Remnant Wiliwili Forest Habitat at Wailea 670, Maui, Hawai`i: II. Comments On the Draft Environmental Impact Statement

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Summary

The proposed project represents the largest deliberate destruction of lowland Hawaiian dry forest ecosystem to occur on Maui in decades. Lowland Hawaiian dry forest ecosystem is among the twenty most endangered ecosystems in the United States. The DEIS compares this remnant with other remnants only to denigrate its conservation value and justify the proposed destruction of some 72% of this remnant, and severe fragmentation of another 14%. But it is silent on the importance of large, unfragmented habitat for conservation of biodiversity, and the fact that the project contains about the fourth largest of eight remaining large contiguous remnants of lowland dry forest on Maui. Moreover, the remnant is some 4 miles from Pu`u O Kali, which contains a number of listed endangered plant species, and it is likely that it could serve as critical habitat in their recovery. All of these eight remnants of this endangered ecosystem should be preserved and dedicated to restoration efforts.

General Comments

Lowland Hawaiian dry forest is an endangered ecosystem. Government and private actions have allowed this ecosystem to be reduced to amounts and states of degradation that threaten its long-term existence. No more than 5% of the original habitat survives in any degree, and that 5% is heavily invaded by alien plant and animal species.

The additional deliberate destruction of remnant habitat of this ecosystem, which is proposed by Honua`ula Partners, should be prohibited by local, state, and federal policy; private interests that propose such destruction should face universal social approbation.

Some 160 acres of lowland dry forest survive in the Wailea 670 project area, nicely demarcated by the Historic Wall that runs mauka to makai bordering the HKEA (Bergmanis et al. 2000) `a`a flow. Any destruction of portions of this 160 acres is the opposite of what should be happening—these 160 acres should be managed for restoration.

The current proposal of the Honua`ula Partners reflects its history. It represents probably about as much conservation as one could squeeze into the site plan developed before 2003. But this level of conservation is still catastrophic to the habitat — a reduction of c. 160 acres of remnant lowland dry forest to 22 contiguous acres under conservation easement, and 23 acres of mostly linear fragments of ungraded land bordering the golf course greens. The plan violates the two most important features of reserve design:

- *A large reserve will hold more species than a small reserve because of the species-area relationships described in Chapter 8.*

- *A single large reserve is preferable to several small reserves of equal total area, assuming they all represent the same ecosystem type.*

  Conservationists prefer large reserves to small reserves for two main reasons. First, large reserves will, on average, contain a wider range of environmental conditions and thus more species than small reserves. Additionally, some species will be absent from small reserves ... simply because they live at low densities and by chance alone are unlikely to be in a small reserve (e.g. many rare plants). ...

  Second, large reserves are more secure and easier to manage (at least per unit area) than small reserves for three reasons: (1) large reserves have relatively large populations that are less likely to become extinct (recall Chapter 7); (2) large reserves have a relatively shorter edge than small reserves and thus are less susceptible to external disturbances such as invasions of exotic species and poachers...; and (3) large reserves are less vulnerable to a catastrophic event... — Hunter and Gibbs, p. 235

So, the proposal represents at least complete destruction of 72% of the habitat, and severe degradation through fragmentation of another 14%, leaving only 14% that is getting the treatment that 100% of this habitat should be receiving due to the endangered state of this ecosystem.

In case it is not obvious why remnant habitat of endangered ecosystems should not be deliberately destroyed, here are some specific reasons:

1. Habitat loss means alteration of the physical environment or destruction of the established organisms to an extent that natural reproduction of the organisms cannot reestablish their community. This is what has happened to at least 95% of lowland dry forest in Hawaii and on Maui in particular.

2. The plan of Honula`ula Partners destroys the ability of the native species to live and reproduce on 72% of the remnant habitat, and imperils their ability to sustained long term survival on the remaining 28% of the habitat by reducing its contiguous area and by reducing the total populations of all organisms.

3. `A`a habitat consists of microsites of soil scattered among clinker lava. Dispersed seeds have to fall upon a habitable microsite before the parent plant dies. This makes it a metapopulation, which survives through extinction and recolonization dynamics. The fewer the total number of microsites, the greater the probability of local extinction, and the faster the time to extinction (Bascompte, Possingham, and Roughgarden, 2002);

4. No amount of cultivation of native plants is a substitute for ecosystem preservation. First, cultivation is human intervention to sustain plants that would die without this intervention. Plants have survived and evolved for thousands of years without human intervention in their native habitat. No one can propose that cultivation of the native plants will be guaranteed for thousands of years into the future. Second, landscaping with native plants does not bring along all of the other species with which they form an ecosystem — soil microbes, pollinators, the invertebrate ecosystem, and other plant species. Third, cultivation causes allele extinction and adaptation of species to the conditions of cultivation, making the resulting plants unable to resume life even in intact habitat.

   The maintenance of genetic variation under cultivation is a complex management problem and one of the main difficulties of such ex situ plant conservation. Furthermore, ex situ plant conservation—the only use of cultivation for conservation—is premised upon the idea that cultivation is a temporary measure awaiting the time when the habitat of the plants is ready for their reintroduction (Guerrant, Havens, Maunder, 2004). This is

the strategy being pursued for Hibiscus brackenridgei at the Maui Nui Botanical Garden, for reintroduction to their site of origin, Pu`u O Kali. Ex situ conservation is never designed as a way to justify the destruction of the habitat of origin.

5. The proposed reduction of population sizes of all native through habitat destruction increases the chance that the remaining population falls below the minimum viable population size (Hanski, Moilanen, and Gyllenberg, 1996), where stochastic processes and genetic mutational meltdown (Higgins and Lynch, 2001) cause the eventual local extinction of the species:

   Theory suggests that the risk of extinction by mutation accumulation can be comparable to that by environmental stochasticity for an isolated population smaller than a few thousand individuals. Here we show that metapopulation structure, habitat loss or fragmentation, and environmental stochasticity can be expected to greatly accelerate the accumulation of mildly deleterious mutations, lowering the genetic effective size to such a degree that even large metapopulations may be at risk of extinction. Because of mutation accumulation, viable metapopulations may need to be far larger and better connected than would be required under just stochastic demography.

   It is the potential of large contiguous areas of habitat to support large metapopulations that makes the HKEA remnant lowland dry forest habitat especially valuable for conservation, and which the proposed plan destroys.

The pre-2003 site plan should be jettisoned, and a new site plan developed that protects all of the `a`a habitat south of the Historic Wall. Such a site plan would have to increase the density of the 76% of the property without native biota by 30% to include all of the currently planned units and features. If the conservation area is kept to the 130 acres mandated by the Unilateral Agreement should DLRN and USFWS find it merits preservation, the revised site plan would be able to develop 81% of the 670 acres, and could maintain all the planned items by a 24% increase in density. Such increased density is a high priority among the "Smart Growth" principles advocated by Honua`ula Partners.

SWCA Environmental Consultants (SWCA) appears to be aware of this situation, but faces the dilemma of providing a product that is satisfactory to their client, Honua`ula Partners. The resulting product reflects the limits of how true to conservation biology a hired consultant can remain within their contractual relationship.

SWCA's botanical survey of the property is unparalleled in its conception, execution, and exposition. It sets a new high bar on what should be expected from an EIS. Moreover, the data in their study provides an invaluable baseline from which to monitor the effects of habitat protection and restoration for the habitat in coming decades — should the habitat survive intact from the current plans of its client, Honua`ula Partners.

But the attempts in SWCA's report to justify their client's development proposal are unfortunate. They resort to several rhetorical tactics:

1. Denigrating the conservation value of the habitat remnant on `a`a flow HKEA;
2. Exaggerating the conservation value of their mitigation efforts — namely, counting the acreage of ungraded, unprotected fragments of land, and counting the acreage of landscaping where native plants are proposed to be used;
3. Using the fact that other Hawaiian dry forest are receiving conservation efforts as justification for destruction of the habitat on HKEA.
4. Using the fact that a few other remnants of lowland dry forest have higher remaining plant biodiversity than HKEA to justify the destruction of habitat on HKEA.
5. Using the fact that other reserves have been forced to work with small acreages as justification for destroying the large acreage of habitat on HKEA.

Comments by Section

The Botanical Survey gives an excellent review, and I have no criticisms, until p. 4, where it cites my report incorrectly:

> *Recently, Altenberg (2007) drew attention to the southern portion of the Property which he claimed to be among the best examples of a remnant native lowland dry forest remaining on Maui. ... Altenberg (2007) identified eight wiliwili (E. sandwicensis) forests in southeast Maui including Kanaio, Pu`u o Kali, Honua`ula / Wailea 670, Makena, La Perouse, Kaupo, Lualailua, and Waikapu.*

Nowhere did I claim it "among the best examples"; the word "best" was used only once—to refer to the best data available on the extent of remnant wiliwili habitat on Maui, the maps of Jonathan Price. It is Price's map, not I, that show eight remaining large contiguous ares of wiliwili habitat, among which Wailea 670 can be seen to be around the fourth largest among these 8. Hence, the large contiguous wiliwili habitat in Wailea 670 is not "among the best examples", but among *the only* examples of large, contiguous lowland dry forest left on Maui.

The rhetorical denigration of the remnant continues on p. 5:

> *Hence, the southern portion of the Property may be described more accurately as a highly disturbed, remnant native coastal dry shrubland (sensu Gagne and Cuddihy 1999) in which wiliwili (Erythrina sandwicensis) has become a common inhabitant. Medeiros (USGS, pers. comm.) suggested that mature wiliwili (Erythrina sandwicensis) trees may be found throughout southeastern Maui, often in abundance and greater densities than those encountered in the Property.*
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> *...Price et al. (2007) recently developed methods using bioclimatic data to map habitat quality for and range of two widespread plant species including wiliwili (Erythrina sandwicensis) and two rare plant species throughout the Hawaiian Islands. The area encompassed by the Property appears on these maps as `medium' to `low' habitat quality for wiliwili (E. sandwicensis) (Price et al. 2007). However, numerous areas in southeastern Maui located between*

> *Pu`u Ola`i and Kaupo outside the Property did appear as having `high' habitat characteristics on the maps prepared by Price et al (2007).*

So, here perhaps see why SWCA misquoted me as saying HKEA was among the "best" examples, so that they could discredit me by showing "other, better examples" exist. But here is what Price and colleagues have to say about the overall situation of Hawaiian dry forest:

> *Hawaiian dry forests were once considered to be the most diverse forest ecosystem on the Hawaiian Islands (Rock 1913), however, today they are extremely deforested and degraded. Our results show that forty-five percent of Hawaiian dry forest taxa are at risk of endangerment and that patterns of endangerment in Hawaiian dry forests are unique compared to other Hawaiian forest types. ... There is currently no data on the number of tropical dry forest fragments remaining on the Hawaiian Islands and no species lists for these fragments. Future research should begin by identifying the remaining extent and distribution of Hawaiian dry forest fragments because they are clearly endangered. The effects of habitat destruction, fragmentation, and the breakdown of native ecosystem functions play a large role in determining patterns of diversity that cannot be fully explained by island age and area. Examining patterns of species richness, composition, and structure among these remaining forest fragments would produce valuable information for understanding patterns of diversity in an increasingly endangered forest type.* (Pau, Gillespie and Price, 2009)

Now, once the text moves into the actual botanical survey, Sections 2 and 3 (pp. 5-17), we find quite excellent work and reporting. The areas of wiliwili habitat shown in Price's map find confirmation in SWCA's aerial reconnaissance:

> *Our aerial reconnaissance confirmed input from others (A.C. Medeiros, USGS, pers. comm.; Altenberg 2007) suggesting that several additional high density wiliwili (E. sandwicensis) groves may be found near Pu`u Olai, Kanaio, Pu`u O Kali, Makena (Figure 12), La Perouse, Kaupo, and Lualailua. (p. 17, 3.5 Aerial Reconnaissance Survey)*

However, in the Discussion, Section 4, the rhetoric returns.

> *Similarly, there have been no previous efforts by any Federal, State, local government agency, or conservation Non-governmental organizations (NGOs) to acquire and protect any portion of the Property.*

Very few have the resources "to acquire and protect" property. The most recent actions putting dry forest into conservation were made by current owners, not by acquisition. The Erdmans put thousands of acres in to conservation easement, and Hawaiian Homelands put c. 250 acres of Pu`u O Kali into conservation. In contrast, Honua`ula Partners propose to put only 22 acres into conservation easement. And while not having the resources to acquire, several NGOs have put efforts into protecting the habitat at Wailea 670, including the Native Hawaiian Plant Society, Maui Tomorrow, the Sierra Club, and Maui Cultural Lands, and many others without resources to acquire have submitted testimony in favor of complete preservation.

> *The remnant native vegetation in the remnant mixed kiawe-wiliwili shrubland represents a highly degraded lowland dry shrubland in which wiliwili trees (E. sandwicensis) are a natural component. High density wiliwili (E. sandwicensis) stands occur in other locations throughout the region. Altenberg (2007) identified eight areas in southeast Maui, including the Property, where wiliwili (E. sandwicensis) groves are found. In this study, we also found dense wiliwili (E. sandwicensis) groves east of Pu`u Olai.*
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> *Far from being pristine, this dry shrubland has been degraded by human activities including unrestricted grazing by ungulates, cattle grazing, invasive plant species, road works, kiawe (P. pallida) logging, and military activities. Only 26 of the 146 species reported from the parcel are native, 14 of these are endemic, and 120 are introduced non-native species (Figure 6).*

More denigrating language, and language intended to make it seem like the ecosystem represented here is common. No quantitative comparison is given between the species list at HKEA and, for example, at Pu`u O Kali. A 2004 list of species at Pu`u O Kali (Forest Starr) shows 35 native species, compared to 26 found by SWCA at HKEA. So, while describing Pu'u O Kali thus: "Pu`u O Kali Forest Reserve is a remnant wiliwili (E. sandwicensis) forest on the slopes of east Maui above Khei. It is among the most diverse and intact lowland dry forests on Maui which also supports endangered flora." (p. 23) it describes HKEA as "highly

degraded lowland dry shrubland" even though it has 72% of the native plant biodiversity of Pu`u O Kali.

The comparisons with the very best surviving dry forest remnants in Hawaii are clearly intended to justify the destruction and degradation of most of the HKEA remnant, and its removal from among the 8 large contiguous lowland dry forest areas that survive on Maui. But that is a fallacious line of reasoning. The fact that a particular Da Vinci painting may not be as well preserved as others does not justify its destruction. The fact that three grandparents may be healthier than one does not justify denying that one the best chance at longevity. Lowland Hawaiian dry forest is an endangered ecosystem, and all surviving remnants of that ecosystem deserve maximal preservation and restoration.

The DEIS emphasizes numerous times that no currently listed endangered plant species are found on the property. But the purpose of the Endangered Species Act is not discussed:

> *ENDANGERED SPECIES ACT OF 1973 [Public Law 93-205, Approved Dec. 28, 1973, 87 Stat. 884] [As Amended Through Public Law 107-136, Jan. 24, 2002]*
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> *(b) PURPOSES. The purposes of this Act are to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve the purposes of the treaties and conventions set forth in subsection (a) of this section.*
>
> *(5)(A) The term "critical habitat" for a threatened or endangered species means:*
>
> *(i) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 4 of this Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and*
>
> *(ii) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of this Act, upon a determination by the Secretary that such areas are essential for the conservation of the species.*

Because the extirpation of species is an ongoing process in lowland dry forest on Maui (having been seen for Hibiscus brackenridgei in Pu`u O Kali in the 1990s, and for Chamaecyse celastroides var. lorifolia on HKEA in 2007), the absence of species that are present on nearby habitat remnants must be considered to be likely the result of local extinction, most likely by ungulate grazing. It is likely that the listed endangered species at Pu`u O Kali would recolonize HKEA if reintroduced, so HKEA needs to be considered as critical habitat for their recovery.

The wildlife survey does not consider invertebrate species such as native Hawaiian bees, which are under discussion for listing as endangered species. It is completely unknown what impacts the proposed habitat destruction may have on the native bee species. A great deal is unknown about lowland Hawaiian dry forest ecology. The HKEA remnant is a potential study site to learn more, and for this reason, should also be preserved in its entirety.

While the destruction and fragmentation proposed for all but 22 of the c. 160 acres of lowland Hawaiian dry forest remaining on the site is unacceptable treatment for an endangered ecosystem, the treatment proposed for the area in the Conservation Easement is well thought out conservation management. This management should be applied to a Conservation Easement comprising the entire 160 acres south of the Historic Wall, and I trust will be mandated by lack of any findings from DLNR and USFWS that any area in the HKEA habitat does not merit preservation.

However, two points should be mentioned.

1. First, the cultivation of native plant species using cultivars derived from outside HKEA for species found in HKEA can be detrimental to their survival and scientific value. In Hawaii, extremely local adaptation and genetic differentiation are common phenomena, and hybridization of the local gene pool with exogenous genotypes brought in for landscaping would ruin the possibility of studying local genetic differentiation, and could compromise the survival by shifting the phenotypes away from adaptations to local conditions. For example, at nearby One Palauea Bay, the very popular "naio papa" is being used in landscaping. Naio papa is a prostrate variety of Myoporum sandwicense that evolved around South Point on Hawai`i island. It would doubtless hybridize with

the Myoporum sandwicense remaining at HKEA and produce offspring that are not adapted to the local conditions.

I applaud the DEIS for making the point that cultivars for native plant landscaping and outplanting should be derived from populations found on the site — a fine point often missed even by conservationists in other efforts on Maui. I think that strong measures should be made to protect the gene pools of the remnant populations at HKEA. This could be achieved through covenants for all future owners of subdivisions of the entire project property. A covenant should prohibit the used of cultivars derived from offsite populations for any of the 26 endemic and indigenous species (even indigenous species show local adaptation and variation in Hawaii) found on HKEA.

2. Second, it is not really known why native species persist on HKEA. The obvious candidates are 1) that `a`a substrate gives a competitive advantage to native over invasive species such as buffel grass, which outcompete native species on deep soil substrate, and that 2) `a`a substrate is so sparse with soil microsites that the canopy is too sparse for fire to percolate through the habitat, thus sparing it from the firestorms that regularly consume portions of the leeward lands. But this is speculation, and has not been verified empirically.

   So it is not really known if the presence of any of the alien species on the property might actually benefit the persistence of the native biota. Besides obvious competitive interactions, there can be subtle higher order effects (e.g. keystone species) that produce counterintuitive interactions. Therefore, an empirical approach needs to be taken with the proposed removal of alien invasive species. Clearly, Axis deer and other alien animals with proven detrimental effects on native ecosystems should be immediately removed from the property and fences installed to prevent their re-entry. It is even conceivable that eradication of rats and fencing that prevents their re-entry could be feasible for a 160 acre Conservation Easement. Similarly, alien plant species where there is a record of experience with their removal — such as *Leucaena leucocephala* — should be commenced immediately. Other species that are long naturalized, such as *Prosopis pallida*, should be

removed on an experimental basis, with monitoring to see the effects on other invasive species as well as the natives. For example, at nearby One Palauea Bay, in the cultural reserve, one observes that Capparis sandwichiana grows along the edge of the *Prosopis pallida* canopy; is that because *Prosopis* is competitively excluding Capparis from all but its edges, or because *Prosopis* is enhancing the microsite in some way favorable to Capparis, by shade or nitrogen from seeds? I am not aware of any studies that answer this.

Therefore, I recommend that an experimental design for removal of *Prosopis* be developed and the effects on vegetation be monitored to acquire empirical experience with the effects of removal.

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