

MINUTES  
FOR THE MEETING OF THE  
COMMISSION ON WATER RESOURCE MANAGEMENT

Approved by Commission on  
Water Resource Management  
at the meeting held on  
3/19/14

DATE: January 22, 2014  
TIME: 10:00 am  
PLACE: DLNR Board Room  
Kalanimoku Bldg.  
1151 Punchbowl St., Room 132  
Honolulu, Hawaii 96813

Chairperson William J. Aila, Jr. called the meeting of the Commission on Water Resource Management to order at 10:22 am.

The following were in attendance:

**MEMBERS:** Mr. William J. Aila Jr., Mr. William Balfour, Mr. Milton Pavao,  
Mr. Kamana Beamer, Mr. Gary Gill

**ABSENT:** Mr. Jonathan Starr, Mr. Ted Yamamura

**STAFF:** William Tam, Roy Hardy, Lenore Ohye, Dean Uyeno, Paul Eyre,  
Jonas Burgon, Rebecca Alakai, Charley Ice, Robert Chenet, Neal Fujii,  
Malie Beach-Smith

**COUNSEL:** Linda Chow, Esq.

**OTHERS:** Jonathan Scheuer, Kaleo Manuel, Dan Purcell

**C. PRESENTATION**

**“The Hawaiian Footprint in Native Ecosystems”**

PRESENTATION by: Sam Gon

Sam Gon presented an overview of his project and the geography of pre-contact human ecological landscapes in the Hawaiian Islands. Areas of native forest offer a glimpse into the past. How does the ecological footprint of pre-contact Hawaii compare with our modern footprint today? Hawaiian biological diversity has seen losses and changes as a result of humans (see pink areas on map in slide 3). So too has Hawaiian culture seen losses, in language, knowledge, and sovereignty. Yet traditional knowledge provides some of our best sources directly describing the pre-contact world. Oahu offers one of the more dramatic examples of the impacts that our human presence has wrought on the original native ecosystems. In telling the story of land use change in Hawai‘i, the first important milestone is the footprint of Hawaiian presence prior to the arrival of Captain Cook in 1778.

It has been well established that the rich ecosystems of the Hawaiian Islands enabled Hawaiians to become one of the pinnacles of Polynesian societies. Hawaiians excelled in voyaging, feather work, fishing and fishponds, kapa fabrics, and crafts of all kinds. They generated an equally rich cultural system in the pre-contact society that developed within it. During the millennium of Hawaiian presence in the archipelago, changes to native ecosystems began with increasingly extensive and intensive agriculture in both wet and drier lowland settings. This was coupled with the effects of occupation and daily living in the largely coastal regions in which perhaps close to one million Hawaiians lived and engaged in all activities of a thriving Polynesian culture prior to 1778. When we think on the activities of daily life, we can ask ourselves about the cumulative impacts of those activities multiplied by hundreds of thousands across a finite island landscape. How much wood was burned to cook food? How much land was worked to grow food? What areas provided ready access to ocean resources? What areas were the best for houses and all the material culture of pre-contact Hawaiian life? Oahu is a good example because of a rich set of resources and varying geographic and climatic conditions (high and low elevations, very wet, moderately dry, etc.). The high mountains fed perennial streams, bringing water and nutrients to the lowlands. This created rich breeding grounds for near shore marine fish.

When we say “Hawaiian footprint” it is shorthand for the geospatial areas that were chronically occupied, directly manipulated, and significantly changed from pre-existing Hawaiian ecosystem types into traditional Hawaiian uses. This includes house sites, agricultural fields, fishponds, religious sites, major roads and trails, etc. The geographic context for such Hawaiian cultural features is comprised of the ahupua‘a traditional land divisions within their moku or districts. The six traditional moku of O‘ahu are Ko‘olaupoko, Kona, ‘Ewa, Wai‘anae, Waialua, and Ko‘olauloa.

The knowledge of the people of old, held in oral tradition, were gathered and promulgated in Hawaiian language texts in the 1800s by large numbers of contributors to the Hawaiian language newspapers. A number of more recent scholars have added to this base of knowledge and translated it into GIS. Using geo-spatial modeling, GIS has helped explicitly map agricultural areas, fishponds, temple sites, trails, storied localities, places of residence, and other traditional areas of frequent use, thus defining the direct change in the Hawaiian footprint. A recent publication entitled “Opportunities and constraints for intensive agriculture in the Hawaiian archipelago prior to European contact” incorporated a geospatial model that depicts areas of high potential for wet and dry agriculture in Hawai‘i. In the book “Roots of Conflict,” the details of the model are further explored, including the population and political ramifications that emerge when essential agricultural lands lend human assets to empower the great Hawaiian chiefdom. The work examined the biophysical requirements of two main staple crops in Hawaii – kalo (taro) and ‘uala (sweet potato). The congruence between the model and archeological evidence indicated that Hawaiians had developed many, if not all areas of highest agricultural potential for those crops that had plentiful water, low elevation, warm settings and gentle slopes. For ‘uala the critical condition is winter rainfall. When the model was tested against actual archaeological evidence there was remarkable convergence. When the agricultural model was applied to Oahu, kalo (purple) and ‘uala (red), occupy the areas near the coast and into valleys with sufficient freshwater flow. Although many of Oahu’s streams flowed year long, about 25 of them (e.g.: Manoa stream) were optimal for kalo agriculture. All these places are celebrated in traditional sources as prosperous lands. Drier areas (shown in red), received sufficient rainfall to support ‘uala and other dry agriculture. In the windward district of Ko‘olaupoko, higher

rainfall meant the agricultural footprint extended into the wetland areas. Adding to the agricultural hotspots were the equally important fishponds. Major overland trails (shown in black) connected the moku and provided access to upland sites including the sacred birthplace of Oahu chiefs at Kukaniloko. The major trail systems connected the most important populations and governance centers, which were also important centers of food production. Heiaus and other major religious sites (yellow dots) were usually in proximity to governance and production areas. However, others were placed very far away near the head waters of important streams or along the coast of important fisheries. The Kolekole Pass trail in Lualualei points to a likely inland agricultural area that was not predicted by the dry land agricultural model. This is probably because the model was not set-up to assess spring-fed fields.

The proposed footprint for pre-contact Oahu indicated that the largest impacts were seen in the wetland areas for growing kalo. Just over 14% of the native landscape of Oahu was displaced by the Hawaiian footprint. The forest and shrubland in the upland areas of Oahu were largely unmodified. In the ancient Hawaiian universe, the realm of people occupied the lowlands and the realm of the gods was in the forests. The mountains were a place to be avoided - a place considered intensely sacred and thus too dangerous for casual human incursion. It was a place where ti leaves should be worn because it was too wet for kapa. The introduction of rats played a major role in the destruction of native vegetation in the mauka areas. However, most of the introduced plants were non-invasive, with the exception of kukui.

After three years of work, through a partnership with the research department of the Office of Hawaiian Affairs ("OHA"), we have extended the footprint analyses to all of the islands of the archipelago. On each island, the patterns and percentages held; always a footprint below 15% of the total land area with island-specific patterns for Maui, Moloka'i, Lāna'i, Kaho'olawe, Kaua'i, Ni'ihau, and Hawai'i Island. The pattern of wet valley occupation and working of large seasonal fields applies across the archipelago. The total area of the footprint suggests a population in excess of 500,000 people based on patterns of gender, and area of the agricultural footprint. It is not so much "how many mouths can the total area feed?" But rather "how many people does it take to work the areas?" As might be expected, the majority of the population was on the large Island of Hawai'i. It is remarkable to look on these maps in terms of the human geography of ancient Hawai'i, and when used as a backdrop for traditional stories and accounts, every prominent place name, and every celebrated place is included within the footprint.

Even though there are eight islands in the main Hawaiian archipelago, traditionally the islands are described as Nā Moku 'Ehā, the 4 islands. The four are Hawai'i, Maui, O'ahu and Kaua'i. The Hawaiian footprint makes it very clear why. It identifies those four islands as the ones that together providing over 90% of the footprint, and therefore a similar proportion of the population. Looking at the footprint of O'ahu, it is clear that within the last 230 years since contact, native ecosystems have declined far more than under native Hawaiian stewardship. That same pattern holds true for all the other islands, to greater or lesser extent. From 11% to 70% on Maui, from 8.4% to ten times that area on Moloka'i, Lāna'i and Kaho'olawe both from about 14 to about 80%, and Kaua'i going from 11 to over 70%. The acceleration of native ecosystem loss since western contact has been dramatic, with the smaller, drier islands such as Ni'ihau losing essentially everything. Hawai'i Island, by virtue of relatively vast and remote interiors, too high and cold for cultivation, retains the highest % in modern times, the only island with less than a 50% human footprint today.

Ultimately, our goal is to provide a geospatial history of land use and change across the Hawaiian Archipelago, building on the milestone of the pre-contact Hawaiian footprint. Eventually it will include the era of widespread sugar cane and pineapple mono-crop agriculture, the introduction and spread of non-native ungulates, such as cattle, goats, and sheep and their wholesale denudation of the lowlands that created the watershed crisis of the turn of the last century, which triggered the establishment of the Forest Reserve System here in 1903. Upon those huge changes come all the other major historical contributors over the decades leading to the current patterns of ecosystem loss and remaining biological diversity.

Most people have no idea what our islands looked like in the past. They presume that it is much the same as it was in their childhoods and those of their parents and grandparents. Understanding the finer details of Hawaiian ecosystem changes can provide us with insights into the maintenance and restoration of our native ecosystem and provide compelling messages about the consequences of our actions.

(DISCUSSION)

Commissioner Gill asked how the introduction of alien pest species has broadened the modern footprint.

Mr. Gon replied that large grazing animals have had a significant impact. The pua'a (Hawaiian pig) of today is much larger than its predecessor. Similarly, unlike coastal rat species, the Norway and Black rat habitat extends far into the mauka regions. There is a qualitative difference between the post-contact introductions vs. the pre-contact introductions. By using the footprint, someone can look at the places that were historically important and anticipate where issues may occur. Kula, Maui was once a prime area for growing 'uala. However it is now no longer suitable for the crop – an indication of climatic changes.

Commissioner Beamer asked how the model could assess changes in stream biota over time.

Mr. Gon said all the streams that fed important areas for growing kalo were areas of high rainfall. For stream biota, the stream would need to be continuous. The pre-contact kalo footprint could be used to identify places that once had active and healthy streams and should be restored.

Chair Aila asked if springs would be included in the next model.

Mr. Gon replied that spring databases tend to be incomplete and many of them have since dried up.

Chair Aila noted that springs on the leeward side of Oahu were instrumental in kalo cultivation.

Mr. Gon said the researchers acknowledged such discrepancies in their model and relied on archaeological data to prove connections and determine the footprint. Historic descriptions were used as secondary sources to “map” areas that did not have the data to support claims of cultivation.

Chair Aila asked if rainfall data could be used to support archaeological evidence such as terraces that extend to the face of the pali in Makua Valley.

Mr. Gon said the model can definitely be improved.

Commissioner Gill asked if the Hawaiian footprint extended to all lands primed for taro or sweet potato.

Mr. Gon answered that in most cases the archaeological evidence supported such assertions.

Commissioner Gill asked if the entire Kalaupapa peninsula was under cultivation for sweet potato.

Mr. Gon replied that Kalaupapa was famous for its potatoes. He noted that all of the information is available on OHA's Kipuka Database.

Deputy Director, William Tam asked about the types of crops grown in North Kohala on the Big Island.

Mr. Gon said North Kohala was known for its sweet potato as well.

Commissioner Beamer commented that sweet potato from Kohala may have fed up to 50,000 people in the area.

Charley Ice (Commission on Water Resource Management) asked if the model included the mapping of species for forest restoration.

Mr. Gon replied that John Price and Jim Jacoby have helped him catalogue and model every single native flowering plant species in Hawaii. The data specifies elevation and moisture range and may be used to indicate the best locations where native species can be replanted. John Price is shifting the climatic zones to account for climate change as well.

Jonathan Scheuer asked if 'o'opu was part of the footprint analysis for streams.

Mr. Gon said "no" but it "can be." The correlation between 'o'opu and kalo cultivation is very high. Therefore, it can be assumed that 80% of the streams that were used in kalo cultivation were probably suitable for aquatic biota such as 'o'opu as well.

Paul Eyre (Commission on Water Resource Management) asked about population densities.

Mr. Gon replied that population densities are skewed toward Oahu. The majority of the pre-contact Hawaiian population was on Hawaii Island.

Mr. Eyre asked how the demographics would change if you looked at people per square mile.

Mr. Gon said pre-contact Oahu was home to 70,000 people. Today there are over 1 million people living on the island of Oahu.

Commissioner Gill asked about population assumptions and the number of people required per cultivated acre of land.

Mr. Gon said the numbers were based on United Nations ("UN") estimates.

Commissioner Beamer commented that wetland cultivation was less labor intensive and would have required fewer laborers.

## D. GROUND WATER REGULATION

### 1. Rescinding Water Use Reporting Exemptions and Deferments Established under September 16, 1992 Commission Action, Statewide, Hawaii

SUBMITTAL PRESENTATION by: Roy Hardy

Item D-1 is a request to repeal a prior Commission action from 1992 that included a number of exemptions and deferments on water use reporting. This particular exemption (Exhibit 1) causes problems for the Commission. The Commission has the authority to require water use reporting on a monthly basis and had attempted to notify users in the 1990s about their duty to report.

There are 4,163 known production and observation wells statewide. About 1/3 are currently reporting. 2/3 of the large users (e.g. county boards of water supply) are reporting. There are roughly 900 wells that need follow-up. Of the estimated 1,288 stream diversions, only 1/5 are reporting. The policy under 1b) (Exhibit 1) exempts individual water systems that do not exceed 50,000 gallons per month, which is equivalent to four times the domestic use of a home. In designated water management areas individual domestic users are exempted from a water use permit, but two or more is not. In an effort to help users report more efficiently online, the staff would like the Commission to rescind parts of the decision from 1992.

#### RECOMMENDATION:

Staff recommends that the Commission:

1. Rescind the September 16, 1992 Commission Policy allowing exemptions from the legal requirement to measure and report monthly water use.
2. Continue exemptions from the requirement to measure and report monthly water use for the activities listed below, UNLESS the Commission determines a specific need for this data to resolve disputes, establish instream flow standards, or quantify the amount of water use for a water use permit in a water management, or for similar needs:
  - (a) Passive agricultural consumption (e.g. when crops are planted in or adjacent to natural springs and natural wetland areas);
  - (b) Livestock drinking from dug wells or stream channels;
  - (c) In non-surface water management areas, individual end uses on multi-user ditch systems where IFS or water use permits are not an issue;
  - (d) Salt-water wells may continue to report monthly *estimates* of pumpage and monthly *actual measured* water-levels and salinity on an annual basis.
3. Affirmatively require that unused and observation wells report monthly water-levels and salinity as determined by staff.

(DISCUSSION)

Deputy Attorney General (“AG”) Linda Chow noted that if the Commission were to rescind the policy it would also rescind the exemptions.

Deputy Tam clarified that certain parts of the policy would not be rescinded as stated in the staff recommendation.

Commissioner Gill asked if it would be easier to rescind the entire policy and adopt a new policy with the exemptions.

Commissioner Beamer asked if the policy related to appurtenant rights.

Mr. Hardy replied only if the diversion is coming directly off the stream.

Commissioner Beamer asked if staff was currently collecting data on these diversions.

Dean Uyeno (Commission on Water Resource Management) said the policy is focused on the physical diversion of water from the stream. At this time, no kalo growers are reporting.

Commissioner Beamer asked if extra burdens would be placed on subsistence farmers.

Mr. Uyeno said the handbook explains the range of options that are available for measuring stream flow. Staff will conduct demonstrations and work with farmers to find the most economic and efficient way of measuring.

Deputy Tam added that staff will try to accommodate users when possible to work out different reporting mechanisms. However, surface water measurements are important for stream flow determination and other issues.

Commissioner Beamer said he supports the intent, but wanted clarification about the impact on rural communities.

Mr. Hardy said manual reporting is still acceptable. However, online reporting will help reduce staff time spent in-putting the data.

Mr. Uyeno mentioned that staff is open to suggestions from the commissioners.

Chair Aila asked Commissioner Pavao to reiterate his suggested amendment to the staff recommendation.

Commissioner Pavao suggested that the recommendation include the words “however” to rescind the policy without rescinding the exemptions.

Chair Aila agreed to amend the staff recommendation.

Mr. Hardy read aloud the amended recommendation.

AMENDED RECOMMENDATION:

Staff recommends that the Commission:

1. Rescind the September 16, 1992 Commission Policy allowing exemptions from the legal requirement to measure and report monthly water use. However, allow the following exemptions from the requirement to measure and report monthly water use for the activities listed below, UNLESS the Commission determines a specific need for this data to resolve disputes, establish instream flow standards, or quantify the amount of water use for a water use permit in a water management, or for similar needs:
  - (a) Passive agricultural consumption (e.g. when crops are planted in or adjacent to natural springs and natural wetland areas);
  - (b) Livestock drinking from dug wells or stream channels;
  - (c) In non-surface water management areas, individual end uses on multi-user ditch systems where IFS or water use permits are not an issue;
  - (d) Salt-water wells may continue to report monthly *estimates* of pumpage and monthly *actual measured* water-levels and salinity on an annual basis.
2. Affirmatively require that unused and observation wells report monthly water-levels and salinity as determined by staff.

Commissioner Balfour reiterated that reporting numbers need to improve.

Commissioner Pavao commented that most of the major water users are reporting.

Mr. Hardy said about 70 percent of the major users report their water use. However, the Board of Water Supply has a lot of observation wells. Mr. Hardy clarified that number 3 would be changed to number 2 in the amended recommendation.

**MOTION: (Balfour / Pavao)**

**To approve the submittal with the amended recommendation.**

**UNANIMOUSLY APPROVED.**

2. **Authorize the Chairperson to Enter into Contract(s) to Conduct Ground Water Use Reporting Outreach, Verification, and Compliance for the Counties of Hawaii, Maui, and Kauai**

SUBMITTAL PRESENTATION by: Roy Hardy

Exhibit 1 gives statistics on the number of wells and reporting numbers by island. Consultants will help with the water reporting effort in management areas and non-designated areas. They will contact non-reporting users and provide them with handbooks and information about online reporting. Status reports will be provided on a

regular basis so staff can assess the number of users who have started reporting and those who continue to be in violation of the reporting requirement.

RECOMMENDATION:

Staff recommends that the Commission:

1. That the Commission authorize the Chairperson to enter into contract(s), not to exceed \$250,000, to conduct the ground water use reporting outreach and compliance on Hawaii island, Maui, Molokai, Lanai, and Kauai (excluding Niihau).
2. Authorize the Chairperson to make such further amendments or modifications of the contract (consistent with the terms set forth above) as may be necessary to accomplish the goals described here, provided that any amendment or modification does not require additional Commission funding.

(DISCUSSION)

Commissioner Pavao asked if \$250,000 was enough money to conduct outreach and ensure compliance.

Mr. Hardy said staff may come back to the Commission to request additional funding.

Commissioner Beamer asked about the users who are not reporting.

Mr. Hardy replied that two notices are sent out to notify the user. However, some landowners are not aware that they have a well on their property. The hope is that registered users will start reporting and it will be easier for staff to identify "gaps" in the reports.

Commissioner Balfour asked about the timeframe.

Mr. Hardy said it would probably take two years. The first update to the Commission will likely be made in July 2014.

Commissioner Beamer asked is staff had identified the contractors.

Mr. Hardy said the consultants will be required to have staff on each island to conduct the work. Consultants will be selected from the Professional Services List.

Commissioner Pavao asked about the consequence of not reporting.

Mr. Hardy said the Water Code authorizes fines of up to \$5,000 per day. The Commission would have to decide on the appropriate enforcement measure.

Commissioner Pavao suggested that the consultants remind non-users about the enforcement actions.

Commissioner Gill asked if the Commission had ever been presented with an enforcement case.

Mr. Hardy replied “not for water use reporting alone.” However, the Commission can Revoke water use permits after four years of non-use.

Commissioner Gill asked if the annual budget for CWRM had been approved.

Deputy Tam said the budget was approved by the Legislature last year and includes lump sums for this type of work. It is covered under General of Special funds. The Commission approves specific contracts. Staff tries to anticipate contracts ahead of time so money is adequately spent.

Commissioner Pavao asked why Niihau was reporting “0” in each category.

Mr. Hardy clarified that in the case of Niihau, no one is reporting in any of the categories. Wells categorized as “abandoned” may not be sealed and would therefore still appear on the list of non-reporting wells. There may be 1,000 wells categorized as “abandoned” throughout the state.

Commissioner Beamer asked about the risks association with un-sealed wells.

Mr. Hardy replied that un-sealed wells can become contaminated and damage the aquifer.

Commissioner Pavao recalled stories about capped wells on the Big Island and vandalism.

**MOTION: (Beamer / Pavao)  
To approve the submittal.  
UNANIMOUSLY APPROVED.**

## **B. ANNOUNCEMENTS**

Commission staff briefed the Hawaii County Water Board on November 26, 2013 about the petition by the National Park Service (“NPS”) to designate the Keauhou Aquifer. Another presentation is scheduled for February 4, 2014 before the Hawaii County Council.

The DLNR budget narrative summarizes CWRM’s request for two new positions. Both positions would be in the Stream Protection and Management (“SPAM”) branch to help with an increasing amount of work related to stream management. A potential contractor has been identified to help with the petition for Interim Instream Flow Determination in Waimea, Kauai. Other parties will be engaged once the contractor has been finalized.

Deputy Director William Tam briefly discussed “Water in the West” and handed out information about the current drought in California and food security around the world. The grain producers of the world (e.g.: India and China) tend to drill the most wells and consume the most water. In many cases, the aquifers are being drained and will soon be depleted. While this does not affect Hawaii directly, it is an indication of how agriculture will change in other parts of the world and eventually put pressure on places like Hawaii. “Water crisis” is now rated as the third highest global risk.

Commissioner Beamer thanked Deputy Tam for providing information that could help the Commission become more progressive and forward-thinking. Lake Waiau on the top of Mauna Kea has become dry – a rare and disturbing occurrence.

Deputy Tam said there are a lot of indicators that point to a problem. The combination of all these issues (e.g.: declining rainfall, encroachment from invasive species, less stream flow, etc.) increase stress levels. It is important to tie these things together to see the larger picture. More and more people need to understand how these things fit together. The Water Commission is the only entity in the State of Hawaii that must integrate water and land issues in a coherent way. Problems will increase and options will be more limited. More information needs to be gathered to help plan for the future. A joint briefing before the Land Use Commission (“LUC”) and Water Commission will be scheduled in an effort to integrated water and land use decisions.

Commissioner Balfour thanked Deputy Tam for the information.

Deputy Tam said he would try to get handouts and information to the commissioners before a meeting so they have time to think about the issues.

**A. APPROVAL OF MINUTES**

November 20, 2013

**MOTION: (Balfour / Beamer)  
To approve the minutes.  
UNANIMOUSLY APPROVED.**

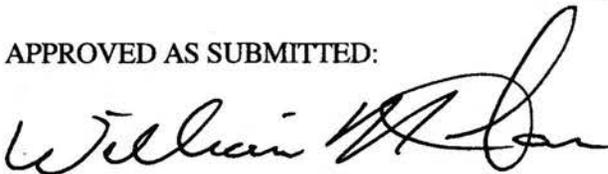
Chairperson William J. Aila, Jr. adjourned the meeting at 12:02 pm.

Respectfully submitted,



**KATIE ERSBAK**  
Private Secretary to the Deputy

APPROVED AS SUBMITTED:



**WILLIAM M. TAM**  
Deputy Director