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**Biocultural restoration of Hawaiian tropical dry forests**

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S1: Interview Questions to Hoa‘āina (caretakers) of Auwahi and Ka‘ūpulehu.

### **Kama‘āina (descendants of this land, long time residents) or Landowners**

*Piko Po‘o (The past, ancestral, spiritual connection)*

1. Can you tell me a bit about your relationship with this ‘āina (land)? How long (generations) has your ‘ohana (family) had a relationship with this ‘āina?
2. Has the relationship between you/‘ohana and ‘āina changed since the restoration project started? If so, how? What seems to be the reason for these changes?

*Piko Waena (The present, yourself)*

3. How would you describe your involvement with this restoration project? And what motivated you to be involved?
4. What do you think makes this restoration project biocultural?
5. What does successful restoration look/sound/feel like to you? Are you seeing this now?
6. Has a biocultural approach helped the project achieve certain restoration goals?
7. Has a biocultural approach helped the project address challenges in dry forest restoration?
8. Any large challenges or failures associated with a biocultural approach that you or the project has had to overcome? How were these overcome?

*Piko Ma‘i (The future, next generation)*

9. What is your vision for this ‘āina into the future? What kind of relationship do you want your keiki and mo‘opuna (children and grandchildren) to have with this ‘āina?
10. Are there any questions you have or suggestions of future studies that might be useful to the restoration project?

### **Interview to Project Managers and Longtime Staff**

*Piko Po‘o (The past, ancestral, spiritual connection)*

1. Can you tell me a bit about your relationship with this ‘āina? And what motivated you to be involved with this restoration project?
2. How has the relationship between kānaka (human community) and ‘āina changed over the years? What seems to be the reason for these changes?

*Piko Waena (The present, yourself)*

3. What do you think makes this restoration project biocultural?
4. What does successful restoration look/sound/feel like to you? Are you seeing this now?

S1 (Continued): Interview Questions to Hoa‘āina (caretakers) of Auwahi and Ka‘ūpulehu.

5. Has a biocultural approach helped the project achieve certain restoration goals?
6. Has a biocultural approach helped the project address challenges in dry forest restoration?
7. Any large challenges or failures associated with a biocultural approach that you or the project has had to overcome? How were these overcome?

*Piko Ma‘i (The future, next generation)*

8. What is your vision for this ‘āina into the future?
9. Are there any questions you have or suggestions of future studies that might be useful to the restoration project?

S2: Auwahi Forest Restoration Project: Post Event Survey

1) How many times have you been to Auwahi?

2) What do you feel was important to your experience today? Check all that apply:

- |  |   |
|--|---|
| <input type="checkbox"/> Hawaiian culture context                            | <input type="checkbox"/> Planting trees                                   |
| <input type="checkbox"/> <i>Mo'olelo</i> (stories)                           | <input type="checkbox"/> Touching soil/dirt/' <i>āina</i> (land)          |
| <input type="checkbox"/> <i>Oli or mele</i> (chant/song)                     | <input type="checkbox"/> Being in nature/greenery                         |
| <input type="checkbox"/> Learning ethnobotany (Hawaiian knowledge of plants) | <input type="checkbox"/> Learning botany (Scientific knowledge of plants) |
| <input type="checkbox"/> Learning/hearing place names                        | <input type="checkbox"/> Science/research                                 |
| <input type="checkbox"/> Sense of community                                  | <input type="checkbox"/> Volunteer hours                                  |
| <input type="checkbox"/> Feeling welcomed                                    | <input type="checkbox"/> Restoration work                                 |
| <input type="checkbox"/> Spiritual experience                                | <input type="checkbox"/> Working towards something positive               |
| <input type="checkbox"/> The staff and leaders                               | <input type="checkbox"/> Instilled sense of hope                          |
| <input type="checkbox"/> <b>Other:</b>                                       | <input type="checkbox"/> Sweating/perspiration                            |

3) What do you feel was the *most* important above and why?

*For each statement, circle what best fits:*

4) Do you want to return to Auwahi?

YES

NO (If so, any reason why?)

5) After volunteering at Auwahi I feel like I have a personal relationship with Auwahi and the community now:

YES

NO (If so, any reason why?)

6) Has volunteering at Auwahi increased your knowledge and/or appreciation of our Hawaiian plants and animals?

Definitely not

Somewhat

For sure

S2 (Continued): Auwahi Forest Restoration Project: Post Event Survey

**7) Has volunteering at Auwahi increased your knowledge and/or appreciation of Hawaiian culture?**

Definitely not

Somewhat

For sure

**8) Has volunteering at Auwahi made you feel strongly about the protection of Hawaiian culture in culturally troubled times?**

Definitely not

Somewhat

For sure

**9) Has volunteering at Auwahi made you feel more strongly about the protection of Hawaiian plants and animals in ecologically troubled times?**

Definitely not

Somewhat

For sure

**10) Has volunteering at Auwahi made you feel that the native forest was made more special by the context of Hawaiian culture?**

YES

NO

**11) Check the boxes that you most identify with:**

- Native Hawaiian ancestry
- Born and/or raised in Hawai'i
- Moved to Hawai'i, been here for 5+years
- Moved to Hawai'i within a year
- Visitor
- Unidentified
- Other:

**12) Any other comments about your experience?**

*Mahalo nui loa for your time and energy!*

### S3: Ka'ūpūlehu Visitor Survey

Program: \_\_\_\_\_

Date: \_\_\_\_\_

1. Mana'o. Please write and share something from time here working and learning. It can be any combination of feelings, thoughts, sights, sounds that you noticed.

2. Record another observation or feeling about today as a quick sketch.



## 'Āina-Based Learning at Ka'ūpūlehu / Ka'ūlupūlehu

Aloha. We'd like to hear your feelings about learning on the 'āina (land). This survey is not a test. There are no right or wrong answers. Please be as honest as you can. It should take 5-10 minutes to complete. Mahalo.

First Name: \_\_\_\_\_

School or Group: \_\_\_\_\_

What is your grade in school?

- 6<sup>th</sup> to 8<sup>th</sup>     9<sup>th</sup> to 12<sup>th</sup>     Post secondary school     Adult not in school     Educator/Teacher
- 5<sup>th</sup> grade or younger

S3 (Continued): Ka'ūpūlehu Visitor Survey

Program: \_\_\_\_\_

Date: \_\_\_\_\_

3. Name one or two native plants special to this Ka'ūpūlehu native dryland forest.

4. What is one thing you learned about Ka'ūpūlehu as a native Hawaiian homeland?  
Either from a mo'olelo told or something shared by the people who work here.

For each statement, circle the number that best fits you BEFORE today's visit and NOW.

5. I know some history of this place.

	Very Little							A Lot
BEFORE	1	2	3	4	5	6	7	
NOW	1	2	3	4	5	6	7	

6. I care about what happens to this place.

	Very Little							A Lot
BEFORE	1	2	3	4	5	6	7	
NOW	1	2	3	4	5	6	7	

7. I'm glad I came here today.

	Very Little							A Lot
	1	2	3	4	5	6	7	

S4. Motivations for Hoa‘āina (Caretakers) in Implementing a Biocultural Approach (N=8)

Categories	Perspectives	Sample Quotes from Hoa‘āina (Caretakers)
Descended from people of place (N=5)	Multigenerational path	"...here I am kind of just on that continuum, right...when you peered behind this long path, all along the way, you know, your people, the people you descend from, all were on the same path that you are presently walking. And then when you look to the future, you see, who will become one day descendants of mine. All converging and making our way to this particular path."
	Familial relationship with place/forest	"I look at this place, as a, literally as a <i>kupuna</i> (elder). These trees, saw my <i>kupuna</i> five generations ago, these trees saw my <i>kupuna</i> 12 generations up....likened to the Elama ( <i>Diospyros sandwicensis</i> ) that I'm sitting next to, to say you too have changed...you live in a place that you and I call home, we share this homeland...do I change as need be? Do I adapt? Am I resilient?"
Hānai-ed (fostered/adopted) by place (N=3)	Pilina (connection/relationship) never wavers, maintain presence	"We are always going to have a strong presence here. And no matter who comes and goes and brings in their different activities and ideas of what they want to do with the land that they have purchased, or whatever, we'll adapt. Because we have to."
	Building pilina (connection/relationship)	"I am not a descendant, I don't have any lineage...And it just happened to be that these things kind of culminated in my undergrad experience at the same time of thinking about reciprocity and thinking about restoration. And what it means to live and be a part of everything we experienced...And it honestly comes down to, well, I have no control over where I was born, who my parents were, and what their ethnicity is. But I feel like I do have control where I am now."
Catalyst for getting involved in restoration	Recognizing the damage done	"But when I finally got there, it was a dying forest. I guess I realized, even though I was pretty young that Auwahi was in freefall. And that it actually wasn't even over. It was still falling...People always talk about there's no <i>keiki</i> (natural recruits). Why would there be <i>keiki</i> if there's <i>kikuyu</i> grass four feet thick from Africa?"



S4. (Continued) Motivations for Hoā‘āina (Caretakers) In Implementing a Biocultural Approach (N=8)

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Recognizing the work that has  
already been done  
Recognizing potential

"I remember being really moved by the place, and the people and the effort."

"You'd have to recreate this habitat you know, and at the time there was a movie, Field of Dreams, and they had a quite corny line in it, but it was, if you build it, they will come. That's what I told people at the time, we just need to build the house. If we build the house, I just know the keikis will come. Not all of them but a good portion of the keiki will come..I used to say the forest was like a broken canoe, I pulled it off the reef into deep water, and it started to run. It showed me that it still had life in it. And then it started to pull me, pulled me to places I didn't know could be reached."

Kanaka (human) relationships  
with landowners, restoration  
team, community, family

"a group of people who care enough about a place that has propelled them to do something."

"...the ranch and I started to have a relationship with trust..".

Initial Western lens and  
perspective

"I went to college for eight years, and I came with a certain skin on, you know, I mean, and that sort of academic lens...and then I got here to the forest and I really had to slow down, get connected here, turn that part off, turn your head off little while."

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S5. Themes of a biocultural approach which emerged from interviews with Hoa‘āina (caretakers/restoration managers) (N=8)

Themes	Description	Sample Quotes from Hoa‘āina
Aloha ‘Āina	Know your Place	<p>"...if you know the attributes, and characteristics of that, you are mindful of where you place things, what you do...being <i>ma‘a</i> (accustomed) to your ‘āina, <i>ma‘a</i>, really knowing your place, which means all of it, knowing its elements, it's attributes and how you function within that, that I think is essential."</p> <p>"...we take the intelligence shaped by our geographies of origin...When you live in a place like this and you have rainfall like you did yesterday, which is fabulous, but rainfall like we had yesterday also leads to fire fuel loading, you know that the rain today brings potential for fire hazard later."</p> <p>"...doing our best to honor stories or elemental cues...what's the name of this wind? What's the name of this rain, what's the name of the moon phase that we're in right now and whether or not it's a good time to plant, or a good time to weed or to spray and to overlap these traditional practices, but blend them into our modern day practices...we try to synchronize or strategize our work techniques or methods in relation to environmental cues."</p>
	Love your Place	<p>"For me it comes to two particular terms which are really in essence the same, aloha ‘āina and <i>mālama ‘āina</i> (taking care of place). You love a place, you <i>mālama</i> a place because you love a place."</p> <p>"...it's like the one interacting with the other and how they affect each other, and the culture that is created from the two, especially if, you know you're a part of ‘āina, I mean, if you think of yourself as separate, it's never going to play into your identity..."</p>
	Collaborate with Place	<p>"For many of us we can list people, agencies, whomever we are collaborating with, in my mind the first and foremost collaborator is, you collaborate with ‘āina, beyond and above of collaborating with an agency."</p>

S5. (Continued) Themes of a biocultural approach which emerged from interviews with Hoa‘āina (caretakers/restoration managers) (N=8)

Wao Kanaka Biocultural Resources	Culturally valuable forest	"Because of what the forest meant to people, because there isn't a forest that had that many tree species, you know, because it is wao kanaka, because it's the forest that not only is where people got things, but it was the physical setting for their lives. They lived right below the forest."
Lineal Descendants		"Another thing that is very important to humans is when the peoples of place return to a place...There is science that happens here, no doubt. And that there is also and I believe for us as equal playing field is cultural components. Lineal descendants are part of the mix, it's not a voice that's absent...I think to go back on, if there are no native people, native kama‘āina, people who are ma‘a and familiar to the landscape have some sort of lineal connection to the place, I believe there is a void, I believe there is an absence."
Different Knowledge Systems	Multigenerational	"I just think there's a lot of beauty in the diversity of perspectives and ages and the associated kind of dynamics that you bring with those attributes." "...there's different levels of people all the time." "So the traditional ecological knowledge, of place is set, its existent, it's here. And we so credit uncle and aunty, they taught us that practice from their kupuna."
	Multicultural	"So there's some really interesting things that we wanted to explore this idea of, can our cultural stories intersect with this scientific data that we're able to gather...we're constantly trying to refine and study more stories and learn more mele and oli of place because it's data; we're doing our best to honor stories or elemental cues...what's the name of the moon phase that we're in right now and whether or not it's a good time to plant, or a good time to weed"

S5. (Continued) Themes of a biocultural approach which emerged from interviews with Hoa‘āina (caretakers/restoration managers) (N=8)

Cultural Practice and Traditions	Ho‘omālie (to calm in silence)	"We Ho‘omālie...we'll always do it with groups but for us on our day to day...it's usually when someone is feeling a little flustered and take a minute to release that...take a deep breath and think about what you do before you do it."
	Ho‘oponopono (to make right)	"We've had issues and we'll just address it. To me it does feel ho‘oponopono-ish, like, okay there's a challenge, lets come to the table, let's just get it out in the open. That's very cultural, for sure. I mean, internally as a team that's helped us, you know, to really try and get it together."
	Pule (prayer)	"...if you pule, our pule will be like the high tide that makes a modest swell a remarkable thing."
Traditions (Continued)	Use of ‘Ōlelo Hawai‘i (Hawaiian Language)	"...we're trying to honor and use hawaiian names of plants, and everything around us: pohaku (stone), lau (leaf), lā‘au (plant), manu (bird)... We're so blessed that we have this amazing environment and the culture which is still alive, to use simple things like that, that help us to strengthen that connection..."
	Oli (chant)	"it was the worst drought on record. And when he started it was crystal blue. And by the time he finished it was pouring rain." [in context of interviewee describing an experience with oli]
	Storytelling through Mo‘olelo (historical narratives)	"Just to see the kids when [name removed] is saying the mo‘olelo, they are in, they are engrossed hundred percent, because it's about them, it's about their place, it's about the gods that their ancestors honored. It's about them..." "...we strive to tell the story of the land, you know, through the multimedia...In our conservation action plan for the rest area, among the more unusual elements were mo‘olelo, but not just that, we would collect them from the Hawaiian language newspapers, or from the old folks telling, but that we would perpetuate the practice of storytelling that we perpetuate the transmittal of information from the lips of the teller to the ears of the listener..."

S5. (Continued) Themes of a biocultural approach which emerged from interviews with Hoa‘āina (caretakers/restoration managers) (N=8)

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Spiritual	Creating space for spiritual engagement	"We're rebuilding natural heiau that are millions of years old. I brought that all along from the very beginning. That this is spiritual work here..." "So this forest affords much feeling, much reflection, pause, for me it's much more difficult to pause in and amongst that that isn't this that we're looking at. This allows kanaka the time and the space they need physically, mentally, physiologically allows DNA to really speak louder than maybe sometimes that the other things of life that tend to speak have a louder voice."
Instilled familial/communal framework	Familial work relationship between restoration team and building a sense of community	"And then just remembering we're 'ohana. We love each other. I make mistakes and they let me know. I like that. And you know how kupuna used to correct you? I like that, you know when I was young, that's how I learned. Yeah, we're in a relationship all together."  "...unfailing practice of aloha i ke kahi i ke kahi (love from one to the other). And even when the land use planning or other political processes cause us to be on opposite sides of the conversation table we still aloha i ke kahi i ke kahi. And because that is our traditional and customary practice, we can move through what in other communities may be even more tense, even more divisive circumstances to a progressive and positive outcome..."

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S6. Categories of biocultural restoration defined by hoa‘āina (caretakers/restoration managers; N=8) and corresponding support from kaiaulu (community)

Category	Description	Sample Quotes from Hoa‘āina	Supportive Quotes from Kaiaulu
Ecological Restoration	More natives than invasive species	"...you can walk through and there's almost no weeds, most of the seedlings are native. It's at that stage where everything's big enough or dense enough, where you don't have to go spray a lot of poison and do a lot of things to it..."	"Restoration work. Because the forests were destroyed, so many plants were lost or went extinct and Maui's ecosystem was altered. It changed everything from soil, to animals, to weather patterns. I think it is important to restock the forest so it can return to how it once was." <sup>A</sup>
	Functioning on its own	"What I see is sequentially building forests that have greater functionality...when systems start to work better, when it's less like gardening...reinforcing their own stability, kind of like taking care of themselves, as long as you help them out, keep the fence up."	"I think that it's very heartening to see the successes of these endangered species once given a protected home." <sup>K</sup>
	Diverse community	"...are the birds...things that are that can function and live without my input, are they here? Are there worms in the ground? Those sorts of things are the indicators...there's just the community, we're all here, we're living together. We're going to our next cycles, there is natural regeneration. Kupuna, makua, keiki, there's all the phases of life in this forest, that's a measure of success for me."	"I noticed the lovely birds chirping, the wind blowing against my skin, and I felt amazing just thinking about how much I am enjoying my time here." <sup>K</sup>
Social Restoration	Community engagement with forest restoration	"And I'm really grateful to all the people. I often told people that said, "wow it worked, it's amazing. It's a miracle." I'm like, "I knew. I knew, I knew the ecological part. You know, what's the miracle? You guys. You guys are the miracle. You guys I didn't predict.""	"Community involvement in restoration of 'āina, re-establishing native biota." <sup>A</sup>

S6. (Continued) Categories of biocultural restoration defined by hoā‘āina (caretakers/restoration managers; N=8) and corresponding support from kaiaulu (community)

	Community coming together	"That was what the volunteers were in a way, I said that I was haku-ing (composing, bringing together), I was going to haku the forest and the community together. And once they became haku-ed, they would almost grow together."	"Sense of community with people who care and are doing environmental activism and preserving culture and spirit of place." <sup>A</sup>
Cultural Restoration	Familiarity with cultural resources	"...really seeing people relate to ‘āina...they're using the names of the trees now. To me, that's a measure of success, if they can re-say the names and say that they felt something here, felt good here and felt connected on some level."	"Feeling welcomed and a sense of community from these wonderful staff and volunteers." <sup>A</sup> "During this visit, my classmates and I were able to learn about the history of this specific area and the various plants that thrive or are being restored here. Examples of plants include kauila ( <i>Colubrina oppositifolia</i> ), lama ( <i>Diospyros sandwichensis</i> ), ‘ohe makai ( <i>Polyscias sandwicensis</i> ), halapepe ( <i>Chrysodracon hawaiiensis</i> ), and alahe‘e ( <i>Psydrax odorata</i> )." <sup>K</sup>
	Protecting a cultural resource	"...when we're able to protect species that are inherently connected to our culture we are making our culture stronger. When we don't lose a plant due to extinction we are still keeping a component or a key piece of our culture alive and on a kanaka understanding level, when people get that, in turn, they want to protect it even more."	"The thing that I had felt like we are giving more life to the ‘āina." <sup>K</sup>

S6. (Continued) Categories of biocultural restoration defined by ho‘āina (caretakers/restoration managers; N=8) and corresponding support from kaiaulu (community)

	People returning to place	"Another thing that is very important to humans is when the peoples of place return to a place. And it's not that they got to look through a gate, or look through some, where they don't have the code to get in, they don't have the key to get in...and you can relay, relay these things to your children or to your grandchildren to say, this is where papa (grandfather) did this. This is where your tutu (grandmother), so that I believe is truly an indicator of success."	"The people who live there know it so well and see it as more than a resource. They see the forest as a friend, a deity and a culture." κ
Spiritual Restoration	Restorative, church-like	"The presence of being around old trees in general, even when you're out in the pasture...when they're surrounded by native shrubs, and you kind of get a semblance of the shade, the air, the wind, something that happens there for people that's really important. And I do consider it spiritual restoration."	"I felt and assuring sense of aloha, a term that means hello and good bye, but more importantly, love to nature and for the beauty and cultural significance/resilience that is reflected in the stories of indigenous communities." κ "Nature is my church. Giving back to the land that feeds my soul." Δ "The sense of sacredness of the land and the restoration." Δ
	Peaceful, keiki (children) brought to life	"I don't know how we would have measured that except for I mean, we do have reflection sheets. I mean they're talking about I felt at peace, I felt like I belonged here...So that's a measure of success for me, just to see the keiki, to see them come alive, and to hear some of the teachers saying, you know, this student does not act like this in school. You know, I've had several teachers say, well this student, they're shy in school. And now they're out and about, together, they're talking. The teachers are like, wow"	"I enjoyed the times of ho‘omālie because it allowed me to create a deeper connection with my surroundings." κ "Sitting in silence in the lama trees, offering our presence is something I've never experienced on the mainland." κ



S6. (Continued) Categories of biocultural restoration defined by hoā‘āina (caretakers/restoration managers; N=8) and corresponding support from kaiaulu (community)

All of above	Profound effects on the na‘au (heart, mind, feeling)  Ecological, Social, Cultural, Spiritual	<p>"...there are the people that are touched, as they pass through...the students, out of all the places they would go, like they thought that they'd like the beach places the best, but they like the dryland forest the best, it went to their na‘au...So the range of ways that it affects us and how we sustain interaction with it, whether it's a childhood memory that informs a course that we take when we're at UH Manoa, or the way that we tell a story or the way that we feel the shade on a sunny day. It's as profound as we remember it might be."</p> <p>"Success is sitting in the shade of the lama and uhiuhi, the mixed canopy, the fragrance of aiea wafting by and seeing naturally occurring reproduction. And with a cohort of people observing and talking about it with one another. And so I love the word na‘au yeah, because it's mind, its heart, it's everything. So you know, just to be able to touch the na‘au from one to the other - i ke kahi i ke kahi, is where the solutions are to be found, you know..."</p>	<p>"The lama tree, endemic and most prominent in this dryland forest is the tree of light. I was inspired by these kupuna tree to tap into that enlightenment and allow the mana (power) of this ahupua‘a and forest to flow into me and share my mana, through work, with them." κ</p> <p>"It's impossible to be at Auwahi without feeling the mana of the place and the aloha for all." Δ</p> <p>"Connection to place. Reflection of home (Pohnpei). Humility, gratitude, uplifting of spirit, eye-opening experience, satisfaction, contentedness in giving back, spiritual presence of ancestors, sense of self, history significance, unique, rare plants need to be protected, great people are taking care of the ‘āina, inspiration and passion, moved, extremely moved by place." κ</p>
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Δ Supportive quotes from the Auwahi kaiaulu (N=31)

κ Supportive quotes from the Ka‘ūpūlehu kaiaulu (N=1)