring money into marketing Hawaii's natural beauty while neglecting to make improvements to the "product" – public facilities, greener buildings, vibrant culture and arts, and our natural environment. The "Energy independence, environmental sustainability, food sustainability – they all come back to water."

economic benefits created, such as jobs, will ripple through our economy for current and future generations. Visitors to Hawaii do observe and tell others about the effects of policies that show we respect the environment. We have an opportunity through our decisions to educate visitors and ourselves about the cultural, economic and environmental importance of our native forests.

### New Day in Hawaii Comprehensive Plan emphasizes stewardship of government on natural resource management.

The governor's office has the overall authority on natural resource management. I take this role seriously for watershed protection. We must enable the Department of Land and Natural Resources to be able to fully steward watershed protection. Taking care of invasive species and other threats are immediate concerns. We must also monitor on-the-ground actions, educate residents and visitors about conserving native forests, and we must promote consistent and informed land use decision-making that protects watersheds.

# Water Production 2012



watershed areas statewide currently protected. Percent of rainfall decline in Hawaii in past 20 years.

# 551

Number of watersheds across the islands of the Hawaiian archipelago.

10

### **\$14** billion

Estimated net present value of Oahu's Koolau forests to provide water quality and recharge, climate control, biodiversity and cultural, aesthetic, recreational and commercial values to residents and visitors.

## **85 million**

Gallons of estimated groundwater recharge lost daily in East Hawaii Island due to invasive plants.

The average response, on a scale of **1 (disagree)** to **10 (agree)**, by Hawaii residents surveyed on the statement: *"Hawaii forests are important to Hawaii's fresh water supply.*"

ONE

How many pigs it

takes to uproot a

forest area the size

of a football field in

one week.

Sources: State Department of Land and Natural Resources; Hawaii Association of Watershed Partnerships (www.hawp.org); University of Hawaii Economic Research Organization, 1997; U.S. Geological Survey Scientific Investigations Report 2011-5078; 2011 Rainfall Atlas of Hawaii, University of Hawaii, Department of Geography; and OmniTrak Watershed Survey, October 2011.





## The Last Drop

William J. Aila Jr., chairperson of the Department of Land and Natural Resources, talks about why watershed protection matters and why it matters now.

## **Q:** Are we losing our fresh water?

Threats to

**Watersheds** 

Hawaii's

ES. And we will continue to lose our ability to produce groundwater. We're already experiencing the hotter, drier conditions predicted ahead. In Waianae, I've seen in my lifetime perennial streams drying up, dike systems built by plantations tapped out. Groundwater levels in Pearl Harbor, which supplies 60 percent of Oahu's municipal water, have declined by half since 1910.

#### **Q:** But it rains now, sometimes enough to flood places like Kakaako in Honolulu. Why don't we just conserve and use less water?

That is why protecting our watersheds now is a challenge. The rain you see is part of a 10-year cycle of wetter weather. We must see this is as a window of opportunity to maximize the protection and restoration of our watersheds. Conserving water use helps. But what's ahead is unlike anything we've seen in the past. We have a larger and growing population, and already the demand by agriculture, residents, commercial, cultural uses, recreation are competing for the water we can produce now.

### **Q:** So this is about our grandchildren?

Absolutely. Ancient Hawaiians revered wai – water – because their very survival depended on it. Waiwai, the Hawaiian word for wealth, comes from water. We still live in a closed ecosystem on islands. As stewards of water today, we must ensure its sustainability for future generations.

## **Q:** Aren't most watersheds in remote mountain areas that we can just leave alone?

Our watersheds work best with native forests, an amazingly efficient multi-level system of capturing and collecting rain. On Lanai, captured fog water supplies even more water than direct rainfall. We have over 2 million acres of forests that supply almost all of the millions of gallons of fresh water we currently need. But half of our forests have already been lost to invasive species and other threats.

#### Q: Can't we just replenish our underground reservoirs by desalinizing ocean water, which is plentiful in Hawaii?

Desalination plants costs millions to build and operate, and will dramatically increase the price of water for consumers. Restoring our watershed forests requires a much smaller investment and provides superior long term economic value. We pay to have water delivered to our homes and businesses. Are we willing to invest in watershed protection — the production side of our water?

### Q: Are you optimistic?

We will be pono for water, because we are seeing more decision-makers who understand ecosystem management. We have a reciprocal relationship with our watershed forests. They depend on us to help them thrive; we depend on the forests to give us water to survive.

Invasive hoofed animals (feral pigs, goats, deer, etc.)

Invasive non-native weeds (strawberry guava, Miconia, Australian tree fern, etc.)
Fires

▶ Predators (*rɑts, insects, slugs, etc.)* ▶ Plant diseases

### →ON THE GROUND: DIVISION OF FORESTRY AND WILDLIFE

# **Protecting Our Forests**

Here's why healthy watersheds are the top priority for Forestry, one of the state's oldest services, established in 1903.



HE LUSH GREENERY of Oahu's Makiki Watershed surrounds Paul Conry, state forester and head of the Division of Forestry and Wildlife, and four county branch managers. The native and non-native trees behind them, part of the 1.5 million acres of state-owned forest reserve – the 11th largest in the nation – that they manage, help make possible the fresh water we expect when we turn on the tap.

"Without vegetation and forest cover in our watersheds, most of our rainfall would just run off into the ocean. Watershed protection is our No. 1 priority and requires active management," says Conry, a biologist and 22-year Forestry and Wildlife veteran who heads a staff of 185 that includes biologists, foresters, invasive species experts, and educators to assess, protect and restore the watersheds.

The Division of Forestry and Wildlife also works in partnership with private landowners to eliminate destructive invasive species and plant trees that can effectively collect rain and fog water to replenish our water supply in a total of 2 million acres of public/private lands.

A key Forestry and Wildlife initiative in recent years has been identifying and acquiring new lands to grow the watersheds under public ownership through the staterun Legacy Land Conservation Program established in 2003. In 2010, 65,000 acres in Puna on the Big Island were acquired, the largest addition to the state's watersheds since Forestry was founded in 1903.

"While we're in the midst of a 10-year cycle of wetter weather, we're still seeing



"Without vegetation and forest cover in our watersheds, most of our rainfall would just run off into the ocean. Watershed protection is our No. 1 priority and requires active management." -Paul Conry

drier areas expanding statewide and anticipate bigger episodes of droughts increasing in the future," explains Conry of the need to expand watershed protection. The state must maintain the current level of water production to serve the diverse needs of Hawaii's population, and must increase efficiency in the long term by protecting forests to capture, retain, and recharge our groundwater supply as a buffer for hotter, drier periods in decades to come.

"We're proud to say that the mountain tops of every mountain range statewide are now associated with an active watershed partnership," Conry says. "We have in place the data, technologies, expertise, experience, infrastructure and dedicated people. With expanded funding, our team can conduct their operations at a landscape scale."

## **Hawaii Priority Watershed Areas**

Department of Land and Natural Resources Division of Forestry and Wildlife

### County of Hawaii 🕨

We have about 600,000 acres in watershed, the largest in the state. Our focus is on the drier areas in West Hawaii – South Kau, South Kona and Puuwaawaa in North Kona – where watershed protection also provides habitat protection for native birds and native plants. Invasive species and fires are big concerns. Fountain grass, particularly, which flourishes along the highways near Keahole Airport, creates a dry, dead underbrush that's a fire hazard. The eucalyptus plantations planted in the mid-1990s in former sugar acreage to help stop erosion is close to harvesting to create a new lumber industry.

#### Roger Imoto

Hawaii Branch Manager and 22-year veteran forester

### County of Maui 🕨

Invasives are a problem in our county's 110,000 watershed acres, particularly miconia, which was introduced as an ornamental plant and just spreads like wildfire. It's taken over former agriculture lands in East Maui, home of the state's last sugar plantation, and invaded Hana, which attracts tourists for its native rainforests and abundant waterfalls. The West Maui Mountains watersheds are a protection priority because it serves the water needs of our drier south shore Gold Coast communities, such as Kihei, Wailea.

John Cumming Maui Branch Manager since 1990 and third-generation Maui native

### City and County of Oahu

Oahu as our urban center is compact in terms of watershed areas, which includes the Koolau Mountains, one of 12 major watershed areas in the state. Our focus is a modern take on the ahupuaa of the ancient Hawaiians. We integrate watershed protection in the mauka forest mountains with the lower wetlands and on to the near shore. In the northern Koolaus, fencing is a priority to keep goats out of the watersheds, which helps protect the Kailua ahupuaa, including 3,000 acres of Kawainui Marsh, and out to the ocean to protect seabird habitats.

Sea of

### County of Kauai 🕨

David Smith

Oahu Branch Manager and 23-year veteran biologist

We have 86,000 acres in watershed and opportunities to acquire former cane lands on my native island. A big priority is protecting Waialeale, the wettest spot in the world, and Kawaikini, the highest peak in that same mountain range, all of which is now 100 percent native trees and ground cover. Keeping out wild pigs and invasive plants, particularly the Australian tree fern that has invaded 20 to 30 percent of Kauai, from spreading into the nearby Alakai Wilderness Preserve area is a major emphasis. Watershed protection on the populated east side is to ensure uninterrupted water for agriculture and residential use.

**Galen Kawakami** Kauai Branch Manager

and 35-year veteran forester



Watershed Protection Priority I Watershed Protection Priority II Watershed Restoration Priority III Watershed Partnership Wells and Stream Diversions Groundwater Aquifers

## Hawaii's Waters: Past & Future

ANCIENT TIMES / First Polynesians believed to arrive in Hawaiian Islands by 600 A.D. Water conservation through kapu (laws) and kanawai (laws of water) become major laws of the land.

**1700s / First westerners arrive, follow***ing Captain Cook's arrival in 1778.* In the 1790s, large hoofed animals, including goats, sheep and cattle brought to Hawaii, roam freely, destroying forests.

**1800s / Sandalwood trade, ranching** and early plantations accelerate loss of **native forests** and raise industry demand for water. Discovery of artesian wells sets off a water boom on all islands that goes bust in 20 years, wasting millions of gallons of water.

1876 / King David Kalakaua signed an act for the protection and preservation of woods and forests. The act included the construction of fences and barriers to prevent hoofed animal trespass into forests important for water resources.

**1900 / Residents of all islands suffer a** *water panic.* Centuries-old springs and rivers had been drying up, wells salting up and fresh water levels becoming muddied and undrinkable from denuded upland forest slopes. Territorial Forest Reserve System established in 1903; builds fences, removes hoofed animals and plants 1.5 million trees on nearly 1 million acres by 1930.

**1920s/ Honolulu faces water shortages** caused by rapid industry and urban growth, and unrestricted use. Board of Water Supply established in 1929 to manage water use.

PRESENT DAY / State Natural Area Reserve System established in 1971 to preserve native ecosystems and cultural resources. First Watershed Partnership, a voluntary alliance, established on Maui in 1991. In 2011, state announces a 10-year plan to strengthen link between protecting native forest watersheds and sustaining water.

SOURCES: Board of Water Supply, City & County of Honolulu; and State Department of Land and Natural Resources Statewide Assessment and Resource Strategy: Hawaii Assessment Historical Context 2010.





SPECIAL PROMOTIONAL SECTION

## HOW WE GET OUR WATER

**Precipitation** Water vapor condenses and falls to earth as rain

2.

#### Evaporation Heat from the sun

converts ocean water to water vapor

**Spring** Groundwater released at the surface, fed by dikes, perched water or underground stream 3

### Loss of native forests

allows rain to fall on bare earth, increasing soil erosion, runoff and less filtering down to replenish the aquifer. Streams flood, debris lines ocean coasts and sediment ration permeates our reefs.

1.

Native forests are a wondrous, multi-layered natural canopy, evolving over millions of years, to soak up rainfall like a giant sponge that lets water drip easily and

slowly into the ground.

### Watersheds,

primarily thick rainforest regions on the mountain tops of each Hawaiian island, are our Islands' fresh water collection basin.

### SPECIAL PROMOTIONAL SECTION

## H20 + YOU



**FENCE BUILDER** We've put up close to 20 miles of fencing covering about 5,000 acres of remote watershed areas on Oahu and Kauai to keep out large hoofed animals to protect native trees and vegetation, but also the habitats of endangered species, such as birds. Fencing helps minimize erosion and preserve the quality of the natural water filtering system. An avid hunter and outdoorsman myself, we are very respectful of the recreational aspects of these remote areas.

Stuart Wellington Owner, Wellington Fencing Co. Lihue, Kauai



**PRIVATE LANDOWNER** Kamehameha Schools recognizes that healthy native forested watersheds provide us with a variety of critical services that contribute to the well-being of our beneficiaries and sustain life for all of Hawaii. As such, we greatly value our participation in seven of Hawaii's regional watershed partnerships, which enable us to leverage ideas, funding and expertise with neighboring landowners to collectively manage threats to our native watersheds on a landscape scale.

Namaka Whitehead Ecologist Land Assets Division, Kamehameha Schools



### FORESTER

Fighting fires in our forested watersheds, one of our most important functions, involves fighting fountain grass, a hardy invasive species that comes back to overtake native forest areas destroyed by fire. Since 2006, we've fought 36 fires burning 31,000 acres and costing the state alone \$2.1 million. We fight back by replanting thousands of trees annually to bring back our forested watersheds. Our Kamuela tree nursery has produced over 1.5 million native and windbreak tree seedlings.

Steve Bergfeld Forester

Division of Forestry & Wildlife, DLNR, Hilo, Hawaii

Well Tapping into aquifers



Head The layer of the freshwater aquifer that lies above sea level

One raindrop takes about 25 years/ to pass from a mountain top native. forest to an aquifer.

The percent a native forest can increase water capture by condensing passing clouds and reducing erosion.

Brackish Water Intermediate zone of mixed fresh & seawater

Saltwater Denser saltwater of seawater salinity

SOURCES: Honolulu Board of Water Supply; State of Hawaii, Department of Land and Natural Resources; and Pacific Disaster Center, www.pdc.org.





ater production from ancient times to today is the result of our islands' unique volcanic origins

and indigenous vegetation. Hawaii's fresh water cycle depends on the lifegiving rain captured and absorbed by healthy native forests to sustain all of life on our islands:

▶ 1. CLOUDS FORM as trade winds push moist air, created by evaporation of ocean water, over high cool mountain ranges.

**2. RAIN RESULTS** when saturated cloud vapor condenses to water.

▶ 3. *Ua* (rain), beloved by native Hawaiians as the preserver of the land (kahiko oke akua), falls on native forest tree leaves and branches, and low spongy growth that thrives on the forest floor. Also, mist passing through the forest condenses on the leaves, providing additional water.

▶ 4. RAINWATER SEEPS through soil and rock to each island's natural underground reservoirs formed by lava flows – called aquifers – for storage. Rainwater also nourishes roots in the ground and flows into surface streams.

> 5. THE WATER in underground aquifers pools in large lens-shaped bodies to be tapped by wells and tunnels to supply almost all of our vital drinking water.

### PARTNERSHIPS: BY COUNTY

# **Allies United**

Successful alliances of more than 71 public and private landowners unite statewide to protect Hawaii's watersheds. Three of these partnerships share highlights of their unique work.



**ATERSHED PARTNERSHIPS** among them the state of Hawaii, the largest public landowner, and Kamehameha Schools, the largest private landowner - lead the way in protecting 2.2 million acres of watersheds that cross property

boundaries on the main Hawaiian Islands. The alliances began in 1991 on East Maui. Today, 11 partnerships on six islands form the Hawaii Association of Watershed Partnerships with 7,000 volunteers statewide. And since 2006 they have leveraged \$12 million in private and federal funding to support local jobs and businesses.

Lisa Ferentinos, who oversees the Watershed Partnership Program on behalf of the Division of Forestry and Wildlife of the Department of Land and Natural Resources, says not all "green" is good at producing water. For example, native ohia captures rainwater in its flowers and leaves to fall gently to the ground vegetation to be absorbed. Not so with strawberry guava, an invasive species which lets rainwater "through-fall" to its roots with less going into the ground to feed the aquifers. Protecting watersheds from hoofed animals is the first priority. Fencing is the most feasible way to prevent feral pigs, goats, sheep, deer and wild cattle from trampling and devouring native vegetation. Animals also spread destructive weeds and plant diseases. Eliminating invasive plants and reforesta-

tion efforts can then follow successfully.

"Because of human activity, we have to intervene to remove invasive weeds, monitor fires, predators and diseases, as well as replant native species," Ferentinos says. "Without active protection, we lose our native forests, we lose our water."





### Mauna Kea Watershed Alliance

"We have workshops taught by knowledgeable kumu (teachers) of Hawaiian culture for teachers and older students on forest restoration incorporating Hawaiian cultural practices, such as moon phases, planting techniques and more."-Cheyenne Perry

THE MAUNA KEA WATERSHED ALLIANCE, established in 2009, is introducing some of Hawaii's littlest people to its tallest mountain. Its program, "More Kids in the Woods," funded by a one-year, \$33,000 federal grant, aims to involve 400 Big Island youth ages 6 to 20 in watershed protection and forest restoration.

"Our approach is a fusion of contemporary ecological restoration with Hawaiian cultural traditions," says Cheyenne Perry, MKWA coordinator. One of three Big Island-based watershed partnerships, MKWA covers all of Mauna Kea and includes large public and private landowners (1,000 acres and more) above the 2,000-foot elevation of the 13,796-foot mountain. Feral cattle, sheep and game animals introduced in the 18th century damaged much of Mauna Kea's native forests.

With students ages 6 to 12 as its core group, MKWA offers forest field trips to gather native seeds for restoration planting in early spring 2012. It is working with Kanu o ka 'Aina in Waimea and Ke Ana Laahana in Hilo, both public charter schools, to construct greenhouses where seeds can be nurtured into seedlings for replanting. At one restoration site at the 6,000- to 8,000-foot elevation, students are planting trees and shrubs.

"We have workshops taught by knowledgeable *kumu* (teachers) of Hawaiian culture for teachers and older students on forest restoration incorporating Hawaiian cultural practices, such as moon phases, planting techniques and more," Perry says. ■



### Kauai Watershed Alliance /

### "We knew the best strategy to protect where the rain fell on Kauai depended on early detection and rapid response." –Trae Menard

**HIGH TECH COMES TO THE AID** of native watershed forests in the innovative work of the Kauai Watershed Alliance. Using high-resolution images, in partnership with the U.S. Geological Survey, KWA was able to virtually pinpoint the worst threats from invasive plants and feral animals in the group's remote, thickly forested 144,000-acre focus area on the Garden Isle.

"Nothing had ever been done before to map weeds using images that show 2 centimeters of area per pixel," says Trae Menard, KWA coordinator and director of forest conservation and Kauai director for The Nature Conservancy. By comparison, Google Earth uses 20 centimeters to 30 centimeters per pixel for its images. A system designed by Resource Mapping of Hawaii hones the resolution to 1 centimeter per pixel.

"We knew the best strategy to protect where the rain fell on Kauai depended on early detection and rapid response," says Menard, who had logged more than 100 hours in helicopter surveys to document watershed threats in isolated and high terrain areas that includes Alakai Wilderness Preserve and Mt. Waialeale, the world's wettest spot.

The mapping detail reveals exact locations of areas affected by weeds, which can be eliminated from the air using a cone-shaped nozzle called the "Stinger" to deliver a herbicide formula developed by the University of Hawaii, Menard says. A precision herbicide ballistic technology that uses paint ball technology is in the works for larger areas inaccessible by foot.

"We can now control weeds in remote, large priority watershed landscapes at a huge cost savings," says Menard of the high-resolution imagery system now used statewide. ■



### Leeward Haleakala Watershed Restoration Partnership /

**MAJESTIC KOA TREES,** prized by

ancient Hawaiians for their hardy sea-faring canoes, once dominated the drought-challenged leeward slopes of Haleakala and aided in capturing valuable fog drip to replenish watershed areas on Maui. In recent times, as the forests were decimated, the area became known for turning the ocean red after heavy rains from topsoil erosion.

Today, with less than 10 percent of the original forest remain-

ing, the Leeward Haleakala Watershed Restoration Partnership is aiming to restore koa forests on Haleakala from Makawao to Kaupo between 3,500- and 6,500-foot elevations.

"We began with just a few volunteers and begging people to help us," says Dr. Art Medeiros, LHWRP technical adviser and biologist with the U.S. Geological Survey. "In eight years, we've attracted thousands of volunteers and planted 100,000 seedlings that will grow into trees that will outlive all of us." With a goal of 60 percent restoration of native koa in the next 100 years, Medeiros is experimenting with scattering seed from the air using special seed-carrying clay balls.

LHWRP, which was established in 2003 and oversees 43,175 acres along the rugged leeward Maui area, has a volunteer waiting list for the day long trips with knowledgeable leaders to plant trees, remove non-native species and collect seeds. "It warms my heart to see so many willing to help on this historic restoration of a unique native forest," Medeiros says.

"It warms my heart to

see so many willing to

help on this historic

restoration of a unique

native forest.

-Dr. Art Medeiros

### ⇒LEGISLATORS: SEN. DELA CRUZ & REP. CHANG

# **Working Now for Tomorrow**

State Sen. Donovan Dela Cruz (D, Kunia Village-Mililani Mauka-Wahiawa-Whitmore-Haleiwa-Mokuleia-Waialua-Sunset Beach), chair of the Senate Committee on Water, Land and Housing; and Rep. Jerry Chang (D, South Hilo-Waiakea Kai-Kaumana-Keaukaha), chair of the House Water, Land and Ocean Resources Committee, talk about legislation, laws and community support to help protect Hawaii's forest watersheds.



### **Representative Chang** /

UR WAT In the 20 Abercrom doubling over the a administ ernor's "#

### **UR WATERSHEDS NEED HELP NOW.** In the 2012 legislative session, Gov. Neil

Abercrombie will introduce a plan aimed at doubling the area of protected watershed over the next 10 years. Legislation in the administration's package addresses the governor's "A New Day in Hawaii" plan on the

stewardship of the natural resources, specifically on replenishing our source of water. It will task the State Department of Land and Natural Resources to increase mauka watershed protection by managing invasive species, addressing climate change, among other things.

In the past, legislation involving appropriating funds to DLNR targeted specific districts for improvements and repair, including watersheds. Unfortunately, because of our state's financial situation, many projects now depend on private contributions and federal matching funds.

Watershed protection is a critical problem statewide. Currently, partnerships with and buy-in from large private land owners are essential for across-land-boundaries success in addressing threats. We now also need to depend on dedicated volunteers, such as the Kohala Watershed Partnership on my home island of Hawaii, which supports watershed restoration by controlling invasive species, building trails and working for the betterment of our environment. We must support our schools to educate students on the cultural and economic benefits of watershed protection. It is their future we are helping to preserve now.



## Senator Dela Cruz /

**OUR WATERSHEDS ARE UNDER ATTACK**. Threats from invasive species will not resolve themselves in our island state. What's needed to save our native forests and sustain water production for future generations are stable funding sources, especially now in our struggling economy. Act 55, which I sponsored last year, will allow DLNR to generate its own revenue and avoid the danger of budget reductions as part of the state's general fund.

"As a state, we must make a solid commitment to ensure that our forest watersheds will be around for now and the future."

Act 55 creates the Public Land Development Corporation as a development arm for DLNR. It will allow low impact and culturally sensitive revenue-generating activities on state lands to showcase our natural environment to help protect it, similar to how Hawaii Volcanoes National Park and Audubon Society generate funding. I do not believe in denying public access to our state lands. DLNR can focus on implementing regulatory functions, including watershed protection, while the Public Land Development Corporation focuses on generating revenue. With stable funding, we can revitalize our natural resource management and create jobs for local people, our children.



## Water in Hawaiian Culture

### FRESH WATER IN ANCIENT

HAWAIIAN LIFE was so fundamental that its main sources – springs, streams, clouds and rain – were attributed to Kane and Lono, two of the major Hawaiian gods, and matched closely to the food crops that each represented.

Kane and his brother Kanaloa, the traditional creators of fresh water springs in Hawaii, are associated with *kalo* (taro) and *awa* (kava), crops of the springs, streams and wet valleys and sacred manifestations of Kane. Lono was the god of the winter rains, presiding over the seasonal cultivation of the raindependent crops, *uala* (sweet potato) and *ipu* (gourd), in the drier, arable leeward lands only during the Hawaiian "winter" or wet season.

Water's sanctity and role in purification and healing today represent a continuity of the deeply spiritual reverence that ancient Hawaiians placed in water's ability to evoke life, cleanse and heal.

Watershed was *Wao Akua*, the realm of the gods, in contrast to *Wao Kanaka*, the realm of people. Thus, upland forested regions grew on the earth not due to the efforts of human beings, but



► Community support and educational efforts are important to encourage lifestyle changes to support conservation and to make our children aware of the need to protect our natural resources in perpetuity. Volunteers make a big difference, but we cannot expect them to solve our long term problem of watershed sustainability, just as we cannot depend on our general fund for perpetual funding for our natural resources. As a state, we must make a solid commitment to ensure that our forest watersheds will be around for now and the future.

to a much higher authority. Trees are the *kinolau* (physical manifestations) of Ku, the Hawaiian god of war, leadership and governance, as seen in the erect strength of trees and their steady persistence through the seasons.

Excerpted by permission from "Spiritual Aspects of Water" presentation by Sam 'Ohu Gon III, senior scientist and cultural adviser, The Nature Conservancy of Hawaii

# Livelihoods & Lives

### Why protecting water is everyone's business

**WE ALL DEPEND ON WATER** to be available to bathe, eat, cook and quench our need to drink eight recommended glasses a day. As residents, we are the big users. On Oahu, where 70 percent of the state's population lives, residents use 62 percent (daily average of 50 gallons to 60 gallons each) of the 150

million gallons the Honolulu Board of Water Supply pumps every day.

Meet three Hawaii residents who became aware, through their work and their lives, of the need to protect and preserve our wai for ourselves and for those to come.

### Marah Hardt /

MARINE BIOLOGIST

T LOOKS LIKE CHOCOLATE MILK SPILLED INTO THE OCEAN," says Dr. Marah Hardt, marine biologist specializing in coral reef ecology and ocean conservation, of the muddy runoff flushing into Pelekane Bay near Kawaihae Harbor on the Big Island. The runoff is believed to come from upland erosion from denuded Kohala Mountains watershed areas.

To determine how mauka watershed restoration efforts affect makai coral

"The complete Pelekane watershed project represents a truly ridge-to-reef model for resource management here in Hawaii and beyond."

reefs, the Kohala Watershed Partnership contracted Hardt to conduct an initial assessment in August 2010 of the marine environment of Pelekane Bay, a oncethriving ecosystem abundant with fish. The survey would serve as a baseline to document long-term changes — hopefully of the recovery of the bay's coral reef community — following KWP's erosion control and vegetation restoration project on thousands of acres of degraded watershed land above the bay.



"We're excited about this project because we know that coral reefs along the coast are the first place to receive the influx of sedimentation from Makeahua Stream, which flash floods when it rains heavily in the Kohala Mountains," says Hardt, who headed a research team from The Nature Conservancy, Cornell University and Scripps Institution of Oceanography.

Hardt says the survey was an "eyeopener." Near-shore areas, compared with areas farther out in the ocean, were shown to have suffered the worst impacts of sedimentation damage, with greater prevalence of diseases, lower presence of all fish families and lack of small coral colonies.

"It woke me up as a marine scientist to the importance of land management," Hardt says. "The complete Pelekane watershed project represents a truly ridge-to-reef model for resource management here in Hawaii and beyond."

"If we want to expand farming ... we have to see the connection to the native forests up in the mountains that replenishes the aquifers to make that possible."

### Richard Ha / FARMER

Hamakua Springs Country Farms



### ISLAND FARMERS SUCH AS RICHARD HA KNOW

the importance of water. Ha's 600-acre Hamakua Springs Country Farms, which grows bananas, leafy vegetables and its renowned tomatoes, relies on three springs and three streams fed by the 130-inch annual rainfall in Pepe'ekeo on the Big Island's Hamakua coast.

But it's not just rainfall alone, says Ha, but "good, healthy

watersheds that feed the steady streams and springs we need to grow our vegetables." A farmer for 30 years, he knows that wellforested upland watersheds can hold rainwater and allow it to drip slowly underground to feed steadily into surface streams and underground springs that farmers depend on in the lower lands.

For the entrepreneurial Ha, food security for the island state is his goal. "Having reliable access to abundant water allows us to think big about realizing a vision to feed our community," he says. He views water as one of his farm's readily available resources to expand into more diversified agriculture. "We're on the slopes of Mauna Kea where water is naturally pulled to the ocean by gravity," says Ha, who envisions harnessing the power of this running water as a potential sustainable source of hydroelectric energy in place of fossil fuel-based electricity to run his farm. He also sees the cost-savings possibilities of using running water, in place of electricity, to naturally oxygenate water to grow fish commercially.

"How far we can go to be food-secure and energy self-sufficient with a stable, uninterrupted and fundamental resource like water is as far as our imagination will take us," Ha says.

### Ed Kenney / CHEF Town & Downtown@HiSAM



**"WHEN I FIRST BEGAN MY RESTAURANTS,** I bought locally purely because of the quality and freshness of the ingredients," says Chef Ed Kenney. While visiting farmers to learn more about locally grown food products, he said he learned about other issues related to Hawaii's food system, such as land, labor, energy and water.

"Food for me is a unifying force that brings people to-

gether, connecting us to the earth and to those we eat with," says Kenney, a leading advocate in promoting Hawaii's food sustainability. "Like energy, water is essential to not just growing our food, but to cooking it and sharing it with others."

He instituted water conservation policies in his restaurants — Town in Kaimuki and Downtown at the Hawaii State Art Museum — such as gray water catchment, no use of bottled water and a dishwashing system that uses recycled water to rinse.

"Working so closely with farmers, I saw the possibilities of water enabling us to feed ourselves," Kenney says. "But fresh water is a finite resource that we are using faster than it's replenishing itself."

Water distribution, particularly prioritizing its distribution, can become a major issue as water becomes scarcer and less affordable to the population. Stable water production is critical through watershed protection and management, Kenney says.

"If we want to expand farming, with methods like aquaponics to grow lettuce, watercress and fish in water, we have to see the connection to the native forests up in the mountains that replenishes the aquifers to make that possible," he says.

### Benefits of Forest Watershed Protection

- Optimize production of Hawaii's fresh water as its primary source
- Reduce water shortages

 Reduce soil erosion from heavy rains by anchoring soil
Prevent stream pollution and floods through better rainwater absorption and retention

- Reduce destructive run-off sedimentation on coral reefs
- Reduce debris from swift, flooding streams on beaches

Improve air quality by increasing oxygen production and reducing greenhouse gas emissions by absorbing carbon dioxide

Protect Hawaii's unique suite of species found nowhere else in the world





## Uwe kalani, ola ka honua

( THE HEAVENS WEEP, THE EARTH LIVES )

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