Loko I‘a Needs Assessment

Hui Mālama Loko I‘a

November 2020

Synthesized by:

Kua‘āina Ulu ‘Auamo

University of Hawai‘i Sea Grant College Program

Pacific Islands Climate Adaptation Science Center

This is a living document. To explore the newest evolution of thoughts and perspectives on loko i‘a resilience please visit www.kuahawaii.org/resilientlokoia

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Partnering Organizations

Hui Mālama Loko I'a (HMLI) is a network – and community of practice – formed by and composed of kia'i loko: guardians, practitioners, and managers of loko i'a (fishponds) in Hawai'i. HMLI first gathered in 2004 to share information, leverage resources, and support each other in their common goals to restore, protect, and manage loko i'a effectively. Their annual gatherings and collective work have been coordinated by Kua'āina Ulu 'Auamo since 2013. The network currently involves 60 sites, which includes distinct individual loko i'a, loko i'a that are directly connected to each other, and sites with many small and related wai 'ōpae (anchialine pool systems).

Kua'āina Ulu 'Auamo (KUA) is a non-profit organization based in Hawai'i and originally formed in 2012 to provide coordination and facilitation for a network of community-based mālama 'āina efforts called E Alu Pū; this network has gathered since 2003. Their community leaders called for the formation of a non-profit to continue facilitating their work and thus, the supportive role of Kua'āina Ulu 'Auamo is reflected in its acronym KUA, which means back or backbone. Since its inception, KUA took on the facilitation of two additional networks: the Hui Mālama Loko I'a, and the Limu Hui, which brings together experts and practitioners of limu.

The University of Hawai'i Sea Grant College Program (Hawai'i Sea Grant) serves as a bridge for communities to access the resources and research they need to make informed personal, policy, and management decisions related to coastal and marine resources. They do this by collaborating with government, academic, industrial, and local communities to both identify management issues and research how to resolve them with innovative solutions.

The Pacific Islands Climate Adaptation Science Center (PI-CASC) is a partnership between USGS and a university consortium, including the University of Hawai'i at Hilo and the University of Guam and hosted by the University of Hawa'i at Mānoa. PI-CASC supports long-term, in-person partnerships and actionable research projects by integrating research, community, and management networks through a collaborative research process. The resulting co-produced research products provide essential scientific knowledge and tools that resource managers and other partners interested in land, water, wildlife, and cultural resources can use to anticipate, monitor, and adapt to a changing climate.

He'eia National Estuarine Research Reserve (He'eia NERR) represents a strong partnership among federal, state, and community-based entities, all committed to a vision of resilient estuaries and coastal watersheds where human and natural communities thrive. The vision of the He'eia NERR is to practice and promote responsible stewardship and outreach consistent through the principles and values of the ahupua'a land management system. These efforts are supported by traditional knowledge, innovative research, education, and training that nourishes healthy and resilient ecosystems, economies, and communities.

An important note on the use of language in this document:

Hawaiian Language

Hawaiian language is highly nuanced and complex, and Hawaiian language is an integral part of loko iʻa (fishpond) bicultural restoration. Most words and phrases have multiple meanings and interpretations. Throughout this report translation resources are provided where contextual explanation is not already available in the text. Translation resources included here do not pull from a single source, instead the most appropriate definition is provided, based on the best assessment and expertise of the editors. We encourage non-Hawaiian speakers to take time to explore the varied interpretations of Hawaiian words used here and form a deeper understanding of their significance.

Layers of Contribution

This report includes knowledge and perspectives from multiple layers of contributors, such that "we" reflects both the voices of Hui Mālama Loko Iʻa members and the writers who provided additional content and support in contextualizing and editing the manaʻo contributed by Hui Mālama Loko Iʻa members. Generally, "we" is used to refer to the team of project partners that supported the design, implementation, and synthesis of the needs assessment process. However, in sections of this report detailing results from the six focus areas (Loina Welo, Hoʻāla Hou, Iʻa, Education, Hui Sharing, and He Hui Hoʻokahi) content directly reflects the contributions of kiaʻi loko. In these sections "we" refers to the kiaʻi themselves. In order to preserve kiaʻi voices and retain the intent or context of their contributions we have not altered this language. A detailed acknowledgement of the contributors to this report (across all layers) is available in Appendix B.

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INTRODUCTION

Intent of Report

This report is the first comprehensive compilation of the research ideas and needs within the community of fishpond managers, landowners, and stewardship organizations to inform adaptation of fishpond practices toward their resilience, adaptation, and sustainability in the face of a changing climate. It reflects the needs, interests, visions, and ideas of the Hui Mālama Loko I‘a (HMLI) as documented in their collective and cumulative conversations in 2019. Importantly, these thoughts and reflections are rooted in conversations that started in 2014, and whose seeds were planted in the foundational loko i‘a movements beginning in the 1970s and extending through the 1990s. As a diverse community of kia‘i loko, contributors, writers, and partners united by this work, we firmly acknowledge the pathways that previous generations have laid to make this effort possible -- pathways of on-the-ground caretaking, community advocacy, historical research, and funding support. We dedicate this inaugural report to the future generations who will continue this work because this project ultimately informs the development of future research, monitoring, and planning for loko i‘a throughout Hawai‘i to endure changing environmental conditions.

This report is not intended to be a comprehensive overview of the history or context of fishponds in Hawai‘i. Most readers will have some familiarity with loko i‘a, and we recommend some background resources and additional reading (available in Appendix A). This is the first version of a living document that will evolve as there are changes in the needs, opportunities, and conditions contextualizing loko i‘a in Hawai‘i. We hope this report activates new and richer collaborations between organizations that directly mālama loko i‘a and auxiliary supporters such as academic institutions, policy advocates, funders, food system workers, and volunteer organizations.

The ideas included in this report weave together a vision of loko i‘a being revitalized throughout the pae ‘āina to a state of abundance that has not been seen by practitioners of this generation. But we know from the recollections and documentation of kūpuna that loko i‘a can be prized and valuable resources for their communities, and we are seeing more and more evidence of their positive influence in our communities today. Kia‘i loko consistently emphasize the many forms of abundance that loko i‘a provide, feeding communities with not just physical sustenance, but intellectual, emotional, and spiritual sustenance as well.

Despite the especially challenging context of a changing climate, the Hui Mālama Loko I‘a persists in their work knowing that the perpetuation of loko i‘a practice will ultimately result in the perpetuation of the abundance that loko i‘a provide. Therefore, this report includes the needs and ideas both directly related to resilience and adaptation in the face of climate change, and also related to the systemic social, political, and economic conditions that facilitate or hinder the perpetuation of loko i‘a practice. This approach reflects a holistic understanding of resilience in keeping with kia‘i loko values and stewardship practices. This report is further aligned with a broad body of knowledge and scholarship surrounding Indigenous approaches to

> Ua iki unu paha aka pa‘a ka pōhaku nui ‘a‘ole e ka‘a – Even though it’s a small wedge stone it can stop the big stone from rolling.
>
> - 'Ōlelo No'eau shared to HMLI by Peleke Flores

climate change planning, adaptation, and resilience. The table below outlines a few select perspectives and definitions for understanding resilience and adaptation in the context of this needs assessment.

Resilience	**Adaptation**
"a trait, reflecting a general ability to master challenges...includes the ability to acquire new capabilities, perhaps emerging stronger from the struggle" (Wong-Parodi, Fischhoff, & Strauss, 2015).	"a state, reflecting how individuals deal with specific stressors...entails preserving existing resources" (Wong-Parodi, Fischhoff, & Strauss, 2015).
"The indigenous relationship between food and people is intimately tied to the cultural, physical, emotional, psychological, and spiritual health of tribal communities. The impacts of climate change on particular species or ecological processes, therefore, are directly connected to climate impacts on tribal culture and the importance that traditional foods have for tribes" (Lynn et al. 2013).	"The inclusion of TEK [traditional ecological knowledge] in adaptation, management and stewardship strategies is actually about respecting systems of responsibilities. It means creating inclusive research practices that are not only about sharing stores of knowledge, but about sharing understanding of a host of responsibilities that should play integral roles in adaptation, management and stewardship strategies" (Whyte, 2013).
	"Our spirituality which link humans and nature, the seen and the unseen, the past, present and future, and the living and non-living has been and remains as the foundation of our sustainable resource management and use. We believe that if we continue to live by our values and still use our sustainable systems and practices for meeting our basic needs, we can adapt better to climate change" (Mandaluyong Declaration, 2011).

Additionally, most of the content in this report was documented prior to the COVID-19 pandemic, so readers will find minimal direct reference to the impact that the pandemic has had on the local and global context for this report. However, the current situation in Hawai‘i -- our economy, social support infrastructure, education system, food distribution, and community cohesion -- further heightens the relevance, urgency, and importance of many of the ideas that kia‘i loko articulated during the needs assessment process. Editors have taken the liberty of inserting COVID-19 relevant comments in some areas.

Background and Process

The needs assessment project to support management of loko i‘a resources and practices was developed in response to an opportunity to consider the immediate and prospective needs of loko i‘a in the context of climate change. This led to the collaboration between the Pacific Islands Climate Adaptation Science Center (PI-CASC), the University of Hawai‘i Sea Grant College Program (Hawai‘i Sea Grant), and Kua‘āina Ulu ‘Auamo (KUA). The project required the facilitation of a year-long

process to enable practitioners to voice their needs, articulate their priorities, and create pathways for resilience in their places and practice. We hope this effort serves as an important example for funders, academic institutions, and other resource/boundary organizations on how to implement deep listening and engagement with community-based experts who most often know the most critical questions to ask about the issues facing our communities.

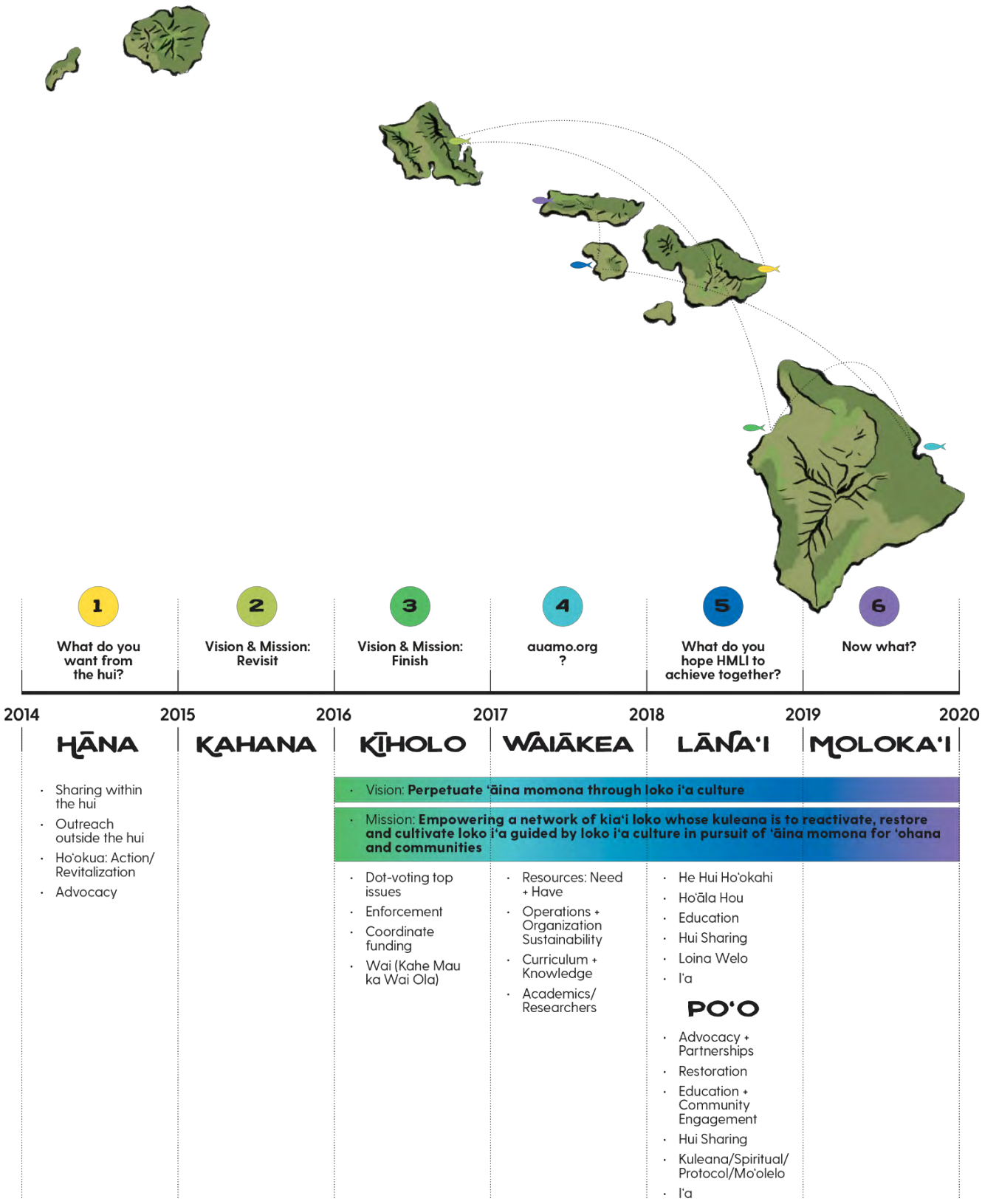
Objectives of the Project

- Facilitate, assess, and synthesize the research needs and information gaps for loko iʻa to help resource managers adapt their management practices to the impacts of a changing climate.
- Accelerate documentation and perpetuation of Traditional Ecological Knowledge (TEK) and traditional environmental resource management related to loko iʻa.
- Grow scientific, cultural, restoration and management collaborations and partnerships between at least 30 loko iʻa and 100 kiaʻi loko.
- Improve communication and grow relationships between kiaʻi loko and academic research institutions in Hawaiʻi.

Data Collection

This report derived all findings from notes recorded at the following gatherings of the Hui Mālama Loko Iʻa: poʻo meeting at Punaluʻu (Oʻahu) in March 2019, annual gathering at Moanui (Molokaʻi) in May 2019 (Hui Mālama Loko Iʻa, 2019), and poʻo meeting at Moku o Loʻe (Oʻahu) in November 2019. Attendees included representative leaders from loko iʻa at the poʻo meetings, and additional staff, interns, community partners, and various collaborators at the annual gathering; all participants are included in Appendix B. The meetings were convened and facilitated by KUA and consisted of group discussions, break-out groups, and plenary share back times, as well as hands-on restoration work. Break-out groups were facilitated in focus areas that Hui Mālama Loko Iʻa collectively articulated in 2018 (Hui Mālama Loko Iʻa, 2018). Importantly, discussions took place throughout the gatherings among a communal setting of camping, preparing and eating meals, and spending unstructured time together.

This process of intentional listening was embedded in gatherings which build trust and relationships through working together, eating together, and camping together for 3-4 days. Photo credits clockwise from top: Chang, Bowen, Chang.



Timeline of Hui Mālama Loko I'a gatherings. Credit: Kelsey Ige

Thematic Analysis

Following the meeting, break-out group notes were digitally compiled, and we conducted a simple interpretative thematic analysis using the raw notes. An interpretive thematic analysis is a common method for qualitative or non-numerical research that employs the identification, examination, and recording of themes or patterns of meanings within the data. This method gives researchers flexibility in the process by allowing for multiple ways of knowing, expands the range of study to past individual experiences, and gives the opportunity for multiple researchers to interpret themes that emerge and are supported by data. Some limitations of this method include the potential for missed nuanced data and difficulty maintaining a sense of data continuity across individuals.

Small group facilitation on Molokai. Photo credit: Kanda.

The process is as follows from Braun & Clark (2006):

1. Become familiar with the data by reading the raw notes
2. Organize the data into one of the six focus areas
3. Re-read compiled notes within each focus area
4. Generate initial codes (a word or phrase assigned to data fragments with some common meaning) that will form sub-topic sections within each focus area
5. Organize data into sub-topic sections
6. Select concise data to highlight key data for each subtopic section
7. Validate the reliability of sub-topic themes through collective evaluation
8. Re-organize sub-topic data based on evaluation
9. Collectively define and name sub-topic themes
10. Interpret final data configuration and report out meaningful contributions for the purpose of meeting group and project objectives

History and Context for Report Framework

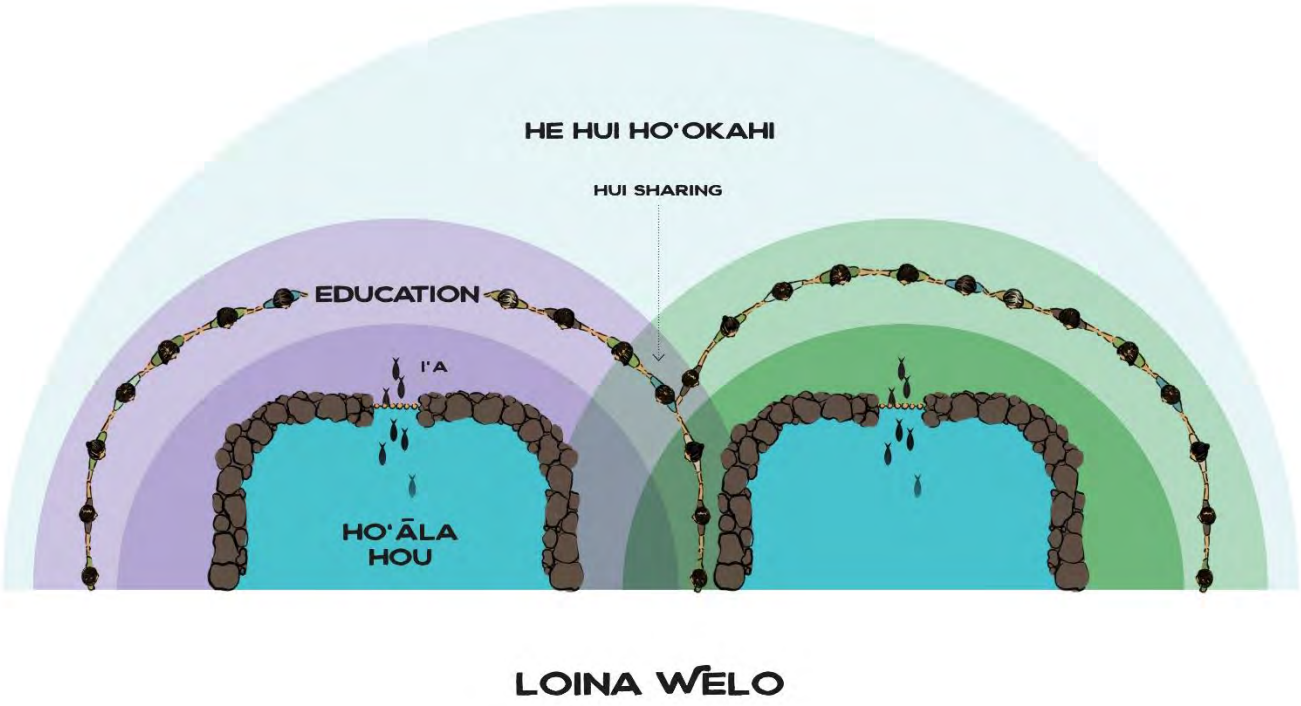
In 2018, leadership representatives of the sites in Hui Mālama Loko I‘a came together for a first-ever po‘o gathering. They brainstormed individually on post-it notes, then grouped similar ideas, responding to the question of ***what they hope[d] the hui could achieve together***. Six groupings arose clearly (listed alphabetically):

Advocacy
Education
Hui Sharing
I‘a
Protocol / Mo‘olelo / Spirituality
Restoration

Later in 2018 at the hui's annual gathering (Hui Mālama Loko I'a, 2018), the larger group of attendees affirmed these groupings and offered new names for some:

He Hui Ho'okahi
Education
Hui Sharing
I'a
Loina Welo
Ho'āla Hou

Since 2018, KUA has utilized these six focus areas as a framework to guide discussions in the Hui Mālama Loko I'a about their collective progress in the areas that they articulated are most important to them. Thus, in order to align needs and areas of inquiry for future work to be done, the same framework was employed in 2019 to inform this project. Importantly, we embrace the interconnectedness between the six focus areas and note that despite grouping ideas in this way, we uphold the holistic nature of this work in which education impacts restoration outcomes, and community-based governance relates to the broader food system which includes loko i'a.



Six focus areas of the Hui Mālama Loko I'a. Credit: Kelsey Ige

Overview of Results

One common theme of inquiry across focus areas is about the connectivity of loko i'a to its surrounding systems. Loko i'a are just one component of an ahupua'a management system that encompassed all resources mauka to makai. There is concern about the health and connectivity (or loss of) upland water systems, as well as the health of their seaward fisheries resources, both in the context

of today's current state and considering a changing climate. Loko i'a are also just one component of a movement for 'āina-based education, and ther2
e is uncertainty about how to effect progress in the complex systems of K-12, post-secondary school, and career development, and how to collaborate with other efforts in culture- and 'āina-based education. Loko i'a are also deeply impacted by the political systems governing land use and environmental regulation at the federal, state, and county levels. Kia'i loko are doing this work in the context of both historical decisions that have legacy impacts, as well as the complex and seemingly inaccessible system of current decision-making.

In each focus area, readers can expect to see a summary of the main points, followed by sections for various subtopics, each with specific "needs", which includes research questions, ideas, or information gaps. Readers should note that in some cases, verbatim phrases were used from individual post-it notes written by kia'i loko to retain the intent or context of their question. In other cases, editors synthesized ideas that were held in common by multiple participants or connected ideas to formulate potential paths of inquiry. Thus, the "needs" sections reflect a spectrum of scale (e.g., individual sites vs. systemic issues) as well as various degrees of separation from the physical loko i'a (e.g., directly related to loko i'a functioning vs. indirect socioeconomic or other influential levers that impacts loko i'a management).

FOCUS AREA

Summary and Main Points

Subtopics (will include additional context)

Needs (will include a range of synthesized content and specific bullet points of ideas)

The inclusive and holistic nature of this report ultimately represents the diversity of future potential work that can be done to perpetuate these places and practices. We hope our synthesis maintains the integrity of the knowledge and ideas of the kia'i loko who participated in this process (see Appendix B for full list of participants).

Circle at Papahana. Photo credit: Asuncion.

LOINA WELO

"Our ancestors are always with us as long as we think of them, talk to them, engage them in our thinking and planning and beliefs and actions."
- Dr. Kekuni Akana Blaisdell, physician, researcher, activist and scholar.

Morning ceremony during the 2018 annual gathering. Photo credit: Kanda.

Summary and Main Points

LOINA WELO

Cultural foundation as research methodology, i.e., indigenous pathways of knowing and understanding

Subtopics
- Piko Po'o
- Piko Waena
- Piko Ma'i

The Loina Welo focus area arose in dialogue lifting up the importance of mele, oli, moʻokūʻauhau, moʻolelo, kaʻao and other loina welo forms to the work of loko iʻa and to the collective advancement of loko iʻa practice, knowledge and culture. When we consider the purpose of this focus area and its relevance to natural resources, wahi pana, policy and governance, societal norms and institutions, education, innovation, and even our individual journeys, we find it to be integral in each of the other five focus areas because it encompasses the understanding of our kūpuna practice, and accelerates our ability to transmit and document our own new knowledge and understanding of loko iʻa practice. In the context of climate research needs, loina welo is both an Indigenous ʻōiwi research methodology, as well as the research itself -- loina welo is a source of knowledge, a cipher for knowledge embedded in the ecology and natural cycles of Hawaiʻi, and a way that new knowledge is created, documented, transmitted and activated (Kapāʻanaokalāokeola Nākoa Oliveira & Kahunawaikaʻala Wright, 2015).

In further dialogue, a question arose: What generation do we focus our energy on? In analyzing this focus area to organize it into subtopics, we identified three key knowledge functions[1]: (1) access to understanding and applying ancestral knowledge, (2) contemporary creation and evolution of knowledge, and (3) teaching and passing on knowledge to future generations. While these functions are generational, they do not occur linearly in time, but rather in cycles that overlap and weave together, generationally and across time, space, and geographies.

In further research, we find these themes to align to the seminal "three piko analysis" of Dr. Kekuni Blaisdell, revered elder, physician, researcher, political activist, and scholar (Blaisdell, 1991)[2]. The three piko analysis is centered around nā piko ʻekolu (the three body points/openings):

- **Piko poʻo**, piko ʻaumakua, piko a, the fontanel or top of the head, connection to ancestral knowledge and wisdom,
- **Piko waena**, piko ʻiewe, piko i, connection to wisdom and innovation of our contemporary/living time, context and selves,
- **Piko maʻi**, piko ʻiwi kuamoʻo, piko o, connection to our descendants and those who will inherit what we build and create.

When we apply our own thoughts, attitudes, and actions, and are open to all the forces in physical and spiritual realms -- past, present, and future -- we can fully engage in this transformational work for ourselves, this hui, and our broader communities[3].

Piko poʻo

The piko poʻo or manawa at the top of the person's head (i.e., also the open fontanel in the infant's skull) is the opening that connects the ʻuhane with the spiritual realm beyond, including one's ʻaumakua, departed but ever-present deified ancestors. Thus, this aspect of Loina Welo encompasses the understanding and relationship to what is in realms other than us, knowledge that exists "outside" of us in time or otherwise, such as mele, moʻolelo, kaʻao, and inoa that have been left for us by past generations. Finding names, learning about ponds' histories, and conducting kūpuna interviews, are all potential pathways to dig into what we already have. In much of the discussion for this focus area, kiaʻi emphasized our kuleana to know the stories of our place and also document kūpuna stories, memories, and knowledge.

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[1] Initially, we articulated the following framework which may be useful to some readers as a metaphorical comparison to the three piko framework that we ultimately used to organize this focus area: (1) Ala, meaning path; to waken; to rise up, arise. Our kūpuna generation gives us foundational knowledge about place and practice and we need to continue seeking and understanding that knowledge, (2) Haku, meaning to compose, invent, put in order, arrange; to braid. Our current generation has kuleana to record our own knowledge and innovations of our time, (3) Kinikini, meaning numerous, very many. Our future generations rely on our commitment to share, spread, and activate our collective wisdom and work.

[2] Blaisdell credits Bushnell OA: The Gifts of Civilization: Germs and Genocide, 1992.

[3] "In spite of this prevalent spirituality, all was natural. There was nothing supernatural in the Western sense. Events could, and were, influenced by all of the numerous forces in the material and spiritual realms, favorable and adverse, and from the past as well as the present and into the future. These forces included each kanaka's thoughts and attitudes, as well as his actions." Blaisdell, Kekuni. 1991. Historical and Philosophical Aspects of Lapaʻau, Traditional Kanaka Maoli Healing Practices: https://inmotionmagazine.com/kekuninf.html. He credits Chun MN: Ka Moʻolelo Laihni Laʻau, for E Ola Mau, Honolulu, August 1989.

Needs:

- Identify the foundational stories that people in hui should know (e.g., ʻAiʻai and Kūʻula and Hinapukuiʻa) and create the tools/pathways needed for people to learn them.
- Help hosts (of gatherings, huakaʻi, hoʻokua) tell moʻolelo, find moʻolelo and share (e.g., have a year before gathering to prepare, we can help them if they need help).
- Apply lessons and values. Look at blueprints, but how do we translate to the "now"?
- Important to be using oli and mele that are pili to the moku.
- Consistent process/resources to be able to cite sources.
- Help Uncles and Aunties write down their stories they would like to tell, so we can hold those voices on in time after folks pass.
    - Need to record their voices because how they tell the story is important.
- Comprehensive collection of stories and resources because there are so many versions and perspectives. Primary documentation of the diversity and nuance is required.
    - This will help the hui decide which ones do we tell, if there are multiple versions.
    - Must still acknowledge that all the versions of seminal stories are important for richness.

Piko waena

The piko waena, or the navel, represents the remnant of our intrauterine umbilical connection to our parents in the contemporary world. This piko covers the naʻau (gut) which is the seat of knowledge, wisdom and emotions. Thus, this aspect of Loina Welo encompasses the relationship to our own naʻau and wisdom, as well as the weaving together of our collective wisdom. This kuleana of our generation adds to the cumulative body of understanding when we are able to capture what we know through the composition of new oli, mele, kaʻao, moʻolelo, as well as through the naming of mākāhā (sluice gates), ponds, and other elements of our work as kiaʻi loko.

The intention of oli and mele is about pilina, and it is through observation of and relationship to place that we are empowered and enabled to haku. For example, we are different than our kūpuna and are experiencing climate change, but we still have winds and rains, so those are important to observe, knowing that some may stay the same, and some will change over time. We must know the old conditions in order to describe new and different conditions, and our pilina with our places is what provides strength and authority that we need to holomua. The composition of oli, mele, and kaʻao also indicates capacity and comfort in the practice. The growing comfort with oli and mele, and then the transition to haku reflects the intangible value of everyone's growth.

Composing oli and creating new ceremony for our time of now at Pāheahea Loko. Photo credit: Moa.

Needs:

- Opportunities for students to learn Hawaiian language and develop cultural analysis skills to understand meanings.
- Support for gathering hosts to get stories together, write an oli, help the visiting kiaʻi learn about the host place while we're there. Everyone can practice retelling the moʻolelo.
- For engaging shy people, oli and mele transforms individuals by developing their potential.
    - How do we build confidence?
    - What are the basics on how to tell a story?
    - Offer different learning opportunities for people who learn differently.
- Develop a process for the kiaʻi to articulate: What are our stories of now? What are today's kaʻao? For example, the story doesn't begin and end with the original construction of a pond (e.g., 800 years ago), but it continues with the magical things happening today, and the revitalization for the next 800 years.
    - Support people to make comparisons in mele/oli as context changes over time. As the environment and climate is changing, what about rains and even resources? For example, with ʻelepī and Honokea loko: Why don't we have elepī, but there are lots of ʻōpae huna? What can we do? Consider bringing back elepī from nearby?
- Cultural confidence workshop to develop spirituality. Folks need help with feeling confident to write their own oli but a lot of it has to do with spiritual connections and time.
    - Will need homework to ensure productive time.
    - Assign research for bare minimum information like winds, rains, moʻo, manō, heʻe, iʻa, ahupuaʻa, landmarks, puʻu, water sources, kiaʻi names (informational feeders for composition).
    - Define process for inviting participants if attendance is limited (e.g., 2 representatives per loko iʻa).
    - Need workshop on each island, find local kōkua (e.g., #GoThere Workshops).
    - Bring in expertise; kiaʻi loko have already identified potential leaders/teachers.
    - Reshape mindsets around expectations to create our own worldview. Who are your own ʻahu?
    - Plan ahead for progression (e.g., 400 level course). Building up authority with time allows you to haku on a deeper or elevated level.

Coming together and offering of wai to manifest return of wai to this loko; creating new ceremony and activating in new places. Photo credit: Kanda.

Piko maʻi

Piko maʻi is the genitalia, which links us to our descendants forever into the future. This aspect of Loina Welo encompasses the activation of both old and contemporary knowledge through spreading, doing, practicing, and teaching, thus amplifying movement by doing things ourselves and also teaching

others. Some main themes that arose in this forward-looking perspective included the transfer of information to broader communities beyond kiaʻi loko and how to activate engagement in loko iʻa, how to surface connections between the healing, health and well-being of loko iʻa and the healing, health and well-being of humans, and how to increase the physical manifestations of loko iʻa practice by increasing opportunities to eat from loko iʻa.

Needs:

- Haʻawina hoʻihoʻi: Publish book (e.g. podcast) of moʻolelo for the fishponds in HMLI.
- Add moʻolelo to booklet.
- Composing oli/mele is a struggle.
    - Reintroducing mele/oli to make it a more constant practice.
    - Teaching to groups and community.
- Practice telling stories to each other and record them at HMLI gatherings.
- Conversation and sharing about how to activate the mindset, intention, humbleness, and desire to engage in these ways ("You are not going to ascend if you don't want to").
- Conversation and sharing about how to build confidence, sense of "can," and sense of responsibility for our kuleana as kiaʻi.
- Keep building upon investigation of names and observations for wind, rain, iʻa, plants, puʻu, valleys, craters, birds, clouds, landmarks, climate, colors, moon; This is done through process of kilo to help people pay attention.
- Process to help folks move from maʻa to paʻa (e.g., help get people ready for gatherings, like calls leading up to gatherings, more comfortable people help others with less comfort or experience).
- Need data for ponds to show the state and other institutions the connection between ponds and healing for folks suffering from addiction or healing from incarceration.
- How to surface the connection between ponds and healing that happens there, both ecologically and for people? What are ecological and human psyche healing impacts of loko iʻa work?
- Make more time or avenues to practice chants and oli already established.
    - Could start with the oli/mele we know collectively as HMLI: Pāheahea Loko, Hula Kai, Paʻa Pōhaku (terminology), Nā ʻAumākua, Kū Mai Lehoʻula (our piko as kiaʻi loko).
    - Oli komo and oli kāhea of some sort is kuleana kiaʻi. Every loko should represent themselves when asking to come into people's wahi. That wahi should have a kāhea back. This is vital for our work for the place, the kūpuna, the elements and each other and to bring awareness of where we are and respect to the place.
    - Oli moʻo – this has to do with sharing who is the moʻo of the place. Maybe the places we go and visit would be able to help share their moʻo with us so that we know the guardian of that pond (kupua kiaʻi).
- Increase opportunities to experience the tangible, physical manifestations of the pilina to loko iʻa.
    - Practice reciprocal feeding (e.g., feeding ʻahu through ceremony).
    - Commit to eat iʻa from loko iʻa.
- When we come together, bring resources from your loko iʻa and we ingest it and take it in as deeper part of us.
- Celebrate together when we can share in the abundance of loko iʻa.

> "Kuaʻāina [are] the backbone of this ʻāina, perpetuating and standing firm for what they believe in as well as their customs and practices of subsistence fishing and farming."
>
> - Gathering participant

HŌʻALA HOU

"You wake up with that fishpond, go to bed with that fishpond every night, and what a privilege for us to be able to help you this weekend. What a gift you gave to each of us to be with you in Kahina Pōhaku, to let you lean on us just for a small moment in time."
- Noelani Lee, Executive Director of Ka Honua Momona International (Aliʻi & Kalokoeli Fishponds), said at 2019 gathering.

Building wall at Waiʻōpae. Photo credit: Kanda.

Summary and Main Points

Restoration has been a central focus for many of the kiaʻi as well as for Hui Mālama Loko Iʻa as a collective. Kiaʻi have made tremendous progress in restoring the physical structures of fishponds and removing invasive species to return ecological balance and biodiversity to fishponds as well as the larger ahupuaʻa systems in which they sit. Loko iʻa restoration includes not just physical restoration but also restoring the identity and pilina of people to place, a process of healing both the ʻāina and the relationship of community to the ʻāina. Many loko iʻa host regular workdays welcoming volunteers, student groups, and partner organizations to spend time in the loko iʻa contributing to restoration efforts and developing their own connection to place. Kiaʻi identified an interest in balancing efforts to

restore place while also bringing elements from other groupings into workdays and volunteer interactions (He Hui Hoʻokahi, Education, Hui Sharing, Iʻa, and Loina Welo).

The ability to measure and communicate the beneficial impacts of fishpond restoration is a priority for kiaʻi to continue improving restoration strategies and growing support for this work. Kiaʻi also emphasized the strength of adaptive ahupuaʻa scale approaches to fishpond restoration and stewardship. They apply a multi-generational perspective to decision making expressing a desire for fishponds to thrive for hundreds of generations to come. A major benefit of the HMLI is the sharing of knowledge, expertise, and resources across ponds. Access remains a significant barrier to restoration efforts. Permitting requirements, complex ownership and leasing arrangements, and safety concerns all represent obstacles to full practitioner access.

HOʻĀLA HOU
Reawakening the physical loko iʻa

Subtopics
- Restoration Economics
- Evaluating Impacts
- Technical Skills and Expertise
- Materials and Collective Capacity
- Upstream Restoration
- Permitting and Access
- Invasive Species
- Historic Guidance
- Adaptation

Restoration Economics

Fishpond restoration aids local economies by providing a host of benefits including: jobs, skills training, educational opportunities, greater abundance and diversity of local foods, enhanced sense of place and community cohesion, better water quality, healthier coral reefs, and improved viewsheds. Loko iʻa are viable forms of coastal protection and even enhancement.

Needs:

- Document the estimates of the monetary value of their collective restoration work as the HMLI.
- Understand the additional economic benefit generated by hui partnership (sharing of materials and labor for example). Kiaʻi view this information as a potential tool for communicating more effectively with funders.
- Better understand the costs of different restoration actions; for example, what is the cost per foot to rebuild a wall or the cost per square meter to remove invasive species and maintain restored areas. Ideally, kiaʻi would be able to provide an estimate for how much money it would take to bring their loko iʻa to an activated and functional state.
- Cost-benefit analysis for fishpond restoration, incorporating cultural, recreational, ecological, and human-health benefits, as well benefits to property value. These types of assessments would require

Restoration requires the protection of many hands. Photo credit: Kanda.

researchers from public health, social work, and urban planning sectors, not just the hard sciences.
- Opportunities to re-purpose or commercialize invasive species after they are removed. For example, mangrove seedlings could be used at other sites (outside of the Hawaiian Islands) where mangrove forests are native and benefit coastal ecosystems and communities.

Evaluating Impacts

Monitoring and reporting restoration impacts is a common challenge across many kiaʻi organizations. The ability to effectively monitor, summarize, and communicate impact and progress is critical not only for continuing to improve restoration strategies but also for growing support and understanding among funders, decision-makers, and the broader community.

Needs:

- Kiaʻi express interest in developing self-evaluation mechanisms beyond survey tools, although support and training is also needed to acquire (or borrow and share), and use various types of monitoring equipment (e.g., for water quality).
- Better understand restoration time-frames, including how long it takes to reach different stages of restoration, depending on the location (e.g., how long to build a yard of wall).
- Document and analyze how wall restoration impacts species dynamics and distribution (e.g., how wall restoration changes the limu on the inside and outside of the wall, and how wall restoration changes fish behavior).
- Frameworks for understanding the relationship between a loko iʻa system and the greater coastal water body it is encased within.
- New kiaʻi and future generations will need to be given a vision to foster and grow. HMLI can provide a roadmap for interested kiaʻi to understand the history, vision, and pathways for achieving self-determined success.

Technical Skills and Expertise

One of the significant benefits of the Hui Mālama Loko Iʻa is the sharing of knowledge and expertise across ponds. HMLI gatherings serve as places of collective learning and provide the opportunity to identify common skills and educational needs across hui members.

Needs:

- Find those within the community with ʻike kūpuna to provide needed mentorship. Identify community practitioners in lāʻau lapaʻau, hala (weaving), hale, loea limu, and lua (fighting). It is important to note that being a steward of a skill comes with significant kuleana and we need to care for those who carry such expertise. These individuals tend to be selfless and they are a huge part of any restoration's success. Their knowledge and input should be compensated fairly.
- Kiaʻi are very interested in groundwater dependent ecosystems (e.g., anchialine ponds) that can be common around some spaces. Spaces with these types of ecosystems can be granted special legal protections, as mentioned by the Commission on Water Resource Management. This topic sets up the conversation for understanding the public trust of loko iʻa.

Materials and Collective Capacity

Just as the HMLI facilitates sharing of knowledge and expertise across ponds it also supports leveraging of resources to support local restoration efforts. No matter whether a loko iʻa is being restored or built, the effort requires materials, labor, and expertise. Kiaʻi want to be able to restore more than just the wall; they also want to rebuild community through education, food security, and cultural connections. To accomplish such transformative restoration requires many hands and minds.

Needs:

- Leverage resources, such as combining volunteers at the island scale to pool ʻike and resources for greater impact.
- Direct collective energy and expertise towards synergized restoration methods, equipment use, and permitting processes.
- Understand context, costs, and processes required for dredging of sediment. Dredging is a restoration practice that requires significant resources for securing permits as well as the necessary manpower and equipment.
- Research other methods (mechanical/physical or biological) to discover how to better optimize water circulation around and out of ponds to minimize the need for dredging.
- Feasibility of moving pōhaku around and between islands to support the restoration of ponds that do not have enough pōhaku for their own needs.
- Access to heavy equipment and machinery is always needed by kiaʻi and HMLI might be able to forge relationships with city and county entities to develop machine loaning programs.
- Communicate to the public the view of loko iʻa as public works projects, which they were originally built to be. They function as hubs for resiliency.

Revealing pōhaku that were lost to long-term land use changes, displacement of native community. Photo credit: Kanda.

Upstream Restoration

Kiaʻi recognize and emphasize the critical role streams and freshwater sources play in restoring fishponds. Many fishponds have been lost over time or have ceased to function because of stream diversions. Kiaʻi have questions about what actions are needed to "get the wai to return." They also emphasize the need for upland restoration knowing that fishponds are part of a larger connected ahupuaʻa system and cannot be restored to full health and abundance until upland areas are also restored.

Needs:

- Methods and strategies to address upstream restoration in the face of multiple jurisdictions, managing authorities, and land ownership patterns.
- Understand how upstream contaminant sources are impacting fishpond water quality and food safety (e.g., cesspools and contaminants from military installations).
- If projects along the coast or mauka from the fishpond site result in damages, then developers should be required to pay a fee in support of restoring damages.

Permitting and Access

Permitting is a barrier to many loko iʻa restoration efforts requiring significant investment of time and financial resources. In recent years, the state permitting process has been streamlined for loko iʻa. However, many kiaʻi find the process is still cumbersome and confusing. Restoration efforts are also complicated by the fact that loko iʻa face a range of different land ownership and leasing situations. Some loko iʻa are privately owned and kiaʻi are limited by when and how often they can have access; others face restrictions on the kind of funding they can accept based on ownership and leasing agreements. Other loko iʻa have limited access based on safety concerns (e.g., restoration in areas with legacy contaminants or water quality so poor it is unsafe for volunteers).

Needs:

- When permitting and access issues become barriers to loko iʻa restoration and care they compromise the constitutional rights of Native Hawaiians to carry out traditional and cultural practices. Work collectively across HMLI to address these barriers through advocacy.
- More staff within regulatory agencies that understand and support fishpond restoration.

Invasive Species

Invasive species (both aquatic and terrestrial) are some of the most significant restoration challenges that loko iʻa face. While loko iʻa deal with a range of different species there are many common challenges and lessons learned to be shared.

Needs:

- Share different methods of invasive species removal to understand what techniques are most effective.
- Restoration planning and strategies to improve efficiency and effectiveness. Planning can help with prioritizing invasive species removal efforts, developing strategies for replanting to ensure long-term maintenance is possible (with limited resources) once invasive species are removed,

and assessing how the removal of invasive species might impact loko iʻa wall structures. One problem for example that could be addressed is what to do with green waste around loko iʻa.

Historic Guidance

Kiaʻi vary in the amount of access they have to historic records about their places. Many utilize oral, written, and photographic records of place to inform their restoration plans. In some cases, the historic design and structure of a fishpond is known but there are still gaps in the detailed understanding of specific design elements and how they relate to unique local conditions (e.g. to be able to take advantage of local current and tide patterns, geology, species migration patterns, etc.).

Needs:

- How to best to find guidance to for understanding what some ponds were originally like in cases where when there is no current wall structure to guide restoration efforts.
- Cultural impact assessments are useful tools for discovering more about a local space, but they need to used, not just sit on a shelf. Sometimes these large assessments require translators for users due to excess jargon and specific terminology.

Removing invasive species, reopening spaces for water to flow, walls to rise, fish to swim. Photo credit: Mozo.

Adaptation

Fishponds are vulnerable to a variety of climate change impacts including sea-level rise, changes in precipitation patterns, rising air and ocean temperatures, ocean acidification, and more frequent and intense extreme storm events. Fishponds have also continually adapted in innovative and dynamic ways over the course of hundreds of years, including through major environmental changes. Kia‘i recognize the strength of adaptive approaches to fishpond restoration and stewardship. They approach planning and decision making from a multi-generational perspective, expressing a desire for fishponds to thrive for hundreds of generations to come.

Needs:

- What will existing fishponds will look like in the long-term 100 or 200 years into the future?
- Where might there be opportunities to establish new fishponds as sea levels rise and shorelines change in the future?
- Understand the implications of sea-level rise for individual fishponds and restoration efforts, including how sea-level rise will impact kuapā.
- What materials will be required for loko i‘a to address climate change and sea-level rise?
- What will the pace of change be? How quickly will brackish water change salinity? How will that impact targeted fish species that kia‘i want to raise in ponds? What will the impacts be for this generation and the ones that follow?

Innovation of barges to move pōhaku. Photo credit: Kanda.

I'A

"Let's continue to do what we're doing… Continue sharing our food. This is something we should always do. Make sure we continue the pū 'ai action (i'a or other 'ai). We have work to do but [the] main thing is we have physical sustenance coming from ponds that we can be proud of. Whether for fertilizer, staff, etc. our loko are providing calories and energy."
-Said at Hui Mālama Loko I'a 2019 meeting

Sharing physical sustenance, the manifestation of our work and relationship to loko, with each other. Photo credit: Rozet.

Summary and Main Points

Fishponds provide physical sustenance to communities in a variety of ways including supplying sustainable local seafood, limu, shellfish, and fertilizer. Loko i'a once produced an average of 400–600 pounds of fish per acre per year, yielding over 2 million pounds of fish annually throughout the Hawaiian Islands (Cobb, 1905). Today an estimated 88% of the food consumed in Hawai'i is imported (Loke and Leung, 2013). Building robust and sustainable local food systems is critical to increasing

community resilience to natural disasters, climate change impacts, and as we witnessed throughout much of 2020, rapid onset and long-lasting situations such as the COVID-19 pandemic. Loko iʻa are sources of energy for feeding people and communities. They have an important role to play in this process of building a stable and enduring food system for Hawaiʻi.

IʻA

The resource that informs the function of loko iʻa

Subtopics

- Fish Monitoring
- Natural Recruitment
- Hatchery
- Protecting Fish Abundance
- Maintaining Ecological Integrity
- Invasive Animals
- Limu

Fish Monitoring

Kiaʻi loko noted that loko iʻa do not need to be completed or fully operational to be actively collecting data. In their first year of identifying shared measures and collecting common data, kiaʻi loko generated many ideas for improving the process, but with an emphasis on the need to develop trust based on the conversations and relationships with other people who are connected to fish and loko iʻa. We acknowledge that it can be difficult to ask each other to report data when relationships are new, or when there is sensitivity around private versus public property. Nonetheless, kiaʻi loko see the inherent value in standardized data collection on the production of their system through kilo (observation). Fish monitoring data can be used to enhance fishpond productivity, support grants, investigate loko iʻa research questions, and inform future policy on loko iʻa.

Needs:

- Standardize names (e.g., mullet vs ʻamaʻama, pāpio vs ulua vs ʻōmilu, paʻopaʻo, aukea)
- Standardize sizes for specific resource fish (e.g., have bin sizes for fish; develop size classes at the site level or collective).
- Some items are not gathered for direct consumption, but there might be an interest in still tracking these resources (e.g., count numbers of puhi [eel] caught for bait).
- Need to share data more regularly with template to streamline reporting and pathways for data validation.
- Make the data relevant to your place and HMLI: The following are options provided by HMLI for data collection. This information would be stored and tracked within HMLI open-access database.
    - Numbers of fish caught vs. pounds caught
        - Both of these tell you about biomass but they differ because you could have 10 huge fish (which are likely to be old and have spawning potential) or 100 small fish (indicating successful juvenile recruitment).
        - It depends on the resource (e.g., crab vs fish).
        - Could have two tables or ways to report for pieces and/or pounds. Numbers are easy, everyone can count. Pounds is another step but we learn a lot more, and it is more related to sales.
    - Life stage: How much āholehole, weke, kākū, pualu caught?
    - How many times did you witness poaching?
    - Limu should be listed – species specific?
    - Add shellfish in the datasets
    - Native vs. invasive fish data collection (interest in recruitment genetics)

    - Catch per unit metric is important to show density in loko iʻa
    - Males vs females
    - How do we convey that we just don't have enough fish, we don't have enough primary producers, we don't have as much fresh water as we want (e.g., for limu)?
    - Habitat-type resource collected within (i.e., informs ecology)
    - Unit effort – how much work an individual has put in vs. what he is taking out?
    - Method of resource gathering (e.g., net - small fish, pole - predator fish, etc.).
    - Reporting period: lunar, calendar vs. fiscal year.
- What are the best metrics to inform management and show impacts? How do we standardize our kilo? What different methods might be most effective?
- Data visualization and analysis:
    - Need to learn to depict scale of difference between species, for example, 15 mullet versus 100 thousand tilapia
    - Seasonal calendar, putting it on a map to see how it might be used
    - Dispersal and spawning maps
- Who is consuming the resources? This supports the story of community importance. Provided to on-the-ground crew? Students, volunteers? Taken to market? Sharing on how people are distributing resources (sell vs. eat).
    - Are we interested in dividing this information? (staff vs students/volunteers vs market). This tells us about distance from food source - the impact of this food system.
- Develop system to collect brood stock from identified spawning zones and create dispersal network within HMLI.

Kalāhuipuaʻa ahole at Kīholo gathering in 2016; sharing physical sustenance, the manifestation of our work and relationship to loko, with each other. Photo credit: Erger.

Natural Recruitment

Historically, the seasonal rhythms of nearshore species were carefully monitored. The recruiting fingerlings use turbidity gradients as an orientation cue (Cyrus & Blaber, 1987) along with tidal transport as a mechanism to move into juvenile habitats. Stocking of loko iʻa was thus achieved by opening the sluice gates during a rising tide. Once fish were in the pond, a wooden slat gate prevented large fish from leaving the fishpond while still allowing tidal circulation.

From local fisher knowledge and scientific studies the behavioral patterns of key fishpond species were as follows: ʻamaʻama (mullet) spawn between December and February, akule spawn between April and November (Kazama, 1977), and ʻōpelu spawn between November and March. The halalū (offspring of the akule) are in the nearshore waters between August and November, and the ʻoama (offspring of the weke) are in the nearshore waters between July and September (Hawaiʻi Coastal Zone Management Program 2005; Institute for Sustainable Development, 1998). Of these spawning and recruitment events, the annual migration of mullet on Oʻahu was one of the most well noted: "To the ancient Hawaiians, the mullet's annual migration around Oʻahu and their return to Waiʻanae to mature and spawn, symbolized a spiritual rebirth of the ocean, land, and its people" (Institute for Sustainable Development, 1998). Indeed, distinct mullet populations were named based on their migration route and appearance, with ʻanae-holo being full-bodied spawning fish moving from ʻEwa to Lāʻie and ʻanaepali being skinny fish returning from Lāʻie to ʻEwa (Wyban, 1992).

Hawaiʻi coastal fishery stocks have seriously declined mostly due to anthropogenic impacts (Shomura, 1987). While DLNR has implemented annual closures to protect spawning populations (ex. ʻamaʻama or striped mullet season is closed from December 1 - March 31), restoration of loko iʻa provides additional natural spawning and nursery areas that can contribute positively to nearshore fishery stocks.

Fish Stocking

The decline in nearshore fish populations and the need for more sustainable loko iʻa business frameworks re-ignited creative solutions in fish stocking by kiaʻi loko. Historically, in Hilo they released fish into the ocean during times of harvest as a way to connect to their moʻopuna (grandchildren) that will eat these fish in the future. Many of the species that are cultivated within loko iʻa are the same species that are heavily fished in the ocean. Loko iʻa can be likened to nearshore nurseries where the fish can safely grow, spawn, and become a source for nearshore fish stocks.

This idea can be expanded to the development of pua (juvenile fish) ponds that would create a consistent supply when natural recruitment from the reefs is low. The pua ponds support kiaʻi loko that are in the shift from restoration to production to improve sustainability of kiaʻi loko livelihoods. Kiaʻi loko now need to understand how wild stocking could work from the loko iʻa system. HMLI would also like to set up a system for exchanging natural recruits across sites. Through pua ponds and wild stocking, kiaʻi loko fight to adapt to bad fish spawning seasons. Framing loko iʻa as natural nurseries connects these systems and practices to the health and function of the greater nearshore habitat and fishery.

Needs:

- Pua Ponds
    - System to share natural recruits

    - Framework to stock loko iʻa and for wild stocking ocean
    - Better understanding about the use of pens, which concentrate fish
    - Predation study -- Sometimes birds are problematic for baby fish, and other predators within the pond if pua are released at sizes that are too small
    - Pua mortality study
- Wild stocking
    - Use of genetic markers to identify recruitment species
    - Dispersal and spawning of fish and broodstock
    - Understanding home ranges of target fish species
- Grants
    - With grant writing its restoration and education but it should also be about the wild community around us**.** We are natural nurseries. We can start writing grants to raise fish and populate those fish back in the ocean.

Hatchery Development

In 1993 a Governor's Task Force Report on Fishpond Restoration called for, among other things, the development of a hatchery. Given the hatchery programs that once operated in Hawaiʻi for fishpond-relevant species, the acceleration in fishponds being restored, and the increased attention to food security in our communities and state, we sense momentum, interest, and a growing urgency to reconsider a hatchery program to be part of a broader effort to restock fishponds, and eventually contribute to the surrounding fisheries. There may be emerging opportunities to connect and leverage conversations, planning and action among initiatives within KUA networks and partners in the state's Department of Land and Natural Resources Division of Aquatic Resources, Department of Agriculture Aquaculture Development Program, Hawaiʻi Sea Grant along with technical experts at institutions such as the Pacific Aquaculture and Coastal Resources Center (PACRC), Oceanic Institute (OI), and the Ānuenue Fisheries Research Center (AFRC).

Needs:

- Revisit the 1993 Governor's Task Force Report on Molokaʻi Fishpond Restoration, focusing on the needs and opportunities for a hatchery facility leveraging existing partnerships listed above.
- Develop a Fishpond Hatchery Advisory Committee to increase partnership with the state on a vision and plan to develop hatcheries for fishpond production as well as nearshore stock enhancement.
- Partner with the state and other landowners to increase fishpond management and operation.
- Explore and develop training and certification pathways for aquaculture technicians/operators at fishponds.
- Continue small-scale fingerling production for several pilot sites to continue exploring various methods of transfer and grow-out (i.e., on foundation of previous and ongoing work several facilities).
- Peer sharing on how to revive a thriving market for fishponds products and pilot new distribution models in the community (e.g., island-based co-ops, inter-island collaborative sales, Indigenous aquaculture branding).

Any discussions about hatchery development should be integrated with efforts to re-build all related segments of the fishpond supply chain, continuing to connect kiaʻi loko with each other and with upstream (e.g., training, education) and downstream (e.g., market) components. These discussions

would include convening with aquaculture consultants through local institutions, as well as colleagues from the World Aquaculture Society's Aquaculture America conference held in Honolulu in February 2020, which KUA staff participated in as steering committee members and session chairs.

Protecting Fish Abundance

HMLI is aware of the need to sustain viable fish populations within their systems, but the concept of protecting abundance can be exceptionally difficult when people from outside HMLI begin to intersect with loko iʻa. One kiaʻi loko keenly pointed out that you have to ask, "Who is the DLNR in your community?" This is because kiaʻi loko must manage so much more than just the biophysical processes within their systems. People are an integral part of loko iʻa and therefore kiaʻi must think about those who are utilizing fishpond resources and may not necessarily be involved with regular fishpond care.

The primary issue with protecting fish abundance is poaching. Some kiaʻi loko have installed cameras and others rely on social pressures and signage. Another proposed solution was the use of drones to scare away poachers. Essentially, HMLI wants to instill more confidence in kiaʻi to help people identify and address behaviors that are pilau (i.e., rotten/not acceptable). For example, some kiaʻi are looking for mutually beneficial solutions to pollution from growing nearby homeless camps. HMLI pointed out that awareness is a key element in the solution to tackle poaching. Kiaʻi want to reinforce their positive image within their local sea harvesting communities to educate others that loko iʻa are not just growing for themselves, but are restocking the oceans, helping all lawaiʻa, and spreading good practices and values in aquatic resource management. More work needs to be done by HMLI to understand how to communicate effectively with poachers and instill respectful communities surrounding loko iʻa for all to enjoy the benefits.

Needs:

- Why do people poach and how do we best manage?
- What is the proper size for harvesting fish? Is it place-based?
- Does HMLI have its own kūlana (standards) for harvest rules?
- Other collection methods: Want to learn to use traditional pharmaceuticals to stun fish, which could be applied for fish counts elsewhere.
- How can we find out what others are harvesting from our loko iʻa to establish community importance? Social-networking study?
- How to determine harvest allocation among different sectors in the community?
- Can we explore value-added products to increase financial sustainability?
- Economics of how to optimize resources (e.g., dry vs. wet season resources to harvest, how to sustain year-long income).

Maintaining Ecological Integrity

HMLI also recognizes the connection of watersheds that supply the nutrients, freshwater, and silt into the loko iʻa. The health of the watershed is directly related to the ecological integrity and productivity of the fishpond. Modern-day loko iʻa continue to face extensive negative impacts from coastal

Mōliʻi oysters at Heʻeia gathering 2020; sharing physical sustenance, the manifestation of our work and relationship to loko, with each other. Photo credit: Moa.

degradation, water impairment, natural hazards, and invasive species. These impacts stem from land-use changes to urban/developed areas, conventional intensive agriculture, and ranching parcels. Into the future, kiaʻi loko will face even more complex environmental shifts as climate change will lead to more extreme weather events, rising sea levels, and precipitation changes throughout Hawaiʻi.

To understand how to manage loko iʻa into the future, HMLI seeks to have more studies focused on mauka-makai connections in the context of loko iʻa health. This systems thinking approach will help kiaʻi to understand what pressures are present in their fishponds and at what level those stressors are currently impacting their practice. This approach will also include all kinds of data, including Indigenous local knowledge gathered and developed by Indigenous people and local communities. Therefore, kiaʻi loko want to cultivate more opportunities to talk about agricultural loss and how historic land-use changes have impacted their practice and livelihoods. HMLI would also like to investigate impacts at the species level because little is known about the fish health impacts of these land-use changes in loko iʻa and how that may interact with human consumption of these fish.

Needs:

- How do we harvest the silt inside the fishponds to use elsewhere (e.g., bio char)?
- Water quality analysis using big data sets.
- Determine "indicators" of fishpond health.
- Research on weather shifts and changes (e.g., temperature, die-off, oxygen levels, freshwater dynamics).

- Predation or food web study. If there are chemical pollutant problems, how do we clean it up so that we can eat the fish again?
- Quantify effective ʻauhuhu concentrations.
- Why are some of our ʻamaʻama blind? (e.g., consider inbreeding)
- Are our fish safe to eat? Are our fish eating marine debris like plastic?
- How do pressures and levels of stressors compare across HMLI? What are the lessons we can share to grow and adapt?
- Develop sharing network or platform to keep each other informed of research studies, restoration efforts, available resources, expert connections, management methodologies, and best practices for adaptation.
- Identifying fish diseases or infections and treatment.
- Learn and expand about growing oysters to improve water quality.
- Related to invasive species:
    - HMLI has an unlimited supply of negatively impacting tilapia and gorilla ogo in some ponds; we have to think of uses and use what we have, and reduce the things that compete with or prey on natives (e.g., tilapia, birds, 5-star generals, rats).
    - Changes in fish habitat from invasive species removal.
    - What invasive species monitoring methods work best for specific types of ponds?
    - Map sites from past to present to show change in fish environment or habitat.
    - Invasive species control methods and efficacy.
    - Tilapia:
        - Investigate new harvest methods (e.g., pumping carbon dioxide into water)
        - Can use sterile tilapia (e.g., backyard aquaponics use males), and couple that with active removal.
        - Consider that tilapia might be an option for ponds that want to go this route.
        - Data to validate that tilapia from ponds is clean (i.e., change public perception).
        - Look into processing options (e.g., fishsticks, fishcake, eliminate shelf life pressure by making things like dog food, fish meal, patis or fish sauce, compost tea).
        - Consider marketing / branding campaigns like “Hawaiian sun fish” or tilapia the survivor fish.
        - Could create one processing facility or a farming co-op to figure out payouts on tilapia that people bring in; a shared facility with shared fees.
        - Look at Costco as a buyer.
    - Toau (blacktail snapper)
        - Investigate relationship between toau and mullet, e.g., “Once toau came it was difficult to keep mullet.”
        - Test ideas for toau control in ponds.
        - Is toau on all the islands?
        - Understand spawning and schooling behavior better.
        - Toau control methods and more information on distribution throughout state.
- Related to limu
    - We need to know more on limu distribution, diversity, predation, and pressures across and within loko.
    - What kind of limu can be planted?
    - Is limu growth limited by salinity levels?
    - Fishponds can be places to out plant limu and have additional functions as limu hatchery.

- Continue work on limu kohu: has 7 stages to grow and hard to close the life cycle in captivity.
- Limu growth
  - Grow limu on ropes; we have a sample of a rope rig. Grow on old carpet.
  - ʻEleʻele grows good in areas with freshwater. Pālahalaha and ʻeleʻele are easy to grow.
  - Test limu growing zones that seeds the rest of the loko iʻa.
  - Experiment with moving rocks with limu and protecting them from grazing.
  - Identify spots in loko iʻa that are cleaner than others.\Build limu tanks on side to help out with loko iʻa.
- Marketing limu
  - Is the limu market saturated?
  - What are positive/marketable uses (e.g., good for diabetes?)
  - Gorilla ogo had salmonella issues a few years ago; is this still an issue?
  - How do you clean the limu? Takes time and labor.
- Old washing machine with salt water, and gentle cycle
  - Bubbler
  - Tilapia can clean epiphytes off the limu
  - Pressure washer
  - The young ones are easy to clean
- What species return after gorilla ogo is removed from pond?
- How are invasive limu affecting all the mea ola in the pond?
- Study limu within fish stomachs to understand limu as indicators in fishpond productivity (e.g., how functional the food web is, is there enough limu).
- Effects of limu restoration (especially in conjunction with loko iʻa restoration).
- Continue prior projects (e.g., Kamala thesis was on limu and grazing pressure).

Healthy loko iʻa, including limu, to bring back iʻa. Photo credit: Chang.

EDUCATION

"Aloha ʻĀina perspective is not a one off, how do we encourage life-long aloha ʻāina and loko iʻa learning—like full circle learning. How do we get students here as kiaʻi in 15 years?"
- Hui Mālama Loko Iʻa 2019 Gathering Attendee

Learning about tides through hula at Waiʻōpae. Photo credit: Kanda.

Summary and Main Points

Nearly all sites in Hui Mālama Loko Iʻa interact with keiki programs and visitor groups of all ages. Loko iʻa have become increasingly important sites for ʻāina-based education initiatives throughout Hawaiʻi. Kiaʻi organizations cultivate unique and site-specific relationships with their partner schools and kumu, but all educational efforts demonstrate the ingenuity of loko iʻa and offer lessons in cross-disciplinary themes such as engineering, biology, oceanography, hydrology, mathematics, history, and politics. Perhaps most importantly, loko iʻa provide sites for students, kumu, and community members to understand all the ways we are fed -- physically, intellectually, emotionally, spiritually -- by ʻāina, and cultivate life-long aloha ʻāina so that people return again and again to mālama these spaces and become kiaʻi themselves.

EDUCATION
The impact of loko iʻa on all learners

Subtopics
- Curriculum
- Huakaʻi
- Assessment
- Research

One main point of focus for the network in this section is deep and rigorous (i.e., detail-oriented) partnership with the broader education system, including post-secondary school career pathways. Kiaʻi also highlight collaboration and diversity of tools in evaluation and assessment. As it is with physical sustenance after cultivation of lands and waters, learning and education at loko iʻa is a reciprocal relationship. Learners of all ages need the opportunity to give, in the form of physical work and/or ʻāina-centered research, in order to receive the most impactful lessons.

Developing educational tools and teaching each other. Photo credit: Asuncion.

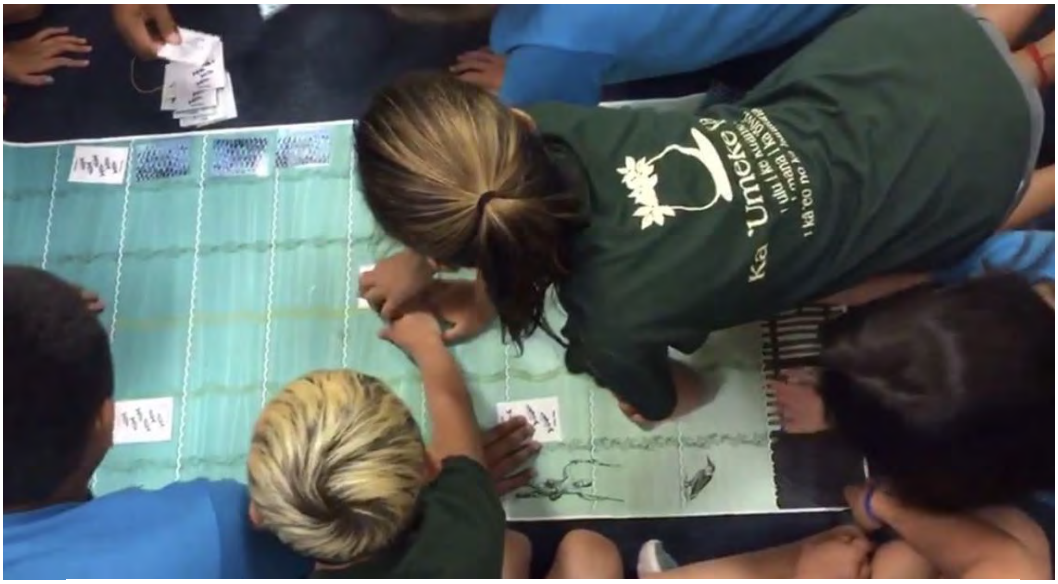
Curriculum Development and Integration with Higher Education

Kiaʻi often find themselves developing their own curriculum for hosting groups, and there is interest in learning from each other and supporting each other in this work. HMLI envisions an education system in Hawaiʻi that includes place-based immersion, fosters relationship-to-place, and activates action.

Needs:

- Curriculum Development:
    - Place-based immersion highlights the opportunity to build understanding by seeing concepts in action in person vs. reading about ideas.
    - Kiaʻi hope that students become anchored to places where learning occurs, so loko iʻa can become additional kumu in their lives. This includes the opportunity to include kūpuna in exchanges and teaching in the places they know so well.
    - Site-specific lessons rely heavily on kiaʻi knowledge and their relationship to their loko iʻa. Kiaʻi determine the narrative they want to share and are best equipped to use kaʻao and other skills to help students find what is relatable and ultimately remember wahi pana, moʻolelo, and the accompanying lessons and values.
    - Kiaʻi can help interpret moʻolelo to transfer knowledge about appropriate behavior and actions in these places. As communities continue to build their relationship to place, kiaʻi also are encouraging each other to give names to various aspects in their place based on their kilo.
    - Kiaʻi recognize the opportunity to partner with neighboring organizations on their islands to develop curriculum and programs together. Loko iʻa can be spaces for other practitioners to teach.
    - Kiaʻi loko and other practitioners should be recognized as experts deserving appropriate compensation for their expertise and time, and we should collectively find pathways to build sustainable livelihoods in these places.

    - Partnership can be fostered directly with educators to connect ʻāina-based learning to standards-based curriculum planning.
    - In some cases, students have provided valuable input to curriculum development. Both educators and students can contribute to educational programs at loko iʻa in advisory capacities.
    - As partnerships grow and more kumu get involved at loko iʻa, increase the concepts of action, community, and place-based curriculum in post-secondary academic institutions.
    - Use the broader education system to facilitate careers and livelihoods as loko iʻa operators and mahi iʻa. Fishpond practice, Indigenous aquaculture and/or sustainable aquaculture should be a degree or certificate program within our institutions of higher education. A pathway could be modeled after the program at MAʻO so college students in these degree programs have internships at fishponds.
- Dissemination and Training
    - Support educators in their journey to incorporate loko iʻa in their teaching, and ultimately create kumu who are anchored in loko iʻa and other wahi pana.
    - In order to educate educators, partner with organizations already focused on building aloha ʻāina leaders (e.g., Kanaeokana, Kamehameha Schools), offer teacher workshops (i.e., with Department of Education [DOE] credits) to introduce wahi pana, moʻolelo, and help kumu become more comfortable with protocol and general guidelines for loko iʻa, perhaps even to the point where some kumu act as liaisons or alakaʻi within their schools to have a permanent relationship to particular loko iʻa.
    - Offer ideas (e.g., kilo activities) for teachers to continue to reinforce learning when they return to their classrooms.
    - Increase understanding among kiaʻi loko about DOE frameworks and strategic plans, and there is interest in collective training on Next Generation Science Standards (NGSS) or Nā Hopena Aʻo (HĀ) standards.
- Sharing:
    - As more kiaʻi organizations develop their own curricula, HMLI hopes to maintain a shared list of programs including workshop ideas, education tools and materials (e.g., activity kits to facilitate kilo), and other related resources.



Transferring and spreading educational tools that kiaʻi have developed. Photo credit: Kahana.

    - Interest in sharing physical materials, doing student exchanges, or developing programs that include multiple loko iʻa. As a first step, kiaʻi can share announcements about training sessions or similar opportunities.
- Tourism
    - Many loko iʻa encounter abundant visitation by tourists. Kiaʻi recognize the need to advise visitors (including tour companies) on pono ways of acting, but also see the opportunity to advise visitors on pono ways of giving in positive ways.
    - HMLI may consider opportunities for tour companies or the broader tourism industry to fund educational programs. For example, we learned that the Hawaiʻi Institute of Marine Biology implements a fee schedule for non-Hawaiʻi visitors which supports educational programs for Hawaiʻi-based learner groups.

Huakaʻi

Huakaʻi are essential for learning about loko iʻa. Each loko iʻa group determines their own capacity and value of recurring group visits versus one-time group visits. Each loko iʻa also determines their decision-making process and reasoning for hosting different types of groups (e.g., adults, keiki, residents, visitors). However, sites consistently hope to see students engage in mauka to makai curriculum, including loʻi and māla alongside loko iʻa, and develop long-term relationships with the places they mālama. Many loko iʻa envision that someday their sites will be fully integrated in schedules (e.g., several days a week in conjunction with other days in the classroom). Currently, there are very real constraints of time, resources, and logistics to support this level of integration, some of these barriers are included as needs/issues below.

Needs:

- Ocean safety: Lifeguard certification requirements often prohibit public schools from engaging in huakaʻi at loko iʻa. A DOE-approved, shared training for youth safety and lifeguard certification would increase the overall capacity of loko iʻa to host all groups while ensuring their safety. Any shared partnerships to exchange personnel, conduct training, or develop guidelines/policies would accelerate the capacity-building across sites.
- Group preparation: A shared or HMLI-developed guideline (e.g., gear list, backup plans, video or kumu workshop to provide an introduction to loko iʻa) can help to ensure students and groups are mākaukau to be prepared and accountable. Individual loko iʻa might also explore ways to convey background site information, expectations, and perhaps even general wahi pana (place names) and relevant moʻolelo in advance (e.g., by video) to make the most of the time that groups have on-site.
- Virtual/remote accessibility: Tap into innovative technologies to develop virtual experiences for students to learn about areas that are difficult to access or have high risks or sensitivities. Additionally, basic background information and orientation could be explored with virtual tools, to make the most of limited time on-site when visitors do come to loko iʻa.
- Department of Education: There is broad interest in how HMLI can support policies to make it easier for public school students to get more time at loko iʻa. We recognized that there is funding for place-based education (e.g., HĀ framework, Office of Hawaiian Education), but there is a perceived disconnect in how that funding is incorporated into classes.
- Transportation: Hurdles to overcome include the cost, restrictions (e.g., standards of cleanliness difficult to adhere to after huakaʻi) and limited time frame that buses are available for huakaʻi because they often have to be back at campus for after-school routes. Non-profits may even consider buying their own buses for transportation.

- Facilities: Some locations have insufficient meetings areas (e.g., shade, shelter) or bathrooms to host groups.

Assessment

At the end of 2018, the HMLI responded to a KUA survey with the first shared measurements of number of learners served at their sites. It became apparent that (1) the impact to many sites was not sufficiently captured and (2) there was a desire to further standardize the process. We recognize the importance of data and that various forms of evaluation and assessment can carry weight (i.e., determine funding, opportunity, power dynamics) in public institutions such as the legislature and the DOE, and for funders and grant-making organizations. HMLI will continue working to understand together the collective impact of their educational efforts across Hawai‘i (including what they do well as educators), to inform their decisions and programs in the future, and to communicate to decision-makers to advocate for changes and policies in the systems which impact education efforts at loko i‘a. The collaborative evaluation among HMLI will help share the experience of loko i‘a to the whole lāhui.

Needs:

- It is clear that for the purposes of using shared measurements, HMLI has to agree on definitions, consider whether the metrics will be valuable for all loko i‘a, and remain flexible enough to serve any site-specific needs.
- HMLI is at a point of defining what data they want to collect together, but could use support in this effort.
- Some example questions about the collective assessment they are embarking on.
    - Define “learner”: from community level to formal educational institution.
    - What is the level or age of the individual or group (e.g., ‘ōpio, mākua, kūpuna)?
    - Shall we count student visits or individual students?
    - Define “service” vs. “learning” vs. “volunteering”: Do we care about distinction? What would “other” mean?
    - How close to home are these learners? Should we collect data about their geographic origin to demonstrate the spatial reach/impact of various loko i‘a with a map?
    - Is it important to distinguish the level of commitment of each individual or group (e.g., track return visits)?
- While numbers reflect quantitative impact, there is a distinction in how to measure the quality of ‘ike and learning. Loko i‘a could capture testimony from students to understand their experiences, emotions, and what they think is relevant, using tools and techniques such as Photovoice.
- Teachers are acknowledged as skilled evaluators, and they could collect testimonial statements, reflections of impact, and general thoughts and feedback from students.
- Pre- and post-visit surveys for kumu can offer feedback about their experiences. In 2018, HMLI piloted a Google Form to serve this purpose and they will continue pursuing the best metrics to establish pre- and post-touch impact to evaluate long-term learning, and ensure that loko i‘a programs uphold educational rigor and are tied back to curriculum.
- Collaboration will help to foster growth and movement in this area of shared measurement. Kia‘i recognize that when they better understand each other’s work, they will know the specific educational “niches” that they fill in their communities. Then, if there is something they cannot provide, they can send groups to other loko i‘a.

- Partner with colleges and research labs to get support collecting these data. Parallels can be drawn between education assessment and grant evaluations, since both require data collection that is sometimes burdensome or beyond the capacity of loko iʻa, and both foster a sense of competition as well as a desire for collaboration between different loko iʻa.

Research

There is generally a desire and openness for loko iʻa to serve as places for academic inquiry and investigation. However, this requires a fundamental understanding that loko iʻa were designed and innovated from the start with a foundation of deep inquiry, observation, and understanding of the environment where they were established. Thus, contemporary research continues and builds upon this place-based knowledge. HMLI envisions future kiaʻi-driven, reciprocal projects that grow students and also help grow the capacity and knowledge at loko iʻa.

Needs:

- Relationship-building and fostering meaningful connections are the important first steps in co-developing research projects, and this applies to all age groups that might consider doing student research projects at loko iʻa.
- Post-secondary school kumu should encourage their classes to volunteer at loko iʻa outside of class time, while collaborations between kiaʻi organizations and colleges could develop internships.
- Primary investigators on large grant-funded projects should bring in young students and incorporate funding for loko iʻa where their projects occur.
- Loko iʻa could collaborate and share money with each other from grants.
- HMLI hopes to see increased exchange of knowledge and share-back of research projects occurring at various loko iʻa, both at individual sites and across the network. They aspire to a broader movement of research that serves the needs of loko iʻa and the community of kiaʻi loko.
- There is an opportunity for partnership in giving conference presentations, and an interest in sharing about wahi pana (e.g., wahi pana science fair).

Collaborative work to co-create monitoring and kilo. Photo credits clockwise from top: Moa, Asuncion, Asuncion.

HUI SHARING

"Pilina, mahalo no ka pilina, pilina kanaka, pilina ʻāina, pilina ʻuhane, I always get recharged seeing Hawaiian faces, getting to work with you [all]."
- Hui Mālama Loko Iʻa 2019 Gathering Attendee

Learning from experts within the network to transfer knowledge across sites. Photo credit: Moa.

Summary and Main Points

HUI SHARING
Functioning as a network

Subtopics
- Pilina (Relationships)
- Centralizing Resource Exchange
- Identifying New Resource Sharing Processes
- Building Full Capacity

The Hui Sharing focus area is all about optimizing internal exchanges of resources, information, new ideas, and work experience across HMLI's statewide network of practitioners. Embracing the simple yet potent slogan of "sharing is caring," this focus area is fundamentally guided by ʻohana connections that are cultivated across HMLI through reciprocal relationships established by in-person experiences with one other, the natural elements that sustain their communities (e.g., freshwaters, sun, wind, etc.), and the other life that surrounds them (e.g., fish, plants, microbes, etc.). Well beyond the exchange of words or information, these intimate relationships are developed and fostered through the "doing" (i.e., action or experience) of a kiaʻi loko. Hui Sharing promotes the reflection on the experience, needs and concerns across all of the other focus areas as one unified hui and this fosters equitable support amongst the community. This equity can be manifested through the development of a cooperative model of resource exchange and in-person stewardship of local sustenance (i.e., nurturing ʻāina momona) as a priority over monetary gain. The collective knowledge of our kiaʻi loko and communities continues to evolve and grow with Hui Sharing efforts, where folks can "talk story" about best practices, practical solutions, and effective

forms of sharing to better steward our greatest resource: the natural world and the sustenance it offers within our local lands and waters.

Some main points of focus for the network in this section include

- Strengthening and growing in-person, reciprocal relationships within HMLI, within partnering communities across the state, and within life-giving natural elements.
- Experience and doing as a priority over pure information exchange.
- Optimizing and formalizing resource exchange internally within HMLI, including centralized tool and resource logs, as well as sharing best practices, challenges, and practical solutions within and across islands.

Pilina (Relationships): Evolving Vision of Resiliency through Pilina

HMLI strengthens its relationships through face-to-face interactions where love, care, and respect is emphasized through the practice of loko iʻa. Kiaʻi loko strive for holistic production systems that enable sustainable harvest for generations to come. Kiaʻi loko do not want just to produce the most fish, like in the world of business. They have a kuleana to balance the whole system to produce enough fish with the goal of feeding their communities. Kiaʻi must adapt their systems daily with shifts in the natural environment and they foster community by always sharing their abundance. Therefore, these practitioners are connected to all those who benefit from the loko iʻa (e.g., eating the fish, volunteering, spiritual grounding, etc.), including the future generations that will continue this practice for their communities. Continuing this community of practice solidifies, for many, an ancestral connection to the incredibly resilient kūpuna who established, refined, and continue to guide loko iʻa practice. See Appendix C for a list of personal closing perspectives on the 2019 Annual Meeting that illuminate the importance and adaptive capacity of building relationships through the regular in-person gatherings of kiaʻi loko developed by KUA. Importantly, the Hui Sharing

Circling up together is common practice at kiaʻi loko gatherings. Photo credit: Asuncion.

Dicussion suggested that the best way to build pa‘a relationships is to prioritize doing work side by side. This vision of pilina is productive and allows for adaptation to change while also developing increasingly sustainable lifestyles locally.

Needs:

- Communicate and share out service work opportunities from other loko i‘a.
- Have HMLI workdays every three months.
- Continue virtual meetings to engage new network members and connect staff with needed expertise and resources.
- Develop in-person hui meetings at relevant scale for different loko i‘a to join the conversations (local, district, island, state).

Centralizing Resource Exchange

Shared resources are the “currency” of communities participating within HMLI. Resource currency must remain centered within the community, grounding any broader impacts, networks, or actions. To utilize resources within HMLI effectively and achieve diversity of local place-based goals, the network will need to address a variety of needs and this may take a few tries to determine what method works best for communicating across the network. To start, kia‘i will need to inventory what resources (tools, services, expertise, etc.) are available at each loko i‘a to potentially exchange and then this inventory will need to be maintained by kia‘i through online communications like a shared drive and listservs. Next, pathways for exchange need to be developed and understood in order to share physical and human resources within and between islands. Finally, training programs and exchanges need to be designed to sustainably share skills, fill resource/expertise gaps, and strengthen the collective impact across HMLI.

To make this process a success, HMLI will need to agree upon fair practices for establishing resource lists and what this may look like across different loko i‘a. HMLI members even noted how they may want to develop these sharing protocols at multiple levels within the network (e.g., loko i‘a, moku (district), hui-wide, etc.). One potential process is to update annually a list of needs for each participating loko i‘a, as well as existing resources potentially available to other loko i‘a. Updates could be communicated through email listservs and/or semi-annual video conference calls that could be developed with kia‘i loko, support staff, researchers, and sub-groups previously mentioned (e.g., loko i‘a , moku, Hui-wide, etc.).

Many valuable resources extend beyond physical tools (e.g., water quality instruments), or raw materials (e.g., pōhaku). A few examples of such critical resources are information, trainings (e.g., kuapā building), mo‘olelo, permits, data entry, and cultural advising. Work exchange for specific expertise locally is a key process to grow and continually communicate and document across the network, even in the form of simply sharing between two people from across loko i‘a. Regardless of how often and how structured in-person meetings are, there is a clear and universally-voiced need to meet more often in hui form, whether hui share within a local setting (e.g., Hui Ho‘oleimaluō), at the moku level, island wide, or statewide.

Establishing such a nested resource exchange processes would require significant time and financial support. If funding support was identified, an annual budget could be created for this overall process and a resource exchange coordinator could be funded. A key issue for financial support is determining shipping avenues for resource exchange whether it is equipment for education, management, or research, staff exchange, or prep for service workshops. It is especially important to consider locations

that may have shipping challenges either inter- or intra-island, such as Lānaʻi or Molokaʻi and to offer additional transport support or resources for loko iʻa in these networks.

Needs:

- Develop framework and checklist for regular resource inventory across HMLI.
    - Regularly inventory available and shareable resources -- tools, equipment, staff expertise, rocks, volunteers, etc.
    - Regularly inventory research and resource needs.
    - Create shared inventory document or database online with easy access for everyone in the network to contribute, review, and refer to.
    - Generate subsets of inventory document for different scales, e.g., district, island, and state-wide levels.
    - Create email listservs including kiaʻi loko, support individuals, and sub-groups to communicate resource sharing needs and inquiries.
- Provide HMLI members with notes from smaller loko iʻa meetings with updates on project status, concerns, and shareable resources.
- Engage new network members in more regular inter- and intra-island meetings.
- Understand travel and shipping pathways and options for resource exchange: management assistance, staff exchange, research project, workshop assistance, etc.
- Assist loko iʻa and communities that are more remote (e.g. Lānaʻi or Molokaʻi) with additional transport and labor support through a donation fund.
- Develop exchange pathways for key resources (e.g., research instruments, pōhaku, pua).
- Develop trainings for critical areas in kiaʻi loko development:
    - Rock wall building
    - Relevant moʻolelo
    - Permitting process
    - Data entry protocol
    - Cultural awareness
- Develop paid work exchange programs.
- Develop "payment" or gifting frameworks for resource exchange (e.g., equipment, monies, expertise).
- Look into fundraising and grants for network exchange opportunities.
- Look into potential shipping sponsorships.
- Develop island sharing networks to unite loko iʻa (e.g., #GoThere workshops or low-cost e-workdays to broaden knowledge).
- Fund a resource exchange coordinator.
- Create an annual budget to maintain resource centralization and exchange process.

Identifying New Resource Sharing Processes that Expand Our Knowledge Base

Knowledge of localized kiaʻi practices traditionally has not always been readily available for all practitioners. Historically kiaʻi practices and knowledge have been highly cherished and, therefore, at times, guarded. Sharing knowledge from practice transparently and widely throughout HMLI will expand collective ability to grow the network, strengthen impacts, and adapt to change.

More often, however, kiaʻi are simply highly limited in time and ability to reach out to wider communities of practice. Facilitating more opportunities for kiaʻi to connect face-to-face with stewards from other locations will substantially build the collective understanding of management pressures,

experiences, and solutions across the network. Discussing challenges and solutions statewide builds up adaptive capacity and efficiency in alleviating obstacles while building upon the HMLI's collective knowledge base. For example, this needs assessment clearly discerned that many practitioners across HMLI are interested in being more aware of the diversity of research and restoration work happening in loko iʻa and the collective manaʻo earned in all such efforts. There was a clear call for growing a general knowledge base, particularly the importance of understanding systems and relationships across systems beyond simply the numbers of fish. Examples of such systemic knowledge are: understanding the timing of events in the loko iʻa, including moon phases, how to kilo, tides to know, best spots to kilo, how to record, etc. It is also important to continue to extend such understanding of relationships and event timing within the loko iʻa to mauka events (e.g., hala blooming).

Learning from experts within the network to transfer knowledge across sites (top) and an example of a finished mākāhā (bottom). Photo credit: Moa.

In addition to the local, moku, island-wide, or state-wide in-person experiences suggested in the previous section, new information could be shared through creating annual reports developed in each loko iʻa and shared across the Hui. Annual reports could highlight many elements, including education experiences, community workdays, invasive species removal, target fish counts, resource theft and best practices learned from such experiences, and ongoing research projects, etc. If all loko iʻa participate, annual reports will also offer tangible impacts of HMLI overall each year, which can be key for obtaining grant support.

Volunteer pathways could also be more formalized. One suggestion was to create an overall electronic event calendar that could stimulate staff support. If everyone submitted event information to the KUA website calendar, awareness of such events could be greatly expanded statewide, both for potential participants as well as volunteer support for trainings, workdays, and other activities. Many local groups ask where else they can volunteer: a centralized calendar would help direct them to get the information they are interested in. To fill this calendar, many workshops were suggested as important to develop or build upon in the near future. Appendix D lists specific workshop ideas.

Needs:

- Facilitation of more kia‘i opportunities to connect with other stewards at other loko i‘a.
- Greater awareness of research and restoration work across the network.
- Syntheses and lessons learned from past trials in management.
- Tool for practitioners to find someone who wants to do the research.
- More systematic understanding than simply tracking fish numbers.
- Workshop on how to kilo (e.g., best kilo spots, metrics, data management, moon cycles)
- Create annual reports for each loko i‘a to share across HMLI (data on educational experiences, community workdays, invasive species management, target fish counts, best practices, ongoing research, etc.).
- Formalize volunteer pathways, HMLI events, and points of contact with a comprehensive electronic event calendar on KUA website for public to access.
- Research temporal indicators in the environment in context of loko i‘a (e.g., reproductive cycles, seasonality, tides, weather, moon cycle, etc.).
- Research pathways of best communication and data management for HMLI.
- Development of relevant metrics and data management for systems understanding.
- Understanding of restoration efforts and lessons learned of HMLI.
- Agreement and sharing of kia‘i loko standards and principles.

Sharing expertise between sites by working together to halihali pōhaku. Photo credit: Makasobe.

Building Capacity: Unification and Resource Exchange Through a Cooperative Model

To build and leverage HMLI’s full capacity, it is critical to develop sustainable capital. In other words, it is vital to think of our greatest resources as the natural world itself and the resources offered by the land and water locally. Sustainable lifestyles and resource exchange would be increasingly dependent on the land, not monetary gain. Money would be restructured as a tool such that communities could shift in the short term to a reality of “I need money; I don’t love money.” Ultimately kānaka are the bank and the product is a stronger culture. Natural resources are for local communities and the goal would increasingly be to offer such resources for reduced or no monetary cost.

Currently, too much monetary currency goes back to larger national and international agencies, not the local communities. Focusing on money as a top priority has led to more pain for people. There was a strong assertion within the needs assessment to develop a cooperative business model (non-profit)

within HMLI for cultural revitalization, rather than monetary gain. A cooperative is a farm, business, or other organization which is jointly owned and run by its members, who share the profits, benefits, and resources. The business vision would be to conduct a strategic search for significant sponsorship and grants to establish a $5-10 million reserve for a 501c3 non-profit organization to further cultural revitalization through HMLI. Committees could be established in each focus area or combined to be led by selected personnel within each focus area. In search of significant startup funds, all committees would target specific funders and political offices relevant to the interests of the focus area. Any significant funding secured would be offered Hui-wide for all to put to work and retain locally. Committees could also investigate possible sister nonprofits that could partner with and support HMLI (e.g., Kaʻalāʻiki, Kāwā).

Alternatively, a single grant committee could be developed that searches out all fundraising possibilities to develop the cooperative. It is critical that all levels of funding opportunities be strategically targeted. Small grants or "mini" grants can be used for a great many localized opportunities in education and work exchange which would not require significant travel funds. Many opportunities for smaller exchanges exist that would strengthen HMLI networks, such as opportunities to visit each other within moku or across a given island to learn about restoration in place while building upon network connectivity. The interest in such visits stresses the paramount priority of in-person, or face-to-face, experiences. Beyond grant writing, many options for fundraising within HMLI can be explored to support the cooperative business model, such as every November posting loko iʻa merchandise on a website that can be purchased for holiday gifts supporting sustainable lifestyles, local economies, and cultural revitalization. HMLI could also regularly set up a booth at the World Aquaculture Conference.

Restoration and education are often chosen as focal areas for grant writing, but HMLI feels its focus more broadly is a "re-wilding" of community, holistically, such that the restoration process is experiential education. Loko iʻa are natural nurseries that raise fish and populate those species back into the ocean. Simultaneously we, human communities, hold great capacities as natural nurseries to reconnect our species directly back to the ʻāina that sustains us. The more we "re-wild" our human communities utilizing all forms of knowledge (experience, instinct, intuition, intellect, etc.) and especially through regular, direct experience with non-human communities in the natural world, the more we ancestrally embrace our greatest capacities as humans individually and collectively, within communities.

Through this new model of resource exchange that is not centrally focused on monetary accumulation but instead on experiential connections to each other and the ʻāina locally, we can increasingly awaken and empower ancestral livelihoods as we unify and leverage our capacities. We can advocate and feel empowered to take action, rather than waiting for larger government agencies to develop

Transferring and sharing techniques across sites. Photo credit: Mozo.

and guide such action[4]. Kuleana to cultural revitalization through action (e.g., direct experience) is the driving and unifying force of such collective empowerment. The kānaka lead. State, county, federal, and university systems do not lead but could follow[5]. One impact of such empowerment could be a reshaping of how centers of cultural revitalization interact with the public. Kiaʻi don't go out to the public to sell a product. The community comes to us to help reconnect to local food sources and develop more sustainable lifestyles through resource exchange models including experience with the ʻāina, earning local sustenance, and renewing experiential education. For instance, educational pathways, particularly those of higher education, conventionally have communities physically travel to indoor classrooms to learn. HMLI could invert this process such that higher education degree pathways would be dependent on experience (i.e., time spent) working with the ʻāina through HMLI. And within political systems, KUA could leverage their resources to make similar reversals happen. Kiaʻi can gain understanding of legislative processes and learn about legislative committees most relevant to the HMLI's goals when state legislators visit and participate in loko iʻa restoration. Through such exchange, time invested in on-the-ground reconnection becomes a commodity of higher value than monetary accumulation. Through the cooperative paradigm time becomes a greater commodity than money because only through time invested do, we holistically connect with each other, the ʻāina, and local sustenance to develop more sustainable pathways that integrate all knowledge forms. Building holistic connections centered on the naʻau (i.e., heart / soul), each moku can increasingly come together and strengthen the local human communities and the ʻāina that sustains us.

Needs:

- Establish a $5-10 Million reserve for 501(c)3 to further cultural revitalization through HMLI.
- Develop grant committees by focus area to investigate opportunities for HMLI-wide funds.
- Investigate possible sister nonprofits that can partner with and support the Hui (e.g., Kaʻalāʻiki, Kāwā).
- Create committee dedicated to searching all fundraising possibilities including small or mini grants to use for localized opportunities.
- Create fundraising campaigns (e.g., conference booths or seasonal merchandise website).
- Make HMLI engagement opportunities widely visible to build experiential connections and develop positive image in community.
- Focus more on collaborative grant proposal writing to prevent competing with other loko iʻa and to show the value of the practitioner without having to justify.
- Require service fees for researching within loko iʻa to sustain work.

[4] Several Hui members have contributed to localized resiliency efforts during the COVID pandemic. These actions, during a time when many in their community were struggling to provide food for their families, demonstrates the contribution of indigenous practices, particularly loko iʻa, to the resilience of communities during pandemics and economic recessions, and the capacity to do so in response to natural disasters and climate change.

[5] HMLI members have also worked to amplify their voices and effective civic engagement to successfully influence policy at the city-county and state levels. This remains an area of growth but already, HMLI has collectively navigated the complicated permitting process often required for restoration and maintenance activities. Another example has been the engagement of kiaʻi loko in the development of culturally responsive economic recovery planning and initiatives during the COVID pandemic.

HE HUI HOʻOKAHI

"Ulu, always a great growing experience to come to this gathering, and kahina, coming to this weekend I saw a lot of kahina amongst all of us, not just leaning on each other but coming as one, to be kahi."

- Hui Mālama Loko Iʻa 2019 Gathering Attendee

Bring together collective manaʻo and mana to open gathering. Photo credit: Kanda.

Summary and Main Points

The concept of laulima is an important value among kiaʻi loko. In the same way that kiaʻi loko find empowerment in accomplishing physical tasks together, they also recognize the need for unified actions to change policies and the greater social, political, and economic context in which loko iʻa exist. We acknowledge that kiaʻi loko are not all the same, and loko iʻa are not all the same. There are many perspectives and priorities within HMLI, but this diversity fosters innovation and creativity when we come together. Kiaʻi loko emphasize the need to embrace all the assets within the group.

HE HUI HOʻOKAHI

A group singularly united

Subtopics

- Governance
- Advocacy
- Developing Care for Loko Iʻa in Local Government
- Supporting Livelihoods at Loko Iʻa
- Economics and Marketing

In order to accomplish this kiaʻi express a desire to develop a self-determined strategy and process, led by poʻo within HMLI, for building network and individual loko iʻa representation and aptitude in network self-governance. They also support a network self-determined strategy for network leadership/membership capacity and aptitude for formal and informal decision-making at all levels of government. Kiaʻi loko further seek collaborative strategies and actions to explore economic development futures where loko iʻa are valued again as a gold standard of community well-being and natural resource resilience.

Governance

HMLI first gathered in 2004, ten years prior to the facilitation and coordination support from Kuaʻāina Ulu ʻAuamo. Despite KUA's commitment to raise resources for gatherings and assist in guiding the agendas for physical gatherings, KUA aims to maintain a supporting role rather than a driving force in the direction and movement of HMLI. KUA regularly surveys kiaʻi loko to learn about emerging and/or common issues, and identify priority needs or ideas that HMLI collectively wants to work on. As the movement of this network progresses, KUA will continue to assist them in building their organizational foundation to grow towards the self-governance and self-determination that they envision.

Needs:

- Decision-making when speaking together:
    - Since 2014, an initial leadership structure has emerged in the recognition that poʻo play the role of representatives for their respective sites. However, some kiaʻi loko note a need for consistency in the point-of-contact for sites.
    - After using the framework of the six focus areas identified in 2018, there might be an interest in forming committees or some other structure around these focus areas to provide further leadership opportunities within HMLI.
    - Creating structure around the focus areas might also help with parceling out information for people to prioritize their interests.
    - There is no defined process for building consensus other than group dialogue; HMLI leadership might want to explicitly articulate a process in order to determine what should happen when they cannot reach consensus.
    - HMLI members might want to identify a process to resolve conflicts, or establish hoʻoponopono protocols.
    - Kiaʻi loko noted the importance of unified resolutions and statements for them to agree and affirm certain values, desires, actions, or policies. In their most recent resolution on the importance of fresh water, kiaʻi loko signed on as individuals who mālama their respective loko iʻa, but their respective organizations, whether incorporated formally or not, were not represented in the signatory process. As the internal governance of HMLI matures, we anticipate a discussion to address the question of how HMLI participants can sign on as organizations rather than as individual kiaʻi loko.
- Ensuring sustainability through transitions:
    - As HMLI gathered over 15 years, kiaʻi loko identified the importance of sustained momentum, anticipation of succession, and not repeating old conversations. For example, kiaʻi loko noted the opportunity to revisit the 1993 Governor's Task Force Report on Fishpond Restoration, which called for specific policy changes, funding mechanisms, and the development of a hatchery, among other key recommendations (Department of Business, Economic Development and Tourism, 1993).

    - Kia‘i would benefit from a system to document and archive discussions for future reference, as well as training or a process to facilitate leadership transitions both at individual sites and within HMLI collectively.
- Representation in government:
    - At the interface of internal governance and political influence is the idea that practitioners and experts of loko i‘a need representation in government, whether their ideals and values are represented in the actions and mindsets of policymakers, or the physical representation of kia‘i in decision-making.
    - We might increase the number of favorable candidates through educational interactions, but ultimately, we hope to promote and create a new generation of policy makers and natural resource managers.
    - Kia‘i would benefit from educational programs for those who might consider conventional governance leadership positions, as well as educational programs for currently elected or appointed law- and decision-makers.

Articulating a collective voice. Photo credit: Kanda.

Advocacy

Kia‘i loko recognize the need for effective interactions with government, where interactions may range from general communication to formal agreements. Several ideas were related to further articulation on how HMLI agrees to work together in their advocacy efforts, whether they develop a HMLI policy on advocacy or form an Advocacy Advisory Committee. There is an emphasis on the notion that the definition of advocacy for HMLI would come from the network, and that it is a diverse topic with many different perspectives coming from different loko i‘a and kia‘i loko. Kia‘i loko also hope to increase their understanding of regulations, policies, and processes already in place. A repository of relevant bills and laws could be a useful collective resource to build. KUA assisted HMLI to define, survey, and compile shared measures of progress in 2018. After discussing these first results of self-defined progress, kia‘i loko noted that these data can be very powerful for advocacy and that there is room for growth and further dialogue in communicating this information. For example, kia‘i loko could determine together what their measures mean and what they can and cannot say with them. Over the course of time, the story-telling through shared measures will demonstrate that HMLI affects change, and that individually and as a collective, they bring value to their communities and Hawai‘i in terms of culture and ethos, ecosystem health, and environmental resilience. This reaffirms the need for self-determined data gathering by kia‘i loko to tell their authentic story.

Voicing collective needs results in transformation in policy landscape. Photo credit: DLNR.

Needs:

- There were many ideas about curator or stewardship agreements, in particular a note to increase private and public agreements (e.g., Kauai mayor stewardship agreements for wahi pana, private landowner put a border around heiau on property; people can contribute to support hui that takes care of the site).
- Regarding loko iʻa on state-managed lands, a mālama ʻāina tax or fee could support stewardship, or legislators could allocate money for stewardship in their districts (e.g., capital improvement project funds). This discussion highlights the interest and need to understand more about co-management experiences.
- Training on proper and effective advocacy (e.g., what are the lobbying rules and roles for non-profits, around community and environmental advocacy? How can we work within the rules to push policy?)
- How do you write bills and laws; also what is the process thereafter?
- Information about accountability in the current processes, such as when kiaʻi loko have opportunities to influence decision-making despite political delays.
- Training on how to advocate more in the presence of people who make decisions about land and water use to address the larger systems that impact loko iʻa work.
- Ability to care for areas surrounding fishponds that organizations presently do not have access to.
- "Report card" as snapshot for the legislature; get specific data on legislators (Note: question on whether KUA or Office of Hawaiian Affairs [OHA] could help put this together.).
- Ways to learn more about current issues (e.g., which laws are moving through the legislature that may impact our wai/loko iʻa?)
- Training on the additional topics:
    - Legal understanding on "personhood" for nature
    - Permitting requirements
    - Access rights on federal land

- Variances or exemptions for cultural practice/public interest
- Federal, State, and local differences: How do sites deal with enforcement and laws of different levels?
- How do traditional laws translate to today?
- Historic preservation issues
- National Environmental Policy Act (NEPA)//Environmental Impact Statements (EIS) processes
- International Union for Conservation of Nature (IUCN), International Resolutions and what is IUCN?

Developing Care for Loko I'a in Local Government

Practitioners of mālama ʻāina often struggle with the question of how to inspire care for their places and raise awareness of the benefits to the community and to the policy world. There are ideas for how to increase interactions with elected officials by inviting them to our places, in addition to inviting decision-makers (e.g., regulatory agencies related to permitting) to our meetings. Some suggestions for public campaign ideas included the "year of the loko iʻa" to uplift loko iʻa, or holding a "state of the loko iʻa" on a regular basis to highlight HMLI's collective progress. HMLI has seen some success in the State Shrimp Bill proposed by the Hui Loko Proposal, which inspired the state to strengthen protections for anchialine ecosystems.

Needs:

- More invitations to decision-makers to come to meetings.
- Increase visibility within public through campaigns that elevate loko iʻa.
- Turn the state capitol tilapia pond into aquaculture system that officials care for.
- The state should be an active ally of fishponds and not a barrier to permitting or access.
- Focus advocacy on key needs first, such as a hatchery which can benefit much more than just Indigenous loko iʻa by enhancing surrounding nearshore fisheries.

Supporting Livelihoods at Loko I'a

By applying the collaborative values of laulima to the internal governance and outward-facing advocacy of HMLI, the network can create a better context for kiaʻi loko to ensure that a livelihood of mālama loko iʻa can be perpetuated for many generations to come. Currently, despite the many ideas and innovations expressed by kiaʻi loko in both private and public forums, the political and economic systems have not made it possible for fishponds to be common places of thriving livelihoods. However, given the context of 2020 and the increased attention to diverse economic pathways for Hawaiʻi beyond tourism, combined with the efforts to increase local food production, there are new opportunities for loko iʻa to be examples of self-determination for the economic frameworks in their communities.

There is an underlying question of whether or not the government can create opportunities (in both policy decisions and in funding) for mālama ʻāina work to uphold native rights and recognize traditional/Indigenous practice. More permanent solutions are needed to perpetuate cultural practices, such as including more cultural practices and practitioners in bills of regulations, or insisting the state include cultural resource specialists to advise their management.

Needs:

- How can we be more informed about the real rights that our kūpuna developed for Hawai‘i?
- In policy decisions, are there any situations where cultural need outweighs a western policy? (e.g., is there advocacy required to ensure worker’s rights if they perceive/believe that a project needs to proceed even if it is unpermitted?)
- What are the components of empowerment for kia‘i?
- How can we develop effective policies to maintain freshwater flow to loko i‘a?
- Why won’t the state give communities back their fishponds when we see the mutual benefits of community and fishpond care?

Economics and Marketing

In terms of a shared model of loko i‘a organizations, a cooperative framework centered on cultural revitalization might be used as a business and education model to reposition money as a tool rather than as a main driver of such organizations, ultimately changing the narrative around how our communities define “value.”

Voicing collective needs results in group conversation with the help of flipcharts. Photo credit: Kanda.

Needs:

- Development of circular economy frameworks.
- Basic economic evaluation of loko i‘a agro-ecosystem services to better visualize benefits to government and community.
- Market loko i‘a as productive lands within City and County Climate Change Commission managed retreat strategies.
- Develop natural resource damage assessment process for loko i‘a (e.g., NOAA has one for wetlands).
- Live rock (e.g., coral) industry to export to mainland aquariums.
- A new trade name or trademark for fish raised in loko i‘a could help distinguish fishpond products from “wild caught” and “farm raised.”
- Kia‘i loko also want to learn if farm subsidies could be developed to help support their livelihoods.

CLOSING & REFLECTIONS

Lessons Learned

The priorities and needs synthesized in this report are the product of a multi-year process of relationship building and knowledge sharing across the Hui Mālama Loko I‘a. Only through years of iterative reflection has it been possible to begin telling a collective story of the needs, interests, visions, and ideas of the Hui Mālama Loko I‘a.

Applying a framework developed by the HMLI was essential in this process of assessing climate needs. The six interconnected focus areas outlined here reflect how kia‘i view their role and the role of loko i‘a in sustaining the physical, ecological, and spiritual health of the Hawaiian Islands. Without this holistic kia‘i centered approach to understanding resilience and adaptation it would not have been possible to develop a needs assessment that represents a relevant and meaningful compilation of loko i‘a knowledge and priorities.

The results of this project were compiled and synthesized by individuals separated not only from their places but from their hui and relationships during the COVID-19 pandemic. In the wake of COVID-19 a holistic approach to building resilience will be all the more important for the long-term recovery and self-determination of the Hawaiian Islands.

Partnership Opportunities

The process of developing this report included bringing together kia‘i and academic based researchers interested in knowledge co-production. The November 2019 po‘o meeting at Moku o Lo‘e (O‘ahu) invited cross-disciplinary researchers from the University of Hawai‘i to engage in dialogue and knowledge sharing with members of the Hui Mālama Loko I‘a. Much work still remains to continue improving communication and grow relationships between kia‘i loko and academic research institutions in Hawai‘i. Our hope is that this report will serve as a tool to further that growth in a reciprocal and equitable fashion.

> O ke kahua ma mua, ma hope ke kūkulu – Make the foundation solid before you build on top.
>
> -'Ōlelo No'eau shared to HMLI by Peleke Flores

It is important to recognize that this report captures the needs and perspectives of a particular set of kia‘i at a particular moment in time. The best way to form a research partnership to explore any of the needs or questions outlined here is to develop a relationship with a loko i‘a and the kia‘i that care for it. Spend time learning from the loko i‘a and its stewards to better understand how the priorities and needs expressed in this assessment apply locally. The Kūlana Noi‘i offers additional guidance for building and sustaining reciprocal research partnerships with kia‘i loko and other stewards of place. For those interested in establishing a partnership or learning more about this report and the questions it brings to light please visit www.kuahawaii.org/resilientlokoia.

The Future (and History) of Loko I'a Adaptation

Loko i‘a are themselves the products of adaptive decision making informed by multiple generations of accumulated observation to optimize changing tides, weather, and environmental conditions. Kia‘i loko have adapted to climate shifts over many centuries. However, contemporary human-induced climate shifts are unprecedented in their scope and rate of change. Thriving through these changes will require a holistic approach to adaptation that includes all aspects of community.

Ultimately, we look to the way our kūpuna regarded loko i‘a: fishponds were considered a touchstone, benchmark, and a gold standard of ‘āina momona. They can serve as a litmus test for coastal health, and they also indicate the health of their surrounding ahupua‘a and human community. We envision that loko i‘a will regain a major role in our food system providing food and education for all people willing to put in the work. As we anticipate the need to adapt to shifts in our weather and climate, our evolving shared indicators of fishpond health will use food system frameworks as well as mauka-makai connections, inclusive of (1) data and knowledge rooted in academic research and (2) in the practices and knowledge gathered and developed by Indigenous people and local communities. As the purpose and intent of this project itself acknowledges:

> ‘A‘ohe pau ka ‘ike i ka hālau ho‘okahi - All knowledge is not learned in one school.
> -‘Ōlelo No‘eau

Working as one through a halihali line. Photo credit: Holladay.

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APPENDICES

Appendix A: Additional Resources About Loko I'a

Kamakau, S. M. (1976). *The Works of the People of Old: Na Hana a Ka Po'e Kahiko*. Bishop Museum Press.

Kamakau describes how Hawaiians traditionally cultivated fish in fishponds, detailing pond construction, maintenance and harvest. Also describes some of the rules associated with the fishponds.

Kikuchi, W. K. (1976). Prehistoric Hawaiian Fishponds. *Science*, 193(4250), 295–299. https://doi.org/10.1126/science.193.4250.295

Kikuchi argues that the complex aquacultural system of fishponds was one of the reasons that Hawai'i developed a complex, highly stratified society.

Manu, M. (1992). *Hawaiian Fishing Traditions* (D. Kawaharada, Ed.). Kalamaku Press.

Each story of Hawaiian fishing traditions in this collection is followed by analysis of the tale within its historical and social context. Included is the story of Kū'ula-kai, Hawaiian god of fishing, and analysis of how a traditional Polynesian war god (Ku) became associated with fishponds in Hawai'i.

Project Kahea Loko. (2003). The Call of the Pond: A Teacher's Guide to Hawaiian Fishponds Grades 4-12. Pacific America Foundation.

This project seeks to incorporate Hawaiian fishponds as learning tools, guiding teachers through units on the physical setting of Hawaiian fishponds, life in a fishpond, early Hawaiian fishponds and fishponds today. Includes teaching materials and readings targeting different grade levels between grades 4-12.

Summers, C. (1964). *Hawaiian Fishponds.* Bishop Museum Press.

Offers an overview of the different types of Hawaiian fishponds and their construction and maintenance. Serves as a good introduction to the topic.

Wyban, C. A. (1992). Tide and Current: Fishponds of Hawai'i. Kolowalu Books.

Wyban, who maintained a fishpond with her husband for four years, describes the history and technology of ancient Hawaiian fishponds, and offers suggestions for ways to maximize fishpond use in the future. Includes in depth description of Lokoea, the fishpond the Wybans managed from 1981-1985.

Appendix B: Sites Represented, Contributors, Facilitators, Writers

Sites Represented: The following loko iʻa are represented through the direct participation of their kiaʻi loko as contributors to the conversations held in 2019. Importantly, we note that 18 additional sites have participated in the Hui Mālama Loko Iʻa over the years, but their issues may be reflected in cumulative conversation rather than through direct participation of their kiaʻi loko in the 2019 conversations.

Hawaiʻi: Haleolono, Honokea, Honuʻapo, Hoʻonoua, Ka Loko o Kīholo, Kaʻalāʻiki, Kaʻelehuluhulu, Kalāhuipuaʻa (including Kahinawao, Waipuhi, Waipuhi Iki, Hope'ala, Milokukahi, Manoku), Kaloko, Kohanaiki, Kuʻualiʻi and Kahapapa, Waiāhole (including Kionakapahu, 'Akahi, Kapalaho), Waiakauhi

Maui: Hokuʻula, Kapoho, Lehoʻula

Lānaʻi: Waiaʻōpae

Molokaʻi: Aliʻi, Kahinapōhaku, Kalokoʻeli, Keawanui, Kūpeke

Oʻahu: Heʻeia, Huilua, Kahouna, Kalauhaʻihaʻi, Kānewai, Kapapapuhi, Kawainui, Kuhiawaho, Loko Ea, Luamoʻo, Mokauea, Mōliʻi, Paʻaiau, Pāhonu, Waikalua Loko

Kauaʻi: Alakoko, Hōʻai, Nōmilu

Contributors: The following individuals attended one or more of the three Hui Mālama Loko Iʻa gatherings in 2019 where facilitated discussions led to the cumulative and collective manaʻo reflected in this document. In some cases, verbatim phrases were used from individual post-it notes, and we hope this synthesis maintains the integrity of the knowledge and ideas of these kiaʻi loko:

We sincerely apologize to anyone we missed!!

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Facilitators: The following individuals facilitated both large and small group discussions among kia‘i loko from 2014 - 2019, leading to ideas such as initial working groups (2014), priority issues and needs (2015 and 2017), and conclusions such as the current vision and mission statements (2015-2016) and focus areas upon which this document is framed (2018-19). Mahalo for the grace, talents, and abilities of these colleagues and friends to create safe spaces for us to truly hear each other.

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Appendix C: Personal Closing Perspectives

One word or short phrase with explanations shared during the closing circle at the 2019 Annual gathering at Moanui (Molokaʻi). These closing perspectives highlight the importance of in-person experiences.

- **Kūpuna:** lāhui, hoʻomau kākou, everybody perpetuate, ʻeleu, ʻohana
- **Kuaʻāina**: as the backbone of this ʻāina, perpetuating and standing firm for what they believe in as well as their customs and practices by their practice of subsistence fishing and farming
- **Hanaunahou:** I see all the generations here learning from the kuaʻāina and perpetuating that practice, may your generations be as passionate
- **Piko:** as we hoʻi hou ka piko, both ʻike sharing and ʻike received via kūpuna
- **Piha:** super piha in my naʻau, from all the food, from all the vibes, grateful for ʻohana, super humbling for me to be hanai-d into ʻohana loko...just started in Jan and it's a beautiful process, and to have the privilege to come here and be surrounded by so many other ʻohana that creates a bigger one, all that connectivity is super crazy and I love it.
- **Proud:** of the flow you all found with each other and soul feeding
- **Fire:** you guys are a fiery bunch. You people satisfy my ʻono
- **Ulu**: always a great growing experience to come to this gathering, and kahina, coming to this weekend I saw a lot of kahina amongst all of us, not just leaning on each other but coming as one, to be kahi
- **ʻEʻehia**: one of the meanings is awesome, and understanding that the root of awesome comes from the Bible and describes Akua, this space and all the ʻohana taking care of us
- **Pilina:** mahalo no ka pilina, pilina kanaka, pilina ʻāina, pilina ʻuhane, I always get recharged seeing Hawaiian faces, getting to work with you
- **Practice**: words either written or spoken are much stronger when they're driven by far more practice (in-person experience) than words
- **Independence**: this circle always reminds me of that progress we're making towards it and to not ignore all the hard work that our kūpuna put upon this place for us
- **Progress collectively**: when I come to these gatherings, it's nice to strengthen the pilina and relationships with you all, it takes me a long time to open up and be myself and get to know people, and through the years, I feel like I'm really getting to know everybody and it's becoming more like a deeper relationship. The work we do together, the progress is a pretty powerful strength that the hui has together and really seeing the momentum of that progress of us actually being able to achieve the things we were dreaming about years ago, and we're going there and doing it and it's pretty impressive.
- **Kupaianaha:** each and every one of us brought our ancestors with us
- **Synergy:** more than normal can be accomplished when a number of people come together with a shared vision and intent.
- **Community:** want mahalo you all for allowing me to share your story. Being newer to these islands, sometimes isolating as an academic, we forget to come down and get out of that and embrace the community that we live in, mahalo for embracing me

Appendix D: Suggested Future Workshops or Trainings to Develop

- Loko iʻa legislative engagement workshop with State and other administrative officials with opportunities to show officials what kiaʻi loko do for our communities
- How to empower bills with the notion of our centralized resources
- Grant application and writing
- Practitioner sharing workshops
- Haku mele and oli
- Cultural confidence training
- Overview of research related to loko iʻa
- Developing effective experimental design and understanding data analysis
- Laws about agricultural theft
- How and where to talk about protecting our loko iʻa
- Best practices for lawaiʻa to empower local enforcement of loko iʻa resources
- Best practices for cleaning and harvesting iʻa and limu
- Expanding the connection in your place and space
- Papakū Makawalu methodologies
- Moon calendar creation
- Storytelling
- Foundational moʻolelo and kaʻao to loko iʻa practice
- Relevant State and County policies and regulations
- Fertilizer workshop
- Measuring and counting fish methodologies
- Building hale
- Building umu
- Building kuapā; foundations and techniques of wall building for different loko settings
- Building mākāhā
- Activating Kanaloa
- Indicators of fishpond health
- Water rights and access
- Food system language and policy to get loko-raised fish on the market
- Conflict resolution of hoʻoponopono protocol

"Hanaunahou, I see all the generations here learning from the kua'āina and perpetuating that practice, may your generations be as passionate."

- Gathering participant

"It is the 'āina that teaches us, and the oral traditions that document our relationship with the 'āina. The lessons our kūpuna learned and the interdependence they shared are alive in our 'āina today. I am certain that the intricacies within 'ōlelo, mo'okū'au'hau, mo'olelo, mele, lo'i, loko i'a, and heiau ground us in who we were as servants to this land, and will manifest as the answers we need to thrive if indeed we look to these sources. In the context of research, this knowledge, experience, and aloha from 'āina will also provide the next generation of scholars with systemic frameworks to further liberate academic scholarship."

- Summer Puanani Maunakea, "Arriving at an 'Aina Aloha Research Framework: What is Our Kuleana as the Next Generation of 'Ōiwi Scholars?"

Aerial perspective of wall building. Photo credit: Kanda.