TKC Leaflet: March 2007 Newsletter

Front

The Hand of Man

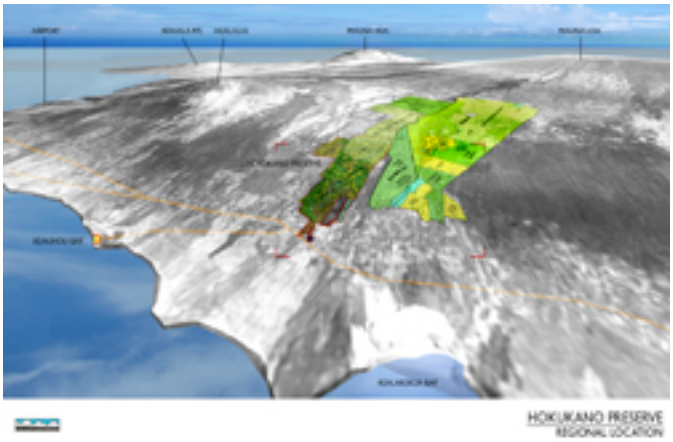

Photo: Aerial perspective of the three *ahupua'a* (traditional Hawaiian land division running from the mountains to the sea), where the planning process began. Image courtesy of Clark Stevens/New West Land Company.

"We should treat the land as our sweetheart because the land must sustain us." – Cindi Punihaole, Hawaiian cultural practitioner

On February 1, 2007, The Kohala Center sponsored a talk for members of its Circle of Friends, the Hawai'i Leeward Planning Conference, the Hawai'i Island Economnic Development Board, and the Kona-Kohala Chamber of Commerce that presented a case study in the application of high ideals to a specific project on the ground on Hawai'i Island. The ideals came from architect Clark Stevens and tax attorney Gregory Hendrickson, who are at the vanguard of the field of conservation planning and development. Roughly translated, this field provides a framework for developing land in ways which promote conservation, enhancement, and restoration of places over the long term. Stevens and Hendrickson have been working for the past two years with members of the Pace family, who own a large tract of land encompassing pieces of three *ahupua'a* in South Kona. Stevens and Hendrickson were charged with translating the Pace family's values into a plan for preserving critical ecological and cultural resources and for developing a place-appropriate inhabitation plan for this land, which encompasses an area larger than the entire island of Manhattan. Stevens and Hendrickson shared their inspirations and concrete plans for achieving these lofty goals at Hokukano Preserve, both in the near term and in perpetuity. Read more.

Irreplaceable Resources

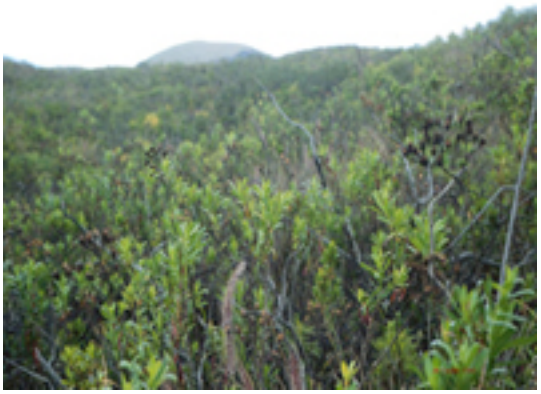

Photo: 1993 photograph of a rare native montane shrubland containing the Endangered *Silene lanceolata* (no common name), taken at the 5,000-foot elevation in the Kipuka Kalawamauna (U.S. Army's Pohakuloa Training Area). This site has since burned, become invaded by fountain grass, and no longer supports the species. Photo by Michael Castillo.

Hawai‘i’s dryland forests have been decimated by human activities, including land clearing, the introduction of alien species, and wildfires. Roughly five percent of these ecosystems now remain intact. J. Michael Castillo, conservationist with Hawai‘i Natural Resources Services, offered some practical advice at the recent Nahele Dry Forest Symposium:

"I cannot overemphasize the degree to which alien grasses and wildfire are responsible for the continuing decline of dryland ecosystems, and the importance of actively and aggressively managing grasses. If we don’t actively manage wildfire fuels on the ground, at the landscape scale, where they are invading the remaining native forest, we will lose the irreplaceable, large, relatively intact stands that remain."

In order to preserve the remaining dryland forests, cooperation between adjacent landowners will be key to effectively apply a landscape-scale strategy. Learn more.

Cornell Reception

Photo: Kohala Center Director Matt Hamabata **(left)** with Dr. Alexandra Moore **(center, behind TKC sign)**, Dr. Louis Derry **(right, behind TKC sign)**, and students in the 2005 EES cohort.

On February 13, 2007, Rich Tucciarone hosted the Cornell Club of Hawai'i's alumni reception at the Kailua-Kona Pub and Brewery. Tucciarone is Director of Brewery Operations for the Kona Brewery, as well as being a 1990 graduate of the Food Science Program at the College of Agriculture and Life Sciences at Cornell. The alumni reception featured home-brewed beverages, fresh-baked pizza, a tour of brewery operations, and presentations by Kohala Center Director Matt Hamabata (ARTS '75) and Cornell Geology Professor Alexandra Moore. Hamabata shared the significance of The Kohala Center's (TKC) partnership with Cornell: "Cornell was our very first partner. We really did not understand the tremendous potential of our organization's ability to serve Island environments and Island communities until Cornell came to the table," said Hamabata. Read more about The Cornell-TKC Connection.

Tangibles

Photo: Students conduct lab experiments to study shrimp behaviour in response to fish.

Doctoral students in Cornell University's Department of Ecology & Evolutionary Biology spent ten days of their winter break on Hawai'i Island, studying three distinct ecosystems and three complex ecological questions. The projects were carefully planned by the students and Professors Drew Harvell, Nelson Hairston, and Jedd Sparks to serve as innovative examples of research in each of the three environments. The goal of the Hawai'i Field Ecology course is to train Ph.D. students in field methods and team research. We think you will be fascinated to learn what the students discovered in their short sojourn on our island. Read the preliminary results of the class, as summarized by the students.

Intangibles

Photo: Lanakila Mangauil and Brown University students exploring lava fields in Hawai'i Volcanoes National Park.

"I find it funny that I feel like I'm actually running out of words to describe

everything that I see. I wish I could stay here forever, witnessing the changing of the light and the music of the world around me." – Julie Pridham, Freshman at Brown University, majoring in Egyptology

Students from Brown University spent the first two weeks of January on Hawai'i Island, as participants in the second *Ahupua'a*: Life Systems of Traditional Hawai'i Program. Kohala Center Program Manager Vanessa Parker-Geisman accompanied the Brown students on their educational odyssey. Highlights included sunset on Mauna Kea; planting loulu palms at Kaloko Honokohau National Historic Park; a visit to the southernmost tip of the Island; an opportunity to meet with Kekuhi Kanae Kanahele Kealiikanaka'oleOhaililani of the Edith Kanaka'ole Foundation; and a breakfast of urchin, *limu* (underwater plants), coconut, and *noni* (Indian mulberry) prepared by Program Assistant Lanikila Mangauil. "The students were impressed at the way in which cultural considerations and spirituality played a role in the way biologists, aquatic resource managers, and others in Hawai'i approached their work," shared Parker-Geisman.

Read an excerpt from Julie Pridham's journal.

Scholarships to Study at Brown or Cornell

Photo: Kamalani Pahukoa aboard NOAA's research vessel Hi'ialakai, November 1, 2006. Read more about Hi'ialakai in West Hawaii Today. *Note: You will be asked to log-on to West Hawai'i Today's site to access this page.*

Generous scholarships are available for two Island high school students to attend the BELL Program in Rhode Island. This summer students may apply to either of two sessions: Session I from June 24-July 6 or Session II from July 8-20. Both sessions focus on sustainable environmental practices and

development: *"Students will learn how human demands on the environment often compromise the long-term health of the very ecosystems that keep us alive. They will also learn about policies, practices, and emerging technologies that can help reduce humankind's ecological impact."*

Generous scholarships are also available to three current sophomores or juniors, who will be juniors or seniors in Island high schools next year and who qualify for admission to the Curie Academy for Girls at Cornell University in Ithaca, New York, from July 21-28, 2007. This summer's project will focus on understanding sports injuries and arthritis: *"The CURIE project for 2007 will introduce high school students to f undamental concepts of using engineering tools to understand biological systems, including the mechanical performance of skeletal tissues, the use of materials to make medical implants, and cell engineering to control biological function."*

Completed admissions and scholarship applications from Hawai'i Island residents for the **BELL Rhode Island** and **Curie Academy** must be received by The Kohala Center by **5 pm on April 16, 2007**. Applications are available at The Kohala Center's website at www.kohalacenter.org. Travel support is also available to qualified Hawai'i Island residents.

Kamalani Pahukoa (photo above), a freshman at Kanu o ka 'Aina New Century Public Charter School, has been awarded a scholarship to the upcoming Brown Environmental Leadership Lab (BELL) Program on Hawai'i Island in April. Read an excerpt from Kamalani Pahukoa's BELL application essay.

Scholarships to these programs are funded, in part, through generous donations to The Kohala Center. To make a donation, visit http://learning.kohalacenter.org/donations. For more information, contact The Kohala Center at info@kohalacenter.org or 808-887-6411.

E Komo Mai! (Please Join Us!)

Photo: Learn about the importance of coral reefs to our island way of life from Kahalu`u Reef Teachers, shown here in their aqua t-shirts.

Join The Kohala Center for a Culture & Science Day at Kahalu`u Beach Park on Saturday, March 31, from 10 am to 2 pm. Did you know that the stones have stories? Learn why Hawaiian petroglyphs (*ki`i pohaku*) need to be protected and how to make your own simulated petroglyphs on sandpaper with Jon Jokeil of the National Park Service. Come listen and learn to play Hawaiian Slack Key with Kauwila, or learn coconut weaving with Kumu Sam Kama. Have fun with John Betlach and Greg Learned as they share face-painting and balloon-character-making with everyone. Learn how you can make a difference in helping the land and ocean stay healthy from Dr. Rick Bennett, of the Surfrider Foundation, and Monica Dunse, from the NELHA Water Quality Monitoring Lab. And enjoy plenty of *onolicious* food! "Please bring your children or students, and share this invitation with everyone," suggests Cindi Punihaole, Kohala Center Public Outreach and Volunteer Coordinator. For more information contact The Center at 808-887-6411.

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The Long Arc

By Linda Copman

Images by Clark Stevens

Photo: Landscapes on either side of the fence result from human choices.

"Our arc in a conservation framework has to be very long and include the past uses of the land. If we lose sight of that arc, we find that what we're doing becomes irrelevant very soon." – Gregory Hendrickson, conservation tax attorney

"For academics there is no greater reward than seeing people take ideas and data, and actually use them in meaningful projects." – Matt Hamabata, Executive Director, The Kohala Center

Greg Hendrickson is among the top conservation tax attorneys in the country. During his career, Hendrickson has been responsible for putting thousands of acres of land into conservation. Hendrickson currently resides in South Kona, where he is serving as the administrator of Kealakekua Heritage Ranch.

Hendrickson shared that he and his colleagues — as accountants, economists, and conservationists — have been talking about these kinds of high-minded ideas for years. Managing land with ideas and with humane values driving the process had always seemed to make sense to them. He never thought that these ideas would attract the attention of so many people in the mainstream of land management. Hendrickson stated that he was honored to be invited to speak about conservation development concepts before such an esteemed audience of land owners, land managers, developers, conservationists, and interested community members.

Hendrickson likened conservation to the task of building new roads in the human mind. He defined "conservation development" as the practice of

conserving, enhancing, and restoring the land — which is quite different from the way most people conceive of development. Conservation, enhancement, and restoration are concepts which stem from the same nucleus of understanding, all focused on healthy land, but they are different in the ways in which they play out upon the landscape.

Photo: The Hokukano Preserve is a case study in conservation planning which incorporates portions of three *ahupua'a* currently operated as ranches.

In considering conservation, one must ask oneself what needs to be conserved. The answer could include "critters," but more importantly, it should include the relationship between people and the land. Creating a balanced interaction between people and the land is at the heart of conservation. Hendrickson emphasized that this interaction is a spatial relationship which unfolds in a temporal context, spanning the past, the present, and the future.

Hendrickson insisted that the divine plays a role in conservation: "There is a spiritual element to what we do that is an important part of the balance. When we promote health and harmony in the landscape, the result has ecological, social, and economic benefits." This resembles the concept of *lokahi* (peace and unity) in Hawaiian culture.

Hendrickson frames the question of conservation in the context of a significant temporal framework: he asks how will this work 100 years from now, not merely five to ten years from now. When dealing with working landscapes which are used for economic purposes, landowners can't be wholly concerned with instant monetization of resources or with timeframes of 30 years or less. The trees on their land are likely older than that, much older. Land planning must incorporate a long-range perspective. "I am a very

strong advocate for perpetuity," said Hendrickson.

Photo: Reforestation of *koa* (an endemic and highly valued forest tree, shown here) and *ʻiliahi* (sandalwood) is a long-term project and an important part of the economics of Hokukano Preserve. Photo courtesy of Rob Shallenberger.

Hendrickson shared a brief historical perspective on the legal basis for conservation easements. Conservation easements were authorized by changes to the Internal Revenue Code enacted in 1969. At that time, Congress outlawed most partial interest allocations of land, based on a perception of misuse by landowners who allowed groups like the Boy Scouts to use their land for a just a few days each year. Thus, conservation easements were written into the Treasury Regulations. In 1976, the federal government temporarily allowed the dedication of 30-year conservation easements. These 30-year easements all came due last year, in 2006. The upshot is that the public investment in these easements has evaporated, since the lands involved have now been released for development. The 30-year timeframe is not long enough to truly conserve land. Federal regulations have been changed, and they now require a perpetual dedication for conservation easement lands.

The connection between the people and the land is significantly in jeopardy right now, explained Hendrickson. The problem here in Hawaiʻi is that the relationship of the people to the land has diminished," said Hendrickson.

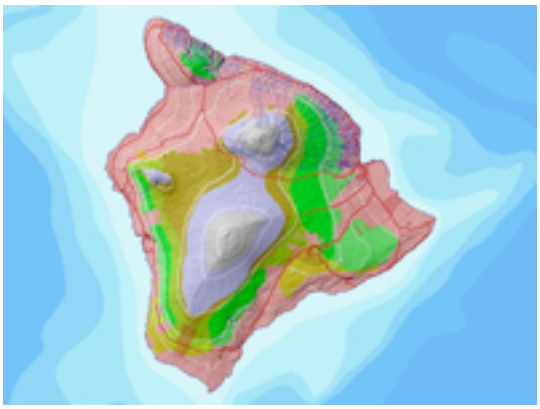


Photo: Hawai'i Island possesses significant ecological diversity with the potential for significant reforestation and conversion of grassland. Photo courtesy of The Nature Conservancy.

A more focused use of the landscape has the potential to create income-generating jobs which will help Hawai'i's people and families, suggested Hendrickson. The kind of income-generating jobs Hendrickson is referring to could reduce the pressure on Hawai'i's parents to hold multiple jobs — thereby freeing up more time for meaningful family life. "Economics means doing right by other people — no economic system will function for long without adhering to this principle," he stated.

Kealakekua Heritage Ranch, which Hendrickson administers, is nearly the same size as the City and County of San Francisco, and is larger than the island of Manhattan. Initial discussions for future development of the ranch have incorporated inclusionary housing for young, middle-income families.

So what is the place of economics in the land planning process? Hendrickson outlined a planning process which is driven by creative and critical thinking. Next, planners incorporate consciousness of others, or emotions. Finally, once ideas and emotions have shaped the process, action can occur. Action is the economic level, but, says Hendrickson, economics do not drive successful businesses:

"If you have your Chief Financial Officer run your business, you have problems. Idea guys run businesses and ideas must drive the process. If you dismiss the ideas, this is just like letting your arms and legs rule your body. It doesn't work."

In the context of economics, the unit rule in an appraisal means that appraisers cannot take the individual uses of a property independently and assign a value. They must look at the property as a whole. "The fact is that if you cut down all the trees, you won't make as much money selling the

homes," said Hendrickson. "We must look at how the individual units come together in the landscape. Can you have meaningful recreation, agriculture, forestry, and inhabitation within a manageable space? Most of us don't need 20 acres of land for inhabitation, unless we do agriculture or forestry. This means that we can use the landscapes surrounding homes for common uses."

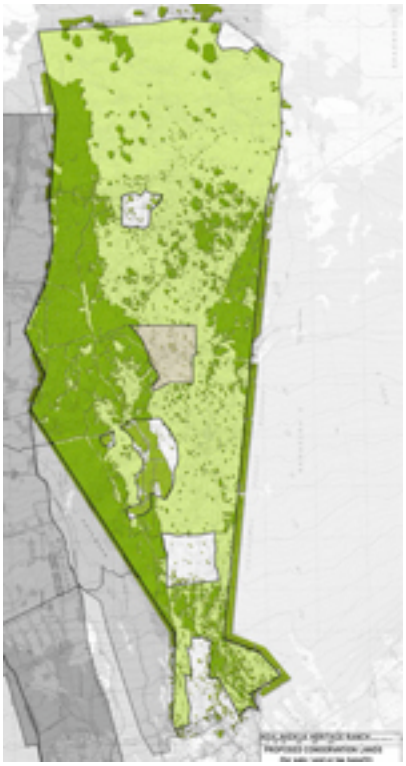


Photo: Proposed conservation lands at Hokukano Preserve.

Two conservation easements at Kealakekua Heritage Ranch are proposed, Phases 1 and 2. Both easements are currently moving through Congress, and both are ranked among the top ten nationwide based on their ecological and cultural value. The two phases will transfer roughly 9,500 acres into conservation easements, and $4.5 million worth of forest management work is proposed for these easements over the next 10 years. Within the easements, no subdivision or fragmentation of the land area will occur, bisection of the landscape with roads will be limited, and degradation of the environment will be minimized through active regulation of the quantity and size of harvest. The forest will be managed over time to achieve conservation goals, which includes managing threats from fires as the native forest is brought back. This task is complex as the site was used as pasture and currently has too much fuel in the form of grasses.

Federal and State law requires a perpetual deed for conservation easement lands. According to Hendrickson, there are significant legal obstacles and economic consequences for bringing the land out of the easements. The owner would have to both demonstrate that the purpose of the easement could no longer be achieved and pay the government its retail value, based on the highest and best use of the land, to bring it out of conservation uses.

The Hawai‘i Island Land Trust has information on tax incentives, as well as on other incentives for landowners, for dedicating their land to conservation uses. “The organization has concrete information on putting these incentives into practice,” said Hendrickson, and he suggested that interested members of the public are welcome to contact the Trust at info@HawaiiLandTrust.org.

Clark Stevens, a conservation planner and architect, has focused on envisioning the right mix of uses for the Pace family land. Two of the three *ahupua‘a*, Ka‘awaloa and Kealakekua, will be primarily encompassed within the conservation easements. Land within the *makai* (towards the ocean) portion of the third *ahupua‘a*, Hokukano, will be “developed,” while the higher-elevation Hokukano Mauka lands will be preserved.

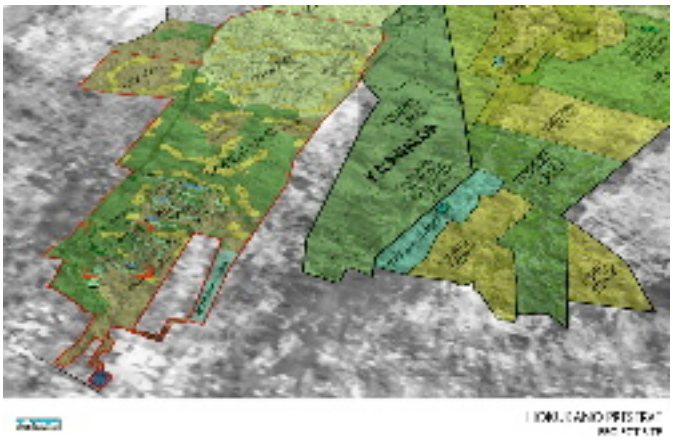


Photo: The Hokukano project presents unique opportunities for economic returns within the context of resident stewardship of ecologic and cultural resources.

Initially, the Kealakekua lands were not part of the Pace holdings, and were not included in the discussion. The Pace family was concerned about existing entitlements for 500 residential units and a golf course on the Kealakekua property, which is located immediately adjacent to their family preserve at Ka’awaloa. So, when the opportunity to purchase the neighboring land presented itself, the Pace family purchased Kealakekua. Fortunately, explained Stevens, the existing entitlements concentrate the development below the 4,000-foot elevation. The higher elevation forest land above the

4,000-foot elevation, where avian malaria is not a threat, would not be affected by the development. (Without the threat of avian malaria, endangered species of birds have the potential to thrive.)

The Pace family was concerned about the proposed density of 500 units on the landscape at Kealakekua. "Acreage is not a very good way of determining land use," said Stevens. "Is five acres better than 20 acres or 40 acres? The answer depends on what you do with the land." At Kealakekua, the zoning overlay is for agricultural 20-acre lots. But this zoning grid is not informed by the actual conditions on the land.

Photo: The existing zoning grid promotes fragmentation of the land. Stevens believes that 500-acre grids are bad, 20-acre grids are likely worse, but 2-acre lots can be better if the balance of the land is functionally whole and allows for integration of the community with the landscape.

Taking into account these initial conditions, Stevens discussed intentions with members of the Pace family. "Here was our common ground," Stevens said. The Paces wanted preservation and restoration of critical ecological and cultural resources. They wanted to engage the community through the land and its stories, in order to enrich both the land and people. They wished to preserve the actual conditions of the land, rather than creating a brandable idea of what Hawai'i is to market to visitors. They hoped to create a model for sustainable development here, on Hawai'i Island.

Stevens relied on basic conservation development principles in order to arrive at strategies he could use to achieve the Pace family's goals. These principles can be summarized as follows:

1. Place is the sum of all relationships, human and more than human, over time and in space.

2. Community is the caretaker of the caretakers. A community has certain values that it wishes to preserve. These values include preserving people in specific places.
3. Ecological places must be evaluated. At Hokukano, much of the project site has been a ranch in grassland for almost as long as it has not been managed as a traditional *ahupua'a* .
4. Cultural values, including things which have been more recently absorbed into the cultural practices of a place, must be understood. The old rock wall at Pauahi, in the heart of Kealakekua, represents the layers and layers of this place. At one time, the wall might have enclosed an old *paniolo* (cowboy) corral, a Portuguese dairy, and a Japanese garden. The wall, like other features of the landscape, carries significance and many stories with it.
5. Resource management, including economic, ecological, and cultural management of resources need to be considered. This can be translated as how we live on the land over time. Traditional Hawaiians used a place from top to bottom, and they were fully engaged with the land.

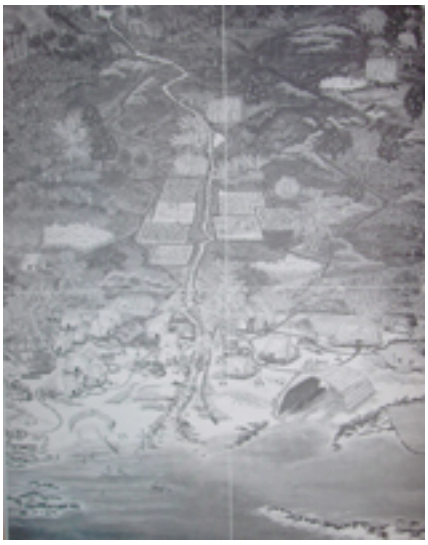


Photo: The Hawaiian *ahupua'a* was a diversified, sustainable economic system, which integrated cultural and spiritual values. Image courtesy of Kamehameha Schools.

Stevens explained what he does to translate these principles into a plan for the land. The process includes interaction with plenty of visionaries, cultural advisors, and technical experts who are knowledgeable about the local conditions of Hokukano. "In addition to more quantitative methods, we also attempt to employ indigenous methods of navigation, through cultural consultants, to determine where to settle, where to farm, etc. We incorporate this feedback into detailed designs that eventually get

implemented," said Stevens.

After reviewing all this varied background information, Stevens walked the ground to see what registered:

"The most sophisticated sensing that will ever come to you comes from your body. Data will not synthesize itself — humans must actively synthesize data into a system. I look at the cultures that inhabited the place for centuries. Then I combine joy, respect, and openness to discover the places that feel good. The hand of man can do good, and it can do better. It leaves a trace for a long time. Development transforms the landscape. There is no place on this planet that is no longer untouched by human beings. Through a voluntary reduction of technology, we can do just enough to create meaning in a place. We can celebrate what's already there through appropriate forms of inhabitation. You see, it comes back to the rock wall, and the old saddle on the wall, many times."

Photo: Conservation development is a form of place-appropriate inhabitation, where development is enhanced by the conserved context.

When Stevens finishes his synthesis, there are very few decisions and little physical evidence on the ground of this planning process. There is movement toward more place-specific plans, and the movement occurs on many levels simultaneously. Stevens and his team study different forms on the land in terms of land use, forest preservation, and economic values. "Where are the pastures, the forests, and the places that must be preserved — the sacred places?" The team's first accomplishment was to define the conservation easements through the Forest Legacy Program to protect the Kealakekua *ahupua'a* from development under its current entitlements, thereby

addressing the Pace family's initial and primary concern. These easements encompass roughly 9,500 acres of land to be conserved, and exclude range land and future orchard land at the base of the property. "But you won't see much physical evidence of this plan on the land," said Stevens.

Inhabitations will be located where the forest is beginning to be fragmented, leaving the intact and most restorable areas of forest for recreational and sustainable agro-forestry uses. At the level of agriculture, the team must look at managing the landscape differently. "We can't just fence the borders of the agricultural land, but instead we must look at these areas in terms of common uses," said Stevens.

Photo: "We map, we sense. We map, we intuit. We map…," explains Stevens.

The Hokukano parcels are the "workhorse" which will support the neighboring conservation easements, explained Stevens. The existing golf course has one big benefit: it provides a great economic return, so much so that it reduces by half the value which must be generated by the rest of the Hokukano land. "There is teaching value to the golf course, as well," says Stevens.

"To improve the existing golf course, we asked ourselves, 'How can we do this differently so that golfers will have an experience that will teach them about the landscape of this place and encourage them to engage with the land?' We have taken great care to tighten up the golf course corridor — sited on previous sugar cane fields — to include agricultural uses, primarily coffee and orchards, and forest uses. These uses take place all around you when you golf. Only recently have common lands been acknowledged as a source of significant returns for investors — but golf courses have long been shown and understood by investors to add value to individual lots. The net result is that the value of golf, combined with recreational and scenic open space, means that less development intensity is required for a given return.

So, in this case, it made sense to keep the course in the development design."

Next Stevens considered how to integrate inhabitation on the landscape. He stated that an agricultural 20-acre zoning generally translates into fragmentation of the land. In order to prevent this, Stevens and his team identified all the places that were "wonderful" in terms of privacy and views of volcanoes or the ocean. Team members surveyed the land, and identified all the potential inhabitation zones and larger agricultural zones using GIS technology. They threw away the grid and redefined the parcels in a much more organic pattern, but one which still complied with the County's strict parameters for minimum lot widths. In defining the parcels, the team considered where to locate enclosures so that cattle don't end up in anyone's garden. The team also created connections between forest areas and agricultural areas using a series of trails. "The agricultural, recreational, forest, and inhabitation areas all overlap, with trails throughout the inhabited areas so that everybody can get to their favorite spots," said Stevens.

Photo: "The goal of inhabitation is not to be invisible, but to do just enough to find the form of inhabitation that was there all along, and to perhaps even delight and surprise the land with what you found there," says Stevens.

Stevens described Hokukano as a large ranch surrounded in the lower elevations by a community of subdivided lots. Stevens saw this as an opportunity to reconnect the ranch with the community through lateral connections. These connections would link pockets within a landscape into an intense pocket — or neighborhoods of inhabitation.

Stevens reported that he is just at the beginning of a long process at Hokukano. "This is a fun process," he said, "to find the appropriate form of inhabitation for this place. As we learn a little more, we change things. We hope that people in the community can add to the knowledge base and

become part of this process."

Learn more about Clark Stevens and his work at http://www.newwestland.com.

A Landscape-Scale Strategy

Images and Story by Michael Castillo, Hawai'i Natural Resources Services

Photo: 2005 Waikoloa Fire.

I've heard it said that in Hawai'i, conservation is not about preservation, it's about management. I believe this is especially true for dry forest ecosystems.

As we have been experiencing over the past few years, wildfires occur frequently in arid portions of all the Hawaiian Islands. Many fires remain small due to effective suppression efforts. We hear about larger fires in the news, but many go unnoticed by the public at large. The large fires often destroy large areas of forest and shrub land habitat, and sometimes even the small fires destroy important dry forest areas. These fires are a major factor contributing to dry forest loss.

As managers, we can take action to reduce the size of wildfires and the overall number of fires that occur.

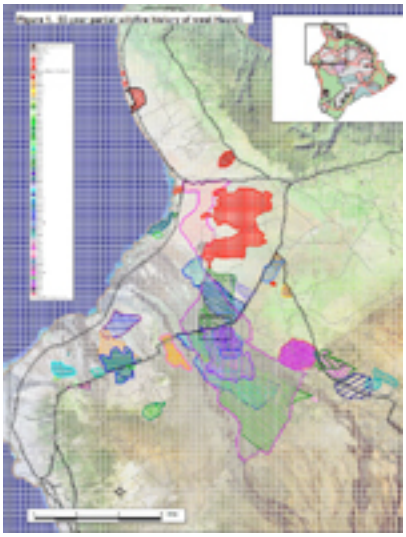
I would like to focus on one particular arid landscape that is the most prone to wildfire in the state, and possibly in the tropical Pacific. This fire-prone landscape can easily be defined by the ridges and saddles extending from Upolu Point over Kohala Mountain, through Waimea, over Mauna Kea, through the Saddle to the summit of Mauna Loa, over the summit of Hualalai, and down to Kailua Kona. Most of this landscape receives an average of no more than 20 inches of rainfall annually.

Prior to invasion by alien grasses, dry forest and shrub land occupied roughly 63% of this landscape, or a land area of approximately 401,000 acres.

The 263,000 acres of dryland ecosystem which have been lost encompass an area more than 1.5 times the size of Moloka‘i – or a land area roughly 2/3 the size of the island of O‘ahu.

Image: Simplified representation of grass invasion-fire cycle.

While some of this dryland ecosystem loss is due to agricultural-related activities, much of it is the result of alien-grass-carried wildfires. Grasses, also classified in fire terms as “fine fuels,” have small particle sizes and high surface area-to-volume ratios that enable them to dry quickly and combust easily. Where continuous stands of grasses form, they enable rapid fire spread.



Map: This fire history map of West Hawai‘i prepared by the West Hawai‘i Wildfire Management Organization shows most of the fires that received a multi-agency response over a 55-year period ending in 2005. This is an incomplete record that does not include the many small fires that were effectively extinguished by Hawai‘i County’s initial attack crews.

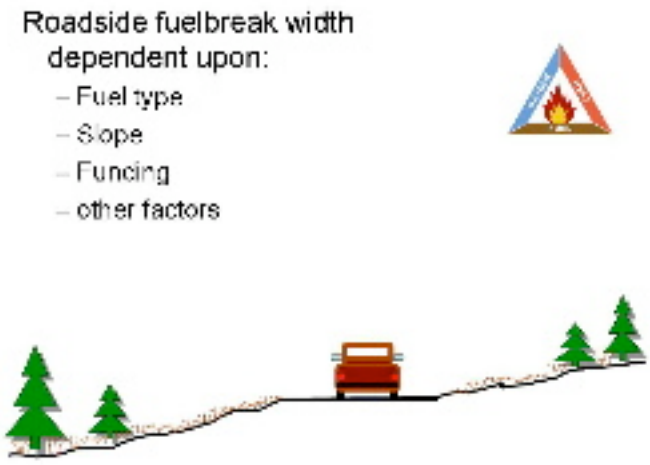
An analysis of fire history records of the West Hawai‘i region shows the bulk of wildfires occur in the months of July, August, and September. September is historically the month when the largest fires have occurred. Records also show that every 10 to 12 years there tend to be fires which consume large acreages. These fires, particularly the large ones, are a result of abundant ignition sources along highways and roads and large expanses of fine fuel beds comprised of alien grasses.

It is worth pointing out the effect that cattle grazing has had on the fire regime of this landscape. On the State-managed lands of Pu‘u Wa‘awa‘a that have been used as rangeland over the past 65 years, fires have been small in size. In contrast, the State-managed lands of Pu‘u Anahulu that NEVER experienced cattle grazing (or any other use at any meaningful scale) are the areas where the largest fires have occurred. Similarly, the number and size of fires on Parker Ranch’s lands around Waimea were very low — until recent years, when Parker Ranch scaled back its utilization of these arid rangelands.

Photo: Cattle grazing as a fuels treatment being applied along the Mamalahoa Highway through Pu‘u Anahulu.

As alien grasses move further and further into native plant communities, they create conditions favorable to the spread of wildfires. Once burned, many elements of the native ecosystem vanish, never to return again. If these elements do return, they do so at greatly reduced densities. Such vanishing species include *ko‘oko‘olau*, *‘akia*, *akoko*, *na‘ena‘e*, and many more.

Futhermore, species that may resprout following a low-intensity fire, such as our native mints, ulei, mamane, and others, are then exposed to browsing by feral sheep and goats, further compounding the effects of the fire. Once the landscape is burned, dominance in the ecosystem shifts toward alien grasses.



Yet wildfires can be effectively managed at the landscape scale. Wildfire management has broad support from every interest group, including: residents of surrounding communities, private landowners, businesses, range managers, and conservationists.

Image: Diagram showing fuels management scheme for remote 4-WD roads.

Effective conservation is achievable only through ACTIVE MANAGEMENT and by manipulating the factors that allow fires to occur. By managing fine fuels along roadsides where most ignitions occur, and along 4-WD roads and firebreaks that compartmentalize the landscape, we can reduce both the number of fires that start and the size of fires that do occur.

Photo: Mechanical treatment (manual cutting) of firebreak road in Pu'u Anahulu.

Part of the strategy that the Hawai'i Division of Forestry and Wildlife is now applying is to maintain the network of roads and firebreaks in fire-prone areas so that fuels are removed completely from the roadbed and maintained at reduced levels on fuelbreaks adjacent to roads. Techniques that have been applied to effectively manage fuels include mechanical treatments using weed wackers and mowers, sometimes followed by herbicide application for longer-lasting results.

Photo: Prescribed Burning as a fuels treatment being applied along the Mamalahoa Highway through Pu'u Anahulu.

Prescribed fire, applied under strict criteria pre-defined in a burn plan, has also been used to remove fuels from roadside areas. This technique produces an immediate effect, but the fuel bed recovers within 1-3 years, requiring a repeat burn-maintenance program. However, prescribed burns are planning and resource intensive, making them costly. They also require a complex level of coordination.

Cattle and other forms of livestock have also been used to effectively manage fire fuel loads. Through a series of rotations, the fuel bed can be reduced and maintained at a low cost, if infrastructure such as fencing exists. This management technique is chemical-free and has direct economic benefits through the production of cattle. Collateral damage to native species can be minimized through careful planning and precise execution of a grazing management plan.

Herbicide is also a cost-effective technique that produces a moderately long-lasting effect if complete kill of the grass is achieved. But kill of the grass bed using herbicide appears to release the existing soil seed bank, which if not managed, can result in the establishment of other undesirable species. This effect has the potential to be utilized as part of a restoration practice in the case where there is an existing or augmented **native** seedbank. Still, there are environmental concerns related to the potential toxicity of large-scale herbicide use.

Photo: Six months following aerial application of herbicide as a roadside fuels treatment along the Mamalahoa Highway through Pu‘u Anahulu.

A combination of treatments produces longer-lasting effects. Burning followed by grazing, for example, produces immediate effects and high-quality forage that can be maintained by livestock.

Alien grass-carried wildfires pose a great threat to the few remaining dryland forests on this island. In order to effectively manage grasses, we must implement cooperative, landscape-scale, integrated wildfire fuels management strategies. Fire management is clearly a win-win solution for all stakeholders in our community.

Learn more about the work of the West Hawai‘i Wildfire Management

Organization.

The Cornell-TKC Connection

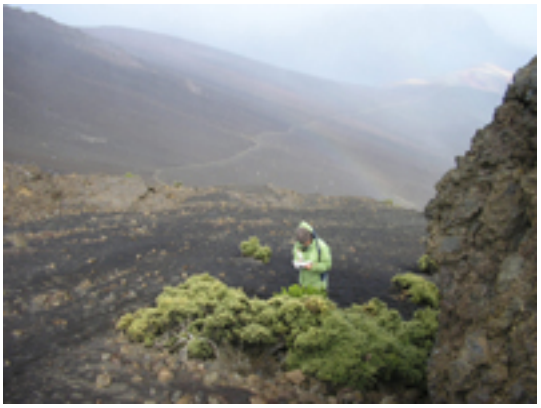


Photo: Identifying native plants in Haleakala Crater, Maui.

Professor Alexandra Moore has been teaching undergraduate geology classes at Cornell University since 1998, and bringing her students to Hawai'i Island since 1991. Hawai'i is an unparalleled natural laboratory said Moore. "The natural progression of age from Kaua'i to Hawai'i allows us to study natural systems and run time forwards and backwards, just by moving from island to island."

Earth systems science looks at the interface between the solid, living earth, the oceans, and the atmosphere. Students in the Cornell University Field Program in Earth and Environmental Systems (EES) have the opportunity to get out into the field to see the forces at work that they write equations about back in their classrooms in Ithaca, New York. Hawai'i is such a great place to study natural processes that, in 2004, Cornell expanded the original three-week intersession program to a semester-long program including five full-credit classes. Moore attributes the program's success to the fact that the Cornell program connected with The Kohala Center back in 2001, Cornell's first year on the Island.

At that time, The Kohala Center was in its first year of operations, with no full-time employees and a very small annual budget. Director Matt Hamabata and Deputy Betsy Cole had been presented by Island communities with a very powerful vision, however. "Our communities envisioned for us a future in which the respectful engagement of Island environments could help us build the science and education sectors of our economy, perhaps turning them into the most important sectors," recalled Hamabata.

Photo: Backyard scientists discover a myriad of surprises in a tree trunk. Photo by Niki Nakagawa.

Now The Kohala Center is six years old. Its programs serve more than 750 Island public school students, and the Center employs seven full-time professionals and 40 independent contractors. It has also garnered the support of 60 volunteers. The Kohala Center has cultivated teaching and research partnerships with several highly esteemed universities, including Brown, Cornell, Yale, and the University of Minnesota. In its effort to bring together academic talent to serve local interests, The Center is working with the County of Hawai'i to prepare a scientific, technical, and business plan (read the Hawai'i County Baseline Energy Analysis) to move the Island to 100% renewables in ground transport fuel and electrical energy by the year 2020. Collaborators on this project include faculty and students from the Yale School of Forestry and Environmental Studies.

The Kohala Center also sponsors professional development seminars to bring principles of conservation into the work of Island developers. "The Western perspective is to buy up property and fence it off," Hamabata said. "But we have tried to connect developers with the Hawaiian paradigm, where native people AND their spiritual and cultural practices, are respectfully integrated with the landscape and its care," he commented.

One real-life example of the impact that The Kohala Center's efforts are having is the Hokukano Preserve, a conservation planning effort sparked by The Kohala Center when it introduced conservation planners to local landowners in 2004. Initial conversations grew into a project encompassing 23,000 acres of land in South Kona – 15,000 acres of which will be dedicated to conservation. Much of the rest of the land will be used for productive agriculture or open space, with minimal land used for residences. Read "The Hand of Man" on the front page, for more details on this successful case study.

As a partner in the Cornell EES Program, The Kohala Center helps to connect Cornell students and professors to the Island community and Island expertise. Newcomers are oriented to the cultural and spiritual landscapes of the island by revered cultural practitioners. Working together, research and teaching programs that benefit Island environments are built.

Photo: Cindi Punihaole, Hawaiian cultural practitioner, has become a dear friend of the Cornell EES Program. In fact, she blessed the program with its Hawaiian name, *Kumu Pa'a I Ka 'Aina* ("knowledge that comes from the land").

Two of the five EES Program courses focus on integrating Cornell students with the Island community. Students formally study Hawaiian history and culture, and as the culminating activity of their five-month stay on the Island, the students complete an intensive internship experience in the community. Past interns have worked at federal and State agencies like Hawai'i Volcanoes National Park, with non-profit organizations like Na Kalai wa'a Moku o Hawai'i, at local taro and bamboo farms, and in local public schools.

"For our Island youth, meeting a young university scientist helps them understand that a career in science is something that they can aspire to," shared Hamabata.

"We're very proud of the contributions that our students have made to the community," said Moore. Moore explained that the Alingano Maisu voyaging canoe that is now sailing across the Pacific Ocean to Satawal Atoll using traditional Polynesian celestial navigation techniques is held together, in part, with lashings made by 2006 Cornell EES Program participants.

Photo: Daniel Wyler, 2006 EES student, lashing the **Alingano Maisu** with master navigator Chadd Paishon. Photo by Andrew Collier.

Moore stated that former graduates of the EES program are either in graduate school, law school, or living here — on Hawai'i Island!

Moore shared some reflections from former EES students:

"I got to interact and work with some of the most interesting and amazing people that I have ever met in my life. This will truly be something that I will never forget." - Daniel Wyler (SES 2007)

"On the Mainland so much weight is put on independence in many facets of our lives. The idea of being part of a community or a team, helping each other out and working together, is something that we all could use a lesson in. This was far more important than any lab we did." - Lauren McPhillips (SES 2007)

"We wanted to be proactive, to make a difference, to give back to the amazing, generous new community that accepted us into their home." - Melissa Duhaime (Bio 2005)

"When classes suddenly throw you out of the lecture hall and into the field and you work with people and see why you know things and how you should use this knowledge, your education takes on a greater meaning. You remember that you wanted to educate yourself so that you could go out into the world and do something in it. You also remember, by working with the community, that sometimes it is just fun to learn. Instead of being an accomplishment in its own right, instead of graduation being the goal, graduation and your diploma become the tool and the permission and the encouragement to accomplish great things." - Kathryn Burns (SES 2007)

Professor Moore is hoping to return to Hawai'i Island in January 2008 with

another cohort of Cornell students. To learn more about the EES Program, visit http://www.geo.cornell.edu/geology/classes/hawaii/index.html.

And Hamabata is still single-mindedly pursuing his vision to create science and engineering pathways for Island students. The Kohala Center is offering scholarships to Island high school students to attend science programs at Brown University and at Cornell University in Summer 2007. The application deadline is **April 16, 2007**. Scholarship information is available at The Kohala Center's website at http://learning.kohalacenter.org.

Sharing Results

Brief Summaries of Research Conducted in January 2007
Prepared by Students in the Cornell Hawai'i Field Ecology Program

Photo: *Opae'ula* are an endemic species of shrimp that inhabit Hawai'i's anchialine ponds, small brackish water ecosystems found only in the Hawaiian Islands.

POND STUDY

Students studied the behavior of fish and *opae'ula* in a series of anchialine ponds at Hualalai Resort on the Kailua-Kona Coast. Preliminary results suggest that a highly ingrained daytime hiding behaviour may help protect *opae'ula* from being completely eradicated by introduced fish in some ponds. Also, larger *opae'ula* may survive in ponds limited to guppy infestation, because they are simply too big for the guppies to eat. **These results suggest that natural recolonization of anchialine ponds is possible once invasive fish are removed.**

PLANT STUDY

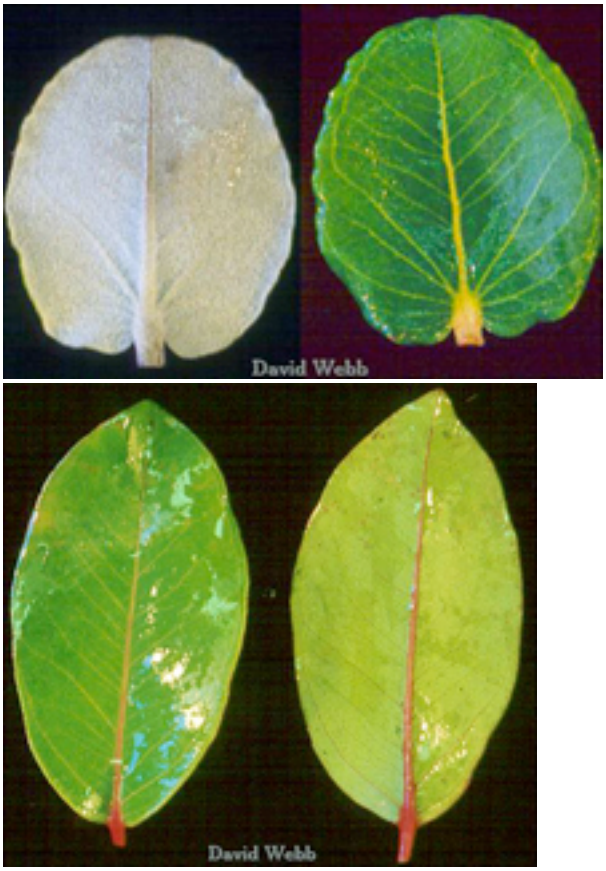


Photo: Pubescent (hairy) leaves **(left)** are contrasted with glabrous (smooth) leaves **(right)**.

The goal was to test three potential explanations for why *ʻohiʻa* leaves are so variable across Hawaiʻi. One trait of *ʻohiʻa* that exhibits such variability is leaf hairiness: plants growing at high elevations (and on young lava flows) tend to have extremely *pubescent* (or hairy) leaves, particularly on their undersides, while those at low elevations (and on older sites) tend to be *glabrous* (smooth and waxy). At intermediate elevations, both types coexist together. Leaf hairiness could have a number of functions that might benefit plants growing at high elevations, which are colder, drier, and can experience greater amounts of ultraviolet (UV) radiation. What the students found was that leaf hairs DO trap escaping moisture, and thereby conserve water; and hairs DO insulate leaves at low temperatures, thereby improving leaf physiology and health. Hairs do not seem to shield leaves from ultraviolet radiation, however. **These results help explain some of the remarkable variation in this ecologically and culturally important plant species. "We hope future Cornell University groups will continue this work," said the students.**

MARINE STUDY

Photo: The fore reef and the back reef at Puako, South Kohala, Hawai'i.

The goal was to determine whether corals living in more stressful environments are more tolerant of temperature fluctuations in the surrounding water. Students looked at two common coral species which are found on both the fore and back reefs of Puako. Under normal reef temperatures, the corals from the fore and back reefs behave similarly. However, when students exposed these same corals to stressful high temperatures, they found that back reef corals from both species showed less of a change in behavior than those from the fore reef. This suggests that back reef corals, because they live under constantly variable temperature conditions, are able to maintain consistent performance in the face of change. **Understanding more about these stress-tolerant individuals could provide insight into how coral reefs may adapt to environmental changes such as increases in ocean temperature. Coral reefs are one of the ecosystems most endangered by climate warming.**

Kohala Sanctuary

Journal Excerpt from Brown University *Ahupua'a Program*
By Julie Pridham, Freshman

Photo: Brown student Jessica Marquardt talks story with a member of the North Kohala Senior Citizens Club.

"Today we had some very special guests. Raylene Lancaster came to teach us about hula. She is such a powerful human being, soft-spoken in the way that she always seems to draw energy from within to speak loudly for her.

She encompasses everything that I know hula to be — the way of life and the history that comes with it. She brought with her three of her pupils who, even at their young age, seemed masters of this art, especially compared to most of our group when we attempted to dance ourselves.

The most remarkable part of her visit, however, was when she asked us, 'What is your purpose?' At first I was completely stunned and felt entirely awkward, because, of course, I had to go first. But as I sat there, fumbling for purpose, I realized that the answer wasn't deeply philosophical or particularly difficult to grasp. Rather, my purpose is something that is already very much a part of me and my belief system -- and that is that I am meant to help others."

Feed Me Knowledge

Excerpts from BELL Application Essay

By Kamalani Pahukoa

Photo: Kamalani Pahukoa focusing on her studies.

Each spring for the past four years high school students from around the nation and across the globe have joined Brown University and The Kohala Center for BELL Programs on Hawai‘i Island. BELL programs focus on learning science within the context of culture and society. The program opens with a traditional blessing at Kilauea with members of the Edith Kanaka‘ole Foundation. Program highlights include lessons in geology and hikes at Hawai‘i Volcanoes National Park; assisting with the restoration of native forest at Niaulani Gardens in Volcano; sea kayaking and snorkeling in Kealakekua Bay; an introduction to ethnobotany at Amy Greenwell Garden; and exploring the historic and cultural sites at Pu‘u Honua o Honaunau National Historic Park.

Several Island students have participated in these environmental programs and shared their perspective as *kama‘aina* (children of the land) with visiting students. Kamalani Pahukoa **(photo above)**, a freshman at Kanu o ka ‘Aina New Century Public Charter School, has been awarded a scholarship through The Kohala Center to join the BELL Program on Hawai‘i Island in April. Here are her thoughts about what this opportunity means to her:

“Aloha. My name is Kamalani Pahukoa. I am 15 years old and attend Kanu o ka ‘Aina New Century Public Charter School. I would like to attend the BELL Program because I feel it can feed me knowledge that can help me in my marine biology career choice.

I love being with the ‘aina (land). I thank the land for everything it provides me: from shade and shelter, to food, to ground to play on. I give thanks to the ‘aina by picking up rubbish and making sure that others know how to malama (care for) their responsibilities to the land. When I explore the land and all its beauty, I take it seriously. I love getting everything I can learn into my head. When I look up at Mauna Kea I freeze, so I can see all the beautiful sights. While down at the kai (ocean), I turn up the sand looking at

all the seashells. I love learning about the ocean and marine life. When learning about these things, I block everything else out of my mind and think about the ocean.

I want to become a leader in my family, so they have another strong source they can turn to for help. I would love to be a leader in my school so I can help my fellow classmates with any problems they have. I would love to lead in my community and make a difference that can affect others in a good way. One of my favorite role models is Nainoa Thompson. He is a man with high hopes for Hawaiian kids. He is a great spokesperson who can get his message out to anyone. He gave a great speech at our school about leadership and how you should try to achieve anything you dream about. He gave me a goal that I promise to fulfill in every way I can — to become a role model for someone else. Like Nainoa, I would definitely like to make a difference in Hawai‘i.

I hope I’ve conveyed my great interest and humbly request your consideration to participate. I intend on sending you updates of my school year progress, as I am currently driving an individual environmental learning project involving coral reef habitat health. I am also a skilled videographer and have participated in two environmental video competitions on my own time. Thank you for your time and malama pono (take care).”