Traditional and contemporary Hawaiian social-ecological systems: informing governance arrangements for loʻi kalo restoration and Land Back

A thesis submitted by

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Abstract

This thesis started with the assumptions that 1) Hawaiian social-ecological system (SES) restoration increases the sustainability and resilience of Hawaiʻi and, thus, should be supported, and 2) kalo (taro) is a biocultural keystone component of the Hawaiian SES and should thus be a priority in 21st-century restoration efforts. With these in mind, this thesis aimed to explore the meaning of Hawaiian SESs historically and today, as well as governance arrangements to restore these systems through case studies of Kīpahulu ʻOhana and Hoʻokuaʻāina's kalo cultivation amid western governance, land tenure, and economic systems. The case studies illuminated thirteen governance arrangements that enabled Hawaiian SES restoration through kalo cultivation. Four enabled land access and control, five enabled land protection, three enabled co-stewardship, and two enabled traditional lifeways. This thesis found that governance arrangements in support of Land Back and rematriation were foundational to meaningful Hawaiian SES restoration.

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Glossary

Ahupuaʻa: a social-ecological community; a smaller land division within a moku

Akua: deity

Aliʻi: chief

Canoe plants: Polynesian-introduced crops

ʻĀina: land, earth; “that which feeds”

ʻĀina momona: “fat land” or “abundant land” in the context of food production; a state of enduring resource abundance achieved by the Hawaiian SES pre-contact

ʻĀina Organizations or ʻĀina Hui: organizations working on biocultural restoration in Hawaiʻi

ʻĀumakua: family or personal gods, deified ancestors who might assume the shape of a natural entity such as an animal or a rock

ʻĀuwai: irrigation ditches

ʻIli: land unit within an ahupuaʻa, frequently associated with an extended family

ʻOhana: family

ʻŌiwi: Indigenous Hawaiian

Hui: group or organization

Kalo: taro

Kanaka: human being; Hawaiian (plural: kānaka)

Kapu: access or harvest restrictions; sacredness

Kilo: to watch closely; to observe

Kīpuka: oasis within a lava bed where there may be vegetation

Konohiki: land agent who managed the people and biocultural resources of an ahupuaʻa

Kuaʻāina: country (as distinct from the city), countryside, or person from the country

Kuleana: responsibility

Kūpuna: elders; ancestors

Loʻi kalo: irrigated terrace or field for growing taro

Lōkahi: harmony; unity

Maka‘ainana: regular people

Makai: toward the ocean

Mālama: to take care of

Mauka: toward the mountains

Mauka-makai: mountain to ocean

Mo‘olelo: story, history, legend

Moku: large district or social-ecological region usually aligned with ecoregions

Pilina: relationship; connection

Pono: well-being through balanced and judicious rule

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Chapter 1: Introduction

The sustainability and resilience of traditional Hawaiian socio-ecological systems (SESs) are well documented. Pre-western contact, Hawaiians lived sustainably on the islands for hundreds of years, supporting an estimated population of over a million people (Winter et al., 2023). Under Indigenous Hawaiian systems of stewardship and governance, the footprint of human-transformed areas across the Hawaiian islands comprised less than 15% of the total land area while providing 100% of human needs (Gon et al., 2018). Additionally, under these systems, Hawaiʻi was one of only nine civilizations on the planet that independently developed into a nation-state before the industrial era (Hommon, 2013).

Even amid a large human population, Hawaiian SESs enabled a state of enduring resource abundance, known as ʻāina momona, throughout the Hawaiian civilization. Winter, Beamer, et al. (2018, p. 2) explain:

> "The word "ʻāina" is a derivation from the word "ʻai," which means "food, or to eat," with the nominalizer "na" added to literally mean "that which feeds," but is generally used as a noun meaning, "Land, earth." The word "momona" is an adjective meaning "Fat; fertile, rich, as soil; fruitful...". Thus, the term ʻāina momona is commonly translated in the contemporary period as "fat land" or "abundant land" in the context of food production. ʻĀina momona was achieved and maintained [pre-western contact] through careful management on a landscape scale, which extended from the mountains to the sea."

Despite resistance by the Hawaiian people, following contact in 1778, American and European colonizers began to systematically dismantle the belief systems that governed resource extraction, delegitimize Indigenous Hawaiian knowledge systems, and dispossess Hawaiian peoples of their lands (Winter et al., 2023). These changes also brought significant transformations of landscapes and waterways, a shift from agroecology to monoculture farming, and changes in governance and resource management from a decentralized approach to a centralized one (Kame'eleihiwa, 1992; Winter, Beamer, et al., 2018; Winter et al., 2023). 'Ōiwi (Indigenous Hawaiian)-led governance of the independent Kingdom of Hawaiʻi adapted and evolved despite these colonizing pressures (Beamer, 2014). Still, the Kingdom was illegally

overthrown by the US in 1893 (Barger et al., 2024; Winter et al., 2023). The Hawaiian Kingdom and its citizens never officially relinquished their sovereignty to the US (Silva 2004). Yet, the US annexed Hawaiʻi as a territory in 1898 and admitted Hawaiʻi as its 50th State in 1959 (Winter et al., 2023).

Modern-day outcomes of the settler-colonial systems introduced to Hawaiʻi stand in stark contrast to the sustainability and resilience of pre-contact Hawaiian SESs. Today, Hawaiʻi imports 90% of its food and energy (Gon & Winter, 2019). Thus, self-sufficiency, expressed as a lack of importation, has fallen from 100% in the pre-contact period to 10% or less in the 21st century. At the same time, habitat loss, invasive species, and over-extraction since the colonial period have led to Hawaiʻi having one of the highest rates of extinction and percentages of endangered species globally (Department of the Interior, 2016; Sakai et al., 2002; Winter et al., 2023). Socially and economically, Hawaiʻi is also not performing well. For example, Hawaiʻi's economy is dependent on a fickle and extractive tourism industry (Beamer et al., 2021), housing is increasingly inaccessible, and the exorbitant cost of living is increasingly causing Hawaiians and locals to be priced out of their homes and communities (Barger et al., 2024; Vaughan, 2018). Moreover, the social-ecological landscape in Hawaiʻi today has shown a lack of resilience in the face of climate change, leaving Hawaiʻi vulnerable to its effects. This vulnerability and lack of resilience were exhibited during the 2018 Kauaʻi floods (NOAA, 2018), the devastating August 8, 2023, wildfires on Maui (Roy et al., 2024), and more (Climate Change Brief, 2018).

Despite the history of colonizers systematically dismantling ʻŌiwi SESs, these traditional systems adapted, endured (Beamer, 2014), and are gaining strength today (Mahi et al., 2024). Additionally, as Winter, Beamer et al. (2018, p. 1) write, “Through research, restoration of agro-ecological systems, and a renaissance of cultural awareness in Hawaiʻi, there has been a growing recognition of the ingenuity of Hawaiian biocultural resource management systems.” As a result of this heightened awareness, traditional Hawaiian SESs are often labeled as the

“Ahupuaʻa System” and put forth as a model of sustainability for modern Hawaiʻi (Winter, Beamer, et al., 2018). However, many modern western notions of Hawaiian SES restoration fall short. For instance, despite talk of restoration, authors such as Enos & Tamanaha (2022) and Sproat & Palau-McDonald (2022) demonstrate that Hawaiian culture is often romanticized and relegated to the past. Similarly, when officials talk about restoring the ahupuaʻa system, there is little acknowledgment that the ahupuaʻa is only a piece of a larger complex ʻŌiwi SES (Winter, Beamer, et al., 2018).

That said, meaningful Hawaiian biocultural system restoration would not only benefit Hawaiians striving to maintain traditional values and regain sovereignty, but it also has the potential to benefit Hawaiʻi at large in numerous ways, from climate resilience and sustainability to community well-being and economic resilience (Beamer et al., 2021; Gon et al., 2018; ʻĀina of Kaʻōnohi et al., 2023; Leung & Loke, 2008; Mahi et al., 2024). Consequently, this thesis aims to contribute to a growing body of work that is generating ideas for governance arrangements (GA) that support Hawaiian SES restoration (Andrade, 2008; Diver et al., 2019; ʻĀina of Kaʻōnohi et al., 2023; Kanahele et al., 2016; Kealiikanakaoleohaililani & Giardina, 2016; Kurashima et al., 2018; Mahi et al., 2024; Vaughan, 2018; K. Winter et al., 2023; K. B. Winter et al., 2022).

This thesis investigates GAs that supported ʻŌiwi SESs pre-contact, as well as how traditional Hawaiian SESs are practiced today through loʻi kalo cultivation (the practice of using irrigated terraces for growing taro), amidst a westernized governance structure and economy. The research focus on loʻi kalo is based on Winter, Lincoln, et al. (2018) findings that kalo (taro) cultivation is a biocultural keystone component of the traditional Hawaiian SES. As with keystone species in ecology, biocultural keystone elements disproportionately influence system function and structure (Paine, 1969; Winter, Lincoln, et al., 2018). In an ecosystem, removing a keystone species would result in a relatively large number of secondary extinctions, causing the system to reorganize itself with a new structure (Christianou & Ebenman, 2005; Pimm & Gilpin,

2014). The researchers assert that the same concept applies to SESs and demonstrate that restoring the function of keystone elements is vital to restoring the structure of SESs observed to be in decline (Winter, Lincoln, et al., 2018). Since kalo cultivation is a biocultural keystone of the Hawaiian SES, it is vital to the structure and function of the Hawaiian SES and should be prioritized in biocultural restoration efforts. Consequently, this thesis focuses on unearthing GAs that enable loʻi kalo cultivation.

This thesis explores these GAs through two case studies, guided by the following research questions:

1. What governance arrangements supported ʻŌiwi SESs through loʻi kalo cultivation in Kīpahulu Moku and Kailua Ahupuaʻa?
2. How are ʻŌiwi SESs practiced today through loʻi kalo cultivation amid the modern social-ecological landscape in Kīpahulu Moku and Kailua Ahupuaʻa?
3. How can these cases help generate ideas about governance arrangements that enable Hawaiian SES restoration through loʻi kalo cultivation?

Each case study is of an ʻĀina Organization focused on lo'i kalo restoration and cultivation: Kīpahulu ʻOhana and Hoʻokuaʻāina. Kīpahulu ʻOhana is a nonprofit based in Kīpahulu Moku (district), a rural area of East Maui (Kīpahulu ʻOhana, 2012). Kīpahulu Moku has been relatively out of reach of modern development, allowing many aspects of the pre-contact Hawaiian SES from this place to continue (McGregor, 2007). The Maui organization stewards loʻi kalo on federal land through a cooperative agreement with Haleakalā National Park (HNP) (Haleakalā National Park et al., 2003; *Kapahu Living Farm*, n.d.). Hoʻokuaʻāina is a nonprofit organization based in Kailua Ahupuaʻa (smaller land division within a moku) (*Home*, n.d.), an urbanized area of Oʻahu (U.S. Census Bureau, 2021). Hoʻokuaʻāina cultivates kalo on a plot of agricultural land (City and County of Honolulu Department of Planning and Permitting, n.d.) that the founders privately own (*Origin Story*, 2024). Kīpahulu ʻOhana provides insights into GAs enabling loʻi kalo cultivation in a rural area where pre-contact ʻŌiwi SESs have evolved but largely continued.

Hoʻokuaʻāina offers insights into an urban area on an island dramatically influenced by colonization and modernization (Gon et al., 2018). The two perspectives are intended to help capture GAs that apply to kalo cultivation projects in different settings.

The thesis explores these research questions in the following manner: Chapter Two presents the methodology and methods used. Chapter Three provides an overview of relevant literature to ground the thesis in existing scholarship and show how this work fits into ongoing restoration efforts. Chapter Four and Five are case studies of Kīpahulu ʻOhana and Hoʻokuaʻāina, respectively, through which research questions one and two will be explored. Chapter Six addresses research question three through a discussion of findings from the case studies. Chapter Six ends with recommendations and conclusions for ʻĀina Organizations, policymakers, and planners to better support the restoration of Hawaiian SESs through loʻi kalo cultivation.

Chapter 2: Methodology and Methods

This chapter presents a positionality statement, methodology, and methods used to answer the research questions. It provides a justification for the use of case studies as a tool for understanding traditional and contemporary Hawaiian SESs and GAs that enable loʻi kalo restoration today, along with a rationale for the choice of case studies, and a description of the case study analysis framework.

2.1 Positionality statement

I am from Hawaiʻi – born and raised in Kaimuki on Oʻahu. However, I am not Native Hawaiian. I have had a privileged education. I received a B.S. in Environmental Science from the University of Oregon and am currently a candidate for an M.S. in Environmental Policy and Planning at Tufts University. I care about this topic for three main reasons. First, I believe there are many things to learn from Indigenous lifeways, especially regarding living a sustainable and meaningful life on this planet. I believe western capitalist culture incentivizes behavior that

encourages unsustainable and harmful exploitative activities and discourages activities that make people truly happy and fulfilled, such as community relationships and connections to nature. So, in that sense, I believe in the amplification of Indigenous lifeways because I think doing so will help restore the planet's ecosystems, help humans learn to live sustainably on this planet, and help people realize more fulfillment in life. Second, the more I learn about the history and continuation of the US occupation of Hawaiʻi, colonizers' attempts to erase Hawaiian and other Indigenous cultures, the systematic dispossession of Indigenous lands, and more, the more I am compelled to support ongoing efforts to correct these historic and ongoing injustices. Third, being from Hawaiʻi, I feel a sense of kuleana (responsibility) to the place that raised me. Growing up white in Hawaiʻi has amplified this feeling of kuleana because although I was born there, I understand I am still a guest. I recognize that as a non-Native Hawaiian, there are limits to the contributions I can make. Still, my hope is that my thesis can help support ongoing Kānaka ʻŌiwi-led biocultural restoration efforts in Hawaiʻi. Given my positionality, the contributions I can make include uplifting the importance of biocultural restoration in Hawaiʻi, elevating Native Hawaiian organizations working on biocultural restoration and helping increase their exposure to potential partners, funders, and volunteers, spreading the story of the US's historical and ongoing illegal occupation of Hawaiʻi, and, as someone who wants to eventually move home and work in the policy and planning field, expanding my own understanding of the barriers, tensions, and opportunities to biocultural restoration in Hawaiʻi.

2.2 Methodology

I approached this research from a transformative and emancipatory paradigm. "In the transformative paradigm, the purpose of research is to destroy myth, illusions, and false knowledge and empower people to act to transform society." (Chilisa & Kawulich, 2012, p 13). In this case, transforming society entails moving beyond western worldviews of economic progress, extraction, development, and individual gain toward supporting ongoing Hawaiian biocultural restoration efforts. A transformative and emancipatory methodology can employ

quantitative and qualitative methods (Chilisa & Kawulich, 2012). Given my positionality as a white person and my research paradigm of moving beyond extractive western approaches, I chose to use qualitative methods, specifically case studies. My commitment to transformative and emancipatory methodologies also helped guide my source selection. Rather than using only western sources to understand traditional Hawaiian SES GAs, I also sought out traditional Hawaiian sources such as oli (chants) and moʻolelo (stories) and relied on them where possible. Moreover, to increase the chances that this research could support ongoing biocultural restoration efforts meaningfully, I conducted informational interviews with leaders and scholars in the Hawaiian biocultural restoration space.

2.3 Methods

2.3.1 Informational interviews and initial literature review

I identified people to conduct informational interviews with by reaching out to leaders in the biocultural restoration space from my network and was connected to others from there. The knowledge holders I spoke with included experts from state and county planning departments, the Office of Hawaiian Affairs, Native Hawaiian scholars from the University of Hawaiʻi, and Native Hawaiian ʻĀina Organization leaders. Additionally, I talked story with folks I met at ʻāina restoration days at Puʻuhonua O Waimānalo and ʻĀina Organizations. I asked folks about their experience in the biocultural restoration space, current initiatives to weave the ahupuaʻa system with the modern western system, what angle of my thesis research would be most relevant and applicable to helping ongoing efforts, what sources they recommend I read, and if there were any other people they recommend I speak with.

The sources and ideas gleaned from these informational interviews guided my research questions and literature review. The literature review topics were chosen based on the research questions to provide a broad understanding of each subject explored through the cases. Much of the literature I found on governance and co-governance arrangements for biocultural

restoration in Hawai‘i focused on marine ecosystems and fisheries. So, I decided to focus on land-based biocultural resources to highlight this less-explored research area. The finding from Winter, Lincoln, et al. (2018) that kalo cultivation, a land-based biocultural element, is a keystone of the Hawaiian SES inspired the focus of this thesis on kalo cultivation.

2.3.2 Case study approach rationale

Generally, a case study approach is good for understanding complex social phenomena (Yin, 2003). Yin (2003, p. 13) explains that a case study is "an empirical inquiry that investigates a contemporary phenomenon within its real-life context especially when the boundaries between phenomenon and context are not clearly evident." Whereas experimental research intentionally controls variables to study phenomena independent from their contexts, case studies are strong methods for analyzing phenomena where the distinction between variables and context is blurry (Yin, 2003). Moreover, a case study method is particularly suitable for research questions that start with "how" rather than "what" or "why" (Yin, 2003). It is advantageous when the researcher has limited control over the events being studied and when the research focuses on understanding a current phenomenon within a real-life context (Yin, 2003). In this thesis, a key strength of the case study approach is that it is non-extractive. That is, it does not take resources from the Native Hawaiian organizations being studied. For the above reasons, the case study method is ideal for the exploration undertaken in this thesis.

2.3.3 Justifying case choices

The choice of cases was determined based on a multi-criteria decision assessment (Table 1). The criteria were chosen based on findings from the literature review, the availability of public information, personal connection to the place, and whether the research could benefit the organization. The literature review revealed that kalo cultivation is a keystone biocultural resource for Hawaiian SESs and should be a focal point for biocultural restoration efforts (Winter, Lincoln, et al., 2018). Mahi et al. (2024) introduced the transformative potential of ‘Āina

Organizations for Hawaiian SES restoration through ecological restoration and political resurgence of Kanaka ʻŌiwi. Thus, ʻĀina Organizations focused on kalo cultivation was the baseline requirement for choosing case studies. A focus on local food production was another criterion, given that abundant food systems were central to the pre-contact Hawaiian SES (Winter, Beamer, et al., 2018). Based on concepts of cultural kīpuka (oasis within a lava bed where there may be vegetation) presented by McGregor (2007) and Mahi et al. (2024), I wanted to include one case that is a cultural kīpuka in an urbanized landscape, as well as one that is a rural cultural kīpuka where traditional lifeways have largely continued. So, I included full moku stewardship and subsistence economies to the decision criteria as key elements of traditional Hawaiian SESs (McGregor, 2007; Winter, Beamer, et al., 2018). Other criteria included a personal connection to at least one case, the cases were not overstudied, and resources about the places were publicly available and accessible. Kīpahulu ʻOhana and Hoʻokuaʻāina meet the decided-upon criteria (Table 1). The two perspectives are intended to help capture GAs that apply to kalo cultivation projects in different settings and for varying degrees of Hawaiian SES restoration contexts.

Table 1: Case study multi-criteria decision matrix for Kīpahulu ʻOhana and Hoʻokuaʻāina.

Case study criteria	**Kīpahulu ʻOhana**	**Hoʻokuaʻāina**
Keystone biocultural resource	yes (kalo)	yes (kalo)
ʻĀina Organization	yes	yes
Food production	yes	yes
Subsistence community	yes	no
Full moku stewardship	yes	no
Personal connection	somewhat (camped in Kīpahulu as a kid)	somewhat (grew up on Oʻahu and frequented the Kailua area)
Isn't overstudied	somewhat (yes for this topic)	yes

Resources are publicly available and accessible	yes	somewhat

2.3.4 Case study analysis framework

Each case includes background information on the location and the organization, followed by analysis through the three research questions presented in Chapter 1. The analysis framework was guided by Yin's (2003) recommendations for research design in case study research. Data collection focused on kalo cultivation and connected land ecosystems and management projects. Question two contained two parts: part one explored the tenets of traditional SESs that the case reflected through kalo cultivation, and part two explored how these case's modern Hawaiian SESs fit within modern governance and economic structures. The analysis framework and purpose of each question are explained in Table 2 below:

Table 2: Case study analysis framework summary for each research question (RQ).

Research Question	Units of analysis	Data collection filter	Purpose
1. What governance arrangements supported pre-contact ʻŌiwi SESs in Kīpahulu Moku and Kailua Ahupuaʻa?	- GAs - Traditional land division the ʻĀina Organization is associated with (if limited information, then expanded to next larger traditional district)	- Connection to GAs of traditional Hawaiian SESs found in literature review - Connection to kalo cultivation	To expand understanding of the meaning of pre-contact ʻŌiwi SESs. To highlight traditional Hawaiian SESs are Hawaiian, give credit and respect to the Native Hawaiian kūpuna that developed these systems, and illustrate that ʻŌiwi SESs cannot be fully understood or restored through western frameworks
2. How are traditional Hawaiian SESs practiced today through loʻi kalo cultivation amid the modern social-ecological landscape in Kīpahulu Moku and Kailua Ahupuaʻa?	Part 1 - Traditional land division the ʻĀina Organization is associated with (if limited information, then expanded to next larger traditional district) Part 2	Part 1 - Connection to GAs of traditional Hawaiian SESs found in literature review - Connection to loʻi kalo of ʻĀina Organization Part 2 - Connection to land	To expand understanding of how Hawaiian SESs have evolved and uncover GAs that enable loʻi kalo cultivation in these cases

	- Areas related to the restoration and management of each case's lo'i kalo system within traditional land division from RQ1	tenure, governance, and economic systems – three key historical SES transformations post-colonization from literature review - Connection to lo'i kalo of 'Āina Organization	
3. How can these cases help generate ideas about governance arrangements that enable Hawaiian SES restoration through lo'i kalo cultivation?	GAs identified in RQ1 and RQ2	Themes developed iteratively from the data: - GAs enabling land access and control - GAs enabling traditional Hawaiian lifeways - GAs enabling biocultural restoration/management	To identify and analyze GAs from the case studies that enable Hawaiian SES restoration through lo'i kalo cultivation

2.3.5 Limitations of the research

Case studies have been criticized for lacking an established, agreed-upon systematic procedure as other empirical research methods have developed, allowing bias or equivocal evidence to sway the direction of findings and conclusions, and producing results with little basis for scientific generalization (Yin, 2003). This thesis used Yin's (2003) case study research design components to guide the design of the analysis framework. However, without an established systematic procedure, the analysis framework developed for this thesis may have introduced subjectivity and bias (Yin, 2003). Another potential limitation was the lack of direct input from the Native Hawaiian community.

Chapter 3: Literature Review

This chapter is a literature review covering key topics related to biocultural restoration in Hawai'i. It will start by defining some key terms, cover essential sustainability and resilience elements of traditional Hawaiian SESs pre-contact, and provide an overview of the history of

colonization in Hawaiʻi. Next is an investigation into contemporary Hawaiian SESs to understand the diversity of ways Hawaiian SESs have evolved into modern times. Following that is an exploration of Land Back concepts and strategies in Hawaiʻi. This chapter will end with a review of the literature on governance arrangements, co-governance, and co-management in Hawaiʻi.

3.1 Biocultural and social-ecological systems

Social-ecological and biocultural are both terms that emphasize the integrated nature of human and natural systems. The framing of humans in nature is important because the two-way relationship between ecological and social subsystems is central to sustainability efforts. SESs are complex integrated systems comprising both social (human) and ecological (environmental) subsystems that interact dynamically across spatial and temporal scales in a two-way feedback relationship (Chang et al., 2019). The term emphasizes a human-in-ecosystem paradigm, recognizing the inextricable nature of human and natural systems (Berkes et al., 2002).

The Hawaiian SES has been called a model social-ecological system for research due to its relatively short human history, isolation, size, and complex biosphere (Kirch, 2007; Winter, Lincoln, et al., 2018). The pre-contact Hawaiian SES's success in nourishing a large, thriving human population while maintaining resource abundance over time has also made it a model for achieving sustainability and resilience in the broader SES of Hawaiʻi and beyond today (Winter, Beamer, et al., 2018).

As used in this thesis, ʻHawaiian SESʻ and ʻʻŌiwi SES' refer mainly to the SES of Hawaiʻi before western contact. Modern Hawaiian SESs refer to the result of Hawaiian SESs evolving through the transformative forces of colonization. Modern Hawaiian SESs are distinct from the broader westernized social-ecological landscape found in Hawaiʻi today but are not untouched by it. Moreover, although modern Hawaiian SESs have retained key elements of the pre-contact SES, the Hawaiian SES today looks very different, as its structure has been in decline since the 19th century (Winter, Lincoln, et al., 2018; Winter & Lucas, 2017).

As Chang et al. (2019, p 1) explain, the “term ‘biocultural’ recognizes humanity as part and parcel of the environment…The term recognizes that even as humanity shapes the environment, the environment shapes us. It also helps us recognize that those who have developed a long-term experience of ‘relationship with place’ may help root us back to our home and guide us in living on this planet in a more just and sustainable way.” According to Winter, Lincoln, et al. (2018, p. 15), SESs are comprised of linked biological-sociocultural relationships they call the “biocultural elements” of these systems.

Biocultural restoration and biocultural resource management (BRM) are terms commonly used in the literature on restoring and conserving Hawaiian SESs in the modern context (Winter et al., 2022). Biocultural restoration and BRM can thus mean restoration or management of the Hawaiian SES to various scales and degrees. For instance, Winter, Beamer, et al. (2018) refer to the approach Hawaiians created and employed to manage the pre-contact Hawaiian SES as a BRM system, encompassing the entire pre-contact SES. Other examples focus on restoring or managing one biocultural element, such as a fishpond or loʻi kalo (irrigated terrace for growing taro) (Mahi et al., 2024).

3.2 Sustainability and resilience

This thesis adopts the Indigenous perspective of sustainability, in contrast to a western perspective, put forth by Kealiikanakaoleohaililani & Giardina (2016). Sustainability from an Indigenous perspective is rooted in a sacredness ethic that emphasizes connections to place, relationships, and sacred exchanges among humans and the ecological resources required for sustenance (Kealiikanakaoleohaililani & Giardina, 2016). In this framework, the goal is to ensure the long-term health of the ecological system that directly supports individual and the community's survival. This perspective contrasts with western concepts of sustainability, which focus on resource management through a commodity-based ethic. That is, resource management is for the purpose of supplying maximum resources and services at the lowest cost (Kealiikanakaoleohaililani & Giardina, 2016).

The resilience of an SES, as used in this thesis, refers to its "capacity to absorb both natural and human disturbance while maintaining structure and function" (Chaffin et al., 2014, p. 4; Folke, 2007; Gunderson & Holling, 2002; Holling, 2001). It refers to the system's ability to adapt and endure despite changing conditions.

3.3 Meaning of ahupuaʻa traditionally and as it is used today

In Hawaiʻi today, there has been a surge of voices calling for the restoration of the ahupuaʻa system (Winter, Beamer, et al., 2018). However, the way people talk about the ahupuaʻa and its associated BRM system today does not accurately describe what it meant and how it was implemented in pre-contact Hawaiʻi (Winter, Beamer, et al., 2018). This section aims to clarify the myths associated with the modern usage of the term ʻahupuaʻaʼ. Given that ʻahupuaʻaʻ and ʻahupuaʻa systemʼ are often used in discussions around the restoration of Hawaiian SESs, clarifying the meaning of ahupuaʻa will help contribute to meaningful restoration efforts (Winter, Beamer, et al., 2018). This section also aims to reassert that the ahupuaʻa is a Hawaiian concept and to recognize that, as such, it cannot be fully understood through western language and frameworks (Gonschor & Beamer, 2014).

Winter, Beamer, et al. (2018, p. 2) found that today, “researchers, policymakers, K-12 educators, and others, frequently refer to the Hawaiian system of biocultural resource management as “the ahupuaʻa system.” In this vein, ahupuaʻa are frequently described as self-sustaining units, and put forth as models for sustainability in Hawaiʻi today.” In this context, ahupuaʻa are often equated with watersheds and described as being aligned with western natural resource management approaches such as ʻridge-to-reefʼ and ecosystem-based management (Winter, Beamer, et al. 2018).

However, research indicates that attributing Hawaiian BRM systems to the ahupuaʻa scale does not stand up to scrutiny. For instance, only 5% of ahupuaʻa boundaries correspond to watersheds (Gonschor & Beamer, 2014); 22% of ahupuaʻa boundaries do not run from the mountains to the sea or ʻridge-to-reefʼ (Gonschor & Beamer, 2014); and not every resource

needed to be self-sufficient existed within every ahupuaʻa. It is more accurate to describe ahupuaʻa as interdependent social-ecological communities (Winter, Beamer, et al., 2018). Thus, Winter, Beamer, et al. (2018) reason that limiting the contemporary application of Hawaiian BRM to the ahupuaʻa scale is not conducive to effective, large-scale restoration. Andrade (2008, p 29) agrees, writing that:

> "ahupuaʻa was only one facet of a sophisticated land classification system developed out of a desire to create order, provoke peace, and support prosperity. Historic and traditional records provide enough examples of conflict and times of warfare when resources became scarce to inform us that the system was not 100 percent perfect. However, this system certainly made administering the land easier by clarifying resource use and designating responsibilities among the different groups of people living on the islands."

Moreover, the understanding of ahupuaʻa, a Hawaiian concept, is lost when translated into English and related to western frameworks. Gonschor & Beamer (2014, p. 79) explain that "Understanding Hawaiian concepts through English synonyms hinders one's ability to grasp the breadth of ahupuaʻa, the larger Hawaiian land system, and its key components for islands sustainability. With that knowledge we have translated ahupuaʻa as a *culturally appropriate, ecologically aligned, and place specific* unit with access to diverse resources."

3.4 Pre-contact ʻŌiwi social-ecological systems

Given the diversity and complexity of traditional Hawaiian SESs, this section will summarize elements of these systems that contributed to their sustainability and resilience, providing context for exploring them and their GAs through the case studies. However, it is not intended to be a comprehensive overview. It will refer to literature by Hawaiian scholars for further reading on the elements discussed. The elements of traditional Hawaiian SESs instrumental to system sustainability and resilience covered in this section include foundational values and principles, land tenure and land use systems, food with a focus on kalo (taro), social and political structure, laws, decision-making, and economic structure of the Hawaiian SES.

3.4.1 Foundational values and principles

Hawaiian SESs are rooted in a set of foundational values and principles that guide behavior and governance. Central to this belief system are views of ʻohana (family), lōkahi (harmony; unity), sacredness, interconnectedness, and reciprocity in humanity's relationships with all entities of the universe. These values and principles are represented in the Hawaiian creation chant, the Kumulipo. The Kumulipo reveals that all of nature, deities, and humanity are kin, lending itself to a worldview that humanity has a familial relationship with all that makes up the world (Andrade, 2008). This relationship is especially important regarding relations to ʻāina. In traditional Hawaiian SESs, the sustenance derived from ʻāina extended far beyond the physical calories and nutrients needed for life, encompassing the mental and spiritual well-being necessary for holistic health (Andrade, 2008). The spiritual and mental nourishment that ʻāina provides stems from a deeply sacred and familial relationship to it.

In the Kumulipo, all are born, rather than created, and are decended from Papa, earth mother, and Wākea, sky father (Andrade, 2008). The chant "traces the evolution of life out of the depths of darkness into the corals, shellfish and seaweeds; the plants of the forest; fishes, insects, and birds; the godly forces of nature; and finally, to a succession of chiefs who establish themselves in Hawaiʻi" (McGregor & MacKenzie, 2015, p. 82). The Kumulipo places humanity as the younger siblings of ʻāina and kalo (taro plant) in the family of life (Andrade, 2008). As in a family, these relationships come with responsibilities and norms of proper behavior. Andrade (2008, p.25) explains, "*ʻāina* is the eldest sibling, and therefore responsible for protecting and feeding the younger ones. As younger siblings, Hawaiian people inherit a *kuleana* (responsibility) to *mālama* (keep, obey, pay heed to, care for) *ʻāina* and *kalo*." This kuleana of reciprocity is woven into all relationships and interactions in Hawaiian culture, particularly with the surrounding environment, but also with one another (Kealiikanakaoleohaililani & Giardina, 2016).

Another fundamental element of the traditional Hawaiian belief system, stemming from the Kumulipo genealogy of life is the view of natural resources as akua (deities) or ʻāumakua (ancestral guardians) (Andrade, 2008). Hawaiian scholar, Aunty Pua Kanakaʻole Kanahele, describes natural resources as "elemental forces which to us as a people are the deities that sustain our lives" (Diver et al., 2019, p 403). This worldview creates the sense that nature and human relations with nature are sacred and further solidifies an outlook of kinship with all things. Viewing nature as sacred and as ʻohana (family) ancestors engenders behaviors that show reverence, care, and respect for the natural world.

The Kumulipo also reflects the Native Hawaiian worldview of lōkahi, which holds that nature, deities, and humans are inextricably linked, interdependent, and united, and that living in balance with one another is essential for their well-being (McGregor & MacKenzie, 2015). These views of interrelationship and balance were also recognized as pono (well-being through balanced and judicious rule) (McGregor & MacKenzie, 2015). This principle served as the ethical directive for the traditional Hawaiian system of governance (McGregor & MacKenzie, 2015). Native Hawaiian professor of political science at the University of Hawaiʻi at Mānoa, Dr. Noenoe Silva, described pono in the Hawaiian polity as follows:

> "In the ancient Kanaka [Hawaiian] world, pono meant that the akua, (deities) aliʻi [chiefs], kahuna [priests], makaʻainana [commoners], and ʻāina [land] lived in balance with each other, and that the people had enough to eat and were healthy. This state of balance hinged on aliʻi [chiefs] acting in accordance with the shared concept of pono" (Silva, 2004 *translation in brackets added by* McGregor & MacKenzie, 2015).

Although the aliʻi held the greatest responsibility for achieving this state of lōkahi, all people took individual and collective responsibility toward this goal (Abad, 2000).

Also central to Hawaiian culture is pilina (relationship; connection) to place. Vaughan (2018) describes that while home may be tricky to pinpoint for many people in the United States today, historical Hawaiian relationships with place are specific. Kānaka in the traditional SES were intimately attuned to the environment in which they lived and subsisted for generations.

This pilina led to a deep knowledge of the natural processes around them. This attunement to places in Hawaiian culture is reflected in the complex knowledge system that classified and named the natural elements in each place. For example, each ahupuaʻa has its own winds, and ʻōlelo Hawaiʻi (Hawaiian language) has a name for each; Wainiha, an ahupuaʻa on Kauaʻi, has forty unique winds (Vaughan, 2018). This attunement with place involves kilo (observation) and experience over long periods, enabling Hawaiians to live harmoniously with the ʻāina and adapt to changing conditions in the diversity of places in the pae ʻāīna (archipelago) (Kanahele et al., 2016). Places are also embedded with traditions, moʻolelo (stories), sacredness, and history passed down through generations (McGregor, 2007).

3.4.2 Land tenure and land use system

The Hawaiian SES was based on communal land tenure. The concept of private land ownership or private ownership of resources had no place in traditional Hawaiian SESs (MacKenzie et al., 2015; McGregor, 2007). Instead, Kānaka Maoli (Indigenous Hawaiians) maintained communal stewardship over the land, the ocean, and all the islands' natural resources (McGregor, 2007). To facilitate sustainable land and resource use, the Hawaiian SES was designed around a system of nested land divisions that Winter, Beamer, et al. (2018) call the moku system.[1] Most literature referred to the Hawaiian BRM system as the ahupuaʻa system, but Winter, Beamer, et al. (2018) found that moku system is more conducive to modern large-scale biocultural restoration.

In the moku system, the land was divided into various scales to facilitate continued sustainable relationships with ʻāina amid a growing population (Winter, Beamer, et al., 2018). From largest to smallest, the main nested land divisions included mokupuni (island), moku (large district or social-ecological region), ahupuaʻa (social-ecological community within a moku), and ʻili (land unit within an ahupuaʻa, frequently associated with an extended family),

[1] For detailed descriptions of traditional Hawaiian land divisions, see Winter, Beamer, et al. (2018), Malo, Hawaiian Antiquities (Moolelo Hawaii) and Kamakau, The Works of the People of Old.

among others (Winter, Beamer, et al., 2018). The traditional Hawaiian SES governance structure followed these nested land divisions, politically and for biocultural resource management (Andrade, 2008; Winter, Beamer, et al., 2018). For instance, the moku and ahupuaʻa served as key political boundaries, managed by members of the ruling class known as aliʻi ʻai moku (district or island chief) and aliʻi ʻai ahupuaʻa (ahupuaʻa chief), respectively, as shown in Figure 1 (Andrade, 2008; Winter, Beamer, et al., 2018). Within the ahupuaʻa, smaller land divisions were primarily kinship-based and were stewarded by specific extended families (Handy & Pukui, 1972).

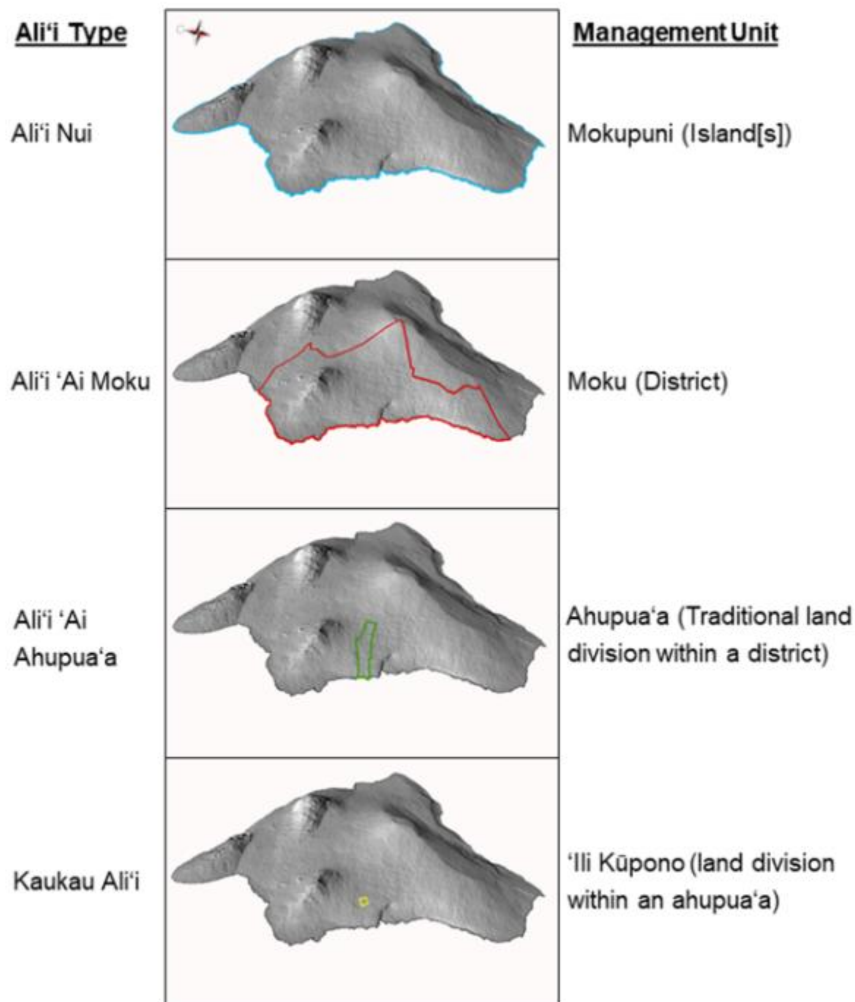

Figure 1: The nested land division scales of socio-ecological management by aliʻi in the traditional Hawaiian SES (figure copied from Kurashima et al., 2018, p. 7).

Unlike modern western-style private property and jurisdiction boundaries, which divide land into somewhat arbitrary boxes, moku system boundaries were determined based on biophysical attributes of the islands' ecosystems as well as socio-cultural drivers (Winter, Beamer, et al., 2018). As a result, they were dynamic and adaptive to changing landscapes and the needs of human populations. Such boundaries were also more logical for the management of natural resources. Moku boundaries closely align with archipelago-scale ecoregions (Winter, Beamer, et al., 2018). Ecoregions are relatively large areas that contain geographically distinguishable groups of natural communities and species and the environmental conditions critical for their long-term persistence (Levin, 2000). Consequently, moku boundaries align closely with the natural ranges of key biocultural resource populations, allowing for more effective management of these populations (Winter, Beamer, et al., 2018). Additionally, Winter, Beamer, et al. (2018) found clear patterns of climatic similarity within each moku, suggesting these divisions were created to optimize land uses and potentially contained specialized biocultural resources.

As shown in the schematic model in Figure 2, each moku was subdivided vertically into social-ecological communities called ahupuaʻa and horizontally into social-ecological zones: wao (terrestrial social-ecological zones) and kai (marine social-ecological zones) (Winter, Beamer, et al., 2018). Ahupuaʻa land divisions created more localized resource governance within each moku. Wao and kai spanned across each moku, dividing each ahupuaʻa vertically while connecting it horizontally to adjacent ahupuaʻa within a moku. "The vertical divisions allowed for system-based management within each ahupuaʻa, while the horizontal connections between ahupuaʻa allowed for coordinated management of the population dynamics of key resource species between ahupuaʻa within each zone spanning a moku" (Winter, Beamer, et al., 2018, p. 5).

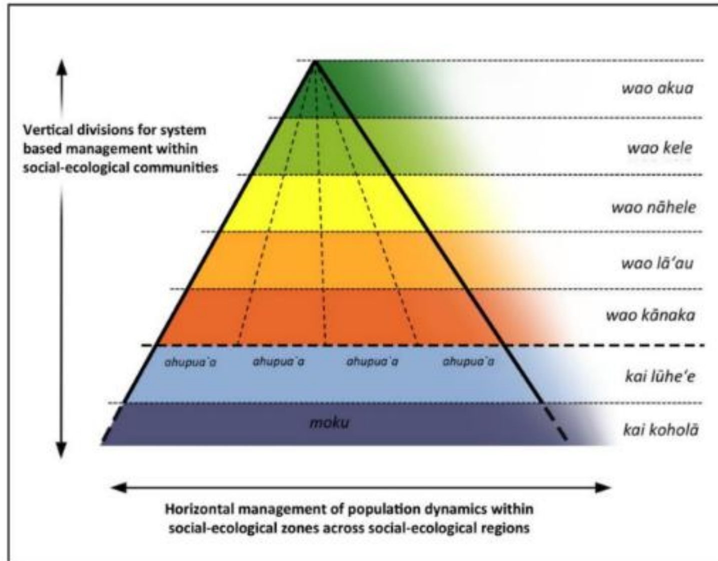

Figure 2: A schematic model of a single moku (figure copied from Winter, Beamer, et al., 2018).

Ahupuaʻa were further divided into portions of land called ʻili and allocated to ʻohana (families) of makaʻāinana (McGregor & MacKenzie, 2015). These ʻohana were often descended from ancestors who initially settled and cleared the land for cultivation, ensuring its productivity for generations. Handy et al. (1972, p. 49) explain:

> "Probably the most permanent units of land were the sections of the ahupuaʻa termed ʻili (strips) or ʻili ʻāina. These were portions of an ahupuaʻa land allotted to the families which lived on them and cultivated them, in distinction to aliʻi who were overseers or higher chiefs. It seems likely that the right to continue to use and to cultivate ʻili stayed with the ʻohana (extended families) dwelling thereon, regardless of any transfer of title to the ahupuaʻa in which they were located."

These ʻili land divisions either extended continuously from the mountains to the ocean or comprised separate plots of land within each distinct resource zone of an ahupuaʻa (McGregor & MacKenzie, 2015).

The moku system boundaries also dictated access, cultivation, management, and allocation of biocultural resources (Winter, Beamer, et al., 2018). ʻOhana of makaʻāinana were allowed access to all resources within the ahupuaʻa, granted they were not kapu (prohibited). In some places, ʻohanas could access forested areas and fishing grounds outside their ahupuaʻa but within the broader moku where the ahupuaʻa was located (McGregor & MacKenzie, 2015).

The ʻili boundaries determined where ʻohana of an ahupuaʻa would steward land and gather and cultivate resources for their own subsistence (McGregor & MacKenzie, 2015). The ahupuaʻa boundaries determined locations for communal stewardship activities as well as who would participate and who would receive the fruits of the communal labor, either via taxes or offerings to the gods (McGregor & MacKenzie, 2015). As mentioned above, the moku boundaries enabled vertically and horizontally integrated population management of key biocultural resources to ensure usage on the small-scale land divisions accounted for impacts on the entire ecoregion system scale (Winter, Beamer, et al., 2018).

3.4.3 Food, resources, and cultural landscape

The cultural landscape in pre-contact Hawaiʻi was shaped by Polynesian settlers who introduced tropical root, tuber, and tree crops, known as canoe plants, as well as pigs, dogs, and chickens, and the skills to modify the landscape for intensive agricultural production or ʻāina momona (Cusick, 2011). Agricultural systems, including loʻi (irrigated terraces), retaining walls, ʻauwai (irrigation ditches), and dams, were the basis of the ahupuaʻa (Cusick, 2011) and the Hawaiian cultural landscape at large (Winter, Lincoln, et al., 2018).

3.4.4 Kalo in the Hawaiian SES

Kalo, or taro as it is widely known, was brought to a higher degree of cultivation in pre-contact Hawaiʻi than anywhere else in the world (Handy et al., 1972). Kalo is often considered the most important crop in the Hawaiian SES, both on a philosophical and practical level (Winter, Lincoln, et al., 2018). Handy et al. (1972) write that the cultivation of kalo determined the fundamental patterns of Hawaiian culture. Traditional kalo agriculture shaped the iconic cultural landscape associated with the Hawaiian SES (Winter, Lincoln, et al., 2018). As the ancestor of the Hawaiian race in the Kumulipo, kalo holds symbolic importance in Hawaiian culture. Functionally, it was the preferred staple food in the Hawaiian SES, its prominence only rivaled by ʻuala (sweet potato) (Winter, 2012). This importance is reflected in the 400 distinct

varieties of kalo, adaptable to varying soil, water, and local conditions, that the Hawaiian SES co-evolved with (Handy et al., 1972; Winter, 2012; Winter, Lincoln, et al., 2018). McGregor and MacKenzie (2015) note that this staple crop was central in the lives of the ʻohana and Hawaiian society. Evidence of kalo's significance in the Hawaiian SES is seen in the ʻolelo noʻeau (Hawaiian proverb), "Ola ke kalo, ola ke kanaka," which roughly translates to "As long as kalo lives, so shall the Hawaiian race" (Winter, Lincoln, et al., 2018, p. 12). Winter, Lincoln, et al. (2018) also found kalo to be a biocultural keystone component of the Hawaiian social-ecological system.

There are two types of cultivated kalo: dry and wet (Handy, 1940). Dry taro is grown in rainfed areas without irrigation, while wet taro is planted along streams or ditches, in spring-fed marshland, or in constructed terraces called loʻi in which the kalo plants are flooded in a few inches of water at all times (Handy, 1940). Kānaka Maoli engineered intricate irrigation ditches for loʻi to draw and return water from permanent streams, carefully managing water flow and circulation within the fields to prevent stagnation, regulate temperature, and reduce disease risk (Kurashima et al., 2019). Loʻi kalo is the most productive way to cultivate kalo (Handy et al., 1972). There is evidence that nearly all land capable of being irrigated was converted from its natural state of lowland wet-to-mesic forest types into loʻi kalo (Handy, 1940; Handy et al., 1972; Ladefoged et al., 2009).

All parts of the taro plant can be eaten (Handy, 1940). The underground corm can be cooked and prepared in a variety of ways, including poi, which is translated as the "Hawaiian staff of life, made from cooked taro corms" (Pukui & Elbert, 1986, p. 337). When prepared for poi, the kalo corm was steamed or boiled and then mashed with a pohaku kuʻi (stone pounder) on a heavy board into a paste (Handy, 1940). The young leaves of any kalo type and the adult leaves of certain varieties are eaten as greens (Handy, 1940).

Kalo was a highly dependable and multi-functional crop in the Hawaiian SES. Compared to the sweet potato, for instance, taro is more drought-tolerant and can be planted in a far

greater variety of conditions, including a range of altitudes, soil types, and humidity levels (Handy et al., 1972). Moreover, taro has a much longer shelf life than sweet potato. For instance, taro poi sours very slowly, while sweet potato poi will sour in a few days. Additionally, paʻiai, taro that is steamed and mashed, can be pressed into hard, dry cakes that will keep virtually indefinitely (Handy et al., 1972). Kalo could also be used for medicinal purposes (Handy et al., 1972).

The Hawaiian SES was geographically shaped around streams on which the taro flooded-field agriculture system depended (Handy et al., 1972; Winter, Lincoln et al., 2018). According to Winter, Lincoln et al. (2018), the conversion of large areas of lowland habitat into loʻi kalo systems had three significant repercussions on the Hawaiian SES structure and function: 1) it transformed the habitat of large areas of land from a forest biome to an expanded riparian ecotone, increasing associated populations such as native waterfowl; 2) it, in theory, increased the capacity of the islandsʻ aquifers, which could result in additional higher elevation artisan springs forming, further increasing the potential for loʻi at higher elevations; and 3) it likely transformed near-shore reef habitats from predator-dominated to herbivore-dominated as the nutrient-enriched water from the loʻi would fuel algal blooms, a shift that was taken advantage of through the emergence of aquaculture technologies such as fishponds. The walls of the fishponds would contain the enriched water, and thus the algal blooms, allowing for the farming of herbivorous fish while maintaining the health of the reef ecosystem outside the fishpond walls (Winter, Lincoln, et al., 2018). Winter, Lincoln, et al. (2018) claim that these repercussions of loʻi kalo development are key components of the structure and function of the SES that existed due to the BRM system of pre-contact Hawaiʻi known as the moku system. Thus, the researchers assert that loʻi kalo cultivation is the foundation of the Hawaiian SES cultural landscape and so is “key to the biocultural restoration of the Hawaiian social-ecological system” (Winter, Lincoln, et al., 2018, p. 16).

3.4.5 Social and political structure

In Hawaiian society, there were three basic classes of people: aliʻi (chiefs), kahuna (priests), and makaʻāinana (regular people) (McGregor, 2007). The political structure of traditional Hawaiian SESs paralleled the moku system land division pattern (MacKenzie et al., 2015), typically including an aliʻi nui (high chief) who ruled over an entire island, aliʻi ʻai moku (district chief) overseeing the largest land division of an island, aliʻi ʻai ahupuaʻa (ahupuaʻa chief), who oversaw the ahupuaʻa scale social-ecological community, the konohiki (land agent), who managed the people and biocultural resources of an ahupuaʻa, and makaʻāinana (commoners). The social structure of the SES was shaped around ʻohana (extended family) units.

According to Andrade (2008, p. 72), "Hawaiian society was established upon a foundation made up of the makaʻāinana." The largest class in traditional Hawaiian society, makaʻāinana, formed a more egalitarian part of the population who lived primarily in extended family units (Abad, 2000). Makaʻāinana were highly valued in the Hawaiian SES and, as the stewards of the ʻāina most intimately aware of environmental shifts and changes that necessitated behavioral changes among kānaka, they were consulted in governance decision-making (Andrade, 2008). Makaʻāinana had liberal rights to use resources within the boundaries of their ahupuaʻa, including "the right to hunt, gather wild plants and herbs, fish offshore, and use parcels of land for kalo cultivation together with sufficient water for irrigation" (MacKenzie et al., 2015, p. 9). Makaʻāinana also had the right to trade and move freely within their ahupuaʻa (MacKenzie et al., 2015, p. 9). The makaʻāinana worked under their respective aliʻi and kahuna to carry out communal endeavors such as "clearing the land, constructing irrigation systems, cultivating kalo, building fishponds for breeding fish…" and many others. Moreover, although makaʻāinana owed a work obligation to those higher in the social hierarchy, they were free to relocate to another area with more benevolent leadership if treated unfairly (Handy et al., 1972).

The konohiki was the head person of an ahupuaʻa under the aliʻi ʻai ahupuaʻa (Pukui and Elbert 1986). It was the konohiki's kuleana (responsibility) to ensure their ahupuaʻa produced sufficient food, materials, and labor to sustain its population (Steele, 2015). To fulfill this responsibility, the konohiki supervised land distribution, planting, harvesting, water rights, construction, and upkeep of irrigation ditches and loʻi (irrigated fields or terraces) (Handy et al., 1972). The konohiki used the kapu system as a tool for ahupuaʻa management, described below.

3.4.6 Kapu and Kānāwai

Mālama ʻāina (care for the land) on an SES scale was dictated by the kapu (access or harvest restrictions; sacredness) religion and kānāwai (laws) (Steele, 2015). Kapu refers to the sacredness of a person, place, or element, determined by their status and contribution to the Hawaiian SES (Kealiikanakaoleohaililani & Giardina, 2016). Kānāwai dictating access and behavior were applied to preserve a person or resource's kapu (Kealiikanakaoleohaililani & Giardina, 2016). Kapu also refers to the system of religion used in the Hawaiian SES based on rotating restrictions or prohibitions, also called the kapu system (Pukui & Elbert, 1986). Kapu system laws regulated appropriate times for planting, harvesting, and gathering (Steele, 2015). "Various types of rotating kapu were employed in concert—between ahupuaʻa within the context of the moku—to synergistically yield long-term abundance of key biocultural resources" (Winter, Beamer, et al., 2018, p. 14). Konohiki managed the maka'āinana using the kapu system, and, as Andrade (2008) explains, konohiki consulted makaʻāinana to determine and enforce seasonal kapu.

3.4.7 Decision-making

Decision-making in Hawaiian SESs was a holistic and inclusive process. For instance, solutions to biocultural resource problems were evaluated through ʻAha (councils) that included representative experts in various parts of the SES, such as agroecology, hydrology,

aquaculture, and others (Akutagawa & Wong, 2020). The ʻaha collectively considered every idea along eight realms of decision-making. The eight components of the systematic evaluation process included categories from various parts of the archipelago's SES, such as Moana-Nui-Ākea, the farthest out to sea one could see from the highest vantage point in one's area; Ma Uka, the area from where the lepo (soil) starts extending to the mountain peaks; Kānakahōnua, the needs of the people; and Keʻihiʻihi, the spiritual realm and the ceremonies needed to maintain pono (balance) in the ʻāina, among others (Akutagawa et al., 2016; Winter, Beamer, et al., 2018). Akutagawa et al. (2016) explain that solutions were evaluated based on their overall impact on each realm—if a proposed solution was found to be beneficial for all realms, it was adopted for implementation. Quoting Kumu John Kaʻimikaua, Akutagawa et al. (2016, p. 46) write that this holistic approach created lōkahi, "the balance between the land, the people that lived upon the land, and the akua (gods)." In turn, lōkahi produced "pono, the spiritual balance in all things."

3.4.8 Economic structure and lifeways

Enos & Tamanaha (2022) illustrate that in pre-contact Hawaiʻi, the economic, ecological, and spiritual systems of the SESs were integrated. Ecological stewardship through regenerative land use was the key directive guiding society and thus constituted economic activity (Enos & Tamanaha, 2022). They assert that loʻi kalo was a core component of the pre-contact Hawaiian economy. Handy et al. (1972, p. 76) agree, writing that the whole subsistence economy was patterned by the course of streams and ditches constructed for kalo cultivation, and, through this, so was "the whole round and cycle of individual and social activity." Moreover, they write that the life of kalo depends on water, and wealth in the traditional Hawaiian SES was associated with water. Demonstrating this connection, 'wai' is the Hawaiian word for water, and 'waiwai,' water water, is the word for wealth (Handy et al., 1972). Beamer et al. (2021) relate the Hawaiian SES economy to the modern-day concept of the circular economy and describe it as

an economy of abundance inspired by the philosophy of aloha ʻāina, which is grounded in the worldview that views the environment as kin.

The traditional Hawaiian SES was predominantly a subsistence agricultural economy with systems of reciprocal exchange, sharing, and cooperative labor (McGregor, 2007). Steele (2015, p.37) explains in her thesis that in pre-contact Hawaiʻi,

> "...Western concepts of monetary taxation and wages were non-existent. Labor was not dictated by economic and political pressures of a capitalist economy but instead by reciprocal and interdependent relationships with man and his environment…Close-knit groups of ʻohana [family] depended on kinship relationships for basic needs. The environment and religious duties dictated the labors and necessities in daily life."

McGregor (2007) agrees that there was no evidence of a monetary system or commodity production as seen in extractive capitalist economic models. Instead, "Makaʻāinana worked cooperatively and shared the fruits of the labor or laulima [cooperation, joint action]. Most of this labor was done within the context of the ʻohana as the primary production unit" (McGregor, 2007, p. 28, *translation added*). Fishermen, gatherers, and taro farmers of extended ʻohana units would share and exchange essential goods (McGregor, 2007). This exchange system within the ʻohana was a function of sharing resources obtained or cultivated on the ʻili land the ʻohana held and worked upon in common (McGregor, 2007). Moreover, all the ʻohana within an ahupuaʻa engaged cooperatively to complete massive public works projects such as the construction and upkeep of irrigation systems used for loʻi kalo (McGregor, 2007).

3.5 History of colonization and shift in traditional land tenure

European colonizers arriving on the shores of Hawaiʻi in 1776 led to rapid, widespread change across the archipelago (Gonschor & Beamer, 2014; Winter et al., 2023). Introduced diseases wiped out a massive percentage of the Kanaka ʻŌiwi population, while introduced monoculture agricultural practices and invasive species transformed the landscape (Andrade, 2008). Moreover, colonizers used religious, economic, and political tools to garner influence, contributing to the transformation of the belief systems and GAs that guided behavior and

management of biocultural resources in the pre-contact era. Four historical changes post-contact were consistently cited in the literature as instrumental to the transformation of ʻŌiwi SESs to the western-dominated socio-ecological landscape found in Hawaiʻi today: 1) the establishment of economic and political influence by colonizers, 2) the enacting of the 1840 Hawaiian Kingdom Constitution, 3) the Māhele (land division into private ownership), and 4) the overthrow of the Hawaiian monarchy by the United States in 1893 (Andrade, 2008; MacKenzie et al., 2015; McGregor, 2007; McGregor & MacKenzie, 2015; Silva, 2004). Capitalist and imperialist forces played a significant role in driving the colonizers' actions and transitioning from the traditional Hawaiian governance structure; foundational to this transition were changes to the land tenure system to appease capitalist interests (Andrade, 2008; McGregor, 2007; McGregor & MacKenzie, 2015; Silva, 2004).

3.5.1 Profit motive and growing economic and political influence by colonizers

Following European contact in 1776, it was not long before visitors began to see the islands as an opportunity for wealth accumulation. Such visitors included profit-driven entrepreneurs and nation-state representatives seeking to enrich their treasuries and claim territory for their empires (Andrade, 2008). Early commerce and trade centered on the sandalwood, fur, and whaling industries (McGregor, 2007). However, as MacKenzie et al. (2015) explain, overharvesting led to the collapse of these industries, and Euro-American colonizers turned to large-scale agricultural exports as their next way to turn a profit. Investments in such large-scale agricultural ventures required a more secure land tenure system, thus mounting pressure on the traditional system (MacKenzie et al., 2015). As foreigners' economic desires increased, so did their pressure on the traditional land tenure system. In one instance, a captain of a British warship took control of the Hawaiian government for five months, partly in response to a lease dispute he was in (MacKenzie et al., 2015).

3.5.2 1840 Hawaiian Kingdom Constitution

Entering the Kingdom period, the islands were unified under a single monarchy known as the Kingdom of Hawaiʻi. At this time, the Hawaiian Kingdom was entering the national arena and had to make diplomatic relations with the western world (McGregor & MacKenzie, 2015). The monarchy wanted to preserve the essence of how kūpuna live while embracing change as they entered the League of Nations (McGregor & MacKenzie, 2015). The 1840 Hawaiian Kingdom constitution codified the traditional Hawaiian SES governance arrangements into a western constitutional government format and "formalized" various roles from the traditional Hawaiian SES into western terms (Andrade, 2008). The constitution provided the basis for developing a representational government in the Hawaiian Kingdom (Osorio, 2002) and set up executive, legislative, and judiciary branches (McGregor, 2007).

The 1840 Constitution was also intended to address heightening conflicts between Hawaiians and foreigners over land while preserving traditional land tenure and lifeways (Andrade, 2008; MacKenzie et al., 2015). It formally declared that the "land belonged to the chiefs and people [in common] with the king as trustee for all" (MacKenzie et al., 2015, p.11). MacKenzie et al. (2015) explain that while the constitution attempted to preserve traditional Hawaiian lifeways, it also attempted to appease foreign interests. For example, one provision "was interpreted to mean that the king would not reclaim land already held by foreigners" (Thurston 1904, p. 1). However, foreigners were not satisfied (Andrade, 2008). They were determined to acquire permanent footholds for capitalist endeavors through a private property system and, in some cases, sought military backing from nation-states with clear imperialistic motives (Andrade, 2008; Kuykendall, 1938).

3.5.3 Land tenure transformations and loss of Hawaiian-controlled lands

The Māhele period marked the end of the traditional Hawaiian land tenure system and the introduction of the private property system. In response to foreign pressures, King

Kamehameha III and the Hawaiian Legislature established the Board of Commissioners to Quiet Land Titles (commission) in 1845 to investigate and approve or deny land claims made by Hawaiians and foreigners for land acquired before the commission's formation (Andrade, 2008; Hawaiʻi State Archives, 2020). The commission comprised five members: two Hawaiians, one half-Hawaiian, and two Americans (MacKenzie et al., 2015). Even though fee simple ownership did not yet exist in the Hawaiian legal system, the commission issued the first fee patents on these awards for Hawaiian land (An Act to Organize the Executive Ministry of the Hawaiian Islands, 1845; MacKenzie et al., 2015).

The commission divided the land as follows: the mōʻī (king) would retain his private lands (Andrade, 2008, p. 80; MacKenzie et al., 2015, p.13); then the rest of the land would be divided into thirds, with one-third going to the Hawaiian government, one-third to aliʻi and konohiki, and one-third to makaʻāinana (Andrade, 2008; MacKenzie et al., 2015). The government, aliʻi, and konohiki were allocated their share of lands, and the makaʻāinana had to file claims with supporting evidence (MacKenzie et al., 2015). Makaʻāinana claims were considered with the passing of the Kuleana Act of 1850 (Andrade, 2008). The phrase "koe wale no na kuleana o na kanaka e noho ana ma ua aina la (reserving only the right of the people who live on the aforementioned land)" was imbued in the deeds of nearly all lands disbursed in the Māhele, protecting the rights of the people in Hawaiian land law (Andrade, 2008, p. 82). Although the makaʻāinana were intended to receive one-third of the non-king lands, they received much less than one percent through this claims process (MacKenzie et al., 2015).

Not only were makaʻāinana dispossessed of their land, but they also could no longer fulfill their obligations to society through reciprocal ʻāina stewardship and collaborative labor, as they had in the traditional system (Merry 2000). Andrade (2008, p. 93-94) aptly describes:

> "From this point in history on, ahupuaʻa inhabitants not awarded a kuleana would have to purchase or rent the means to produce their livelihood, most often compelling them to enter the cash market economy. Many abandoned the land and moved to port towns. Even those awarded kuleana would have to "rent" the land from the government by paying real estate taxes in cash in perpetuity.

> Failure to pay these taxes meant forfeiting the land. The makaʻāinana had no choice: they were forced to enter the cash economy…Taxation not only coerced people into earning cash, it undermined the traditional relationships aliʻi and makaʻāinana had enjoyed over centuries. Traditional checks and balances in the ahupuaʻa serving to curb abuses of power and promote relatively egalitarian relationships between aliʻi and makaʻāinana were displaced by foreign concepts of law necessitating judges, lawyers, and legal paraphernalia. The imposed market economy and Euro-American systems of jurisprudence/land tenure in which the Native people were now enmeshed would unravel and erode traditional familial relationships they enjoyed with the land, its creatures, and each other."

In the half-century following the Great Māhele, numerous laws enabled wealthy foreigners to obtain large swaths of land to produce cash crops, especially sugar (MacKenzie et al., 2015). Meanwhile, the makaʻāinana who claimed land struggled to subsist on the small plots of land they were awarded while paying taxes, rent, and buying material items now necessary, such as clothing required by the Christian morality (Andrade, 2008).

However, some makaʻāinana came together to form hui kūʻai ʻāina (cooperative organization to purchase land) (Andrade, 2008). These hui (organizations) were a response by groups of makaʻāinana, who recognized that the lands and rights awarded by the Kuleana Act and Māhele were inadequate for continued survival (Andrade, 2008). The hui movement was a "counteroffensive against the ongoing alienation of land and dispossession brought on by the new regime of private property and real estate" (Andrade, 2008, p. 99). Hawaiians who organized themselves in hui raised capital to buy or lease portions of ahupuaʻa land not awarded to them; they adopted strategies that enabled them to live in the ways of their kūpuna while also engaging with the newly introduced market economy and jurisprudence (Andrade, 2008).

3.5.4 Sugar Industry Expansion to Hawaiian Monarchy Overthrow

Although changes in GAs by 1850 laid the foundation for the cash economy to largely take over the traditional subsistence economy, McGregor (2007) writes that the emergence of sugar as the dominant commodity of Hawaiʻi's economy catalyzed the complete transformation of Hawaiʻi's SES. Before the 1893 overthrow, during King Kalākaua's reign, the passage of the

Reciprocity Treaty allowed Hawaiian sugar to be imported to the US duty-free, stimulating unprecedented growth in the sugar industry, which was controlled by and for the benefit of American and European businessmen (McGregor, 2007). Native Hawaiian elite lacked the financial capital to invest in and benefit from the sugar industry, and makaʻāinana were displaced from their traditional lands as sugar plantations expanded. The treaty effectively led Hawaiʻi to become an economic colony of the US (McGregor, 2007). Silva (2004) claims the treaty bound Hawaiʻi tightly to the US and contributed to diminishing Hawaiian sovereignty.

The Reciprocity Treaty expired in 1886, and when the Hawaiian Monarchy was reluctant to renew it, American sugar barons revolted, staging a coup against King Kalākaua. They forced him to sign the Bayonet Constitution, which stripped him of his sovereign powers and limited the civil rights of Native Hawaiians (McGregor, 2007). The constitution "created an oligarchy of the haole planters and businessmen" that extended voting rights to wealthy white haoles while excluding Hawaiians and non-white people" (Silva, 2004, p. 128). The cabinet designated by the coup renewed the Reciprocity Treaty, allowing the American economic colony in Hawaiʻi to persist (McGregor, 2007). After Kalākaua's death, Queen Liliʻuokalani proposed a new constitution to restore the monarchy's power while extending voting rights to native Hawaiians. In response, American and European businessmen formed the Committee of Safety and laid their plans to overthrow the monarchy and annex Hawaiʻi to the US (Silva, 2004).

3.5.5 Loss of Hawaiian-controlled land

By 1920, Hawaiian-controlled land was 10% or less (Stauffer, 1990). Hawaiian-controlled land continues to be lost due to land's transformation from ʻāina to commodity and the admittance of Hawaiʻi as a US state. As described above, in the 50 years after the Māhele, makaʻāinana and aliʻi lost much of their land to westerners because of the new legal and institutional system and cash economy. Land grabs did not end after the Māhele, however.

Westerners have continued to leverage the new governance regime and market economy to claim even more Hawaiian-controlled land.

One prime example is the loss of Hawaiian lands, as discussed in detail by the U.S Supreme Court in Hawaii Housing Authority v. Midkiff, 104 S.Ct. 2321 (1984). In a unanimous decision (Justice Marshall did not participate in the case), the Court held that the State of Hawaii's use of eminent domain to take land from private landowners to be transferred to other landowners was constitutionally sound. At the time, almost 49% of the State's land was government-owned, and only 72 private landowners owned 47% (*Hawaii Housing Authority v. Midkiff*, 1984). The Bishop Estate, a charitable trust that held the residual lands set aside by King Kamehameha III and used proceeds of the lands to benefit Native Hawaiians, was the largest private landowner. The Hawaii State Legislature claimed the concentration of land ownership was an oligopoly, "skewing the State's residential fee simple market, inflating land prices, and injuring the public tranquility and welfare" (*Hawaii Housing Authority v. Midkiff*, 1984, p. 6). The Land Reform Act enabled the State to take title and land from lessors and transfer them to lessees (*Hawaii Housing Authority v. Midkiff*, 1984). Emphasizing the economic motive of this ruling, Justice O'Connor said, "This is a comprehensive and rational approach to identifying and correcting market failure" (*Hawaii Housing Authority v. Midkiff*, 1984, p. 6). Although ostensibly meant to address all large private landowners, the provisions of the Land Reform Act overwhelmingly targeted the Bishop Estate.

The dominant narrative of Midkiff is that it was a righteous decision to break up an "evil" oligopoly and correct the "feudal"[2] legacy of the Hawaiian SES (Greenhouse, 1984, p. A19). The Court even gratuitously and wrongly compared the State's actions to reduce Hawaiian land holdings to the settlers of the original 13 Colonies' actions "to reduce the perceived social and

[2] Hawaiian SES differed significantly from the feudal systems in Europe, and equating Indigenous SESs with the European feudal system is often used to justify imperialism in the name of democracy and progress (Andrade, 2008). For more on the differences between the European feudal systems and the traditional and customary SES of the Hawaiian people, see Andrade (2008).

economic evils of a...land oligopoly traceable to their monarchs" following the Revolutionary War (*Hawaii Housing Authority v. Midkiff*, 1984, p. 10). However, other narratives argue that this case is part of the long history of native land dispossession (Rosser, 2024). King Kamehameha III had distributed this land partially to keep the ʻāina "in Native Hawaiian hands in the event sovereignty over the Hawaiian Islands was lost to a foreign power" (Van Dyke, 2008, p. 315). Kamehameha's descendant, Bernice Pauahi Bishop, who inherited the lands, set them aside to support the education of Native Hawaiians through Kamehameha Schools (Andrade, 2008, p. 87). Additionally, as it was argued when the Land Reform Act was being debated, the Bishop Estate was not "concentrated in the hands of a few" because "[t]he beneficiaries of those estates are not just a few people but about 120,000 Hawaiian and part Hawaiian people" (Rosser, 2024, p. 34). Although considered constitutional by the US Supreme Court, the other narrative is that this is an example of neo-colonialism, and the loss of Native Hawaiian lands contributes to the erasure of the traditional Hawaiian SES.

3.5.6 New governance regime

These events paved the way for a new governance regime that supported western values, economic structure, and lifeways. This new regime reshaped people's relationships with land, including how land is owned, used, and managed. Governance and economic lifeways transformed from those made to manage biocultural resources for ʻāina momona to those structured to support a system of individual ownership and wealth maximization. Despite these colonizing pressures, ʻŌiwi SESs have adapted and evolved and continue to be central and distinct modern systems amid the westernized social-ecological landscape of Hawaiʻi today.

3.6 Hawaiian social-ecological systems today

This section touches on some of the ways pre-contact Hawaiian SESs continue or have been restored but is not intended to be a comprehensive overview. The modern Hawaiian SES realms covered in this section include Native Hawaiian rights and laws, kuaʻāina (people from

the country) and cultural kīpuka, ʻĀina Hui (organizations working on biocultural restoration in Hawaiʻi), and the Nation of Hawaiʻi.

3.6.1 Native Hawaiian Rights and Laws

One component of modern Hawaiian SESs comprises contemporary Native Hawaiian traditional and customary rights, remnants of the 1840 Hawaiian Kingdom Constitution and Māhele era laws. The 1840 Constitution preamble secured the rights of the hoaʻāina (tenant, caretaker, as on a kuleana) in “their lands, their building lots, and all their property,” stating that these rights could not be “taken from any individual except by express provision of the laws” (Translation of the Constitution and Laws of the Hawaiian Islands, Established in the Reign of Kamehameha III, 1842, p. 10). Although most provisions from the 1840 Hawaiian Constitution and Māhele era legislation have been repealed, a few laws have persisted, preserving some traditional and customary Native Hawaiian rights in the code of law. These provisions include 1) the Kuleana Reservation in property deeds, 2) Hawaiʻi Revised Statutes section 7-1, 3) Hawaiʻi Revised Statutes section 1-1, and 4) Hawaiʻi Constitution Article XII, Section 7.

1) Kuleana Reservation in Property Deeds: During the Māhele, all land was awarded “koe naʻe ke kuleana o nā kānaka” or “subject to the rights of native tenants” (Lucas, 1995, p. 55; Chinen, 1958, p. 29). This stipulation protecting the rights of Native tenants was made through either an implicit or explicit “kuleana reservation” (Forman & Serrano, 2012, p. 9) in all property deeds in Hawaiʻi (Lucas, 1995). Hawaiʻi courts have consistently recognized that Native Hawaiian tenant rights are grounded in the kuleana reservation (MacKenzie et al., 2015, p. 834). For example, in the case of Rogers v. Pedro (1982), the Hawaiʻi Intermediate Court of Appeals ruled that the kuleana reservation outlined in the plaintiffs' original grant served as an explicit reservation of specific rights for kuleana owners.

2) Hawaiʻi Revised Statutes Section 7-1: Kamehameha III ensured the 1850 Kuleana Act included a provision that protected the rights of native tenants to access resources for personal

use, including “firewood, house timber, aho cord, thatch or ti leaf ” and guaranteed rights to “drinking water, and running water, and the right of way” (Forman & Serrano, 2012, p. 9).[3] Thus, the Kuleana Act gave hoaʻāina a statutory right to their kuleana parcels and free access within their resident ahupuaʻa to obtain necessary resources to make their kuleana productive. The provision the king added has remained virtually unchanged since 1851 and is currently codified as Hawaiʻi Revised Statutes (HRS) section 7-1 (Forman & Serrano, 2012). The Hawaiʻi Supreme Court has interpreted section 7-1 to apply to any individual who lawfully occupies a kuleana parcel or is a lawful tenant of an ahupuaʻa (Forman & Serrano, 2012). Hawaiʻi courts later interpreted the law to mean that these Native Hawaiian rights extended beyond the ahupuaʻa of residence (MacKenzie et al., 2015).

3) Hawaiʻi Revised Statutes Section 1-1: Section 1-1 of the Hawaiʻi Revised Statutes states that “The common law of England, as ascertained by English and American decisions, is declared to be the common law of the State of Hawaii in all cases, except as otherwise expressly provided by the Constitution or laws of the United States, or by the laws of the State, or fixed by Hawaiian judicial precedent, or established by Hawaiian usage[.]” (Haw. Rev. Stat. § 1-1, 2024). The Hawaiʻi Supreme Court maintained that the reference to Hawaiian usage in this section ensures the continuance of a “range of practices associated with the ancient way of life which required the utilization of the undeveloped property of others and which were not found in section 7-1...so long as no actual harm is done thereby” (*Kalipi v. Hawaiian Trust Co.*, 1982, ⁋ 33).

[3] The 1850 Kuleana Act allowed makaʻāinana living in an ahupuaʻa to obtain fee simple title for their plots of land, including land to cultivate and a house lot no more than one-quarter acre (Forman & Serrano, 2012). Makaʻāinana’s subsistence lifeways depended on their ability to access resources from lands traditionally held in common rather than solely their house and cultivated plots. Kamehameha III was concerned that "a little bit of land even with allodial title, if [the people] were cut off from all other privileges, would be of very little value" (Minutes of the Privy Council, 1850, p. 713). Allodial title provides absolute ownership of land, free of obligations and interference (Phelps & Lehman, 2005). Fee simple title is ownership of land under common law in which the land is subject to government regulations and taxation (Setting the Record Straight on Fee Simple, 2019).

4) Hawaiʻi Constitution Article XII, Section 7: Article XII, Section 7 of the Hawai'i Constitution is an amendment that state voters passed in November 1978, further protecting Native Hawaiian traditional and customary rights (Forman & Serrano, 2012). The amendment reaffirms "all rights, customarily and traditionally exercised for subsistence, cultural and religious purposes and possessed by ahupuaʻa tenants who are descendants of native Hawaiians who inhabited the Hawaiian islands prior to 1778, subject to the right of the State to regulate such rights" (Haw. Const. art. XII, § 7, 2022). The Hawaiʻi Constitutional Convention delegates stated that "in reaffirming these rights . . . badly needed judicial guidance is provided and enforcement by the courts of these rights is guaranteed" (Hawaii Constitutional Convention, 1980, p. 640). The delegates explained that these rights are "an integral part of the ancient Hawaiian civilization...retained by its descendants" and wrote that they "did not intend to remove or eliminate...any rights of native Hawaiians...but rather...intended to provide a provision in the Constitution to encompass all rights of native Hawaiians, such as access or gathering." (Forman & Serrano, 2012, p. 10; Hawaii Constitutional Convention, 1980, p. 640).

3.6.2 Kuaʻāina and Cultural Kīpuka

Kuaʻāina is translated as country (as distinct from the city), countryside, or person from the country (Pukui & Elbert, 1986). McGregor (2007, p. 4) describes kuaʻāina as "the Native Hawaiians who remained in the rural communities of our islands, took care of the kūpuna or elders, continued to speak Hawaiian, bent their backs and worked and sweated in the taro patches and sweet potato fields, and held that which is precious and sacred in the culture in their care." McGregor (2007) writes that kuaʻāina and the rural communities where they reside were bypassed by the major forces of economic, political, and social change Hawaiʻi experienced and thus acted as a form of cultural kīpuka. Kīpuka are pockets of vegetation that remain intact after a lava flow (Pukui & Elbert, 1986). These oases of life provide the seeds and spores that regenerate the ecosystem on the new lava field. Like natural kīpuka, cultural kīpuka

are communities where traditional Hawaiian customs and practices have been preserved amid devastating change and thus provide the basis for regenerating and revitalizing Hawaiian culture in the modern Hawaiʻi setting (McGregor, 2007).

McGregor (2007) explains that cultural kīpuka in Hawaiʻi were originally traditional centers of spiritual power that were isolated and difficult to access. Missionaries established themselves in these places later than other areas of Hawaiʻi, allowing traditional Hawaiian beliefs and practices to persist without foreign competition for longer (McGregor, 2007). The geography of these places also discouraged the growth of sugar plantations (McGregor, 2007). Where plantations and ranches were not established, traditional subsistence activities continued undisturbed by the lava flow of western economic development.

Kuaʻāina lifeways embody traditional Hawaiian SES elements, including foundational values, pilina to place, ʻohana folkways, subsistence activities, the use of kapu system and konohiki land management, and more. As McGregor (2007) describes, kuaʻāina continue to recognize the presence of spiritual ancestors in their environment by maintaining practices of reciprocal care for ʻāina. They gather resources for subsistence living and adhere to traditional nested land divisions such as ʻili and ahupuaʻa. Practitioners stay attentive to the state of resources and their environment's natural cycles and dynamics. If a resource is diminishing, they will observe a kapu on its use until it recovers. Likewise, kapu is placed on animals and plants in their reproductive phase. Kuaʻāina also assemble to renew their understanding of place, including wahi pana (legendary places), place names, locations of plants and animals, history, and more (McGregor, 2007). Like in traditional Hawaiian SESs, the pursuit of lōkahi and ʻāina momona is inherent to these practices.

Although kuaʻāina communities uphold many key elements of traditional Hawaiian SESs before western contact, they are not entirely untouched by modern social, economic, and political changes. The growth of the market economy created a demand for manufactured

goods, and the imposition of government taxes meant kuaʻāina had to earn cash and participate in the market system (McGregor, 2007).

3.6.3 Nation of Hawaiʻi

Located on Oʻahu, Puʻuhonua O Waimānalo, or the Refuge of Waimānalo, is the land base of the sovereign Nation of Hawaiʻi and home to around 80 Kānaka Maoli Hawaiians (Puʻuhonua O Waimanalo, n.d.). The mission of the Nation of Hawaiʻi is "to maintain and preserve the sophisticated religion, language, and culture of the Native Hawaiian people, who, prior to the overthrow, lived in a highly organized, self-sufficient, subsistent social system based on Communal Land Tenure" (Independent & Sovereign Nation State of Hawaii, 2021, ¶ 1).

Puʻuhonua O Waimānalo was established in 1994 when Hawaiian sovereignty activist "Bumpy" Kanahele and his Aloha First organization ended a 15-month occupation of stolen ancestral Hawaiian land in exchange for a 45-acre plot in Waimānalo (Tizon, 2005). The occupation started in response to the US Congress signing the Apology Resolution in 1993, adopted "to acknowledge the 100th anniversary of the January 17, 1893 overthrow of the Kingdom of Hawaii, and to offer an apology to Native Hawaiians on behalf of the United States for the overthrow of the Kingdom of Hawaii" (107 Stat. 1510, 1993, p. 1). Today, the Nation of Hawaiʻi, using Puʻuhonua O Waimānalo as its headquarters, asserts itself as the Independent Sovereign Nation State of Hawaii (Independent & Sovereign Nation State of Hawaii, 2021).

Despite acknowledging the illegality of the 1893 overthrow of the Hawaiian monarchy, the US government does not recognize the Nation of Hawaiʻi as an independent sovereign nation (PBS Hawaiʻi, 2015). Instead, the US views the Native Hawaiian community within the framework of American Indian Law (PBS Hawaiʻi, 2015), which considers federally recognized Indian Tribes to be "domestic, dependent nations" (*Cherokee Nation v. Georgia*, 1831, ¶ 7). Within this framework, Native Hawaiians have not been federally recognized and thus are not considered to have an official government like other federally recognized Indian Tribes. So,

while federally recognized Indian Tribes have a “government-to-government” relationship with the US, the “Native Hawaiian Community has a government-to-sovereign relationship and uses Native Hawaiian organizations as its informal representatives” (US Department of the Interior et al., 2022, p. 3). There is an ongoing debate within the Native Hawaiian community as to whether federal recognition would benefit or hurt the Nation of Hawaiʻi’s credibility and power as an independent sovereign state (PBS Hawaiʻi, 2015).

3.6.4 ʻĀina Hui

Mahi et al. (2024) describe ʻĀina Hui as community-based organizations focused on ʻāina restoration. As mentioned earlier in this literature review, ʻāina means “that which feeds” and refers to physical, spiritual, emotional, and intellectual nourishment (Vaughan, 2018, p.4). The holistic nature of ʻāina means that, in restoring ʻāina, people and communities “restore themselves, their self-determination, and wellbeing” (Mahi et al., 2024, p. 2; Corntassel, 2012; Diver et al., 2024; Goodyear-Ka’opua, 2013). In this vein, the authors connect ʻāina restoration to political sovereignty, writing that “In many ways, the ʻĀina Organizations’ day-to-day physical labor on dedicated space reclaims a substantial land base of kīpuka aloha ʻāina (Peralto, 2018) and embodies practices of self-determination and sovereignty” (Mahi et al., 2024, p. 2). In this way, the authors describe ʻĀina Hui as ‘Land Back’ initiatives that support the political resurgence of Native Hawaiian people and which contest the “neoliberal framework of environmental protection (i.e., greenwashing) and cultural resurgence” (Mahi et al., 2024, p. 15; *NDN Collective Manifesto*, 2022; Simpson, 2017; Thompson, 2022). Additionally, the work of ʻĀina Organizations is fundamental to building climate change resilience and sustainability (Mahi et al., 2024).

Mahi et al. (2024) compiled a geospatial database of ʻĀina Organizations from 1950 to 2022 called the ‘ĀINAVIS Index’ and conducted interviews with select ʻĀina Organizations from the dataset. Their research revealed numerous findings, including the following: the number of

‘Āina Organizations being established has grown rapidly over the last 50 years, indicating a growing ‘āina restoration movement and greater awareness of culture's role in addressing community and ecological needs. They found that the work of these organizations is multifaceted, while sharing common missions that highlight the centrality of culture to resource management and the need to protect ‘āina to protect the community. The interviews revealed that connections with grassroots, community-based, or "formal” institutional networks of peer organizations were a key source of support for these ‘Āina Huis (Mahi et al., 2024, p. 11). The networks “connect kīpuka” throughout Hawai‘i, allow for the exchange of grassroots resources, experiences, inspiration, and collectivity in movement building, and are vital to the sustainability and effectiveness of ‘Āina Hui work (Mahi et al., 2024, p. 14). Moreover, they found that the "involvement of schools, educators, and the younger generation nourishes the continuation of social movements and the formation of new hui” and that “In both the interviews and the ‘ĀINAVIS Index, education emerges as a central theme when ‘Āina Organizations describe their work” (Mahi et al., 2024, p. 11).

The interviews also revealed challenges, including access to funding, “conflicts with market and tourist-based economies, degraded ecosystems, climate change, and the encroachment of non-native species” as well as “Social and political challenges, such as development, tourism, and limited land access” (Mahi et al., 2024, p. 10). The interviews emphasized that access to land, essential for ‘āina restoration work, “is continually threatened by development, urbanization, tourism, and military presence” (Mahi et al., 2024, p. 9). They write that this threat to land access makes ‘āina restoration work a political effort that hinges on restoration of sovereignty.

‘Āina Organizations are also connected to cultural kīpuka (Mahi et al., 2024). In this context, cultural kīpuka encompasses organizations that conduct ‘āina work but are not necessarily rural communities where traditional subsistence lifeways have continued, as defined by McGregor (2007). Both forms of cultural kīpuka are oases of Land Back and ‘āina restoration

movements amid devastating change and thus provide the basis for ecological and political resurgence of Native Hawaiian people in modern Hawaiʻi.

3.7 Land Back

The history of colonization that Native Hawaiians endured is one shared by Indigenous peoples worldwide. In the US, Indigenous peoples have lost 98.9% of their ancestral homelands due to colonial, capitalistic forces (Farrell et al., 2021). Moreover, the same forces that have displaced First Nation peoples have also devastated ecosystems and driven anthropogenic climate change (Pasternak & King, 2019; Whyte, 2017). Land Back is a global movement in response to these capitalist-colonial outcomes to return the land and relations to the land to Indigenous peoples (Barger et al., 2024). The movement “addresses the root pain of colonization—the theft of Indigenous lands, alienation of lands for resource extraction, the violence and genocide committed against Indigenous peoples for statehood and capitalism, and the hundreds of years of devastating aftereffects” (Pieratos et al., 2021).

Land Back efforts operate both within and against a western, capitalistic property ownership system (Barger et al., 2024). One approach in the Land Back movement is called rematriation (Barger et al., 2024). This process seeks to "restore sacred relationships between Indigenous people and [their] ancestral land" and "honoring [their] matrilineal societies...in opposition of patriarchal violence and dynamics” (What Is Rematriation?, n.d., ¶ 1). Strategies to rematriate lands include "buying back ancestral lands, accepting land donations, securing rights to access and steward land, enforcing historic treaty agreements through legal action, and co-managing lands with other entities" (Barger et al., 2024, p. 2; Seeds of Land Return, 2023).

Land Back efforts in Hawaiʻi can be linked to the Hui Movement, which arose in response to the historical changes from traditional land tenure to a private property system after the Māhele (Andrade, 2008; Barger et al., 2024). A modern equivalent to these hui kūʻai ʻāina (land-buying associations) is community land trusts (CLT).

3.8 Governance arrangements, co-governance, and co-management

Governance and co-governance arrangements are integral to Hawaiian SES restoration because kīpuka of the Hawaiian SES live within the westernized social-ecological landscape in Hawaiʻi today, including the governance structures and market economy imposed by the US. This section aims to clarify what is meant by governance arrangements, co-governance, and co-management both generally and in Hawaiʻi.

Governance refers to the structures and processes through which societies make decisions and distribute power (Lebel et al., 2006). Governance structures are the institutions of social coordination (Stoker, 1998) that shape individual and collective behavior (Lebel et al., 2006; Young, 1992). Governance arrangements can include a wide range of formal and informal processes and interactions. As Lebel et al. (2006, p. 2) explain,

> "Governance includes laws, regulations, discursive debates, negotiation, mediation, conflict resolution, elections, public consultations, protests, and other decision making processes. Governance is not the sole purview of the state through government, but rather emerges from the interactions of many actors, including the private sector and not-for-profit organizations. It can be formally institutionalized or expressed through subtle norms of interaction or even more indirectly by influencing the agendas and shaping the contexts in which actors contest decisions and determine access to resources."

According to Kooiman (2003), there are three primary governance models: hierarchical governance, characterized by top-down state intervention; self-governance, marked by autonomous decision-making; and co-governance, involving collaborative interaction between various actors.

Dodson (2014) defines co-governance as "arrangements in which ultimate decision-making authority resides with a collaborative body exercising devolved power—where power and responsibility are shared between government and local stakeholders." In New Zealand, co-governance are formal arrangements based on the Treaty of Waitangi to share decision-making between Māori and the New Zealand government (Maxwell et al., 2020). By contrast, in Hawaii, there is no formal co-governance system between Native Hawaiians and the US government

because the US government does not recognize the Nation of Hawaiʻi (see section 3.6.3). Thus, in the Hawaiʻi-focused literature, co-governance mainly appears as co-management or co-stewardship.

3.9 Conclusion

This chapter was a literature review covering key topics related to biocultural restoration in Hawaiʻi. It clarified the meaning of the ahupuaʻa system traditionally and today and defined key concepts such as social-ecological systems, biocultural restoration, sustainability, resilience, and governance. It covered key sustainability and resilience elements of traditional Hawaiian SESs pre-contact, provided an overview of the history of colonization in Hawaiʻi, and identified some of the ways Hawaiian SESs have evolved into modern times. This section also reviewed literature on Land Back concepts and strategies in Hawaiʻi. The next chapter will be an exploration of the research questions through a case study of Kīpahulu ʻOhana.

Chapter 4: Case study 1, Kīpahulu ʻOhana

This chapter is an investigation of GAs that supported traditional Hawaiian SESs related to kalo cultivation in Kīpahulu Moku before contact, as well as how traditional Hawaiian SESs are lived and practiced today through kalo cultivation in the moku within the modern western social-ecological landscape.

4.1 Background: Kīpahulu moku and East Maui

Kīpahulu Moku is a traditional hunting, fishing, gathering, and agricultural area that has sustained the local Hawaiian population for centuries (Kīpahulu ʻOhana, 2023). The moku is in East Maui (Figure 3), one of the places McGregor (2007) identified as a cultural kīpuka because of its relative isolation and resulting continuation of traditional lifeways and native biological abundance, despite the onslaught of development around the island chain.

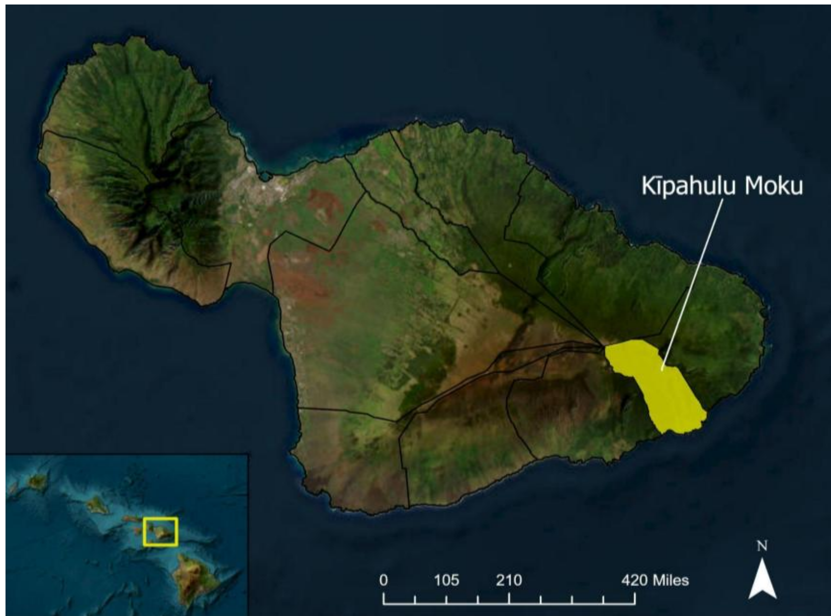

Figure 3: Kīpahulu Moku (yellow) is on East Maui and is one of twelve moku on the island of Maui (data source Hawaii Statewide GIS Program, 2021).

4.1.1 Landscape key features

Kīpahulu moku is on the wet, windward slopes of Haleakalā. The moku is approximately 12,000 acres, beginning at 8,000 feet elevation on Haleakalā and continuing to the deep sea (Kīpahulu ‘Ohana, 2012). Haleakalā (10,023 ft) topographically sets East Maui apart from the rest of the island and creates ecological zones from coastal habitats at sea level to wet and dry forests at mid-elevation to subalpine ecosystems toward the summit (Cusick, 2009). Being on the windward side of Haleakalā, Kīpahulu Moku and the surrounding area receive high precipitation year-round, resulting in dense vegetation. Kīpahulu Valley’s dense vegetation cover makes it one of the most impenetrable valleys in the Hawaiian archipelago (Cusick, 2009).

Figure 4: Kīpahulu Valley viewed from the upper elevations of Haleakalā volcano (image source Szlachetka, 2009).

The annual rainfall gradient in Kīpahulu Valley (Figure 4) ranges from approximately 79 inches by sea level to about 157 inches at 3,280 feet, with maximum rainfall exceeding 300 inches (Cusick, 2009). There are ten streams in Kīpahulu moku. ʻOheʻo and Puaʻaluʻu streams are perennial, and all other streams are intermittent (Kīpahulu ʻOhana, 2012). ʻOheʻo stream is the largest, crossing many of the moku's ecological zones and hosting rare native aquatic species that depend on the stream and marine ecosystems for survival (Kīpahulu ʻOhana, 2012).

The high annual rainfall and perennial streams in the moku create ideal conditions for loʻi kalo agriculture. In fact, East Maui has significant assets forming a foundation for kalo production (Kīpahulu ʻOhana Inc, 2008). Virtually every flat area along every stream in the region has historic abandoned loʻi that could be restored (Kīpahulu ʻOhana Inc, 2008). There is also a range of genetic varieties of kalo suitable for different areas and uses in the East Maui region from when Hawaiians historically cultivated this sacred food in the region (Kīpahulu ʻOhana Inc, 2008). In a 1980 inventory of Kīpahulu vascular plants, taro was found along Waimoku Falls Trail in very wet areas, including the base of the falls, at the "Hawaiian Planting

Area” where Kapahu Living Farm is today, and at remnant taro patches in upper gulches (Smith, 1980, p. 20). The survey also documented a small area of wet taro growing near the Palikea Stream at an elevation of 1290 feet (Smith, 1980).

4.1.2 Ecosystem health

Kīpahulu Moku’s ecosystems are some of the healthiest in the archipelago but have not been entirely unaffected by colonization and modern threats. Kīpahulu Moku’s montane rainforest and sub-alpine grasslands have been identified as the least disturbed in Hawaiʻi and are centers of endemism (Cusick, 2009). The rainforests and bogs of Kīpahulu Valley (Figure 4) are rich in biodiversity and serve as an essential refuge for a host of native Hawaiian plant and animal species that are disappearing elsewhere (Haleakalā National Park, 2023). However, disruption by human activity, feral ungulates, invasive species, and climate change has left ecological communities in a state of constant change, especially in lower elevation areas (below ~1640 feet) (Cusick, 2009; Kīpahulu ‘Ohana, 2012).

The moku environments have been impacted by the degradation of the watershed by feral ungulates – e.g., goats, pigs, deer, and cattle, all introduced by colonizers except for pigs – and introduced invasive plant species (Kīpahulu ‘Ohana, 2012). The landscape of Kīpahulu at lower elevations mainly consists of non-native vegetation (Haleakalā National Park et al., 2003). Invasive plant species and ungulates create conditions that expose soil to runoff, increase water transpiration into the atmosphere, and reduce freshwater infiltration into groundwater. The disturbance of native vegetation and soils means more fresh water becomes runoff instead of percolating underground, thus carrying more sediment to the ocean, especially during heavy rainfall events, and contributing to nearshore marine habitat degradation (Kīpahulu ‘Ohana, 2012). Feral ungulates and introduced rodents also contribute to leptospirosis, a bacterial pathogen, in freshwater streams and the proliferation of disease-carrying mosquitoes (Kīpahulu ‘Ohana, 2012).

Kīpahulu's ecosystems are also threatened by the effects of climate change (Haleakalā National Park, 2023). Warming temperatures are causing rain clouds to form at higher elevations, reducing precipitation in Kīpahulu Valley, between sea level and 3000 feet elevation (Haleakalā National Park, 2023). Shifting temperatures and rainfall patterns have enabled invasive species to spread more effectively through the lower ʻOheʻo Gulch area and continue inland (Haleakalā National Park, 2023). Warming temperatures also threaten endemic birds. This is caused mainly by avian malaria spread by mosquitoes whose larvae cannot hatch in cooler temperatures (Haleakalā National Park, 2023).

Loʻi kalo enhances the health of ecosystems within the moku, while healthy moku and ahupuaʻa ecosystems support the health and production of loʻi kalo systems. Loʻi kalo restoration has been identified as a strategy for sediment control and water retention in the moku (Maui Nui Makai Network, 2020). Reestablishing loʻi kalo has also been identified to increase the abundance of rare endemic species, such as the pinapinao (Hawaiian damselfly), found at Kapahu Living Farm (Smith, 1980). A healthy loʻi kalo system requires clean, fresh water, so a healthy ahupuaʻa watershed is integral to kalo production, both in Kīpahulu and beyond (Kīpahulu ʻOhana Inc, 2008).

4.1.3 Population demographics and community features

The population of Kīpahulu Moku is a rural community of approximately 150 residents who live off the grid (Kīpahulu ʻOhana, 2023). The most recent demographic profile specific to Kīpahulu moku from 1930 indicated that the population consisted of 80% Hawaiians (McGregor & MacKenzie, 2015). There is no recent demographic data specific to Kīpahulu Moku. However, census data for the ZIP Code Tabulation Area for East Maui that includes Kīpahulu Moku shows the following demographic data for the area's 938 people (US Census Bureau, 2021). Almost half (48.08%) of the population is Native Hawaiian or Pacific Islander, about a third (32.73%) is white, and about a fifth (18.34%) is two or more races. The median household income is

$50,486, while the per capita income is $28,112. The area has a high unemployment rate at 15.78%. East Maui residents' population density and median incomes are lower than those of central and west Maui (Cusick, 2009).

The residents generate their own power with solar energy, and they obtain water through a catchment system, local streams, or wells (Kīpahulu ‘Ohana, 2012). The only public utility the moku residents have is telephone service (Kīpahulu ‘Ohana, 2023). Haleakalā National Park et al. (2003, p. 15) write, "The Kipahulu community retains a strong Hawaiian identity that perpetuates human heritage and offers examples of balanced resource use." Despite the small, remote residential population, Kīpahulu moku attracts about one million visitors annually (Kīpahulu ‘Ohana, 2012).

4.1.4 Brief history of location

Kīpahulu means “fetch [from] exhausted gardens” (Pukui et al., 1974, p. 112) and "place where soil is worn out (pahulu) from constant farming; worn-out soil" (Pukui & Elbert, 1986, p. 154). The area is aptly named, as Kīpahulu was previously rich in diverse agricultural resources, such as taro and other native food plants (Kīpahulu ‘Ohana, 2012). Colonizers transformed the coastal zone into largely monoculture in the post-contact period (Cusick, 2009). Around the start of the 19th century, lo‘i and ‘auwai were cleared at random for sugar cane and pineapple plantations and bulldozed later for commercial ranching (Cusick, 2009).

4.2 Background: Kīpahulu ‘Ohana

The Kīpahulu ‘Ohana is a grassroots nonprofit ‘Āina Hui founded in 1995 that focuses on the sustainability of Hawaiian culture and the stewardship of the Kīpahulu Moku through traditional Hawaiian customs and practices (Kīpahulu ‘Ohana, 2012). For almost 20 years leading up to 1995, the organization’s founders’ work centered on lo‘i kalo restoration in the East Maui area, encouraging lineal descendants to come back home and revive the traditional agriculture practice (*History*, n.d.). Kīpahulu ‘Ohana ultimately aims to re-establish a Hawaiian

lifestyle in Kīpahulu and take care of the moku’s families using the wisdom and spiritual guidance of their kūpuna (Haleakalā National Park et al., 2003; Kīpahulu ‘Ohana, 2012). They are also committed to educating residents and visitors about the Hawaiian traditions and practices they seek to restore. The ‘Ohana has developed various programs related to “ahupuaʻa management” to accomplish their vision (*History*, n.d., ¶ 2). Since even before the hui was established as a nonprofit, a central ahupuaʻa management project has been loʻi kalo restoration in the moku, particularly the area now known as Kapahu Living Farm (Figure 5).

Figure 5: Kapahu Living Farm loʻi patches (image source Kapahu Living Farm, n.d.).

4.2.1 Key players

Uncle Mike Minn, Uncle John Lind, and Auntie Tweetie Lind founded the Kīpahulu ‘Ohana under the guidance and mentorship of the late kūpuna, Tevi Kahaleuahi, when they began restoring the loʻi at the Kapahu area of Kīpahulu (*History*, n.d.). Between 1978 and 1995, John and Tweetie Lind, Mike Minn, and other key stakeholders led the restoration of lo’i kalo in East Maui (*History*, n.d.). Today, the Kīpahulu ‘Ohana constituency includes traditional subsistence practitioners and ‘ohana (families) with ancestral connections to Kīpahulu moku spanning multiple generations (Kīpahulu ‘Ohana, 2023).

4.2.2 Project areas

Kīpahulu ʻOhana achieves its mission through several mauka-makai (mountain to ocean) project areas, but this thesis concentrates on the hui's loʻi kalo-related work. The hui's flagship project is Kapahu Living Farm, where historic loʻi kalo and other canoe plants have been restored to active production (*Kapahu Living Farm*, n.d.). As of 2008, Kīpahulu ʻOhana and stakeholders had restored 25 historic loʻi on about 2.5 acres, with plans to expand (Kīpahulu ʻOhana Inc, 2008). Kapahu Living Farm is also used for educational programs for schools, community groups, and others (*Kapahu Living Farm*, n.d.).

Kalo harvests from the farm are processed into traditional food products, such as poi (cooked taro pounded and thinned with water), at Kīpahulu Kitchen, their shared-use certified kitchen, and distributed to the Maui community (Crawford, 2021; Kipahulu Kitchen, n.d.). Kīpahulu Kitchen is also shared by other value-added food processors and lunch wagon vendors in East Maui, enabling them to meet Department of Health requirements (*Kipahulu Kitchen*, n.d.). The kitchen is off-grid, with solar energy, satellite internet, and a composting toilet (*Kipahulu Kitchen*, n.d.).

4.3 Pre-contact ʻŌiwi SESs through kalo cultivation in Kīpahulu Moku

As Cusick (2009, 2011) and Kirch (1997) write, despite the concentration and political significance of the pre-European contact population in the area, archaeological research in East Maui has been limited. However, researchers agree that Kīpahulu and its neighboring areas, Hana to the northeast and Kaupō to the southwest, were historically coveted due to their plentiful environmental and human resources (Kirch, 1997; Kornbacher, 1993; Smith, 1980; Smith et al., 1985; Youngblood, 1983). Abundant food and resources enabled a large population in this area (Soehren, 1963; *cited in* Cusick, 2009), and kalo was the principal crop grown, as discussed below.

4.3.1 Historical biocultural keystone: kalo in Kīpahulu Moku pre-contact

A 1975 National Park Service (NPS) survey of 208 acres in the Kīpahulu area documented 759 archeological features at 26 archeological sites and 14 historic sites (National Park Service, 1995). These sites' features were primarily stone mounds, stone walls, and earthen terraces, reflecting the local population's food base – agriculture, with the principal crop being taro – supplemented by protein from the sea (National Park Service, 1995). A report from the State of Hawaii Department of Agriculture & AECOM (2019, p. ES1) agrees that taro was the predominant crop in East Maui, writing that

> "While the wet trade winds provided the area with ample rain to grow awa, maiʻa (bananas), ʻuala (sweet potatoes), ulu (breadfruit); the most important staple was kalo. Kalo was generally grown in loʻi (fields or patches) and families were encouraged to use the "spirit of mutual dependence" in the use of water within the loʻi complexes and amongst the users on the same stream."

Handy writes that "Kīpahulu was a moku (district) with rich and diverse but scattered agricultural resources. Its great valley and lower fringing forests nourished forest taro and other native food plants…" (Handy, 1940, *cited in* Smith, 1980, p. 72). Kīpahulu contained many ahupuaʻa with small valleys fed by streams, which were terraced and planted with wet kal,o while the lowland forests that fringed the area were planted with dryland kalo (McGregor, 2007). A 1980 survey recorded evidence of extensive terraces associated with ancient dry taro cultivation in the kula (flat lands) areas of ʻAlaenui, ʻAlaeiki, and Kaumakani ahupuaʻas, which was confirmed in interviews of lineal descendants of Kīpahulu (Smith, 1980). In addition to the loʻi of Kapahu Living Farm, there are extensive walls of loʻi and some of the original ʻauwai still intact along the Kaupō side of the 'Ohe'o Gulch stream. These loʻi indicate a considerable amount of wet-taro farming once occurred here (Smith, 1980).

Archaeological research from various sites in Hawaiʻi has shown that the development of terraces and irrigation systems was closely linked to population growth (Kirch, 1997). Cusick (1994) writes that in Kīpahulu Valley, these water delivery systems would have led to higher crop yields for labor invested, allowing for the expansion of loʻi kalo and other agriculture

systems into previously forested areas cleared and modified to support intensive farming. The construction of this infrastructure to access freshwater required significant labor and management. However, once the land was cleared and prepared for cultivation, the community thrived materially, allowing individuals to engage in various forms of cultural expression, including arts, crafts, religious ceremonies, and rituals (Cusick, 1994).

4.3.2 Moku system nested land divisions

Kīpahulu was one of twelve moku on the mokupuni (island) of Maui; eight of the twelve moku intersect at Haleakalā crater on the East side, including Kīpahulu (Haleakalā National Park, 2021). On East Maui, the land division followed principles like those on Hawai‘i island, with a stronger adherence to the radial system (Lyons, 1875). On the east side of Haleakalā crater, there is a rock called the "Pohaku oki aina" (land-dividing rock) or the Pōhaku Pālaha that is the piko (center, belly-button) from which the eight moku of East Maui emanated (Lyons, 1875, p. 111; Soehren, 2002).

On Maui, ahupua‘a were defined from stream to stream rather than ridge to ridge (McGregor, 2007). According to Kīpahulu ‘Ohana (2012), within Kīpahulu moku, there are eleven ahupua‘a; heading northeast, they include Ka‘āpahu, Kukui‘ula, Kapuaikini, Maulili, Kīko‘o, Kalena, Kakalehale, Halemano, ‘Alaenui, ‘Alaeiki, and Kaumakani. Historically, Kīpahulu was also considered to be a part of the Hāna district, which encompassed the area from Ko‘olau to Kaupō, most of East Maui today (McGregor, 2007; Youngblood, 1983). The ahupua‘a in the Hāna districts generally "extend from the sea to the uplands. Some extend inland only as far as the forest, while others sweep up to the top of the mountain. A few go into the crater to meet ahupua‘a from other districts at the piko (umbilical) stone, Pōhaku Pālaha…" (McGregor, 2007, p.84)

4.3.3 Traditional biocultural resource management system in Kīpahulu

According to McGregor (2007), Hawaiian ahupua‘a mauka-makai land use in southeast Maui was linked to the planting cycle, which depended on rainfall variations according to

elevation and seasons. Planting could be done year-round in the uplands, where it typically rained daily. Planting was usually timed with the rainy season in the lowlands. When the rains moved to the lowlands, each family moved with them to temporary habitation sites along the coast (McGregor, 2007).

The mokus of East Maui were interdependent in their use and management of biocultural resources. For instance, according to McGregor (2007), if there was a drought, the families of Kaupō moku visited their relatives in Kīpahulu to gather and receive food. Most families in the two districts were related, and exchange and sharing between the mokus families were typical and expected (McGregor, 2007).

Additionally, there is evidence that the communal land tenure customary among traditional Hawaiian SESs was alive in early society in Kīpahulu. A 1941 dissertation reported that a few of the older Hawaiians in Kīpahulu still remembered the "days when the whole community functioned as a single unit, carrying on such common work as planting, harvesting, and fishing" (Yamamura, 1941, p. 35).

Researchers have also speculated how the kapu system may have been used in Kīpahulu. For instance, below 3280 feet, the land in Kīpahulu was under intensive cultivation, but there was an absence of agricultural remnants of the upper plateau of the valley. It is hypothesized that the area was either kapu (off limits) or abandoned earlier than the lower plateau (Smith et al. 1985).

4.4 Modern ʻŌiwi SESs through kalo cultivation in Kīpahulu Moku

Although Kīpahulu Moku's SES is a cultural kīpuka that has been relatively protected from the forces of colonization and globalization, it still interacts with the modern western SES that has evolved in Hawaiʻi. Kīpahulu ʻOhana and moku residents seeking to maintain traditional Hawaiian lifeways regularly engage with modern governance and economic systems and must contend with ecological impacts beyond their control, such as the effects of invasive species or climate change.

4.4.1 Modern biocultural keystone: kalo cultivation in Kīpahulu Moku today

Most modern-day kalo cultivation in Kīpahulu Moku occurs at Kapahu Living Farm. However, there are other sites in the moku that were historically used for dryland kalo farming that Kīpahulu ʻOhana seeks to restore (Kīpahulu ʻOhana Inc, 2008). The loʻi kalo at Kapahu Living Farm is restored from ancient loʻi and ʻauwai infrastructure. The wetland taro patch is fed by the ʻOheʻo stream, which flows all the way down to the ocean. The loʻi (irrigated terraces) of Kīpahulu provide important ʻōpae (prawn) and ʻoʻopu (goby fish) habitat when they return upstream from the ocean. ʻOʻopu and ʻōpae sometimes climb waterfalls, underground springs, and pipelines hundreds of feet inland to enter Kapahu Living Farms' loʻi kalo, journeying into upper ʻOheʻo stream (Kīpahulu ʻOhana, 2012).

4.4.2 Continuity of traditional Hawaiian SESs through Kīpahulu ʻOhana's loʻi kalo

Communal land tenure: The loʻi kalo at Kapahu Living Farm demonstrates a form of communal land tenure like that of the Hawaiian SES before European contact. Kīpahulu ʻOhana staff and volunteers share the labor to grow, harvest, and prepare kalo. The farm is also located on land considered public land, HNP, the arrangement for which is described in more detail below. They then use the kalo for communal benefit or share it with the community and educational programming groups.

Moku system BRM approach: Kīpahulu ʻOhana uses a moku system approach to ensure a healthy loʻi kalo system by managing the health of the whole ahupuaʻa system in which the loʻi is located. For instance, in a 2008 Hawaiʻi state funding grant application Kīpahulu ʻOhana submitted for ahupuaʻa management, Kīpahulu ʻOhana describes the project as follows:

> "With this project, the Kīpahulu ʻOhana will conduct ahupuaʻa restoration and management, including A) loʻi kalo restoration and cultivation, and B) native forest conservation and restoration through feral animal control, invasive species removal, and native plant propagation…The two aspects of this request are both an integral part of one overall ahupuaʻa management plan. The ahupuaʻa extends from the wao akua, or realm of the gods, in the high-elevation forest areas, down to the kahakai, the shoreline, and on out into the ocean. This proposal deals with the land-based components of the ahupuaʻa. One obvious

> example of the interconnection of these two elements is water, the lifeblood of the ahupuaʻa—a healthy native forest is the source of sufficient water to ensure healthy kalo production” (Kīpahulu ʻOhana Inc, 2008, p. 1).

The grant application goes on to say that the practice of growing kalo is “an integral part of overall ahupuaʻa management efforts” (Kīpahulu ʻOhana Inc, 2008, p. 2). Thus, in line with traditional Hawaiian BRM, Kīpahulu ʻOhana treats ahupuaʻa management as essential to a healthy loʻi kalo and treats loʻi kalo as a fundamental part of ahupuaʻa management.

Konohiki-led land management: John Lind, co-founder of the Kīpahulu ʻOhana and generational resident of Kīpahulu and Hāna, was a traditional konohiki of the Kīpahulu Moku until he passed away in 2022. He oversaw all lands and projects of Kīpahulu ʻOhana and managed Kapahu Living Farm (*Staff*, n.d.). In the aforementioned grant application, Lind’s responsibilities as a konohiki project director included management tasks such as timing of plantings according to moon phases, managing weeding and harvesting schedules, overseeing the flow of water, prioritizing the re-opening of previously fallow loʻi, selecting target areas for forest conservation, and directing the planting of other crops, that are interplanted between rows of dryland kalo (Kīpahulu ʻOhana Inc, 2008).

Subsistence and sharing economy: Within Kīpahulu Moku, the dominant economy is based on subsistence (Crawford, 2021; Hawaiʻi DLNR, 2014; McGregor, 2007) as well as sharing, exchange, and cooperation (Kīpahulu ʻOhana, 2012, p. 3; Maui Economic Development Board, 2022; McGregor, 2007), reflecting the Hawaiian SES in Kīpahulu pre-contact. The hui writes that preserving their culture means "initiating sustainable projects, dividing the labor, and sharing the results" (Kīpahulu ʻOhana, 2012, p. 3)

A significant portion of the labor for Kapahu Living Farm comes from volunteers. The hui hosts monthly community workdays and some of their educational programming involves taro patch weeding, planting and harvesting (*Kapahu Living Farm*, n.d.). According to their 990 tax form for 2022, most of the employees of Kīpahulu ʻOhana work for free (Kipahulu Ohana Inc, 2022). This may suggest that subsistence-based economic production supports the needs of

employees who are residents of the moku. It could also mean they must work other jobs on top of their work at Kīpahulu ʻOhana; however, given the high unemployment rate in the area (see population demographics in section 4.1.3 above), the latter is probably uncommon. Much of the harvests from the loʻi kalo are shared, both with the Kīpahulu community and visitors to the farm.

Collaborative decision making and consulting makaʻāinana and kūpuna: Since Kīpahulu ʻOhana was established, moku residents have been regularly consulted and play an integral role in the stewardship of Kīpahulu Moku (Kīpahulu ʻOhana, 2023). The nonprofit also helps coordinate Kupuna Council meetings to provide cultural consultation from community experts to the park (Kīpahulu ʻOhana Inc, 2008; *Partners*, n.d.). Moreover, the founders of Kīpahulu ʻOhana are a part of Aha Moku o Maui, which is a modern version of the Aha councils of pre-contact Hawaiʻi. Every moku on Maui has a representative, thus representing each of the 12 moku of Maui.

4.4.3 GAs enabling kalo amid modern western social-ecological landscape

The Hawaiian SES that has continued in Kīpahulu Moku from the pre-contact era has evolved in response to the governance and economic changes in Hawaiʻi's post-contact SES landscape. The Hawaiian SES around kalo cultivation has had to work within the introduced land tenure system of private property ownership, US governance institutions, and laws for using and managing land within NPS conservation and agriculture lands.

Operating as a nonprofit: The residents of Kīpahulu working toward restoring loʻi and perpetuating traditional Hawaiian lifeways in the moku did so by forming Kīpahulu ʻOhana as a nonprofit, a formalized western institution. It allowed them to form a cooperative agreement with Haleakalā to cultivate the land at Kapahu Living Farm, access new funding opportunities, and have a voice in federal conservation efforts (i.e., government-to-sovereign relationship mentioned in section 3.6.3 above). However, working as a nonprofit means Kīpahulu ʻOhana's

SES restoration work must fit into western institutional frameworks that are regulated by US governments and influenced by funders, which could limit their work to projects deemed acceptable by funders and government authorities.

Private land ownership system: There are multiple landowners in the Kīpahulu moku, but most land is government-owned. Most of the land in the moku, including Kapahu Living Farm, is a part of HNP, owned and managed by the federal government (Figure 6). The State of Hawaiʻi is the second most prominent landowner, shown in green in the figure. Some of the state-owned land in Kīpahulu Valley is designated as a forest reserve and is managed by the State of Hawaiʻi Department of Land and Natural Resources (DLNR), Division of Forestry and Wildlife (DOFAW) as a part of the Forest Reserve System (Hawaiʻi DLNR, DOFAW, 2023). Other landowners in the moku include the County of Maui, private individuals, trusts, and organizations like The Nature Conservancy (TNC) and Kīpahulu ʻOhana.

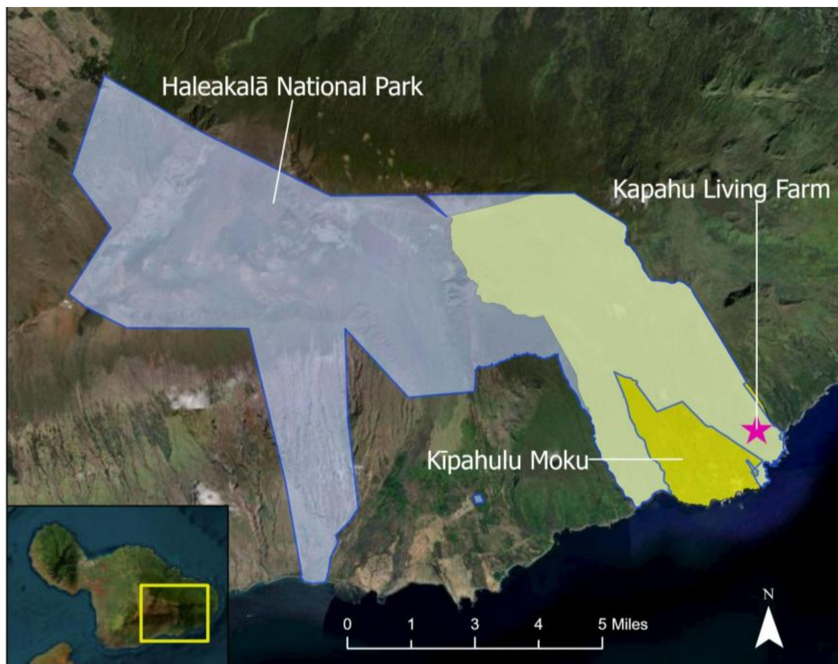

Figure 6: Most of the land in Kīpahulu Moku (yellow) is part of Haleakalā National Park (blue), including Kapahu Living Farm (pink star) (data sources Hawaii Statewide GIS Program, 2021; xhan24_GISandData, 2019).

Kīpahulu ʻOhana is a private owner of a parcel makai (toward the ocean) of the moku. The nonprofit also leases at least two other parcels from the State of Hawaiʻi DLNR (Hawaiʻi DLNR, 2014). Kīpahulu Kitchen, where kalo from the farm is processed into poi and other products before being distributed to the community, is located on one of the leased parcels known as the triangle (Hawaiʻi DLNR, 2014). According to the lease agreement for the two parcels, Kīpahulu ʻOhana leases the land for a significantly discounted rent because of the public benefits the hui provides at no extra cost to the State (Hawaiʻi DLNR, 2014). The hui achieved this discounted rent price with the support of the Office of Hawaiian Affairs (OHA), which proposed to the DLNR that the lease agreement "be amended and disposed the lease to an eleemosynary (charitable) organization pursuant to HRS 171-43.1, at nominal rent, by direct negotiation" (Hawaiʻi DLNR, 2014, p. 5).

Management through western governance system arrangements: As mentioned, Kapahu Living Farm operates through a cooperative agreement between Kīpahulu ʻOhana and HNP. As a result, the BRM of the loʻi kalo and interconnected ecosystems is the responsibility of both the Park and Kīpahulu ʻOhana. For Kīpahulu ʻOhana, the agreement enables them to restore loʻi kalo and the cultural landscape of the moku using traditional BRM methods, fostering the continuity of traditional lifeways. The park's goal is to restore and conserve native resources and present living cultural interpretation for visitors to the Park.

According to the 2000 version of the Cooperative Agreement, "16 USC § 1a-2(g) authorizes the NPS to enter into cooperative arrangements with respect to living exhibits and interpretive demonstrations and park programs and to credit the proceeds therefrom to the appropriation bearing the cost of such exhibits and demonstrations" (Haleakalā National Park et al., 2003, p. 107). The agreement is regularly revised by the NPS and Kīpahulu ʻOhana and approved by the park superintendent (National Park Service, 2018). Farm changes—including management structure or boundary adjustments—are addressed through the agreement

process (National Park Service, 2018). In the Haleakalā National Park Long-Range Interpretive Plan, Haleakalā National Park et al. (2003, p. 83) describe the agreement as follows:

> The cooperative agreement between the park and the Kīpahulu ʻOhana provides private sector assistance in preservation of Hawaiian culture, a major interpretive theme at Kīpahulu. By terms of the agreement the Kīpahulu ʻOhana assists the park through cultural demonstrations, interpretive talks and exhibits, restoring the traditional landscape, constructing Hawaiian hale and cultivating Hawaiian loʻi (taro patches) within the park - all of which lend themselves to living history demonstration program.

The cooperative agreement statement of work for Kīpahulu ʻOhana requires the hui to assist the NPS in preserving, maintaining, and restoring the Kīpahulu Ahupuaʻa[4] for public use and enjoyment, assist the NPS in the restoration of native Hawaiian plant species including canoe plants on the condition that "propagating material sources, species, planting locations are determined by the Park's Resource Manager," assist the NPS "in the propagation cultivation nurturing and harvesting of Hawaiian plants used for production of ceremonial, demonstrational and sales items at Kipahulu" (Haleakalā National Park et al., 2003, p. 107, p. 108). The statement of work also requires Kīpahulu ʻOhana to designate a liaison to meet with park management to coordinate the hui's activities within the park, include a representative of the NPS as a non-voting advisory member of Kīpahulu ʻOhana's Board of Directors, and provide advance notice for any proposed actions by the Board (Haleakalā National Park et al., 2003). The rest of the statement of work is related to the hui's responsibility to provide interpretive cultural experiences for park visitors. The NPS's statement of work is a much shorter list but most notably includes a stipulation to provide financial assistance to Kīpahulu ʻOhana in furtherance of the agreement, authorized by individual Project Statements (Haleakalā National Park et al., 2003).

[4] The cooperative agreement uses the term ahupuaʻa. It is unclear whether this is a misuse of the term and is meant to refer to the moku. It could also refer to the ahupuaʻa where Kapahu Living Farm is located.

In 2021, this partnership was further "formalized" through Order No. 3403: Joint Secretarial Order on Fulfilling the Trust Responsibility to Indian Tribes in the Stewardship of Federal Lands and Waters (US Department of the Interior, 2024, p. 6). "The Order directs Interior, Agriculture, and Commerce (Departments) to ensure that their decisions relating to Federal stewardship of lands, waters, and wildlife include consideration of how to safeguard the treaty, spiritual, subsistence, and cultural interests of Tribes. It also directs the Departments' agencies to enter agreements with Tribes to facilitate their co-stewardship of Federal lands and waters…" (US Department of the Interior, 2024, p. 2). It is unclear whether this Joint Order changed the existing cooperative agreement between HNP and Kīpahulu ʻOhana. The Order does not change the status of the US's relationship with the Native Hawaiian Community, which remains a government-to-sovereign as opposed to a government-to-government relationship (US Department of the Interior, 2024). The Order explains that since the US government does not recognize Native Hawaiians as having their own sovereign nation like American Indian tribes and Alaska Natives, Native Hawaiian organizations are legally considered the representatives of the Native Hawaiian Community in co-stewardship agreements through this Order (US Department of the Interior, 2024).

Additionally, much of the Kīpahulu Moku was incorporated into HNP and designated a biological reserve in 1969 (Haleakalā National Park, 2023). TNC conducted an expedition into Kīpahulu Valley, revealing the significant value of the ecosystem and helping make the case for its protection (Haleakalā National Park, 2024). Shortly after the expedition, TNC acquired almost 10,000 acres of land, including the upper valley, through monetary and land donations from hundreds of people. Moku residents supported this effort, and many of them donated or sold their land to TNC. TNC subsequently transferred the land to HNP for permanent preservation (Haleakalā National Park, 2024). The designation means only scientists and managers authorized to conduct research and conservation projects are allowed into the reserve today (Haleakalā National Park, 2023). The valley's lack of trails and development is intended to

preserve its pristine character (Haleakalā National Park, 2023). This connects to Kīpahulu ‘Ohana’s loʻi kalo cultivation because the majority of the moku is now owned and under the jurisdiction of the federal government, including Kapahu Living Farm. As a result, Kīpahulu ‘Ohana’s ahupuaʻa management efforts in support of their loʻi kalo system are ultimately controlled by NPS authorities, despite the cooperative agreement. However, consolidating the land and protecting it through NPS and biological reserve regulations helps to preserve the moku’s ecosystem integrity at a time when human activity from the modern SES would otherwise put it at risk.

Modern strategic planning for the moku is another western governance process that influences the management of loʻi kalo cultivation, as planning documents guide government action and decision-making. One example is the Hāna Community Plan. The plan’s Cultural Resources section includes the objective to “Encourage the restoration and use of lo’i kalo (taro terraces) found in the Hāna region,” with the implementing action to “Develop regulations and implement programs to protect loʻi kalo (taro terraces), and encourage their productive use” (Maui County Council, 1994, p. 17, p. 18). Additionally, under the Economic Activity section, the plan includes the objective to “Maintain taro farming, ranching and floriculture as major economic activities and promote their economic viability and sustainability” (Maui County Council, 1994, p. 19). Furthermore, in the broader statewide planning context, the Hawaiʻi 2050 Sustainability Plan includes strategic actions to “Perpetuate Kanaka Maoli food production associated with land and ocean traditions and practices,” and to “Provide support for subsistence-based businesses and economies" (Hawaiʻi 2050 Sustainability Task Force, 2008, p. 59).

Modern economic system influences: Although the loʻi of Kapahu Living Farm in Kīpahulu Moku helps support an economy that is largely subsistence-based, Kīpahulu ‘Ohana still is subject to byproducts of capitalism – namely, the tourist industry – and it must participate in the cash economy to carry out its management efforts by obtaining grants and donations, and

through program revenue. Modern planning efforts for the moku have also identified supporting loʻi kalo cultivation as a viable approach to economic development for the community.

Tourism is a major part of Maui's economy. Just as the State of Hawaiʻi and the County of Maui are dedicated to attracting tourists to bolster their economies, the NPS is dedicated to attracting visitors to HNP as that helps pay for conservation efforts and park operations. Consequently, Kapahu Living Farm, including its loʻi kalo, is a destination in Maui's tourism industry, and the agreement Kīpahulu ʻOhana has with the park is largely around how Kapahu Living Farm can provide cultural demonstration and interpretation for park visitors.

Kīpahulu ʻOhana obtains most of its revenue to carry out its work from government grants. The hui also offers paid programming to support their work, but it makes up a much smaller portion of their revenue. Based on financial data from Kīpahulu ʻOhana's 990 tax forms from 2018 to 2023, the hui's average annual revenue was $566,865 ("Kipahulu Ohana Inc," 2018; "Kipahulu Ohana Inc," 2019; "Kipahulu Ohana Inc," 2020; "Kipahulu Ohana Inc," 2021; "Kipahulu Ohana Inc," 2022; "Kipahulu Ohana Inc," 2023). On average, over 95% of that revenue came from government grants, while just over 2% came from program service revenue. Their paid programming related to their loʻi kalo includes but is not limited to educational tours and retreats at Kapahu Living Farm for schools and community or corporate groups and a Cultural Interpretive Hike Tour for visitors who are not part of a group. Moreover, the hui sells t-shirts on its website (*Kapahu Living Farm Long-Sleeve*, n.d.) and charge a nominal fee for reservations of their communal commercial kitchen (Hawaiʻi DLNR, 2014).

Contemporary planning efforts for the moku have identified the support of loʻi kalo cultivation, along with other subsistence activities and resources, as a viable approach to economic development for the community. As mentioned above, the Economic Activity section of the Hāna Community Plan includes the objective to maintain taro farming as a major economic activity and to promote its economic viability and sustainability (Maui County Council, 1994).

4.5 Conclusion

This chapter explored governance arrangements that supported traditional Hawaiian SESs related to kalo cultivation pre-contact and today in Kīpahulu Moku. The case showed an example of a rural area where traditional subsistence agricultural lifeways have largely continued despite modernization. Historically, Kīpahulu Moku supported a large population and was coveted for its abundant agricultural resources, including loʻi kalo, remnants of which are found today. Loʻi kalo cultivation has been restored in Kīpahulu Moku from the pre-contact era at Kapahu Living Farm and demonstrates a continuity of traditional Hawaiian SES elements amid the modern Western SES. Loʻi kalo restoration in the moku was made possible through contemporary governance arrangements, including a cooperative agreement between Kīpahulu ʻOhana and HNP, JSO No. 3403, the protection of moku lands by incorporating them in HNP, the designation of Kīpahulu Valley as a biological reserve, the leasing of land from the DLNR at a discounted rate, the reciprocal relationships Kīpahulu ʻOhana has with volunteers and the community, and the Kīpahulu Moku community's self-sufficiency. The next chapter explores the research questions through a case study of Hoʻokuaʻāina, a nonprofit organization based on Oʻahu.

Chapter 5: Case Study 2, Hoʻokuaʻāina

This chapter is an exploration of governance arrangements that supported ʻŌiwi SESs through kalo cultivation in Kailua Ahupuaʻa pre-contact, as well as how ʻŌiwi SESs are lived and practiced today in the ahupuaʻa through kalo cultivation at Hoʻokuaʻāina, amid the modern western social-ecological landscape.

5.1 Background: Kailua Ahupuaʻa today

Kailua ahupuaʻa is located on the windward side of the Koʻolau mountain range on the island of Oʻahu (Figure 7) (Nohopapa Hawaiʻi, 2024). The ahupuaʻa is bordered by Waimānalo

Ahupuaʻa to the southeast and Kaneʻohe Ahupuaʻa to the northwest. Hoʻokuaʻāina is in the ahupuaʻa's Maunawili Valley (Hoʻokuaʻāina, 2024).

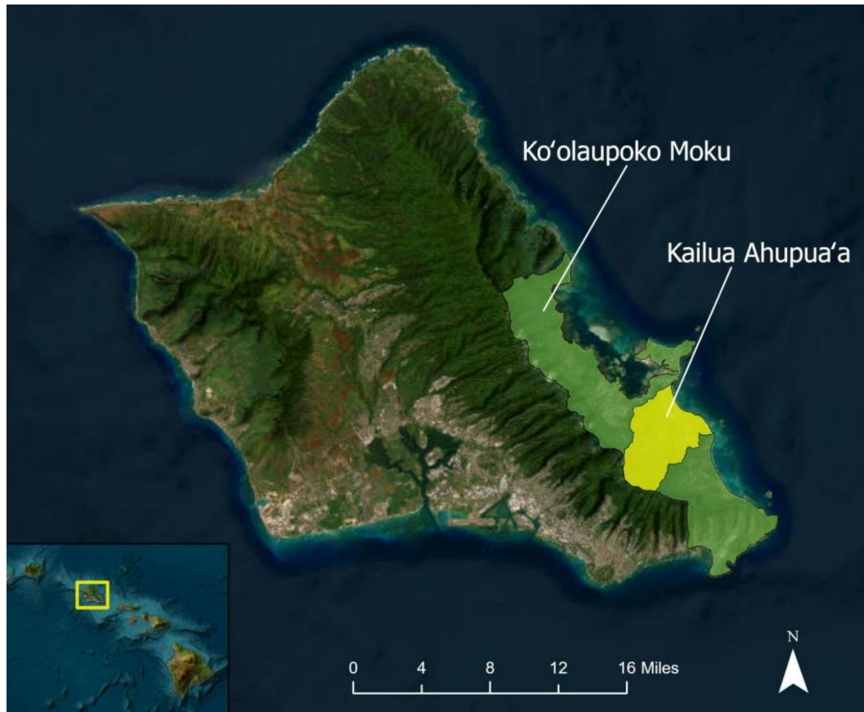

Figure 7: Map of the island of Oʻahu showing the Kailua Ahupuaʻa location (yellow) within Koʻolaupoko Moku (green) (data sources Hawaii Statewide GIS Program, 2021, 2024).

5.1.1 Landscape key features

Kailua Ahupuaʻa is rich with hills, peaks, ridges, gulches, plains, waterways, springs, caves, forests, and fisheries (Merrin et al., 2023). The ahupuaʻa watershed is approximately 12,910 acres (Merrin et al., 2023). It extends from Kōnāhuanui, the highest peak of the Koʻolau mountain range, to the sea (Merrin et al., 2023). The Koʻolau mountains are characterized by near-vertical cliffs that rise steeply to the south and west (Figure 8) (Athens & Ward, 1997). From the Koʻolau mountains heading makai (seaward), Kailua ahupuaʻa opens into Maunawili Valley, then extends into the Plains of Kekele at Nuʻuanu Pali's base through the Plains of ʻĀlele in Keahupuaanui before meeting the ocean (Athens & Ward, 1997; Merrin et al., 2023). On the east side at the Waimanālo border, the ahupuaʻa extends into the ocean at Wailea Point (Becket and Singer 1999: 158 cited in Merrin et al., 2023). On the Kāneʻohe side to the west,

the ahupuaʻa boundary bisects Oneawa beach between Kalāheo Fishery in Kailua and ʻAikahi Fishery in Kāneʻohe (Merrin et al., 2023).

Figure 8: View of the mauka (toward the mountains) side of Kailua Ahupuaʻa, showing the steep Koʻolau Mountain cliffs and the Maunawili Valley upper watershed (image source Weston Fulfer, 2025).

Notable ecosystems of Kailua ahupuaʻa include the rainforest of Maunawili Valley, marshland and wetland, including Kawainui marsh, coastal plains, and the nearshore marine environment, including Kailua Bay (Athens & Ward, 1997; Kailua Bay Advisory Council, 2007; Merrin et al., 2023). Maunawili Forest is characterized by a mixture of endemic trees, ferns, and groundcover species, plants brought by Polynesians with significant cultural values and uses, and recently naturalized plant populations (USDA Forest Service, 2022). Kawainui Marsh is the largest remaining wetland in Hawaiʻi (~830 acres) (Hylton, 2012). The marsh serves as a key habitat for four endangered native Hawaiian waterbird species and migratory bird species (Hylton, 2012). The coastal plains landscape is primarily urbanized.

Windward Oʻahu, where Kailua Ahupuaʻa is located, produces the most water on the island (Kailua Bay Advisory Council, 2007). The Koʻolaupoko region's annual average rainfall is between 300 and 350 inches, resulting in numerous perennial streams (Kailua Bay Advisory

Council, 2007). The three major streams are Maunawili, Olomana, and Mokulua, with numerous tributary offshoots (Merrin et al., 2023).

5.1.2 Ecosystem health

Human activities, especially urbanization and other forms of development, have severely impacted the natural landscape in all the Koʻolaupoko Moku ahupuaʻas (Kailua Bay Advisory Council, 2007). Polluted runoff from impervious surfaces is a major contributor of pollution in freshwater streams and the nearshore marine environment (Kailua Bay Advisory Council, 2007). Preserved ecosystems such as Kawainui Marsh, Maunawili Forest, and loʻi kalo farms contribute to the health of the ahupuaʻa ecosystem. For instance, the Kawainui watershed, a subbasin of the Kailua Ahupuaʻa watershed and where Hoʻokuaʻāina is located, was rated an 8 out of 10 for water quality in the Hawaii Stream Atlas (USDA Forest Service, 2022). The high ranking has been credited to "the presence of native forest and aquatic species, high native macrofauna species diversity and endangered aquatic species such as damselflies" (USDA Forest Service, 2022, p.2).

5.1.3 Population demographics and community features

There is no recent demographic data specific to the Kailua Ahupuaʻa land division. However, Social Explorer Profiles based on census data for the Kailua and Maunawili Kailua Census Designated Places (CDP), both located within the Kailua Ahupuaʻa (Figure 9), revealed the following. The Kailua CDP contains a population of 40,402 people. Almost half (41.41%) of the population is white, about a quarter (24.25%) is two or more races, about 20% is Asian, and only 4.08% is Native Hawaiian or Pacific Islander. The median income is $133,327, and the unemployment rate is 4.11% (US Census Bureau, 2021). The Maunawili CDP contains 2,071 people. Most of the population is Asian (35.01%), two or more races (29.21%), or white (26.32%), while Native Hawaiian or Pacific Islanders make up only 6.08%. The median income is $159,583, and the unemployment rate is 2.68% (US Census Bureau, 2021).

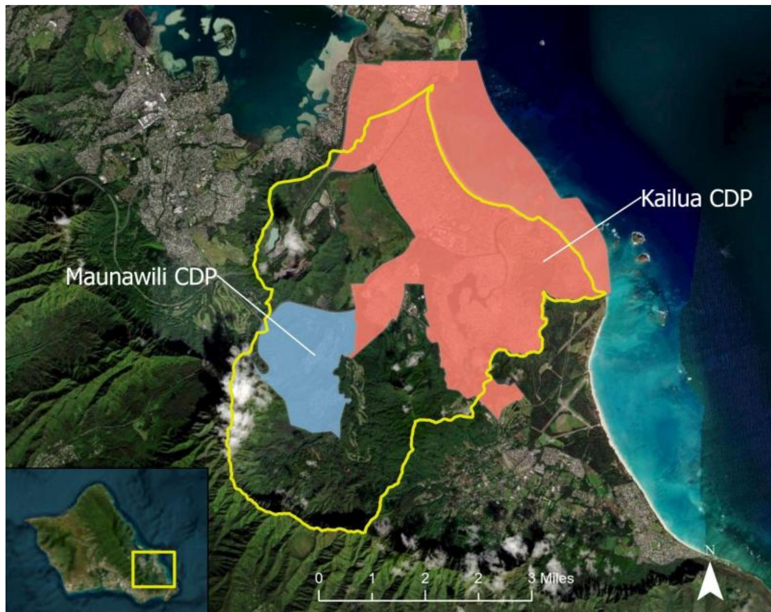

Figure 9: Map of the Kailua CDP (pink) and the Maunawili CDP (blue) within the Kailua Ahupuaʻa (data sources Esri US Federal Data, 2025; Hawaii Statewide GIS Program, 2024).

5.1.4 Brief history

Before western contact, Kailua Ahupuaʻa was associated with natural and Kānaka-engineered abundance (Merrin et al., 2023). Its cultural landscape consisted of "deep valleys planted with upland kalo, hala, maiʻa (banana), ʻawa (kava), wauke (mulberry), ʻulua (breadfruit), hau, koa, noni (from which red dye was extracted for dying malos), expansive and fertile plains and marshlands hosting loʻi kalo, coastal sand dune systems, fringing reef, and fishponds" (Merrin et al., 2023, p. 49). Following European contact, urban development, as well as the dairy, rice, and pineapple industries, caused the ponds and loʻi of Kailua to become mudflats in the late nineteenth to early 20th centuries (Becket & Singer, 1999; Merrin et al., 2023).

5.2 Background: Hoʻokuaʻāina

Hoʻokuaʻāina is a nonprofit that fosters community connections to each other, to Hawaiian culture, and to place through the cultivation of kalo (*Home*, n.d.). Founded in 2007, the hui aims to perpetuate Hawaiian culture and cultivate a culture of individual well-being and community waiwai (wealth, value, worth, importance, benefit, riches) through aloha ʻāina (love of

the land), especially through the cultivation and preparation of kalo (Figure 10) (*About*, n.d.; *Home*, n.d.).

Figure 10: Hoʻokuaʻāina's loʻi kalo farm in the Maunawili neighborhood of Kailua Ahupuaʻa (image source Home, n.d.).

5.2.1 Key players

The hui was founded by Dean and Michele Wilhelm (*About*, n.d.). A mentor to the Wilhelms and instrumental in the property's restoration was Uncle Earl Kawaʻa, a respected and revered kupuna in the Hawaiian community who was born and raised as a kuaʻāina in Halawa Valley on Molokaʻi (wholeworld, 2013). The hui focuses on bringing students, families, and other volunteers, especially Polynesian students and at-risk youth, to work on the farm (wholeworld, 2013).

5.2.3 Project areas

Kalo Cultivation: Hoʻokuaʻāina restored and currently cultivates 23 loʻi patches in the Kailua Ahupuaʻa (Figure 10) (*Kalo Production*, n.d.). The hui regularly donates its kalo harvests to communities in need through partnerships with Hui Mahiʻai ʻĀina, Kulanakauhale Maluhia O

Na Kūpuna, and Hui Mālama O Ke Kai (*Kalo Production*, n.d.). They provide raw kalo to their community twice a week year-round and poi and kalo paʻa (cooked taro) twice a month year-round (*Kalo Productio*n, n.d.).

***Kūkuluhou Program*:** Through their flagship mentoring program, Hoʻokuaʻāina mentors youth in traditional Hawaiian customs and practices (*Kukuluhou (Mentorship)*, n.d.). The program is meant for youth ages 12 to 25 facing challenging life circumstances. The goal is to restore the ʻāina, perpetuate traditional values, and empower youth by helping them develop life strategies and skills. Hoʻokuaʻāina accomplishes this goal by providing internships, college apprenticeships, and alternative learning opportunities (*Kukuluhou (Mentorship)*, n.d.).

***Kupuohi Program*:** Their K-12 ʻāina-based education program is designed for public and charter schools that enroll underserved students. Through multiple visits to the farm, students connect to the ʻāina and Hawaiian culture through kalo cultivation and a curriculum aligned with Nā Hopena Aʻo standards from the Office of Hawaiian Education (*Kupuohi (Education)*, n.d.). Hoʻokuaʻāina also works with teachers through this program, providing resources, lessons, and curricular support, partnering with them on events and lessons, and hosting students, families, and faculty in the loʻi kalo (*Kupuohi (Education)*, n.d.).

***Kaiāulu Program*:** Hoʻokuaʻāina calls this their community program in which they invite the community to volunteer in the loʻi. The hui hosts weekly community days and regularly scheduled events for businesses, clubs, organizations, schools, and individuals.

5.3 Pre-contact ʻŌiwi SESs through kalo cultivation in Kailua Ahupuaʻa

5.3.1 Historical biocultural keystone: kalo in Kailua Ahupuaʻa pre-contact

The principal crop on Oʻahu was wetland taro (Kamakau, 1961). Kailua Ahupuaʻa was no exception. Maunawili Valley was considered the breadbasket of Oʻahu's Koʻolaupoko Moku because of the prolific kalo cultivation (Hoʻokuaʻāina, 2024). Maunawili's importance as a food-producing region resulted from its plentiful streams and over 160 acres of fertile Hanalei soil—

the most productive farming soil in the archipelago (Maunawili Forest & Loʻi, 2022). The ahupuaʻa supported large populations because of this abundant production of kalo, among other crops (Becket & Singer, 1999). The deep valleys were planted with upland kalo, while expansive and fertile plains and marshlands hosted loʻi kalo (Merrin et al., 2023). Kawainui Marsh was a prominent marshland area in Maunawili used for kalo cultivation as well as aquaculture (Erkelens, 1993). Kawainui was known for its lepoʻai (edible dirt) (Kailua Bay Advisory Council, 2007). Kalo grown in Maunawili was renowned for its sweetness and requested explicitly by the aliʻi (chiefs) (Maunawili Forest & Loʻi, 2022).

5.3.2 Island, moku, ahupuaʻa, and other land division context

Kailua Ahupuaʻa may be one of 12 to 13 ahupua'a in Koʻolaupoko Moku. Kailua Ahupuaʻa served as the political and administrative center for ruling Koʻolau chiefs for centuries (Handy et al., 1972 cited in Merrin et al., 2023). The abundance of resources led to a large population (Merrin et al., 2023). Most makaʻāinana lived in the ʻili of Pālāwai and on the kula land above it (Merrin et al., 2023). Additionally, ālāwai was one of the main cultivation areas of makaʻāinana before disease devastated the population (Merrin et al., 2023).

5.3.3 Traditional biocultural resource management in the ahupua'a of Kailua

Communal land tenure, collaborative stewardship of ʻāina, and sharing of resources customary among traditional Hawaiian SESs was alive in the pre-European contact Hawaiian SES in Kailua Ahupuaʻa. These traditional elements are evident in the following moʻolelo:

> "Kahinihiniʻula, a young boy who is a descendant of Haumea [goddess of fertility and childbirth], joins the community to help remove the limu [algae, seaweed] that is choking up Kawainui and Kaʻelepulu fishponds. Everyone, even the littlest child, is promised a share of fish, but because Kahinihiniʻula runs off to play, he is not there when they hand out fish. This happens twice. His going home empty-handed was an oversight, but nonetheless, Haumea punished the community. Soon, no one would be able to catch the fish at these ponds. Kahinihiniʻula is taught how to use Mākālei, a piece of kupua [magic] wood that has the ability to attract and lead fish. He is told to use Mākālei to lead the fish from these fishponds to the pond near their upland dwelling. When the community realizes that the fish are suddenly gone, people suspect that Pākuʻi, the fishpond caretaker, has erred in some way. Notably, it is not Hauwahine but

> Kahinihiniʻula's grandmother, Niula, and his ancestor, Haumea, who decide to remove the fish from Kawainui and Kaʻelepulu…" (Brown, 2022, p. 149, 150 cited in Merrin et al., 2023, translation added in brackets).

This moʻolelo demonstrates numerous elements of pre-contact ʻŌiwi SESs that connect to the foundational values of lōkahi, maintaining harmonious balance between humanity and the ecosystems upon which they rely, and pono, just and fair rule. Firstly, the community working together to care for the common resource demonstrates the GA of communal land tenure and collaborative labor associated with communal land tenure. Rather than the problem of limu choking up the fishponds being viewed as the responsibility of a few, the responsibility was shared among all community members. In turn, all members of the community benefit from the communal fishponds by being guaranteed a share of the fish. Haumea punishing the community for not sharing the fish harvest with the little boy demonstrates the GA among makaʻāinana that communal resources are generally expected to be shared. Furthermore, since it was a deity, Haumea, who punished the community for failing to share the fish with the young boy, this moʻolelo suggests that accountability for this GA was at least partially based on foundational values and beliefs rather than a policing authority built into the governance of the SES.

The moʻolelo also points to the presence of a form of konohiki in the ahupuaʻa. Firstly, it mentions Pākuʻi, the fishpond caretaker. Later in the moʻolelo, "Ahiki, the konohiki of Kawainui and Kaʻelepulu, eventually discovers fish stocks disappeared due to Kahinihiniʻula's lack of fish" (Merrin et al., 2023, p. 52). The mention of two different konohiki implies that Kailua Ahupuaʻa had multiple specialized konohiki to sustain higher levels of food production, which was common in ahupuaʻa with abundant resources (Steele, 2015).

5.4 Modern ʻŌiwi SESs through kalo cultivation in Kailua Ahupuaʻa

5.4.1 Modern biocultural keystone: kalo cultivation in Kailua Ahupuaʻa today

Hoʻokuaʻāina's loʻi kalo system is in the ʻili ʻāina of Kapalai in the Maunawili neighborhood on land that, before the nonprofit was founded in 2007, had not been touched for

over 100 years (*Kalo Production*, n.d.; *Origin Story*, n.d.). As mentioned, Maunawili is a historic site for loʻi kalo agriculture, although there is limited information on the history of loʻi kalo farming, specifically on the ʻili ʻāina of Kapalai. There is also limited information on where the hui sources the water it uses for the farm and the management practices of the farm.

5.4.2 Continuity of traditional Hawaiian SESs through Hoʻokuaʻāina's loʻi kalo

***Teaching traditional Hawaiian values to youth and community*:** Central to Hoʻokuaʻāina's programming is teaching and practicing traditional Hawaiian values that are aligned with the foundational values and principles of the traditional Hawaiian SES discussed in the literature review. This alignment is demonstrated in the curriculum lessons available on their website (Hawaiian Values, n.d.). The first lesson uses the story of kalo in the Kumulipo to demonstrate the importance of respect in all aspects of life. The second teaches well-being based on the concept of lōkahi. The third encourages students to practice being community minded. The last encourages students to see wealth from a Hawaiian perspective (*Hawaiian Values*, n.d.). Moreover, through hands-on work in the loʻi, Hoʻokuaʻāina aims to cultivate pilina (connection) to place and aloha ʻāina values (Croft et al., 2022).

Reorienting to family: The hui's programming has a distinct family focus, both to help students connect with their families by working together in the loʻi kalo and to teach about the ʻohana worldviews of Hawaiian culture, including those associated with the kalo plant itself. One of the motivations for centering family in their programming came from a co-founder's experience working as a Department of Education teacher at the Hawaii Youth Correctional Facility (*Origin Story*, n.d.). He often heard stories about the challenging life circumstances of the kids in the facility and noticed that a common denominator was that they came from broken families (*Origin Story*, n.d.). Hoʻokuaʻāina's ʻohana days invite families to join students, teachers, and Hoʻokuaʻāina staff for workdays in the loʻi (Croft et al., 2022). Besides working in the loʻi patch, families can also practice kuʻiʻai (pounding kalo). A video about the organization explains

that ku‘i‘ai is a sacred activity in traditional Hawaiian culture that is centered around family (wholeworld, 2013). In the video, Kaipo‘i Kelling, a Ho‘okua‘āina educator, explains that from the kalo plant we get the word ‘ohana – the ‘ohana is the offshoot of the makua (the parent plant) and that the ‘ohana is reenacted through the activity of ku‘i‘ai and making food with the family (wholeworld, 2013).

Communal land tenure: The lo‘i kalo at Ho‘okua‘āina demonstrates a form of communal land tenure like that of the traditional Hawaiian SES. Although the work occurs within a private property system, the hui can steward the land communally within the property boundaries by owning the plot. Moreover, Ho‘okua‘āina's programming brings thousands of students and volunteers to work in the lo‘i annually, working communally and sharing the labor of growing, harvesting, and preparing kalo (Croft et al., 2022; wholeworld, 2013). In 2018, over 3,700 people from the community volunteered at the farm through community days alone (Nakaoka, 2019). In 2022, the hui's Kupuohi (education) program brought 1875 students over 88 events, and their Kaiāulu (community) program brought 1667 volunteers over 105 events to work in the lo‘i (Croft et al., 2022).

Sharing and collaborative economy: As mentioned above, Ho‘okua‘āina regularly donates kalo harvests to communities in need. They donate raw kalo twice a week year-round and poi and kalo pa‘a (cooked taro) twice a month year-round (*Kalo Production*, n.d.). In 2022, the hui donated $14,724 worth of raw kalo, $2,357 worth of lau (leaves), and $5,100 worth of poi and kalo pa‘a (Croft et al., 2022).

Not only does Ho‘okua‘āina share their kalo harvests with the community, but the community also shares their time and labor with the organization by volunteering on the farm. These volunteers contribute collaborative, free labor to cultivate and prepare kalo. Moreover, when the founders first bought the land, they relied on many community residents and family friends who volunteered to establish the initial lo‘i kalo patches (Nakaoka, 2019).

5.4.3 Hoʻokuaʻāina's loʻi kalo amid the modern social-ecological landscape

Operating as a nonprofit: Hoʻokuaʻāina's work is restoring the above elements of traditional Hawaiian SESs through the western institution of a nonprofit organization. Founders Dean and Michele Wilhelm bought the land for Hoʻokuaʻāina in 2007 to start the organization and achieved nonprofit status in 2009 (Nakaoka, 2019).

Private land ownership system: Although Hoʻokuaʻāina demonstrates practices of communal land tenure in their loʻi kalo cultivation work, the ʻāina they work upon is a parcel in a private land ownership system. The founders bought the seven-acre plot outright (*Origin Story*, 2024) and it is unclear how they obtained the funding.

The hui is also in the process of obtaining another large (116 acres) plot of land in Maunawili that the hui's members are calling Pālāwai for loʻi restoration (Hoʻokuaʻāina, 2024). The Harry and Jeanette Weinberg Foundation, the previous owner of the Maunawili land, and Trust for Public Land (TPL) entered an agreement in which TPL will purchase 1,084 acres of land for conservation in Maunawili Valley; then, TPL will transfer 116 acres to Hoʻokuaʻāina (Figure 11) (Hoʻokuaʻāina, 2024). TPL will also transfer 59 acres to Kauluakalana, another Kailua-based nonprofit. The remaining lands will be transferred to the DLNR for conservation (Hoʻokuaʻāina, 2024). The land was purchased through contributions from US Department of Defense's (DOD) Readiness and Environmental Protection Integration (REPI) Program ($11,200,000), City & County of Honolulu Clean Water Branch ($9,572,000), State of Hawaiʻi ($7,000,000), US Forest Legacy program ($4,950,000), and State Legacy Land funds ($4,072,034) for a total of almost $37 million (Maunawili Forest & Loʻi, 2022).

Moreover, the City and County of Honolulu and Hawaiʻi Land Trust, a nonprofit dedicated to protecting lands that sustain Hawaiʻi, will jointly hold a permanent conservation easement over Pālāwai, ensuring the land will be protected in perpetuity (Trust for Public Land,

2023).[5] Conservation easements in Hawaiʻi (Haw. Rev. Stat. § 198-1, 2024, ⁋ 1) are defined as "an interest in real property created by deed, restrictions, covenants, or conditions, the purpose of which is to: (1) [p]reserve and protect land predominantly in its natural, scenic, forested, or open-space condition; (2) [p]reserve and protect the structural integrity and physical appearance of cultural landscapes, resources, and sites which perpetuate indigenous native Hawaiian culture; (3) [p]reserve and protect historic properties as defined in [HRS] section 6E-2, and traditional and family cemeteries; or (4) [p]reserve and protect land for agricultural use." The unique rights, restrictions, and uses in a conservation easement depend on what stakeholders aim to protect (Trust for Public Land & Hawaiian Islands Land Trust, 2020). There is little public information on the specific conditions of the conservation easement over Pālāwai, but it is implied that the cultural landscapes and agricultural land use will be preserved in perpetuity. For instance, Hoʻokuaʻāina estimates that the additional land will enable the organization to increase their loʻi kalo production thirty times their current capacity over the next ten years (*Palawai Land Expansion*, 2024).

[5] "A conservation easement is a voluntary legal agreement between a landowner and a land trust or government agency that permanently limits uses of the land in order to protect its conservation values" (Trust for Public Land & Hawaiian Islands Land Trust, 2020, p. 9). Conservation easements are permanent, meaning that the owner and all future owners must comply with the conservation easement agreement terms forever (Trust for Public Land & Hawaiian Islands Land Trust, 2020).

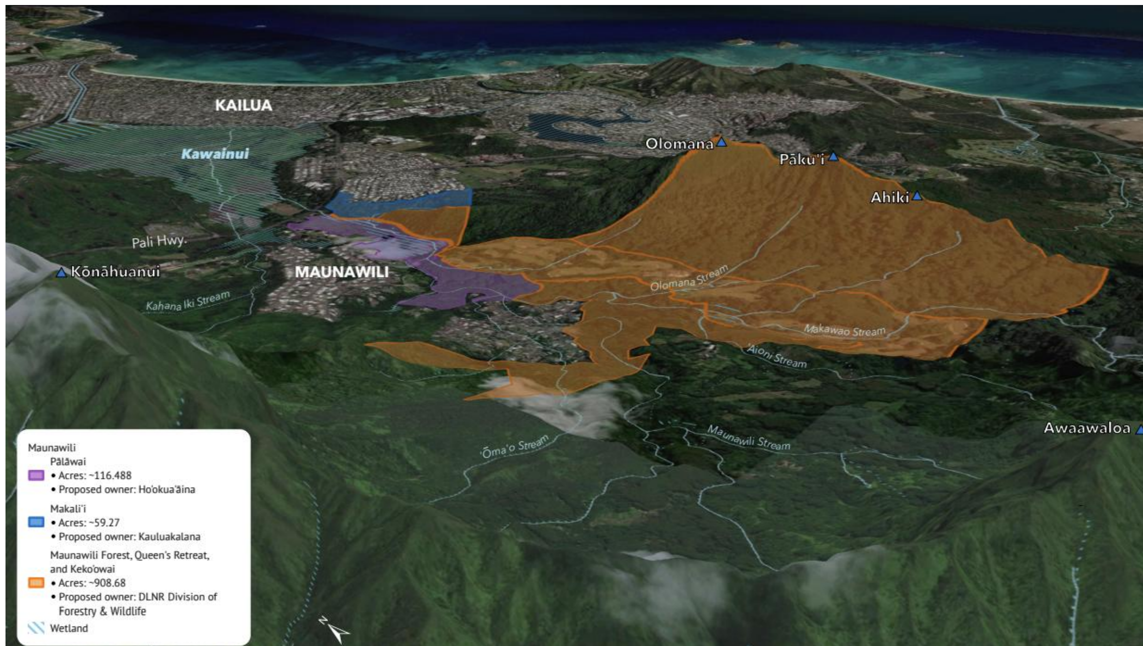

Figure 11: the proposed land consolidation and subdivision from the Maunawili Forest land acquisition. The purple area is Pālāwai, 116 acres of land that will go to Ho‘okua‘āina (map copied from Maunawili Forest & Lo‘i, 2022).

The system of private land ownership in the area put the Pālāwai land that Ho‘okua‘āina recently acquired at risk of being subdivided for development (*Maunawili Forest & Lo‘i*, 2022). The previous owner, a real estate investment company, attempted to change the underlying county zoning, which was designated based on the County Sustainable Community Plan, to build an extensive residential subdivision (USDA Forest Service, 2022). The real estate investment company submitted subdivision application plans for over 200 acres of land zoned for agriculture in 2016, 2017, and 2019 (USDA Forest Service, 2022). Ho‘okua‘āina, in partnership with TPL and other stakeholders mentioned above, protected the land through their collaborative acquisition and the imposition of a conservation easement. However, other agricultural land in the ahupua‘a and the City & County of Honolulu is at risk.

Management through western governance system arrangements: Above the lo‘i, the upper Maunawili Valley and Ko‘olau Mountains of the ahupua‘a are protected as a part of the Waimānalo Forest Reserve (Figure 12). The DLNR DOFAW manages Hawai‘i's Forest Reserve System (FRS) (*Forest Reserve System*, n.d.). The Hawai‘i FRS was created to “protect

mauka (upland) forests to provide the necessary water requirements for the lowland agriculture demands and surrounding communities” and to “to protect and enhance important forested mauka lands for their abundance of public benefits and values” (*Forest Reserve System*, n.d., ¶ 2, ¶ 3).

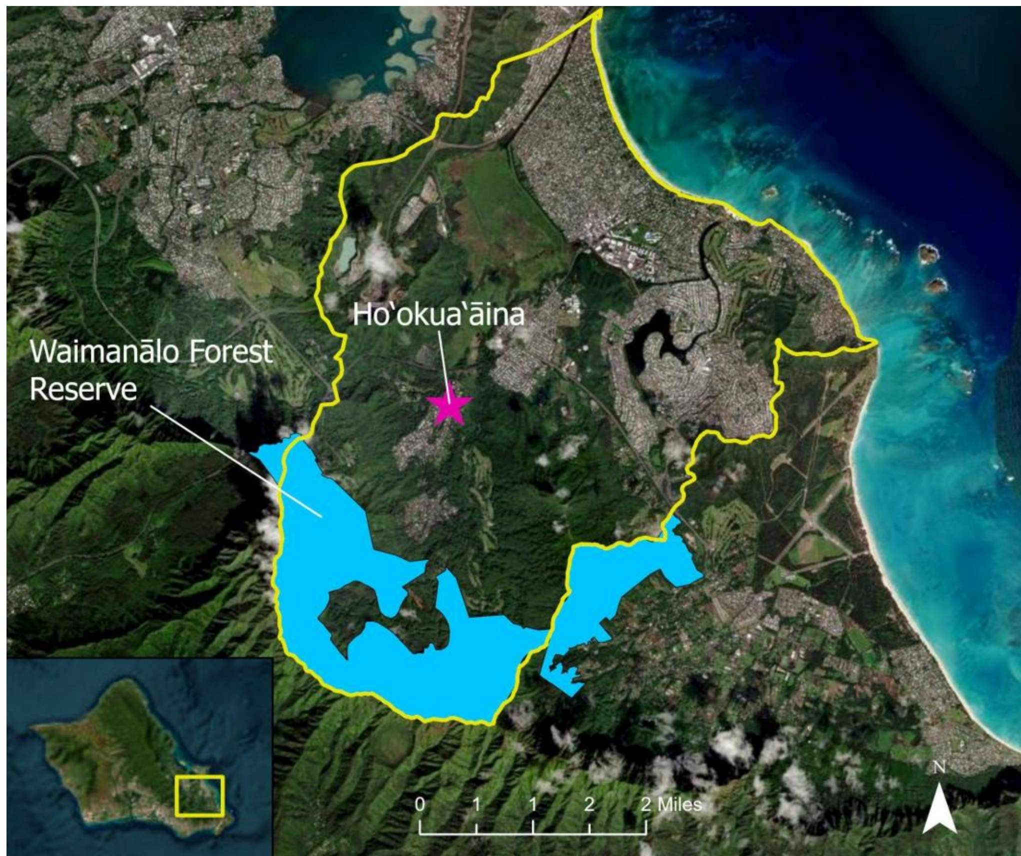

Figure 12: Waimānalo Forest Reserve area (blue) helps protect the watershed and freshwater resource Hoʻokuaʻāina’s loʻi kalo farm (pink star) relies on (data sources Hawaii Statewide GIS Program, 2020, 2024).

The Hawaii State Constitution, Hawaii Revised Statutes (HRS) Chapter 183, and the associated Hawaii Administrative Rules (HAR) Chapter 104 are the legal directives guiding state forest reserve management (*Forest Reserve System*, n.d.). The DLNR DOFAW also creates management plans for each reserve. Guided by these directives, DOFAW protects, manages, restores, and monitors the FRS's natural resources (*Forest Reserve System*, n.d.). The Waimānalo Forest Reserve management plan draft, published in 2013, has not been updated

since the inclusion of the area that falls within the Kailua Ahupuaʻa (Baribault, 2013). Only the draft version of the plan is available on the DLNR DOFAW website as of the writing of this thesis. Neither the legal directives nor the management plan includes requirements to include Native Hawaiian organizations in management in any capacity. DLNR DOFAW is connected to Hoʻokuaʻāina as they are one of the recipients of the land acquired in Maunawili through the collaborative acquisition. However, there is little evidence showing any relationship beyond that project.

Zoning and land use designations and laws: According to the City and County of Honolulu Parcels & Zoning Information App, the parcel where Hoʻokuaʻāina is located is in an urban land use district zoned for agriculture. The area surrounding it is in an agricultural State land use district with a mixture of agricultural, residential, and country zoning. The mauka (toward the mountains) area of Hoʻokuaʻāina toward the Koʻolau mountains is a conservation land use district and is zoned as a restricted preservation district (City and County of Honolulu Department of Planning and Permitting, n.d.).

Under current laws, land in State agricultural land use districts zoned for agriculture by the County can be subdivided into two-acre residential lots where little or no agriculture occurs (USDA Forest Service, 2022). The Forest Legacy Project briefing on the Maunawili forest land protection mentioned above suggests that a significant portion of agricultural land in the Kailua Ahupuaʻa has since been subdivided into residential lots, which has resulted in Maunawili Forest being "the remaining parcel amidst a sea of development" (USDA Forest Service, 2022, p. 3).

Modern strategic planning: Hawaiʻi's 2011 Rain Follows the Forest Plan identifies Maunawili Forest as a high-priority watershed for restoration action (USDA Forest Service, 2022). Hawaiʻi's Forest Action Plan suggests management strategies such as invasive species removal and reforestation to restore watersheds and enhance climate resilience (USDA Forest Service, 2022). Additionally, the County of Honolulu's 2017 Koʻolaupoko Sustainable

Communities Plan calls to "Adapt the Concept of Ahupuaʻa in Land Use and Natural Resource Management" and to "Preserve and Promote Open Space and Agricultural Uses" (City and County of Honolulu Department of Planning and Permitting, 2017). The Forest Legacy Project briefing for the Maunawili forest parcel acquisition cited these plans to back up its position for acquiring the parcel for conservation and agriculture (USDA Forest Service, 2022). It is unclear whether Hoʻokuaʻāina has been involved directly with planning efforts other than benefiting from the recent land purchase.

Modern economic system influences: Hoʻokuaʻāina carries out its management efforts by obtaining grants and donations and through program revenue. Based on financial data from Hoʻokuaʻāina's 990 tax forms from 2018 to 2023, the hui's average annual revenue was $848,241 (Guidestar, 2018, 2020, 2023a, 2023b, 2024, 2025; Hoʻokuaʻāina, 2020). On average, over 70% of that revenue came from non-government grants and other contributions, just over 17% from government grants, and almost 3.4% from program service revenue. The hui's earned income primarily comes from kalo, poi, and paʻa sales. In 2022, they sold $121,065 worth of taro products (Croft et al., 2022).

5.5 Conclusion

This chapter explored governance arrangements that supported traditional Hawaiian SESs related to kalo cultivation pre-contact and today in Kailua Ahupuaʻa. This case provided insight into loʻi kalo restoration in an urban area dramatically influenced by colonization and modernization. Similar to Kīpahulu Moku, Kailua Ahupuaʻa was historically a breadbasket for the island of Oʻahu because of its thriving agricultural lands, primarily consisting of loʻi kalo. Hoʻokuaʻāina provides a window into how an ʻĀina Organization can uphold this traditional Hawaiian practice amid modern political, economic, cultural, and ecological changes. Loʻi kalo restoration in this case was made possible through contemporary governance arrangements, including private land ownership, cooperative land acquisition, land protection through a conservation easement and State Forest Reserve designations, and volunteer and community

relationships. The next chapter will synthesize and analyze findings from both cases through a discussion, then provide conclusions and recommendations.

Chapter 6: Discussion, Recommendations, & Conclusion

Both cases offer insights into GAs that enable the continuation or restoration of traditional Hawaiian SESs through loʻi kalo cultivation, albeit to different degrees. Kīpahulu ʻOhana provides insights with relevance for a rural area where pre-contact traditional Hawaiian SESs have evolved but largely continued. Hoʻokuaʻāina offers insights that apply primarily to urban areas dramatically influenced by colonization and modernization. This chapter discusses the governance arrangements that have enabled loʻi kalo restoration and cultivation in both case studies, to shed light on possible avenues for biocultural restoration in Hawaiʻi. The governance arrangements are organized into three themes: land, lifeways, and BRM. However, given the interrelationship between the governance arrangements, there is some overlap between themes. The chapter will end with a table of findings (Table 3), recommendations for the communities of practice, and conclusions.

6.1 Discussion

6.1.1 Enabling access to and control of land

The governance arrangements at the foundation of the restoration work in each of these cases are those enabling members of each ʻĀina Hui to access and use the land they steward for loʻi kalo. Representatives of Kīpahulu ʻOhana access the land for loʻi kalo restoration and cultivation, as well as the surrounding HNP lands for ahupuaʻa management, through the cooperative agreement with HNP. The nonprofit also leases land in the moku where the Kīpahulu Kitchen is located, the facility in which they process kalo harvests from the farm. Members of Hoʻokuaʻāina access the plot where they have restored loʻi kalo in Maunawili through private ownership. Pālāwai, the large swath of land the Kailua-based hui is about to acquire in Maunawili for loʻi restoration, will also be privately owned and is being obtained

through a partnership with the nonprofit organization Trust for Public Land (*Maunawili Forest & Loʻi*, 2022).

6.1.1.1 Land access through National Park Service cooperative agreement

The cooperative agreement between Kīpahulu ʻOhana and HNP enables the Kīpahulu ʻOhana to steward loʻi kalo on their ancestral lands without incurring financial costs associated with owning or leasing land. Instead, the organization provides services to HNP – interpretive demonstrations and educational programming for visitors to the park – in exchange for access to and use of the land for loʻi kalo cultivation at Kapahu Living Farm and ahupuaʻa management in the surrounding area. The non-monetary agreement is favorable for an organization like Kīpahulu ʻOhana that continues the subsistence economic structure of Kīpahulu Moku's traditional Hawaiian SES and is not focused on revenue generation. However, this GA limits the hui's control over how they use the land; the federal government has a say in land use decisions, and some of the hui's time, energy, and resources are diverted to NP directives (Haleakalā National Park et al., 2003), as discussed more in section 6.1.3.2 of this chapter.

Another consideration about Kīpahulu ʻOhana's cooperative agreement with HNP is the question of its stability. The agreement has held since 1995, 30 years at the time of the writing of this thesis. However, nothing in the agreement guarantees this partnership indefinitely. Considering the current presidential administration's federal funding cuts and regulation rollbacks associated with the NPS and environmental protection, it begs the question of whether agreements like these can endure through federal administrations that are not ideologically aligned with biocultural restoration work.

6.1.1.2 Leasing land

Kīpahulu ʻOhana leases land from the DLNR in the moku, enabling them to access land to operate their shared-use kitchen, where they process kalo harvests from the farm. Leasing land provides Kīpahulu ʻOhana control over the land and flexibility like ownership. However, leasing land is less stable. Not only does the lease agreement entail a fixed timeline, but the

rent costs can be subject to dramatic changes. This uncertainty was evident in the lease agreement for the parcel Kīpahulu ʻOhana leased from the DLNR. The DLNR tried to increase rent so steeply that the hui would not have been able to afford it if not for OHA advocating that they get a discounted rent as a charitable organization that provides significant benefits to the community at no cost to the state (Hawaiʻi DLNR, 2014). Thus, although the lease allows the hui to access land with a high degree of control and use flexibility, the fixed term of a lease and unpredictable future costs make the hui's tenure on the land somewhat precarious.

6.1.1.3 Private land ownership

Hoʻokuaʻāina privately owns the land where they steward loʻi kalo. Private ownership appears to provide the most stable tenure on the land and entails a higher degree of control over land use. This high degree of stability and freedom opens the door for modern Hawaiian SES restoration on privately owned plots of land with minimal interference from outside governance structures. However, purchasing land entails high upfront costs and recurring costs such as property taxes. The founders of Hoʻokuaʻāina bought the land before the hui was officially established as a nonprofit, which suggests that they bought the land without government or foundation grants. Given the exorbitant cost of land in Hawaiʻi, purchasing land for biocultural restoration work with personal incomes is not an accessible arrangement to replicate. However, the next land acquisition journey of Hoʻokuaʻāina reveals a Land Back strategy for Hawaiian biocultural restoration work that is more attainable.

Hoʻokuaʻāina recently acquired Pālāwai, a 116-acre plot of land in Maunawili, through a partnership with TPL. TPL raised blended capital from various federal, state, and county government agencies and will transfer the Pālāwai portion to Hoʻokuaʻāina, who will become the owner and steward. This arrangement gives Hoʻokuaʻāina ownership of the land, enabling them to significantly expand loʻi kalo cultivation and traditional resource management practices without incurring financial costs to purchase the land themselves. Privately owning the land makes their tenure more stable. Additionally, the permanent conservation easement held over

Pālāwai ensures that the land protections are secured in perpetuity even if there is a transfer of ownership. This arrangement allows the ʻĀina Organization the independence and stability of private ownership without the high cost of buying land in Hawaiʻi.

Although private land ownership provides land security and autonomy that other land governance arrangements do not offer, private land ownership as a land tenure system in Hawaiʻi on the whole presents challenges for Hawaiian SES restoration via loʻi kalo cultivation. First, as mentioned, the high cost of land in Hawaiʻi makes purchasing land unattainable for the vast majority of individual ʻĀina Organizations. Second, even if funding were readily available, prime land for restoration is not always for sale. Third, landowners in the same ahupuaʻa or moku may have plans that are at odds with Hawaiian biocultural restoration or there may be competing land use priorities, especially in an urbanized area. For example, Hawaiʻi also has a housing shortage (Barger et al., 2024), so land use for residential development is a competing priority. Finally, private ownership of land impedes holistic biocultural management, because natural ecosystem boundaries do not necessarily align with the parcel and land use zone shapes created by the private property system. The fact that Hoʻokuaʻāina's farm operates on a parcel surrounded by residential developments demonstrates this misalignment between large-scale stewardship and the private property land tenure system. It also emphasizes the important role of land protection for Hawaiian SES restoration in urban areas.

6.1.2 Enabling traditional Hawaiian SES lifeways

In both cases, especially Kīpahulu Moku, the SES around loʻi kalo exhibited elements of traditional Hawaiian SES economic lifeways, such as subsistence, collaboration, and resource sharing. Hoʻokuaʻāina did not evolve continuously from a traditional subsistence community like Kīpahulu Moku. However, the Kailua-based hui still demonstrates some elements of traditional Hawaiian SES economic practices, such as resource sharing and collaborative labor. Hoʻokuaʻāina demonstrates resource sharing through its sizable kalo donations to the community every month and collaborative labor by attracting volunteer help to the farm.

Kīpahulu ʻOhana's loʻi kalo exemplifies environmental stewardship as economic activity. That is, stewardship of ʻāina for loʻi kalo cultivation is also the economic activity that supports the community's subsistence lifeways.

The governance arrangements that enable Kīpahulu ʻOhana's members and community's traditional Hawaiian SES livelihoods include grant funding, volunteer relationships, and self-sufficiency. Kīpahulu ʻOhana sells some kalo and offers paid programming related to the loʻi. However, the fact that only 2% of revenue comes from program services demonstrates that revenue generation is second to the hui's mission – traditional moku stewardship and supporting the subsistence of the moku community. Government grants make up the largest portion of the nonprofit's revenue and thus can be seen as the capital source enabling these traditional Hawaiian SES economic practices. Volunteers help Kīpahulu ʻOhana with the maintenance of the loʻi and the cultivation of kalo for free. This is possible because of the arrangements Kīpahulu ʻOhana makes with local schools and community groups and the hui's relationship with the local community. For local schools, Kīpahulu ʻOhana offers a hands-on educational opportunity in exchange for help in the loʻi. Furthermore, besides being off-grid save for telephone service, the community can sustain itself on the local food system. Through the protection of the moku's land and ocean ecosystems, freshwater sources, and the cultivation of kalo and other crops, the Kīpahulu Moku community is resource-stable, making the local subsistence economy viable. As a result, the community has a degree of independence from the market economy, at least where basic needs such as food, water, and energy are concerned.

Similarly, the elements of traditional Hawaiian economic lifeways demonstrated by Hoʻokuaʻāina are made possible through capital sources, including non-government and government grants, other contributions, and sales of kalo, as well as through the reciprocal relationships Hoʻokuaʻāina's team has with its community, stakeholders, and partners. Non-government grants and other contributions comprised most of Hoʻokuaʻāina's revenue (70.29%),

followed by government grants (17.12%). The organization has a strong community network, relationships with schools, and partnerships with like-minded organizations. This network of reciprocal relationships enables the hui to attract thousands of volunteers to help in the loʻi annually.

The Kīpahulu ʻOhana community's self-sufficiency and subsistence lifeways, supported by loʻi kalo cultivation, are "informal" governance arrangements that present alternatives to the modern governance system designed to support extractive economic activities in the name of profit. These governance arrangements support a sustainable and resilient hyperlocalized system in which the focus of labor can be primarily subsistence and ecological stewardship rather than cash accumulation. Self-sufficient subsistence economies may not be possible everywhere in Hawaiʻi today. However, certain elements could be more feasible to replicate. For instance, place-based nonprofit ʻŌiwi food production could be supported throughout Hawaiʻi. Allocating resources to such projects could increase self-sufficiency and independence from food imports, thus improving the sustainability and resilience of Hawaiʻi communities and promoting Hawaiian SES restoration, even if the result is not 100 percent self-sufficiency.

6.1.3 Enabling biocultural restoration of loʻi kalo

GAs that enable and shape BRM were also key to loʻi kalo restoration in each case. BRM of loʻi kalo includes the BRM of the broader ecosystems that influence the health of the loʻi kalo in addition to the loʻi system itself.[6]

6.1.3.1 Conservation land designations

The arrangement to incorporate Kīpahulu Moku in HNP and designate Kīpahulu Valley as a biological reserve is a GA that shapes the BRM of Kīpahulu Moku's loʻi kalo. This arrangement was made possible by TNC acquiring the land and transferring it to the NPS

[6] As established, a healthy and productive loʻi kalo system depends on a healthy surrounding ecosystem, including the availability of clean freshwater, which relies on the health of the watershed's ecosystems. Thus, GAs to protect land in the surrounding moku or ahupuaʻa where a loʻi kalo system is located are GAs related to the BRM of loʻi kalo.

for permanent preservation. The motivation was the discovery of its ecological importance through the Kīpahulu Expedition. Consolidating the land and designating it as a biological reserve in HNP preserves the ecosystems by restricting public access to and development of Kīpahulu Valley and slating it for conservation management carried out under the leadership of the NPS.

This governance arrangement to protect the Kīpahulu Moku land is interesting from a land access and control perspective because to protect the land permanently, the local population – a high percentage of Native Hawaiian people – had to sell or donate their land to TNC before transferring it to the NPS. Thus, the control of the land effectively transferred from the Native Hawaiian community to the US federal government. This arrangement brings up tensions regarding land back and decolonization strategies of traditional Hawaiian SES restoration (Barger et al., 2024; Thompson, 2022).

Additionally, as a biological reserve, only scientists and managers authorized to conduct research and conservation projects are allowed in the Kīpahulu Valley Biological Reserve within HNP today (Haleakalā National Park, 2024). Restricting access helps to prevent tourists from entering Kīpahulu Valley and harming the ecosystems. However, this may also prevent Native Hawaiian moku residents from accessing the valley for traditional and customary practices. Native Hawaiians have the legal right to access undeveloped land for traditional purposes per Hawaiʻi Constitution Article XII, Section 7. However, since the reserve is on federal NPS land, the Hawaiʻi Constitution provision does not automatically apply (*Pai ʻOhana v. United States*, 1995).[7] Instead, land access is under federal jurisdiction guided by NPS policies, and there is no clear NPS policy that permits Native Hawaiians to access the protected biological reserve land in the Kīpahulu area of HNP (Superintendent's Compendium, n.d.). As Diver et al. (2024) write,

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[7] In Pai ʻOhana v. United States, 875 F. Supp. 680 (1995, ¶ 145), the United States explicitly did "not concede that native tenant rights, such as access and gathering rights, may be asserted against the federal government."

western conservation strategies that restrict those most connected to a resource and the sustenance it provides from accessing it can harm the community connected to the resource and lead to less effective conservation outcomes. Loosening these access restrictions would help bolster the Kīpahulu community's rematriation to the moku (*What Is Rematriation?*, n.d.).

Maunawili Forest was recently protected as a part of the Waimānalo Forest Reserve and is designated as conservation district land. These designations accomplish the important task of regulating use of and activity in the Maunawili Forest, helping to prevent development and degradation of the forest ecosystems and watershed, and are precursors to the development and implementation of management plans. However, these are top-down governance strategies that do not incorporate BRM practices of traditional Hawaiian SESs and do not require input from or participation of the Native Hawaiian Community. Policies to ensure Native Hawaiian participation in Hawaiʻi State conservation land and Forest Reserve management would be a step toward co-stewardship and biocultural restoration of Hawaiian SESs through these conservation land designations.

6.1.3.2 Co-stewardship

Kīpahulu ʻOhana's cooperative agreement with HNP shapes the BRM of the moku on top of granting the hui access to land for Kapahu Living Farm. The agreement grants Kīpahulu ʻOhana a role in managing HNP lands. It establishes a co-management relationship between HNP and Kīpahulu ʻOhana, allowing the hui a voice in decision-making, the ability to participate in the BRM of the moku with the NPS, and the opportunity to help the NPS incorporate traditional BRM practices into the management of the park. As explained in Diamant et al. (2007, p. 27), the work through the cooperative agreement helps the NP "better interpret the rich traditions and values of Hawaiians and put these tenets into practice in our [the park's] resource management efforts." The agreement also stipulates that the park provides financial assistance to Kīpahulu ʻOhana for projects that further the agreement. This partnership has

allowed the hui to have a seat at the table in park planning and management decisions, such as through their Kupuna Council, which meets with the NP managers to discuss BRM initiatives.

However, the agreement limits the hui's autonomy in carrying out BRM work. For instance, from the BRM-related points in the scope of work for Kīpahulu ʻOhana, decisions around the restoration of native Hawaiian plants must be approved by the Park's Resource Manager, and the hui must include the Park Superintendent representing the NPS in an advisory capacity on its Board of Directors. Additionally, some of the BRM responsibilities cited goals of creating sale items or an experience for visitors rather than goals of restoration or of creating a state of ʻāina momona in the moku. Adding to this point, most of the responsibilities outlined under Kīpahulu ʻOhana's statement of work are related to providing interpretive cultural experiences for park visitors rather than co-management activities for biocultural restoration.

The interpretive programing Kīpahulu ʻOhana is required to provide for HNP visitors presents advantages and disadvantages for the organization's mission. On one hand, hosting park visitors for interpretive programming translates to more volunteers helping in the loʻi, more revenue, and an opportunity to foster understanding and respect for traditional Hawaiian customs, practices, and lifeways. On the other hand, program service revenue makes up a fraction (2%) of Kīpahulu ʻOhana's average annual revenue, and the hui already has educational programming for local students and community groups. NP requirements to provide interpretive activities for park visitors may be diverting time, energy, and resources from traditional BRM work – such as reviving additional historic loʻi kalo and restoring the moku to a state of ʻāina momona – or educating the local community.

Additionally, one of Kīpahulu ʻOhana's concerns for NPS in planning for Kīpahulu district management was "limited access to training certification and jobs for local Native Hawaiian youth in resources management" and a future concern about "Continued and increased local Native Hawaiian presence and values in all aspects of resources management in the Valley" (Haleakalā National Park et al., 2003, p. 163-164). Kīpahulu ʻOhana's planned solution was to

“Establish with the NPS an effective, relevant, “hands-on” training/apprentice program targeting local Native Hawaiian youth using present Hawaiian resource managers as mentors; create Native Hawaiian values program to train and educate NPS personnel in being culturally oriented in their work” (Haleakalā National Park et al., 2003, p. 163-164). This suggests a lack of Native Hawaiian involvement in formal western management positions in the NP and underscores the importance of fostering Native Hawaiian participation for Hawaiian SES restoration today.

Joint Secretarial Order No. 3403 underscored Kīpahulu ‘Ohana’s role in the co-stewardship of Kīpahulu Moku. The Order primarily aimed to formalize and expand federal agencies' commitments to co-stewardship and co-management with Tribal Nations and Native Hawaiian communities, including those already engaged in cooperative agreements. It is unclear how this Order changed the co-management relationship HNP and Kīpahulu ‘Ohana already had in place from the cooperative agreement. It appears that the existing cooperative agreement and co-management practices were not significantly altered by the Order. The main finding gleaned from this GA was that the Order restates the US’s relationship with the Native Hawaiian Community as a government-to-sovereign relationship in which Native Hawaiian organizations are considered legal representatives of the Native Hawaiian Community.

At the least, this Order provides additional legal backing to support the hui’s right to co-steward the moku. This could be useful if leadership changes threaten the nonprofit’s position at the decision-making table in the future. One drawback is that the Order is subject to being revoked. Given that this Order seems to have had no impact on the agreement between Kīpahulu ‘Ohana and HNP, it begs the question of how impactful this Order will be for creating meaningful biocultural restoration through co-stewardship in Hawai‘i, especially given the unique relationship the US has with the Native Hawaiian Community compared to other Tribal Nations. More research is needed to determine the effectiveness of this Order as a restoration strategy.

Kīpahulu ‘Ohana and Ho‘okua‘āina are engaged in co-management indirectly by helping fulfill community, county, and state strategic plan goals. For instance, by fulfilling

the Hāna Community Plan goals to increase loʻi kalo agriculture, Kīpahulu ʻOhana is indirectly co-managing the biocultural resource in the region. Hoʻokuaʻāina is helping the state and county fulfill goals outlined in multiple strategic plans, such as the Koʻolaupoko plan goal to increase traditional agriculture in the moku. These plans cited loʻi kalo cultivation as a strategy that supported numerous goals, including economic security and development, ecological restoration and stewardship, climate resilience and sustainability, amplifying Hawaiian culture, enhancing tourist experiences, and more. Kīpahulu ʻOhana was able to use the loʻi-related goals set by the Hāna Community Plan and the Hawaiʻi 2050 Sustainability Plan to help them secure State funding in their 2008 grant application (Kīpahulu ʻOhana Inc, 2008). In the Hoʻokuaʻāina case study, the Forest Legacy Project briefing for the Maunawili forest parcel acquisition cites numerous strategic planning goals to back up their position, including the County of Honolulu's 2017 Koolaupoko Sustainable Communities Plan and Hawaii's 2011 Rain Follows the Forest Plan (USDA Forest Service, 2022). These findings suggest that urban and environmental planning departments and other agencies can support loʻi kalo restoration, and in turn, Hawaiian SES restoration, by continuing to include related projects in strategic plans because it can help ʻĀina Organizations secure funding, land, and a legislative edge.

Table 3: Key governance arrangements enabling loʻi kalo restoration found in the case studies.

Governance arrangements	**Enables**	**Advantages**	**Disadvantages**
Cooperative agreement with HNP	Land access and control Co-stewardship	1) Access to land without financial cost 2) Voice in decision making 3) Participation in BRM 4) Direct funding source for management projects	1) NPS has ultimate authority and control: Kīpahulu ʻOhana's autonomy over BRM practices is limited, and some organizational resources are diverted to NPS directives 2) Park has no apparent plan for continuing and increasing local Native Hawaiian presence and values in moku management 3) Limited access to training certification and jobs for local

			Native Hawaiian youth in park management 4) Agreement is not permanent, so federal administrations not aligned with such partnerships could threaten its stability.
Private land ownership	Land access and control	High degree of stability and autonomy	High cost and limited availability of land
Collaborative land acquisition	Land access and control	Benefits of private land ownership without the financial cost	Limited availability of land and challenges with securing funding partners.
Leasing land	Land access and control	1) High degree of autonomy and control over land (like ownership) 2) Lease rents can be reduced for charitable organizations pursuant to HRS 171-43.1	Lease agreement entails a fixed timeline, and rent cost is subject to dramatic increases
Incorporating Kīpahulu moku land in Haleakalā National Park	*Ahupuaʻa land protection	Consolidating land and transferring it to HNP ensured permanent preservation, clarified management, and protected lands from future exploitation	Land effectively transferred from the Native Hawaiian community to the US, presenting a tension with land back and decolonization ʻŌiwi SES restoration strategies
Agricultural zoning	Ahupuaʻa land protection	Designates land for agricultural uses, protecting it from development and resource extraction.	Can be changed relatively easily – can be subdivided into two-acre residential lots where little or no agriculture occurs.
Kīpahulu Valley National Biological Reserve designation	Ahupuaʻa land protection	Preserves ecosystems and watershed by restricting public access to Kīpahulu Valley and slating it for NPS-led conservation management	Prevents Hawaiians from accessing the land, which could hinder well-being of the Hawaiian community and conservation efforts by preventing rematriation
State Waimānalo Forest Reserve designation	Ahupuaʻa land protection	Protects ecosystems and watersheds by regulating use and activity, helping to prevent development and degradation, and slating it for DLNR-led conservation management	Top-down western management strategies that do not incorporate traditional Hawaiian BRM practices and do not require input from or participation of the Native Hawaiian Community.
Conservation easement	Ahupuaʻa land protection	Provides permanent protection of conservation values, customizable agreement terms, and it is a strategy to prevent future owners from rezoning	Not simple to draw up – there is no “one size fits all.”

		agriculture land for development	
Joint Secretarial Order No. 3403	Co-stewardship	Provides additional legal backing to support the hui's right to co-steward the moku	1) Effect on co-stewardship in Hawaiʻi is unclear 2) Order is subject to being revoked
Planning	Co-stewardship (indirect)	Citing loʻi kalo restoration in strategic plans can help ʻĀina Huis secure land, funding, and a legislative edge in restoration efforts, while loʻi kalo restoration can help planning agencies achieve strategic goals	No guarantee that including loʻi restoration in strategic plans will lead to more resources for these projects.
Volunteer & community reciprocal relationships	Traditional lifeways	1) Ensures collaborative communal labor for kalo cultivation at no cost to the organizations and supports the organizations' abilities to share kalo harvests with their communities 2) Presents alternative to conventional western labor and market economy relationships and activities	Organizations cannot rely completely on these relationships; need to supplement with financial capital, such as from government and non-government grants.
Self-sufficiency	Traditional lifeways	1) Enables the focus of labor to be on subsistence and ecological stewardship rather than cash accumulation 2) Supports sustainability and resilience 3) Presents alternative to modern governance system designed to support extractive economic activities in the name of profit	Self-sufficient subsistence economies may not be possible everywhere in Hawaiʻi today

*Ahupuaʻa land protection: protects land for direct loʻi kalo stewardship or protects clean freshwater resources and ahupuaʻa ecosystems connected to loʻi kalo system.

6.2 Recommendations

This thesis started with two assumptions: 1) that Hawaiian SES restoration increases the sustainability and resilience of Hawaiʻi and, thus, should be supported, and 2) that kalo is a biocultural keystone component of the Hawaiian SES and should thus be a priority in 21st-century restoration efforts. With these in mind, this thesis aimed to explore the meaning of

Hawaiian SESs historically and today, as well as GA avenues to restore these systems through case studies of Kīpahulu ʻOhana and Hoʻokuaʻāina's loʻi kalo. These cases revealed GAs in the "formal" western framework as well as informal GAs outside of the western framework that reflect elements of traditional Hawaiian SESs. Based on the findings outlined in the discussion above, this thesis provides the following recommendations:

Recommendations for ʻĀina Organizations: 1) Seek co-stewardship agreements with the NPS to steward NP lands. Forming co-stewardship agreements with the NPS allows for land access and a consistent funding source, without the high cost of land in Hawaiʻi. Native Hawaiian-led ʻĀina Organizations seeking to restore loʻi kalo on NPS lands in Hawaiʻi can leverage the Joint Order No. 3403 to help make their case to form a cooperative agreement. The downsides of this strategy are that autonomy over BRM practices could be limited, some organizational resources could be diverted to NPS directives, and the agreement may not be permanent. ʻĀina Huis negotiating a cooperative agreement with one of Hawaiʻi's NPs should strive to add a provision that secures agreement and land access in perpetuity. 2) Form partnerships for cooperative land acquisition. Private land ownership is the most stable and flexible for SES restoration, but it is the most inaccessible. Organizations that lack the financial resources to buy land and for which a cooperative agreement does not make sense should connect with land conservation organizations, such as TPL and TNC, and funders that can help them raise blended capital to acquire additional land for restoration. 3) If seeking funding, land, or legislative sway for kalo cultivation, check state, county, and community strategic planning documents for kalo restoration-related goals.

Recommendations for HNP: 1) Continue and increase local Native Hawaiian presence and values in all aspects of resource management in Kīpahulu Valley, and increase access to training, certification, and job opportunities in resource management for local Native Hawaiian youth to foster Native Hawaiian participation in modern Hawaiian SES restoration. This presence and access can be achieved through Kīpahulu ʻOhana's proposals to work with

Kīpahulu ʻOhana to establish a training and apprenticeship program targeting local Native Hawaiian youth using current Native Hawaiian resource managers as mentors; and to create a Native Hawaiian values program to train and educate NPS personnel to be culturally oriented in their work. 2) HNP should research whether giving Kīpahulu ʻOhana more autonomy in ahupuaʻa management activities would benefit restoration efforts. 3) Loosen access restrictions for Native Hawaiians in the Kīpahulu Valley Biological Reserve to bolster the Kīpahulu community's rematriation to the moku lands, supporting conservation efforts and community well-being.

Recommendations for Hawaiʻi State, City, and County governments: 1) Enact policies to ensure Native Hawaiian inclusion in Hawaiʻi State conservation land and Forest Reserve management to increase opportunities for co-stewardship and biocultural restoration of Hawaiian SESs through conservation land designations. 2) Protect agricultural and conservation-zoned land by removing provisions that allow for easy conversion to residential zoning and other zoning types that permit urban development.

Recommendations for planning agencies: 1) Continue to cite loʻi kalo restoration and related projects in their strategic plans, as it can help ʻĀina Organizations secure funding, land, and a legislative edge in restoration efforts. Additionally, loʻi kalo restoration can help community, county, and state planning agencies achieve goals, from economic security and development to climate resilience and sustainability. 2) Increase research and monitor the benefits of loʻi kalo restoration in relation to strategic planning goals to strengthen the justification for prioritizing such projects.

6.3 Conclusion

This thesis aimed to identify governance arrangements that enable ʻŌiwi SES restoration through loʻi kalo cultivation in the 21st century. Identifying governance arrangements that enable such restoration necessitated first exploring the meaning of Hawaiian SESs historically and today as these Native Hawaiian systems are often misrepresented when attempted to be

understood through the english language and western frameworks. One example is that the traditional Hawaiian BRM system is often attributed to the ahupuaʻa scale with little acknowledgement that the ahupuaʻa was only a piece of a larger complex SES. From the exploration of pre-contact ʻŌiwi SESs, the main takeaway was that ʻŌiwi SESs were complex systems rooted in sacred and familial relationships to each other and to ʻāina. This thesis revealed land protection strategies to create opportunities for such relationships to be restored; that is, avenues for Land Back. Stemming from this, my main takeaways are that rematriation cannot occur if land is not protected and SES restoration cannot occur without Native Hawaiians. Additionally, most of the governance arrangements recommended were through the "formal" western framework. However, the governance arrangements that present alternatives to settler-colonial systems – such as volunteer and community relationships and self-sufficiency – restore traditional Hawaiian lifeways while resisting the dominant worldview that says capitalism, western governance systems, and the culture that results are the only options.

6.3.1 Positionality Reflection

As a non-Native Hawaiian researcher, I started this thesis questioning whether I was best positioned to make statements about Hawaiian concepts, the Native Hawaiian Community, and decolonization. However, through this research, including the informational interviews, my perspective on my role in Hawaiian biocultural restoration as a seller-ally has grown. This thesis taught me that I can contribute to restoration by consulting and taking the lead of Native Hawaiian scholars, leaders, and community members, supporting decolonization – for instance, by continually reasserting that ʻŌiwi social-ecological systems, both historically and today, are Hawaiian developments, and promoting Land Back and Native Hawaiian participation in all aspects of biocultural resource management. I hope to one day move home to enter the policy and planning field in Hawaiʻi. I aim to apply these lessons and maintain humility while working to support biocultural restoration as a settler-ally.

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