RECOGNIZING INDIGENOUS KNOWLEDGE AND VALUES THROUGH THE DISCIPLINE OF CULTURAL ECOSYSTEM SERVICES: INSIGHTS FOR RESEARCH, MANAGEMENT, AND ACADEMIA

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ABSTRACT

The discipline of cultural ecosystem services (CES) has gained momentum in recognizing some of the connection between social and ecological systems mainly through human-nature interactions. CES has gained recognition within management agencies as there have been national memorandums to include ecosystem service research in decision making within federal agencies. While the discipline of CES offers an avenue to recognize connections between humans and our surrounding environments, standard CES research and conceptualization does not do well at including diverse worldviews and values such as Indigenous Knowledge. In this dissertation I seek to explore avenues to elevate the CES discipline to better recognize and understand Indigenous Knowledge and diverse worldviews and values. I am conducting this research as a Native Hawaiian Indigenous social scientist funded by NOAA to support their West Hawaiʻi Integrated Ecosystem Assessment. I conducted this research in Hawaiʻi and within my own community of West Hawaiʻi with four main objectives. These objectives are: (Chapter 2) creating an elicitation tool, the levels of intensity, using a two-eyed seeing approach to present information in a way that could be used by management agencies while better acknowledging the diverse meanings and reasons humans interact with their environments; (Chapter 3) employing the levels of intensity tool in deliberative workshops to understand the deeper reasons of and meanings behind human-nature interactions and move CES research beyond a one-dimensional categorization; (Chapter 4) spatially representing socio-cultural relationships to place and Indigenous Knowledge by conducting participatory mapping interviews about kuleana with key informants of Native Hawaiian knowledge holders in West Hawaiʻi; and (Chapter 5) exploring the benefits and limitations of survey research on CES with a broad audience to better acknowledge some of the diverse meanings and interactions people have with their surrounding environments. Throughout this dissertation I explore ways to elevate Indigenous Knowledge and worldviews so they can be better recognized within current research and management practices.

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CHAPTER 1. INTRODUCTION

Introduction—E hoʻolauna ʻoe i kaʻu noiʻi

Aloha mai and welcome to my dissertation. This chapter serves as an opening and orientation to my dissertation. In this chapter I introduce myself, my dissertation, my motivations, and the objectives of my research. My dissertation explores the connections and relationships between humans and the environment. To understand these connections and relationships we need to understand more about how humans think, behave, and are motivated. Our worldviews (conception of the world) and epistemologies (theory and methods of knowledge) drive our thoughts, motivations, and behaviors. As worldviews and epistemologies differ among peoples, this can result in different beliefs and desires for environmental management and differing personal connections and relationships with the environment. Differing worldviews and epistemologies, depending on how they are manifested, can create conflict, power imbalances, injustice, and mismanagement. I explore more on differing worldviews in this chapter and throughout my dissertation. Worldviews play a huge role in our beliefs and connections to nature. In my dissertation, I explore: how to create a tool to better express diverse worldviews and values (or perceived importance) of the environment (Chapter 2); what are our reasons for interacting with nature and what meanings do we ascribe to nature (Chapter 3); can we and how can we spatially express our meanings and reasonings for interacting with nature (Chapter 4); and can we gather generalizable and broad-scale data to understand the diverse values for nature and our reasonings and meanings for interacting with nature (Chapter 5).

Positionality

My name is ʻAlohi Nakachi, I am a Native Hawaiian who grew up in Kona on the Island of Hawaiʻi. I was blessed with a twin brother and adventurous parents and spent a lot of my childhood in and on the shores of West Hawaiʻi. My dad is a boat captain who has been lucky to explore most of the Hawaiian Islands and has taken the time to listen and learn from place. He has intimate knowledge from his explorations and from listening to kūpuna and practitioners. I continue to both take for granted and still try to

learn from his knowledge. My dad made sure that my brother and I learned from the place, from the elements, and from our relatives all around us. Learning this literacy of place is never ending, and like learning anything it is not without its struggles. There are still aspects I struggle to connect to, comprehend, or just plain remember. But these teachings are some of the most foundational instructions guiding me, who I am, and my research.

Having some of the most unique and rare experiences with nature created a strong bond within our family and a calling of advocacy on behalf of Hawaiʻi, its people, and the environment. My dad led the charge for our family by sitting and participating in various councils, being a part of and supporting community-based management efforts throughout Hawaiʻi, testifying at the legislation, and trying to support and work with various management agencies. I learned a lot and witnessed a lot of good and bad alongside my family. Working with community-based management efforts, I got to see the lengthy and time-consuming process that takes; the seeming lack of support from top-down management; being yelled at by opposers; but also, information sharing and knowledge dissemination from advocacy efforts; relentless love, motivation, and aloha ʻāina from kiaʻi; collaboration from and among various groups and agencies; and eventually community-based management victories and successful implementation. Testifying in the legislation, I experienced racism towards Hawaiians; not recognizing culture or social science as "real" science; heckling, defeats and heartbreaks; but also created new bonds and allies; felt immense pride in my family and my culture; aloha ʻāina; and occasionally wins protecting the environment of Hawaiʻi, its inhabitants, and cultural practices. My dad led our family on supporting and working with management agencies. He has worked to help bring light to various environmental impacts and injustices including impacts from coral bleaching, commercial fishing, over-tourism, lack of cultural representation or understanding, lack of enforcement, illegal activities, and a lack of understanding or literacy of place. Researchers within the same agencies my dad has worked to develop relationships with, and support have called our family "concerned citizens with no merit."

My own experiences with my family and with management and agencies have motivated me to pursue higher education and driven my own research. Over time things

have been changing for the better. There is greater representation and inclusion of Hawaiians and Hawaiian culture within agencies, a recognized need for social science and data within management, and increased relationship building within agencies. There are still leaps and bounds to go but it gives me hope that we are going in the right direction. The experiences with my family led me to pursue higher education as it seemed the Hawaiian voice wouldn't be heard within our top-down management system unless there was a PhD attached to it. Despite feeling a need to get a PhD to help advocate for Hawaiʻi, it is my love for Hawaiʻi, its people, its inhabitants, and my culture that motivates all my efforts and advocacy for Hawaiʻi. In addition to my experiences driving my desires for a PhD, they also are foundational and drive my research. I hope in my work I can get greater representation and protection of Hawaiians and Hawaiian culture in management, empower community and community-based efforts, strive for a more bottom-up management, and shift the burden off of the community including costs, information gathering, and relationship building.

Worldviews

The impacts from settler colonialism and the differing worldviews brought with it perpetuate the many struggles in Hawaiʻi such as power imbalances, conflicts, and mismanagement. This section will outline what a Hawaiian worldview/way of life is and how colonialism impacted our ʻāina, people, and way of life. The dominance of Anglo-American[1] worldviews reinforce the impacts of settler colonialism and the continuation of social and environmental inequities.

It is important to note that I use Hawaiian words and Hawaiian ideologies throughout this dissertation. Hawaiian words and ideologies do not translate well, and meanings are often lost if translated. The deeper meanings and sentiments may not be well understood, particularly if you do not have or sympathize with a similar

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[1] Anglo-American is a term that will be used in this dissertation to refer to American and European worldviews that are commonly referred to as "Western". I learned this term from Kumu Kamana Beamer who articulated the importance of place and relationality in a Hawaiian way of life; not all peoples and worldviews that lie west of Hawaiʻi are the issue (nor are they monolithic). The worldviews and peoples we do refer to as "Western" that are problematic lie to the East of us. The conflicting worldviews of importance to highlight in Hawaiʻi are Americans and those with like-minded worldviews, as such I refer to them as Anglo-American.

cosmocentric/kincentric worldview as Native Hawaiians. As Hawaiian words are included, they are intentionally not italicized or translated. Hawaiian words are not italicized to recognize that Hawaiian is not a foreign language to the author and in Hawaiʻi where this dissertation research has taken place. Translations are not included so as to not create the misunderstanding of the layered and diverse meanings of these words. I include paratranslations for some words to provide some context for readers, but for a greater understanding of meanings readers can reference Hawaiian language dictionaries such as wehewehe (https://wehewehe.org/ or https://hilo.hawaii.edu/wehe/) ("Wehe²wiki² Hawaiian Language Dictionaries," n.d.).

The Hawaiian archipelago flourished under a Hawaiian way of life that was connected through our governance, belief systems, lifestyles, and practices (Kame'eleihiwa, 1992). The foundation to a Hawaiian way of life is a Native Hawaiian worldview that centers ʻāina. Centering ʻāina does not even quite grasp a Native Hawaiian worldview, as even just referring to Native Hawaiians includes ʻāina–the land, the ocean, the skies of the Hawaiian archipelago and all of its non-invasive inhabitants–plants, animals, and other beings. Native Hawaiians "center" ʻāina because we know we come from ʻāina, we are related to ʻāina, and we are and know our place as the youngest members of this interrelated family (Beckwith, 1972; Kame'eleihiwa, 1992; Liliuokalani, 2020). Our relationship with ʻāina shapes our worldview, beliefs, practices, and management and stewardship systems. All components of ʻāina such as the elements of nature and environmental species are also known to be embodiments of Hawaiian spirits and deities (also known as kino lau) (Andrade, 2013; Beckwith, 1972; Kame'eleihiwa, 1992; Kurashima et al., 2018; Liliuokalani, 2020). Knowing this, Hawaiian interactions and practices with and in ʻāina maintain and perpetuate our spirituality and cosmological connections reinforcing the necessity to revere and nourish ʻāina. To further explain this paragraph and put it into perspective, āina is our god (or gods, more accurately), our elder/ancestor, our food source, our teacher/guide, and—as ʻāina persists through time and exists after us—it is also our children and our future. As such, ʻāina deserves the reverence, respect, admiration, care, and nurturing that all those aspects warrant.

Important to a Hawaiian worldview and connecting with and understanding ʻāina (our gods, elders, ancestors, food, teacher, guides, and keiki) are moʻolelo and spending time in place. Our moʻolelo teach us that we descend from our elemental ancestors linking us together throughout time in place. We keep our own genealogies alive and known as we remember our history, our ancestors, and our connections to our places/elements through moʻolelo (Kame'eleihiwa, 1992; Kikiloi, 2010; Osorio, 2001; Reyes, 2018). Place names are important in our moʻolelo to keep our own mana and the mana of place alive. Place names and Hawaiian terms in general can also give us a more intimate understanding of place as they are often based on genealogy, appearance, and functions (ecological, environmental, and cultural) (de Silva, 2022; Kikiloi, 2010). To help understand the significance of place, moʻolelo, names, and a Hawaiian worldview you also need to spend time in place. You need to take time to get to know the elements and let your senses become familiar with the place (Andrade, 2013; Hoʻomanawanui, 2012). Getting to know your place by spending time there, understanding and knowing the moʻolelo, and your genealogy, aid in connecting to ʻāina and all that entails.

The flourishing Native Hawaiian way of life was greatly impacted by foreign contact and Anglo-American worldviews. Native Hawaiians have struggled, often to survive, with the bringing of foreign diseases, colonization, imperialism, capitalism, detrimental development, destructive tourism, and environmental degradation (Beamer, 2014; Goodyear-Ka'opua et al., 2014; Kame'eleihiwa, 1992; Osorio, 2001; Trask, 1999). Today the impacts of settler colonialism endure through the dominance of colonial Anglo-American worldviews that are continued in the rhetoric and policies of society (Andrasik et al., 2022). Wolfe (2006) describes settler colonialism as not a single event but rather a structure with the ongoing effect of replacing Indigenous Peoples from a place to settle in their land in ways that erase and replace us and render us invisible.

Settler colonialism creates and perpetuates enduring social inequities that are included in governance, management, and capitalistic economies (Bacon, 2019). Conservation and modern environmental management practices favor Anglo-American worldviews that produce many social inequities including displacement, power imbalances, increased poverty and economic imbalances, incarceration or ineffective

carceral punishments (Bennett et al., 2021; de Silva, 2022; Fisk, 2021; McGill et al., 2022; Reyes, 2018). A huge driver maintaining settler colonialism is the dominant[2] society's education system (de Silva, 2022; Kaʻanehe, 2020; Reyes, 2018). Through education practices and societal learnings, knowledge about Native Peoples come from sources that are non-Native (Bacon, 2019; de Silva, 2022; hoʻomanawanui, 2013; McGill et al., 2022). Our history, place names, practices, and beliefs are taught and appropriated and misrepresented through their continuation from non-Native sources. As we strive for reconciliation and addressing persisting social inequities, we need to also recognize the harms that have been perpetuated from settler colonialism and anthropocentric Anglo-American worldviews.

Research aims and objectives

My dissertation seeks to address and overcome some impacts of settler colonialism. While my dissertation will not solve everything, it can be a small step to head in the right direction. In a predominant top-down management system with limited Hawaiian representation, my dissertation aims to: (Chapter 2) create a tool that can help to acknowledge diverse values and worldviews, particularly Native Hawaiian; (Chapter 3) better understand how and why the community actually interacts with the environment; (Chapter 4) spatially represent Native Hawaiian connections to place; (Chapter 5) develop a draft survey to collect broad data on how, why, and where people interact with the environment). I hope my dissertation will create tools to aid in a greater inclusion of Hawaiians and Hawaiian culture within coastal management, better acknowledge diverse worldviews and values, and empower community and bottom-up management efforts.

Literature contributions

Anthropocentric worldviews dominate Hawaiʻi today in management, governance, academia, and research. Even research trying to better incorporate social

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[2] Dominant is used as a term to recognize structures, knowledges, epistemologies that are widespread and commonly referred to or thought of as the only way or best way of doing something. By using the term Dominant, it acknowledges the mainstreaming of the concept and the power imbalances that come with mainstreaming.

values or the importance of nature to humans, such as ecosystem services, are still dominated by an anthropocentric worldview. Nature is commonly viewed not as kin folk but as an "other," and to most, an inferior. Nature is often thought of as a commodity, a resource or source of resources in service to humans. This worldview is reflected in ecosystem services research and many researchers have critiqued this common view of commodifying nature (Chan et al., 2012; Comberti et al., 2015; Costanza et al., 2017; Fish et al., 2016; Gould et al., 2019; McCauley, 2006). Ecosystem services are gaining popularity as a research need at both the national and international scale[3]. The field of ecosystem services is gaining traction as a method to look at the socio-cultural aspects of nature. This dissertation will use the field of cultural ecosystem services as a lens to try to better acknowledge and understand a Native Hawaiian worldview at a research and management level. In particular, this dissertation will look at acknowledging and understanding a Native Hawaiian worldview in Cultural Ecosystem Services (CES) in general (chapter 3), valuation (chapter 2), mapping (chapter 4), and surveys (chapter 5).

Ecosystem services (ES) are a way to understand what people find important about the environment. Ecosystem service research was developed with an economic approach mainly through monetizing services of nature (Rawluk et al., 2019). The goal of ecosystem service research is to identify, describe, and quantify the importance of nature that provides essential and beneficial services for human well-being (Brown, 2013; Chan et al., 2012; Gould et al., 2015; Millennium Ecosystem Assessment, 2005). The MEA (2005) then introduced the concept of CES that stems from ecosystem services. ES are typically organized into four categories, one being CES, and the others are provisioning services, regulating services, and supporting services (Millennium Ecosystem Assessment, 2005). The MEA (2005) defines CES as the "'non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experience." CES research seeks to understand the more intangible and social aspects of ES. While some researchers have

[3] See Presidential Memorandum M-16-01, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), The Common International Classification of Ecosystem Services (CICES)

moved away from the CES framing, a focus on CES is still widespread and used by many agencies and organizations.

This dissertation focuses on the elicitation of CES and representing them in a way that is useful to managers but also accommodates diverse worldviews (particularly non-anthropocentric and Native Hawaiian worldviews). I use cultural ecosystem service research and theory to understand methods of representing people's connections to nature. It is important to note that I focus on CES because management agencies today start with and rely on ecosystem services to acknowledge the connections between environments and humans. I focus on this discipline of CES because it is a discipline that holds promise to be operationalized within management agencies. There are a number of other disciplines that also look to understand the connections between humans and ecosystems that also inform this research. Other important disciplines include: social values–what is important and what matters to people (Kenter et al., 2019, 2015; Rawluk et al., 2019); socio-ecological systems (SES)–a systems approach that recognizes link between humans and the environment and the feedback and influences between them (Berkes et al., 1998; Ciftcioglu, 2017; Masterson et al., 2019); biocultural research–applied research relating the interconnections of influences and impacts of various systems; such as economic systems influencing ecological systems and political influences resulting in biological impacts (Goodman and Leatherman, 1998); and relational values–recognize the reciprocal relationships between humans and nature (Berghöfer et al., 2022; Chan et al., 2018, 2012; Comberti et al., 2015; Gould et al., 2019; Kenter and O'Connor, 2022). While I focus on CES, this dissertation still seeks to 1) understand the connections between humans and our surrounding environment (SES research), 2) recognize what is important around human-nature interactions (social values), 3) take a place-based approach to recognize the connections and influence between ecological and social systems (biocultural research), and 4) represent and accommodate reciprocal connections between humans and our surrounding environments (relational values).

Methodologies

Grounded theory is essentially a qualitative research method for studying an occurrence, experience, or process and developing theories based on the collection and analysis of real-life data (Glaser and Strauss, 2017). Glaser and Strauss (1967) founded grounded theory explaining the methods they used to develop their qualitative research of death and dying in hospitals. In grounded theory, Glaser and Strauss explain that data collection and analysis as an iterative process that leads to researchers focusing on meaningful issues in their own research. The foundations of this iterative process are researcher reflections, note taking, and coding of data (Glaser and Strauss, 2017). Coding creates themes from the data for a greater understanding of the phenomena being researched. In this research, I create first and second order codes from interview and workshop data using inductive (creating codes from the meanings behind interview and workshop discussions) and deductive (creating codes from research questions and concepts such as CES being studied) approaches. Important to grounded theory to understand a social phenomenon are the knowledge from those most familiar with it (Kanahele-Mossman and Karides, 2021). Grounded theory is an Anglo-European research method of qualitative data analysis that can support Indigenous methods of organizing thought to understand the natural environment such as Papakū Makawalu– essentially using multiple knowledges to understand something (see Kanahele-Mossman and Karides, 2021). As this dissertation aims to better understand human-nature connections in an Indigenous setting of Hawaiʻi, grounded theory, and qualitative research in general, serves as a useful guideline for collecting and analyzing qualitative data.

This dissertation also draws inspiration from Indigenous research and methodologies, but I hesitate to say I employed Indigenous methodologies. Indigenous methodologies are those that are conducted by Indigenous researchers stemming from the needs and wants of Indigenous communities following the place-based knowledges and ways of knowing of Indigenous People. This dissertation stems from management needs and supporting existing efforts and research questions within NOAA and specifically NOAA's West Hawaiʻi Integrated Ecosystem Assessment (IEA) program. While I may identify as an Indigenous researcher, the research done in this dissertation

focuses mainly in Anglo-European-American fields of research (of CES) that are dominated by an anthropocentric worldview where humans are centered and nature is viewed as serving or a benefit to humans. As mentioned above, management agencies and academia are still colonial institutions that can reinforce power dynamics that contribute to ongoing social injustices. Knowing this and realizing, while my aim is to get better acknowledgement and eventually uptake of Indigenous worldviews to benefit Indigenous peoples, my research will more directly benefit Dominant institutions of academia and management. Thus, I hesitate to say this research employed Indigenous methodologies.

However, while drawing inspiration from Indigenous methodologies I seek aloha ʻāina as a guide for my research. As mentioned above, ʻāina is foundational to a Hawaiian worldview and way of life. Aloha ʻāina has been used to uplift ʻāina and recognize "he aliʻi ka ʻāina", ʻāina is our chief, our guide, our kumu, our source, our lifeforce, our blood (Mary Kawena Pukui (editor and translator), 1983). We need to always do what is best for ʻāina in order to survive, to flourish, and to take care of ourselves. Aloha ʻāina has been used as a guide in many local projects and political movements. Aloha ʻāina is a part of Hawaiian history throughout time but as a term it has been credited among historical political parties (Hui Aloha ʻĀina) (Noenoe K Silva, 2004) and in Hawaiian nupepā (Ke Aloha Aina founded and edited by Joseph Nāwahī) (Osorio, 2020). Among Native Hawaiian academics, aloha ʻāina is described as uplifting our devotions to ʻāina and to ourselves as we are ʻāina (Noenoe K Silva, 2004), as "our most basic and fundamental expression of the Hawaiian experience" (Kikiloi, 2010, p. 75), and love for the land and for one's country while defiant to colonialism (Osorio, 2020). Understanding ʻāina as a foundation for a Native Hawaiian worldview, in my dissertation, I seek aloha ʻāina to guide myself, my research, be acknowledged from my research, and ideally be an outcome of my research.

Content and contribution

Settler colonialism maintains enduring inequities that are prevalent in management and education institutions. Acknowledgement is a first step to recognizing inequities and making steps towards reconciliation (Bennett et al., 2021). This

dissertation aims to better acknowledge Native Hawaiian worldviews in CES research. Acknowledging a Native Hawaiian worldview is a necessary step for a better understanding of Native Hawaiian values, the ongoing impacts to Hawaiʻi communities, continued inequities, for more informed decision making, and more effective management practices. I use grounded theory and aloha ʻāina as guides in my research. My research is qualitative data collected from interviews and workshops with Hawaiʻi community members and Native Hawaiians. Grounded theory is used in my research as an iterative process to understand the connections between humans and nature in Hawaiʻi. Table 1.1 describes the various objectives, methods and contributions of my dissertation chapters to understand the connections between humans and their surrounding environments. Participants were asked to express their own thoughts and connections with nature to help to discover meaningful issues of how humans express values and types of connections with nature (Chapter 2), the meanings and reasons why humans interact with nature (Chapter 3), spatially acknowledging meanings and reasons for interacting with nature (Chapter 4), and developing a survey to show the types of connections, meanings and reasons for interaction with nature on a broad scale (Chapter 5). The thoughts and personal experiences of participants are analyzed using coding and researcher notes to articulate common themes and ideals achieved through saturation of the data. Aloha ʻāina is also a common guide in this research. ʻĀina and aloha ʻāina are foundational to a Hawaiian worldview. Aloha ʻāina recognizes the importance and necessity of ʻāina and our own pilina and intimacy with ʻāina as Kānaka (Osorio, 2020). To acknowledge a Hawaiian worldview and our connections (and our pilina) with ʻāina, aloha ʻāina is also necessary in this research.

Table 1.1 Contributions of the various PhD Chapters

Chapter	Research question/objective	Methods	Contribution
2: Developing a tool to elicit Cultural Ecosystem Services (CES): The Levels of Intensity	Creating an elicitation tool that acknowledges a Native Hawaiian	Two-eyed seeing approach • One lens with a Native Hawaiian worldview	The Levels of intensity valuation tool • Uses types of connections and our emotional

Chapter	Research question/objective	Methods	Contribution
	worldview and diverse values	• The other with lessons learned from important CES disciplines: four foundational CES frameworks, economic valuation, and environmental psychology/ relational values	depth of connections to articulate a near commensurate “estimated worth” or irreplaceability of our interactions with nature
3: Understanding the deeper meanings of socio-cultural concepts: evolving from Cultural Ecosystem Services	What are the reasons why we interact with nature and what makes our interactions with nature important to us?	Deliberative workshops using the levels of intensity as an activity board	Reasons why we interact with nature and why nature is important to us. Steps needed to lead to develop measuring and operationalizing CES
4: Spatially representing relationships of Kuleana in West Hawai‘i	Spatially representing Native Hawaiian connections to place. Sub Questions: • What can we map/what is appropriate to map? • How can we address or acknowledge potential harms of mapping?	Participatory mapping exercises • Asking what kuleana means to them • Why types of kuelana they may have • Where they have kuleana	Maps showing social-cultural values of Hawaiian connections to place. • Types of kuleana held • Where kuleana is
5: Management Operationalization tool for diverse and pluralistic values of Cultural Ecosystem Services: A draft survey	Creating a CES survey that addresses why we interact with nature and spatially representing our interactions and the importance of nature	Literature review • CES and RV surveys Previous research • Lessons learned from ch 2-5 • Researcher reflections	Draft survey

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CHAPTER 2. DEVELOPING A TOOL TO ELICIT CULTURAL ECOSYSTEM SERVICE (CES): THE LEVELS OF INTENSITY

Abstract

Over the last two decades, researchers and managers have widely used the concept of Cultural Ecosystem Services (CES) to characterize how humans are connected to their surrounding environments. While CES research has enhanced our understanding of some connections, contemporary methods are ill-equipped to adequately represent connections to which people ascribe multiple values (i.e. value pluralism), as well as those that are difficult to describe using a common measure (i.e. incommensurability). This study uses a “two-eyed seeing” approach, with one eye looking from an Indigenous Native Hawaiian worldview and the other looking at tools from Dominant science, to develop an elicitation tool for CES that overcomes these challenges. The levels of intensity elicitation tool draws from four foundational frameworks (the Millennium Ecosystem Assessment–MEA, The Economics of Ecosystems and Biodiversity–TEEB, the Intergovernmental Science-Policy Platform for Biodiversity and Ecosystem Services–IPBES, a Native Hawaiian framework), economic valuation, environmental psychology, relational values, and a Native Hawaiian worldview. The levels of intensity is a quasi-ranking tool comprising five levels (referred to as “intensities”) using emotional depth and types of connections as near-universal commensurable metrics. The levels themselves use Hawaiian language and concepts, aspects of time, and types of connections to accommodate diverse worldviews and the wide range of values, meanings, and interactions people hold for nature. The levels of intensity elicitation tool can be used to present information about CES to decision makers and provide a greater understanding of the meanings and functions people hold for CES that current contemporary methods do not capture.

Introduction

With increasing awareness of the importance of nature for people, management agencies strive to articulate and embrace the many ways that nature contributes to

human well-being within management processes and decision making (Schumacher et al., 2020; Velasco-Muñoz et al., 2022), but methods and metrics that have been relied on to-date can be problematic. In response to a national policy memorandum calling for Federal agencies to incorporate ecosystem services into decision making (Donovon et al., 2015), many management agencies are relying on the Ecosystem Services framework (e.g. EPA, USDA, USGS). For example, the National Oceanic and Atmospheric Administration (NOAA)'s Integrated Ecosystem Assessment (IEA) program is actively researching and incorporating Cultural Ecosystem Services (CES). NOAA's IEA program is a nationwide ecosystem-based management program aimed at providing metrics for all components of an ecosystem, including human dimensions (Gove et al., 2019; Levin et al., 2009; Monaco et al., 2021). CES are one component of ecosystem services that has emerged as a concept to acknowledge the intangible benefits that flow from nature to humans, supporting various dimensions of human well-being, such as aesthetics, education, and spirituality (Millennium Ecosystem Assessment, 2005). The concept of CES has evolved from its original characterization as one type of ecosystem service (ES) in the MEA (Millennium Ecosystem Assessment, 2005), branching into many lines of research that seek to describe, quantify, value, and monetize the diverse and multi-directional relationships between humans and the environment. A key international effort to build on the MEA framework, The Economics of Ecosystems and Biodiversity (TEEB) examined existing monetary evidence on the values of ecosystem services and the dependence of human well-being on ecosystem services (Massenberg, 2019; TEEB, 2010).

Methods to measure the well-being benefits of nature, and the manner of expressing the magnitude of these benefits (metrics), rely mainly on economic and sociocultural valuation approaches. These valuation approaches focus on how human well-being is impacted by nature and provide different but complementary information and sets of indicators. Both are framed in valuation typologies (e.g. use, non-use, intrinsic, and instrumental values) (Buonocore et al., 2021). Economic valuation is based in welfare economics theory, and focuses on an individual's preferences for nature, which are reflective of their individual needs, perceptions, and worldviews (IPBES, 2022a). These methods reflect a utilitarian ethic, typically resulting in monetary

metrics, and are best suited to evaluate benefits that have formal markets, and that unidirectionally flow from nature to humans (Costanza et al., 2014; de Groot et al., 2012). As such, economic methods can be quite limiting as they do not account for benefits and impacts such as equity and well-being (Bennett et al., 2021; Berghöfer et al., 2022; Martin et al., 2020; Sterling et al., 2020), and they don't acknowledge diverse human-nature relationships including reciprocity and the epistemologies and beliefs that shape those relationships (Berghöfer et al., 2022; Calcagni et al., 2019; Chan et al., 2012; Comberti et al., 2015a; Gould et al., 2015; Himes et al., 2020; Isacs et al., 2023; Kenter et al., 2019a; Kronenberg and Andersson, 2019; Martin et al., 2020; Sterling et al., 2020).

Sociocultural valuation efforts have tried to fill gaps by reflecting broader values and social and cultural metrics in analysis (Buonocore et al., 2021; Velasco-Muñoz et al., 2022). Applications of sociocultural valuation in the ES realm have focused on human principles, importance, preferences or perceptions towards nature (Buonocore et al., 2021; Chan et al., 2016; Ciftcioglu, 2017; Díaz et al., 2015; Velasco-Muñoz et al., 2022). These studies have typically resulted in expressions of value using non-monetary metrics (e.g. "place-based" spatial allocation of values (Scully-Engelmeyer et al., 2021), or number of jobs available (Velasco-Muñoz et al., 2022)), but often they still use economic typologies such as monetary metrics (e.g. Bagstad et al., 2013; Sherrouse et al., 2014). Sociocultural valuation tends to blend sociocultural metrics with those from economics and include expressions about the importance of nature to people through direct and indirect observation (e.g. spatial mapping of human uses (Sherrouse et al., 2014)), people's expressions of their values (e.g. stated preferences), and their interactions with nature (e.g. expenditures, hedonic pricing, livelihood dependence) (Pascual et al., 2023).

Largely missing from these approaches measuring the contribution of nature to human well-being, are representations that are inclusive of diverse worldviews, diverse value systems, and Indigenous and local knowledge (Pascual et al., 2023). Some authors have pointed out that the omission of diverse worldviews in conventional methods and value representations, may result in benefits being inappropriately incorporated into decision making, due to power dynamics and asymmetries that make

certain user groups or actions seem more valuable than others (Hernández-Morcillo et al., 2013; Pascua et al., 2017; Pascual et al., 2023). Some methods have been developed for local, place-based valuation, and Indigenous Knowledge (Gould et al., 2015; Khunweechuay et al., 2022; Normyle et al., 2023; Pascua et al., 2017; Robinson et al., 2016), yet pragmatically, management structures are often unable to incorporate these into decision making. These methods are not operationalized within decision making because agencies either do not have the capacity to include these methods and/or these methods are framed in a way that does not accommodate management needs for decision making. This may be because management structures have typically relied on generalizable policies and measurable quantitative indicators such as monetary values. These structures are slowly changing and hopefully will evolve to accommodate some of these more place-based valuations and Indigenous Knowledge.

In light of critiques of CES and the limitations of monetary approaches, researchers are continuing to seek alternative approaches and consensus to be more inclusive of diverse worldviews. A major effort has grown from the Intergovernmental Science-Policy Platform for Biodiversity and Ecosystem Services (IPBES), that explicitly recognizes that there are many worldviews and our current understanding of CES may not be reflective or representative of non-anthropocentric worldviews (Christie et al., 2019; Díaz et al., 2015a; IPBES, 2022; Pascual et al., 2017). Recent work from this group has made important advances in conceptualizing human-nature relationships and proposing a typology of nature's values that highlights the interactions of diverse worldviews and knowledge systems (IPBES, 2022b). CES are commonly organized into broad categories that could reflect multiple worldviews, but the dominant paradigm of current methodologies for ecosystem services limits the ability to support Indigenous Knowledge and acknowledge diverse worldviews and perpetuates general equity and justice concerns within research and institutions (Berghöfer et al., 2022; Chan et al., 2012; Pascual et al., 2023; Sterling et al., 2020).

As the CES framework of categories of "intangible" benefits from nature gains recognition in management circles, it is critical to advance non-conventional metrics to better reflect diverse worldviews and values. Worldviews "encompass the ways people conceive of and interact with the world, expressed through 'knowledge systems'"

(Pascual et al., 2023 pg. 813). Foundational to Indigenous Knowledge and worldviews are place-based knowledge and value systems where human well-being and environmental well-being are directly linked and interwoven (Andrade, 2013; Kikiloi, 2010; Kimmerer, 2013). While CES engenders connections between humans and nature, a major limitation of CES research and theory is that it stems from a Dominant worldview that is often contradictory to Indigenous Peoples and other worldviews (Berghöfer et al., 2022; Chan et al., 2012; Fish et al., 2016; Gould et al., 2019). I use the term "Dominant" when referring to worldviews for many intertwining reasons. Often the roots of governance, including in the United States, stem from colonization and the efforts to *dominate* Indigenous Lands and People that often coincided with spreading Christianity (Bacon, 2019; Darrah-Okike, 2020; Goodyear-Kaʻōpua and Kuwada, 2018; Grandinetti, 2019; Hernandez, 2022; hoʻomanawanui, 2013; Parsons and Fisher, 2022; Wolfe, 2006). Anthropocentrism is at the center of modern *predominant* science and stems from Christian ideals that humans are created in God's image and the world was created for humans to *dominate* (Bacon, 2019; Goodyear-Kaʻōpua and Kuwada, 2018; Kenter and O'Connor, 2022). Capitalism also stems from this perspective that the world exists to serve humans and for humans to *dominate* over (Bacon, 2019; Darrah-Okike, 2020; Fernández-Llamazares et al., 2021; Whyte, 2020). Through capitalism and settler colonialism, these worldviews have come to *dominate* the prevailing assumptions of institutions such as academia, research, and government which frequently *dominate* over other ways of knowing, which can contribute to ongoing harms such as injustices and erasures (Bacon, 2019; Darrah-Okike, 2020; de Silva, 2022; Grandinetti, 2019; Hernandez, 2022; hoʻomanawanui, 2013; McGill et al., 2022; Parsons and Fisher, 2022). Other relevant harms include that this *dominance* contributes to further obstacles for Peoples with other worldviews to be part of these institutions, can limit opportunities, besides being excluded and erased can also contribute to financial, health, and educational inequities (Andrasik et al., 2022; Bacon, 2019; de Silva, 2022; Hernandez, 2022; McGill et al., 2022). "Dominant" is used throughout this paper to encompass all of these notions of *dominance:* anthropocentrism of humans believing to *dominate* over nature, the *predominance* of an anthropocentric way of knowing within institutions, the root of colonization as *domination* over Indigenous Peoples/Lands, and the ongoing

harms of capitalism and settler colonialism perpetuating this *dominance.* A Dominant worldview is particularly contrasting to an Indigenous worldview that often centers relationships and is thought to be “kincentric” rather than anthropocentric (Hernandez, 2022; Osorio, 2018; Salmón, 2000; Topa and Narvaez, 2022). It is also important to note that not all Indigenous cultures and worldviews are the same and should not be thought of as a monolith, rather these worldviews are shaped from the lands that the cultures are birthed from (Case, 2021). But an overarching Indigenous worldview that resonates with me as a Native Hawaiian and that seems to resonate among other Indigenous Peoples is that we are descended from the Earth, elemental forces, and are related to all inhabitants of the world with humans being the youngest descendant. As such, humans are here to be a part of this vast family to live from the gifts provided from all other elements and inhabitants and in turn we must respect, care for, and preserve those gifts (Kimmerer, 2013).

This study addresses three main challenges that limit current CES research and theory to accommodate diverse worldviews and knowledge systems in value assessment. These interconnected challenges are: (1) incommensurability, (2) pluralistic values, and (3) the one-way flow of benefits from nature.

Incommensurability

A wide range of indicators can be used to value nature (biological, economic, socio-cultural), but the diversity of values poses challenges for decision-making as it is difficult to combine them (IPBES, 2022a). Trade-off analysis is simplified when values are *comparable* and can be accounted for in identical metrics such as monetary indicators. For instance, is it worth spending $10 million dollars on watershed restoration to accrue sediment retention and water recharge benefits worth $15 million, or worth converting 10 hectares of land to a parking lot for a similarly sized compensatory public park. Even with these comparable metrics, the different outcomes would have different effects and social benefits. For example, these analyses do not capture equity concerns such as who may benefit or be harmed from these projects and the disparities or compounding environmental impacts from changes such as improved

or decreased water quality. Trade-off analysis is also possible when values use different indicators but share common features. An example of such *compatible* values might be gains in biological species richness, economic opportunities from tourism, and aesthetic enjoyment from a wetland's protection, which might be paired with losses in access for hunters and anglers. While these values do not share a common metric, they can be spatially overlayed, enabling an analysis of value trade-offs, ranking, and design of compensation. Values that are not comparable nor compatible, in that they cannot be brought together, nor ranked, nor compensated for, are *incommensurable*. For instance, if the protection of the wetland also causes a loss of relational value derived from traditional cultural hunting practices, these values cannot be analyzed in a trade-off analysis, and must be considered in parallel. While it is understood and recognized that other values need to be considered in parallel, clear ways to do so have not been well established. Additionally, these assessments and framings of tradeoffs may not always be culturally and socially appropriate.

Value Pluralism

When commensurate metrics are used, the broad and diverse values people hold for nature still contribute to asymmetries and incommensurability of values when trying to garner a holistic understanding of the broad range of values and potential impacts. While commensurability is important for decision making as it facilitates consideration of trade-offs, commensurable and comparable metrics often only account for a narrow range of values. For instance, monetization may only accommodate certain values while being inappropriate for others (Costanza et al., 2014; de Groot et al., 2012), and not all values share common features such as spatialization that make them compatible, leading to their exclusion when these methods are employed (Bagstad et al., 2017a; Nahuelhual et al., 2016). Pluralistic values are the diverse meanings people hold for nature (Kenter et al., 2019b; Kronenberg and Andersson, 2019; Massenberg, 2019; Pascual et al., 2017; Raymond et al., 2019); they are the different ways people prioritize values based on how they relate to or frame nature (Pascual et al., 2023), which in turn is influenced by one's worldview, knowledge systems, epistemology, and way of knowing. For example, some people may view wildlife as a nuisance, an

enjoyment or a prize, as life forms deserving of respect, as relatives, or as some combination of these. If people are asked their willingness to pay to protect wildlife, or if they are asked to delineate areas that they would want to prioritize to protect wildlife, their answers (in $ terms or areas mapped) may seem comparable and compatible, but they likely mean vastly different things to individuals from different backgrounds, histories, cultures, etc. The problem with typical CES valuation approaches is they often account for what is happening, what people are willing to pay, or would want to prioritize, such as protecting wildlife. But these approaches do not do well at getting a deeper understanding of why people value something, what makes it important to them, or the motivations behind their reasoning. The why is rooted in the different worldviews and value systems of individuals and communities contributing to value pluralism. Understanding more about why people value something, and what makes nature or CES important, can give researchers and managers more insight into the connections between and within SES, as well as ongoing societal harms such as injustices from management practices.

One-way flow

The one-way flow of benefits from nature to humans that is embedded in the ES framework and most valuation approaches, also limits which values are recognized as CES. The dominant conceptualization of ES is as a unidirectional flow of benefits that humans receive from nature, that exists to benefit us (Berghöfer et al., 2022; Comberti et al., 2015a; Kenter and O'Connor, 2022; Pascual et al., 2017). This conceptualization is popularized as many studies of CES focus mainly on categories such as recreation and tourism (Nahuelhual et al., 2016; Oleson et al., 2018; Velasco-Muñoz et al., 2022). This dominant conceptualization excludes the many diverse pluralistic values people hold for nature where benefits are reciprocated or relational–when people relate with and within nature as well as human relationships that involve more than humans (Calcagni et al., 2019; Gould et al., 2019; Kenter et al., 2015). Conventional CES approaches that seek to employ comparable or compatible methods largely only capture this one-way flow framing of benefits which exclude and limit many diverse pluralistic values. This study develops a CES elicitation tool using a two-eyed seeing

approach (Bartlett et al., 2012; Reid et al., 2021), by creating a near commensurable metric more accommodating to diverse worldviews and values beyond a framing of a one-way flow of benefits.

This study seeks to create a CES value elicitation tool that results in a commensurable metric. In other words, the elicitation process should result in a metric that enables direct comparison across CES categories despite the various interpretations and values ascribed to them. This tool seeks to provide at least compatible metrics to values that normally only are considered in parallel as these values get left out of contemporary commensurable or compatible approaches. This study was originally conceived to bring in a spatial understanding of social values within the coastal environment for the NOAA West Hawaii IEA, however, it quickly became clear that the challenge of appropriate metrics needed to be addressed first. In this study, I build off of previous work in the West Hawaiʻi IEA that developed a CES framework based on local and Indigenous knowledge from in-depth interviews (Ingram, 2019, 2019, 2020; Ingram et al., 2018). I use insights from Native Hawaiian culture as a Native Hawaiian Indigenous scientist, to help broaden thinking about CES and create a CES valuation elicitation tool that can accommodate diverse worldviews and Indigenous and local values and knowledge. Two fields in particular informed the development of the elicitation tool: Indigenous Knowledge and environmental psychology. The field of environmental psychology helps reveal what makes things important and how people may value things. Emotions and feelings are important in decision making and ascribing value (Araña and León, 2008; Hanley et al., 2017; Lange and Scheve, 2021; Levy and Glimcher, 2012). Additionally, how we relate to things and connect to our surroundings and others, the foundations of kincentric worldviews common to Indigenous cultures, are important to accommodating diverse worldviews and other ways of knowing.

Background and methods

Positionality and two-eyed seeing

In this research, I employed a two-eyed seeing approach by using the lens of an Indigenous Native Hawaiian worldview and using tools from Dominant science to

develop an elicitation tool with a near commensurable metric that captures diverse worldviews and the plurality of values; and enables decision-making. The two-eyed seeing approach was coined by Mi’kmaw Elder Albert Marshall in 2004 (Bartlett et al., 2012; Reid et al., 2021). Two-eyed seeing comes from the Mi’kmaw word Etuaptmumk. Elder Albert describes this approach as learning from both Indigenous and Dominant ways of knowing to use the strengths from both to benefit all (Bartlett et al., 2012; Reid et al., 2021). Robin Wall Kimmerer has described this approach as using the lenses of an Indigenous worldview and using select tools from Dominant science without adopting an exploitive worldview in order to benefit all (“all” is referring to the ecological world and its non-human inhabitants) (Kimmerer, 2023). I created an elicitation tool for CES to understand the reasons why human-nature interactions are important to people, and the meanings behind these interactions. Doing so will aid in gaining a better understanding of diverse and dynamic feedbacks, and influences between human values, behaviors, and environmental outcomes. The methods in developing this elicitation tool, as well as the elicitation tool itself, aim to use the lens of a Native Hawaiian worldview while applying tools from Dominant science. Recognizing the diverse meanings of interactions and reasons why human-nature interactions are important, can illuminate pluralistic values of concepts. The elicitation tool focuses on creating a non-monetary, qualitative unit of measurement that can acknowledge the lack of trade-offs or un-substitutability of concepts. The aims of the elicitation tool are to accommodate decision-making needs by having a unit of measurement that acknowledges the trade-offs or un-substitutability of concepts. Additionally, the elicitation tool provides a deliberative non-monetary, qualitative unit of measurements that seeks to address challenges of CES of incommensurability, value pluralism, and one-way flow.

A two-eyed seeing approach is needed in Hawai‘i because of the duality that exists within Hawai‘i stemming from American occupation. In Hawai‘i, environmental management and contemporary research are dominated by Anglo-American, Judeo-Christian worldviews and processes (e.g. government and legal procedures) that can conflict with Native Hawaiian worldviews and ways of life. Often, these dominant contemporary processes are prioritized as the only recognized knowledge system continuing injustices and inequities. This can lead to Indigenous Knowledge systems

getting ignored, resulting in Indigenous values being excluded or given no value. By using a two-eyed seeing approach, I work to create an elicitation tool that is rooted in Indigenous worldviews/knowledge systems in a form that is recognizable with contemporary management processes and Dominant methodologies. Important in a two-eyed seeing approach, is also the Native Hawaiian approach similar in meaning and methodologies of makawalu, essentially meaning “eight eyes”, but is a Native Hawaiian Indigenous science method of looking with many different lenses and perspectives to better understand a concept or process (Nu’uhiwa, 2019).

A two-eyed seeing approach is also beneficial for CES research. As noted previously, CES were developed from Dominant academic worldviews, but CES research and theory does seek to understand nature’s contribution to people, including Indigenous Peoples. Yet, recognizing Indigenous and other diverse worldviews has also been noted as a challenge among CES research. A two-eyed seeing approach can apply one eye/lens with Indigenous and other diverse worldviews or methodologies and use the other eye/lens with Dominant CES methodologies, research tools, or frameworks. Together this two eyed seeing approach can create a greater understanding of CES and the diverse connections and influences within social-ecological systems (SES).

It is also critical to acknowledge my positionality within this study. I am a Native Hawaiian graduate student working as a graduate assistant for NOAA. I was funded by NOAA to forward research on CES in the region where I was born and raised, the west coast of Hawaiʻi Island extending from Ka Lae to ʻUpolu point (see Figure 2.1). I have the privilege of being raised under cultural teachings as well as Dominant academic education where I am pursuing a PhD in natural resources and environmental management. My upbringing gives me an advantage of implementing a two eyed seeing approach (Bartlett et al., 2012; Reid et al., 2021) as I have been practicing this approach throughout my life. I have established relationships with the community I was raised in, providing me insider knowledge, established trust, and continued responsibility to my community. Due to established relationships and trust, those in my community may be more likely to open up to me and they may feel that I can relate to their thoughts and beliefs. I also have an expected reciprocity to my community and

hope my research will benefit them. I am empathetic to their beliefs and worldviews and believe I can accurately represent their thoughts and experiences. I have exceptional responsibility to my community to ensure my community is protected and their voices are uplifted as my own work stems from agency objectives. Communities in Hawaiʻi often distrust government agencies due to past and ongoing harms perpetuated by the policies of agencies and their actions. The two-eyed seeing approach extends to my own duality and balance of ensuring that I can help fulfill agency needs and improve management processes while also uplifting community voices and ensuring community benefit and are not harmed by research.

Employing both lenses gives me insider knowledge, plus an outsider perspective of Dominant academia and management, that together I can use to better represent community values and knowledge in a way that can accommodate agency needs and capacity.

Figure 2.1 Map of West Hawaiʻi study area.

Developing the elicitation tool

My research objective was to spatially represent social values, or types of connections between humans and their surrounding environment. I began by conducting an exploratory literature review of various topics to better understand how human-nature connections are currently acknowledged and articulated in the Dominant scientific literature. I narrowed down my search to CES theory and research focusing on four foundational CES frameworks (MEA, TEEP, IPBES, a Native Hawaiian framework) to understand how human values of nature are commonly represented. I then looked at economic valuation to understand how values of nature are commonly measured and compared. Then I looked to environmental psychology and relational values to find potential alternative measurements. Throughout all these stages I employed a two-eyed seeing approach to look through the lens of a Native Hawaiian worldview along with these research disciplines to understand how to better recognize diverse worldviews and values.

Disciplines I reviewed to understand and evaluate how human-nature connections are represented include social values, cultural ecosystem services, socio-ecological systems, relational values, and biocultural research. Each of these fields has its own merit in understanding the connections, influences, and relations between humans and our surrounding environment (see Table 2.1). However, I use CES as a starting point because 1) I wanted to build off of previous research done in West Hawaiʻi that used a CES framing (Ingram, 2019, 2020; Ingram et al., 2018; Leong et al., 2019), 2) CES acknowledges types of connections between humans and their surrounding environment, and 3) CES have been represented spatially previously (e.g. SolVES research: Bagstad et al., 2017, 2016; Sherrouse et al., 2014, 2011; Sherrouse and Semmens, 2014; Sun et al., 2019). While I focus on CES, this research still seeks to 1) understand the connections between humans and our surrounding environment (SES research), 2) recognize what is important about human-nature interactions (social values), and 3) represent and accommodate reciprocal connections between humans and our surrounding environments (relational values).

Table 2.1 Overview of the different disciplines I reviewed, explanations of these disciplines and examples of the type of research, values, or human-nature connections.

Discipline	Explanation	Examples
Social Values	Social values comprise what is important and what matters to people (Kenter et al., 2019b, 2015; Rawluk et al., 2019). There are a broad range of fields that have studied concepts pertaining to social values. These fields include anthropology, psychology, philosophy, environmental management/sustainability, geography, and economics. Social values can be thought of as an umbrella term that captures the variety of conceptions of values (Gould et al., 2019; Ives and Kidwell, 2019).	Different disciplines have many concepts to try to understand what social values are and how to represent them. Examples of these concepts include: instrumental values (use and non-use values of nature) and intrinsic values (values inherent to nature) (Christie et al., 2019), transcendental values (beliefs and behaviors that guide value) and contextual values (relating to the worth or importance of something from what it comprises) (Horcea-Milcu et al., 2019; Kenter et al., 2015).
Cultural Ecosystem Services (CES)	The MEA first introduced CES as part of the ecosystem services framework. The MEA (2005) defines CES as, “non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experience.”	CES are often represented as categories of human-nature interactions. CES categories represented in the MEA are spiritual and religious values, knowledge systems, educational values, inspiration, aesthetic values, social relations, sense of place, cultural heritage values, and recreation and ecotourism (Millennium Ecosystem Assessment, 2005). Since the MEA, many other studies have developed other categories that are more suited to their study and/or place (e.g Leong et al., 2019; Pascua et al., 2017)
Socio-Ecological Systems (SES)	This is a systems approach to environmental management that recognizes that social and ecological systems are linked (Berkes et al., 1998). SES research focuses on the understanding of the link between	Different research approaches (from all the other disciplines in this table) can take a systems approach. Some specific research that has evolved from

	humans and the environment and the feedback and influences between them (Ciftcioglu, 2017; Masterson et al., 2019).	this field include concepts such as landscapes (Ciftcioglu, 2017), seascapes (Chakraborty and Gasparatos, 2019; Dam Lam et al., 2019) and human-environmental systems or coupled human and natural systems (Fischer et al., 2015).
Relational Values	Relational values recognize the reciprocal relationships between humans and nature (Berghöfer et al., 2022; Chan et al., 2018, 2012; Comberti et al., 2015; Gould et al., 2019; Kenter and O'Connor, 2022).	Relational values research can include highlighting the relationality of place-specific values or cultural ecosystem services (Gould et al., 2019) as well as explaining value framing such as (1) living from nature; (2) living with nature; (3) living in nature; (4) and living as nature (Kenter and O'Connor, 2022; O'Connor and Kenter, 2019).
Biocultural Indicators	Biocultural studies relate the interconnections of influences and impacts of various systems; such as economic systems influencing ecological systems and political influences resulting in biological impacts (Goodman and Leatherman, 1998). Biocultural indicators are more of an applied approach to research to recognize the connections and influences of socio-ecological systems.	Biocultural approaches acknowledge the importance of taking a place-based approach and working with communities to acknowledge the intersection of biological and cultural diversity (Bremer et al., 2018; McCarter et al., 2018; Morishige et al., 2018; Sterling et al., 2017). To engage in biocultural research requires community-based and participatory methods that should include building and developing research relationships with community members and stakeholders as well as including local action (McCarter et al., 2018; Sterling et al., 2017).

Four Foundational Frameworks

While researching tools and methods to spatially represent CES, it became clear that most elicitation methods for CES were unsatisfactory for the purposes of my study, which led me to develop a new elicitation tool for CES. In order to develop an elicitation tool for CES, I first reviewed existing CES frameworks and associated elicitation

methods. My literature review revealed three main frameworks used in CES research: the MEA, TEEB, and IPBES (Díaz et al., 2015; IPBES, 2022; Millennium Ecosystem Assessment, 2005; TEEB, 2010). Additionally, there are some specific place-based frameworks that acknowledge the limitations of generalizable frameworks and seek to represent the specifics and contextuality of environments and peoples where these studies are conducted (e.g. Arki et al., 2020; Leong et al., 2019; Pascua et al., 2017; Petway et al., 2020; Potschin and Haines-Young, 2013; Reed et al., 2017; Robson et al., 2019). I examined the benefits and limitations of these three main frameworks as well as a place-based Indigenous framework of CES in West Hawaiʻi (Pascua et al., 2017) (See table 2.2). In order to identify how to understand CES and how I may improve upon the research and conceptualization of CES, I critically assessed the benefits and limitations of these four CES frameworks.

Table 2.2 The benefits and limitations of four CES frameworks. These aspects were used to create the levels of intensity framework.

CES Framework	Strengths	Limitations
Millenium Ecosystem Assessment (Millennium Ecosystem Assessment, 2005)	Generalizable categories (author) Categorizes and organizes “non-material benefits” (MEA, 2005) Foundational CES framework (used widely in literature)	Stems from a Dominant worldview and can be excluding to other worldviews (Berghöfer et al., 2022; Chan et al., 2012; Comberti et al., 2015b; Fish et al., 2016; Gould et al., 2019; Kenter et al., 2019b; Kosanic and Petzold, 2020; Kronenberg and Andersson, 2019; Massenberg, 2019; Raymond et al., 2019) Incommensurable and incomparable categories due to the ambiguity of categories (Calcagni et al., 2019; Chan et al., 2012; Gould et al., 2015; Himes et al., 2020; Irvine et al., 2016; Raymond et al., 2014) No standardized metric or set method to measure categories (Author)

		Largely implies one-way flow from nature to humans (Berghöfer et al., 2022; Comberti et al., 2015b; Gould et al., 2019; Kenter and O'Connor, 2022; O'Connor and Kenter, 2019; Pascua et al., 2017)
The Economics of Ecosystems and Biodiversity (TEEB, 2010)	Measurements and metrics (Author) Recognizing tradeoffs and prioritizations of values (TEEB, 2010)	Relies on monetization methods that can be limiting or excluding to values that are not appropriate to quantify (Bennett et al., 2021; Berghöfer et al., 2022; Calcagni et al., 2019; Chan et al., 2012; Comberti et al., 2015b; Gould et al., 2015; Himes et al., 2020; Isacs et al., 2023; Kenter et al., 2019b; Kronenberg and Andersson, 2019b; Martin et al., 2020; Sterling et al., 2020) Stems from a Dominant worldview and can be excluding to other worldviews (Berghöfer et al., 2022; Chan et al., 2012; Comberti et al., 2015b; Fish et al., 2016; Gould et al., 2019; Kenter et al., 2019b; Kosanic and Petzold, 2020; Kronenberg and Andersson, 2019; Massenberg, 2019; Raymond et al., 2019) Largely implies one-way flow from nature to humans (Berghöfer et al., 2022; Comberti et al., 2015b; Gould et al., 2019; Kenter and O'Connor, 2022; O'Connor and Kenter, 2019; Pascua et al., 2017)
The Intergovernmental Science-Policy Platform for Biodiversity and Ecosystem Services (IPBES) (Christie et al., 2019; Díaz et al., 2015; IPBES, 2022b, 2022a)	Acknowledges there are diverse peoples and values (Christie et al., 2019; Díaz et al., 2015; IPBES, 2022) Recognizes the importance culture can play and starts to acknowledge reciprocal flows between nature and humans (Christie et al.,	No standardized metric or set method to measure categories though it does acknowledge the multiple methods and approaches that have been used (Author) Still can stem from an Dominant worldview and value system (Berghöfer et al., 2022; Chan et al., 2012; Comberti et al., 2015b; Fish et al., 2016; Gould et al., 2019; Kenter et al., 2019b; Kosanic and Petzold,

	2019; Díaz et al., 2015; IPBES, 2022)	2020; Kronenberg and Andersson, 2019; Massenberg, 2019; Raymond et al., 2019)
Indigenous Native Hawaiian framework (Pascua et al., 2017)	Place-based and culturally relevant categories (Pascua et al., 2017) Acknowledges reciprocal relationships (Author) Acknowledges other ways of knowing and worldviews (Author) Accommodating to Indigenous peoples and values (Author)	Creates a framework, but no standardized metric or set method to measure categories (Author) May not be applicable generally (place specific) (Author)

Millenium Ecosystem Assessment (MEA)

The Millennium Ecosystem Assessment (MEA) introduced the concept of CES. The MEA was launched in 2001 with the objective of understanding how ecosystem change impacts human well-being (Millennium Ecosystem Assessment, 2005). The MEA included the following components of well-being: basic materials for a good life, health, good social relations, security, and freedom of choice and action (Millennium Ecosystem Assessment, 2005). The assessment focuses on using the ecosystem services framework to understand the services nature provides to humans. The ecosystem services framework consists of four types of services: 1) provisioning services are the economically valuable products obtained from ecosystems (e.g. food, energy sources, and pharmaceuticals); 2) regulating services are those services that help govern natural ecosystem processes (e.g. climate regulation such as floods and droughts); 3) supporting services are environmental functions that underpin other ecosystem services (e.g. nutrient cycling); and, 4) cultural services comprise the non-material benefits people obtain from ecosystems (e.g. recreation and spirituality)

(Comberti et al., 2015b; Millennium Ecosystem Assessment, 2005; Pascua et al., 2017).

With the introduction of CES, the MEA attempted to bring more focus to the social aspects of ecosystem services that are often overlooked. Categories of CES outlined in the MEA include: cultural diversity, spiritual and religious values, knowledge systems, educational values, inspiration, aesthetic values, social relations, sense of place, cultural heritage values, and recreation and tourism. The MEA created a framework that could align with conventional resource management and popularize the incorporation and acknowledgement of these categories that bring attention to the intangible benefits provided by nature.

A primary benefit of CES as a framework is the creation of generalizable categories. However, while it can be beneficial to have widely applied and generalizable categories, this can also create limitations of the framework. Because of the generalizability of terms, they can have ambiguous meanings and applications which makes them incommensurable among and between different peoples (Calcagni et al., 2019; Chan et al., 2012; Gould et al., 2015; Himes et al., 2020; Irvine et al., 2016; Raymond et al., 2014). This ambiguity and incommensurability also stems from the largely Dominant epistemology that this framework was created in and for (Berghöfer et al., 2022; Chan et al., 2012; Comberti et al., 2015b; Fish et al., 2016; Gould et al., 2019; Kenter et al., 2019b; Kosanic and Petzold, 2020; Kronenberg and Andersson, 2019; Massenberg, 2019; Raymond et al., 2014). Peoples, worldviews, and values that are not in line with a Dominant epistemology are not well represented and/or are excluded from this framework.

The MEA is relevant to the elicitation tool developed in this research as they introduce CES, and the categories and definitions outlined of CES are used and elicited in many other studies. The MEA's CES categories and their definitions are used as a steppingstone in this study to understand how CES are represented in current literature and how they can be expanded upon.

The Economics of Ecosystems and Biodiversity (TEEB)

The Economics of Ecosystems and Biodiversity (TEEB) provides another avenue for understanding how nature may influence people. TEEB focuses on how you can measure and elicit ecosystem services monetarily to further understand them. TEEB looks at existing monetary evidence on the values of ecosystem services and the dependence of human well-being on ecosystem services (Christie et al., 2019; Massenberg, 2019).

TEEB categorizes ecosystem services through the economic concepts of use values and non-use values (TEEB, 2010). Use values are further divided into direct use values, indirect use values, and quasi optional values. Direct use values are the consumptive resources and the ecosystem services most likely to be priced in markets (e.g. provisioning services), these can be studied using market analysis and cost methods (TEEB, 2010). Indirect use values are the values that may be used indirectly by an economic agent (e.g. regulating and supporting services), these can be studied using methods such as hedonic pricing and contingent valuation (TEEB, 2010). Quasi optional value gets at freedom of choice as a component of human well-being and the replicability of ecosystem services, these can be studied using methods such as replacement cost method, mitigation cost method, and avoided cost method. Non-use values are the non-consumptive values that have been influential in decision making but are rarely valued in monetary terms (e.g. supporting services and cultural services), and methods to study these include contingent valuation and contingent election (TEEB, 2010).

TEEB places importance on being able to elicit monetary values for ecosystem services. However, assigning value in monetary terms can limit application and seemingly commodifies the interactions and meanings of nature (Berghöfer et al., 2022; Chan et al., 2012). While monetary values are important to understand and relevant to decision making, monetization can contribute to degradation and overuse of valued places or resources (Bennett et al., 2021), does not accommodate diverse worldviews (Comberti et al., 2015a; Gould et al., 2015; Kenter et al., 2019b), and the incommensurability of values make them ill-suited to be measured in monetary terms (Calcagni et al., 2019; Chan et al., 2018). For example, allocating a hypothetical amount

of money to a CES such as spirituality does not reflect the significance and the diverse meanings of that value.

Following the strengths of TEEB, I aim to recognize perceived tradeoffs or lack of tradeoffs in values within the elicitation tool and how values may be prioritized (through their lack of tradeoffs). To aid in understanding prioritization, I aim to use a qualitative representation of values and provide a level of commensurability through their perceived substitutability or lack of substitutability (tradeoffs) of peoples' connections and emotional depth with human-nature interactions.

Intergovernmental Science-Policy Platform for Biodiversity and Ecosystem Services (IPBES)

The Intergovernmental Science-Policy Platform for Biodiversity and Ecosystem Services (IPBES) is another initiative acknowledging the values of nature. The IPBES recognizes that there are many worldviews and our current understanding of CES may not be reflective or representative of non-Dominant worldviews. The IPBES uses a conceptual framework and coined the term 'nature's contribution to people' (NCP) (Christie et al., 2019; Díaz et al., 2015). NCP acknowledges that there are diverse perspectives and values, and the aim is to be more inclusive to increase the capacity to understand and account for this diversity (Christie et al., 2019). NCP builds on the MEA's definitions of CES by recognizing the central and pervasive role culture plays in defining all links between people and nature (Christie et al., 2019; Díaz et al., 2015). This is important in acknowledging and representing multiple peoples and worldviews, particularly to Indigenous peoples as the use of NCP elevates, emphasizes, and operationalizes the role of Indigenous knowledge in understanding NCP (Christie et al., 2019; Díaz et al., 2015).

IPBES diverges slightly from the MEA by noting nature's contributions to people and the diversity of these contributions, making it challenging to define nature's values (IPBES, 2022a). Some of the diverse values that nature contributes to humans include economic (e.g. investment, production, consumption), political (e.g. recognition of individual and collective rights and duties), and socio-cultural (e.g. forming, maintaining or changing peoples' socio-cultural identities) (IPBES, 2022a). To understand the

diverse contributions of nature we also need to recognize the people's relationships with nature including: worldviews (how people interact with the world); knowledge systems (people's beliefs, practices, and knowledges embodied in worldviews); broad values (morals, ethics, and life values that guide people and their interactions); specific values (perspectives such as the importance of nature); and value indicators (quantitative measures and qualitative descriptors) (IPBES, 2022a). Important groupings in specific values include instrumental values (means to a desired end and are commonly associated with ecosystem services), relational values (the meaningfulness of human-nature connections), and intrinsic values (natures contributions independent of people as valuers) (IPBES, 2022a).

IPBES' conception of NCP creates space to acknowledge different worldviews and recognizes the importance of culture and Indigenous knowledge. I seek to also recognize the central role of culture in shaping the interactions and meanings between nature and people. I aim to create the elicitation tool to be receptive to a diversity of peoples and worldviews but also be used to distinguish the differences of importance and priorities among and between different peoples. While the IPBES creates space for diverse worldviews it does not offer a means to elicit and measure CES.

Indigenous Native Hawaiian framework (Pascua et al.)

While the IPBES and NCP acknowledge a diversity of peoples, perspectives, and the importance of culture, at a general broader scale some of the nuances and importances of place-based values and connections are not adequately acknowledged. The IPBES does well at acknowledging general reasons why connections are important and the need to acknowledge diversity that can give merit to more place-based values and connections. Further place-based and Indigenous research can better acknowledge some of the more nuances and diversity of values and connections. Pascua et al. (2017) developed a CES framework that is representative of place-based and Native Hawaiian Knowledge. This framework has been foundational for the development of my own study. This framework aids in representing concepts such as reciprocal relationships, traditional values, and cultural subsistence that previous CES frameworks did not sufficiently capture (Pascua et al., 2017). These concepts further relate how

humans are not only influenced by nature but also influence nature and that other peoples and epistemologies do not see humans and nature as separate. This framework presents CES in four categories: ʻike (knowledge), mana (spiritual landscapes), pilina kanaka (social relations), and ola mau (physical and mental well-being). Creating this place-based framework required understanding the nuances of place, such as socio-political history, the diverse perspectives and peoples of places, and acknowledging the variety of connections and ties to the place and the resources of place. To be inclusive of diverse peoples and perspectives, a lot of time is needed in the place and with the people of place, which can include in-depth interviews, story-telling, and deliberative processes. This will benefit and be useful to local communities as it will stem from the people of place and be representative of their perspectives.

The framework developed by Pascua et al. is important in understanding and representing CES in a framing that is relevant and accommodating to Indigenous Peoples. The elicitation tool I develop aims to use such an approach to capture and represent interactions and meanings of nature in a way that is accommodating to Indigenous Peoples and multiple ways of knowing. I aim to build off of Pascua and other's work and provide further understandings to accommodate Indigenous Worldviews and ways of knowing and ways that this knowledge can be used in decision making.

Economic Valuation

Valuation methods of CES are foundational to this study and understanding how to measure and elicit CES. Many diverse valuation methods and metrics were looked to when creating this study and likely influenced the creation of the elicitation tool. However, this study focused on economic valuation specifically as monetary approaches typically result in commensurable comparable metrics in comparison to socio-cultural valuation that results in largely compatible features of measurement. Monetization is commonly used as a method to elicit values of CES. It is a useful method in that it turns each CES into a commensurate unit. One of the three CES umbrella frameworks, TEEB, and many other CES research methods use different non-market valuation approaches to assign monetary values to things that are not traded in

markets as a way to identify comparable values (e.g., travel cost method, willingness to pay, stated choice, quantitative ranking, etc.) (TEEB, 2010).

To create a research tool to elicit CES I looked to economic valuation to see what should be included within the tool. Specifically, the aspects of commensurability of economic valuation that are useful to decision makers and how can these aspects be replicated in an elicitation tool without duplicating the harms or contradictions of monetizing CES. While I drew upon economic valuation and comparability to inform the making of the tool, the elicitation tool will likely have aspects of both comparability and compatibility and aiding in a commensurable metric.

I looked at economic valuation to understand what may be needed to create an elicitation metric for CES. Valuation is essentially the estimation of something's worth (Costanza et al., 2014; de Groot et al., 2012; Jacobs et al., 2016). Economic valuation using monetization is beneficial and commonly used because it presents a standard "near-universal" human understanding of something's value/worth by translating it into equivalent metrics (i.e. is commensurate) (de Groot et al., 2012). Knowing something's estimated worth, aids in understanding people's motivations and behaviors and assessing trade-offs in decision making (Costanza et al., 2014; de Groot et al., 2012; Lazo, 2002; Lliso et al., 2020; Mika et al., 2022). However, monetization does a poor job of representing other non-monetary values of whatever is being monetized and it is extremely difficult to determine the substitutability and economic value of anything that is valued but not marketed, such as CES (de Groot et al., 2012; Manero et al., 2022; Nie et al., 2021). Nonmarket valuation is an approach that looks at individual utility and tradeoffs for ecological goods that are not directly observable or established in markets but can still indicate monetary valuation (de Groot et al., 2012; Lazo, 2002; Nie et al., 2021). While non-market valuation is an economic approach that aids in valuing goods not easily marketable, these approaches are still ill suited to CES that are not adequately or appropriately expressed in monetary terms. Just as it would feel inappropriate to put a monetary value on your human relatives to those that view the natural environment and all its elements and inhabitants as kin it would be inappropriate to put a monetary value on them.

Concepts used in economic valuation, including near-universal metrics, commensurability, and substitutability, aided in the development of this elicitation tool. Achieving commensurability through near universal metrics provide a standard for evaluating or understanding concepts in relation to each other. Substitutability is the ability of something to be replaced or interchanged with something else. To put this in other words, consider this example of using money as a commensurable unit to purchase goods and services, in this case a bag of flour and a liter of soda that each cost about $3. If I just cared about monetary value, they would be worth the same value and therefore substitutable with one another, and having either would give me the same outcome. However, if I were trying to bake a cake, while they are commensurable in monetary value they are not substitutable in this instance. Both commensurability and substitutability give us insight into potential tradeoffs of aspects as well as prioritization that are useful in decision making. There are many limitations to valuation uptake in decision making such as the limited capacity of decision-making processes and lack of reliable methods (Pascual et al., 2023). While other more desirable methods may be sought such as co-production, place-based management, and interweaving of local knowledge and practices, the unfortunate reality is that many management and decision making processes are not equipped or capable of integrating those objectives yet. As a first step, this paper seeks–to provide a tool based on commensurable metrics that can also be a steppingstone to those objectives and that can meet the capacities of decision making as it currently exists.

Environmental Psychology and Relational Values

As monetization is not often an appropriate commensurate metric for CES, I looked at the fields of environmental psychology and relational values for elicitation approaches to gather information from people and other forms of measurements, or indicators that signal importance to people to be included in an elicitation tool. Specifically, I sought ways to acknowledge the aspects of CES that make them difficult to elicit and poor subjects of monetization, namely their incommensurability and intangibility. The reciprocal/relational connections of relational values research and relevance of emotions in decision making in environmental psychology provided

important insight for methods/measurements that could be included in an elicitation tool for CES.

The concept of relational values emerged from the false dichotomy between instrumental and intrinsic values and in part in response to critiques of CES and value typologies, particularly the seemingly only one-way flow of benefits from nature to humans. Relational values specifically recognize reciprocal relationships between humans and nature (Berghöfer et al., 2022; Chan et al., 2018, 2012; Comberti et al., 2015b; Gould et al., 2019; Kenter and O'Connor, 2022). Relational values are those values that contribute to desirable relationships (Christie et al., 2019) and encompass preferences and principles about human relationships that involve more than humans (Gould et al., 2019). Reciprocity is often foundational in relational values, in that in any relationship, there is a give and a take, or a dynamism between those who are involved within the relationship (including more than humans). In Hawaiian culture, the relationality between humans, our environmental/elemental surroundings, and our more-than-human counterparts is reinforced in Hawaiian belief and traditional management systems (Andrade, 2013; Beckwith, 1917; Hoʻomanawanui, 2012; Kame'eleihiwa, 1992; Kealiikanakaoleohaililani et al., 2018; Kikiloi, 2010; Kikiloi et al., 2017; Kurashima et al., 2018). Recognizing reciprocal relationships is an important step in working to acknowledge and accommodate these diverse worldviews that are not captured in only one-way flows.

I looked to environmental psychology literature to understand what other assessments of tradeoffs and substitutability could be used to create a metric with a near-universal human understanding. Environmental psychology has been used to understand alternative ways in which human-environmental connections are linked to human well-being (Dou et al., 2021, 2017; Huynh et al., 2022; Kenter et al., 2019b; Pedersen, 2019). Environmental psychology research with CES typically looks at how human behavior and motivations may be linked to their interactions with nature and their own health and well-being (Pröbstl-Haider, 2015). I look to environmental psychology research to understand the connections between human motivations, behavior, and human-nature interactions in how humans relate to or value nature. Emotions, memories, and connections are important to behaviors and choices, decision-related

valuation, and assessing personal tradeoffs (Araña and León, 2008; Hanley et al., 2017; Lange and Scheve, 2021; Levy and Glimcher, 2012). Specific emotions and their response can be incommensurable as they are typically individualistic, ambiguous in their meanings, context dependent, and cognitively difficult to identify (Junot et al., 2017; Perrin and Benassi, 2009; Sznycer and Lukaszewski, 2019). For example, if a negative event were to occur in someone's life, this could trigger "negative" emotions that could range from sadness, guilt, anger, etc. Environmental psychology teaches us that emotions play an important role in decision making but specific emotions are not a good indicator of value as they are more relevant to individualistic experiences. A specific emotional response to a situation would not be a near-universal human response but rather the eliciting of emotions, the how and why people are having those emotions and the impacts and connections from those emotions can create a more common understanding and a better unit of measurement. As such, this study sought to focus on emotional connections and emotional depth (the "intensity" of emotions and how they are felt) as a unit of measurement.

In addition to emotional connections/depth, I include types of connections as part of a unit of measurement to help address diverse meanings and pluralistic values of CES. Our emotions, experiences, and connections all tie into our identity and how we make decisions. Aspects such as "place attachment" and "biophilia" have been used to explain human connections and values of nature. Types of connections were chosen because it can articulate one's beliefs and identity in, with, and towards nature (Dang and Weiss, 2021; Hinds and Sparks, 2008; Mayer and Frantz, 2004; Perrin and Benassi, 2009). Additionally, types of connections can create space for understanding and eliciting diverse relational values that are foundational to human-nature interactions. These connections and relational values are important for better understanding and relating to Indigenous and other worldviews. Many Indigenous worldviews highlight the relationships and connections that humans build within the world and how these connections are highlighted with time and ancestry/genealogy (Andrade, 2013; Hoʻomanawanui, 2012; Wilson, 2008).

Results and Discussion

The Elicitation Tool

I created the levels of intensity CES elicitation tool from the lessons learned applying a two-eyed seeing approach (see table 2.3). The levels of intensity are divided into categories of different "intensities." While these categories could be used to organize concepts, they differ from CES categories in that they can be used to "rank" and reveal meanings behind concepts. The following section details what each category consists of and the ranking/measurement aspect of the tool. The categories themselves are different types of connections that are relevant to worldviews in Hawaiʻi, particularly Native Hawaiian worldviews. Hawaiian language is also used within these categories to highlight the different types of connections and concepts that are not commensurable in English. The meanings and descriptions within these categories could be applied and adapted elsewhere and with other languages if appropriate. These types of connections and the "intensities" vary between the categories to address how your emotional connections and depth may be felt and impacted within yourself, extending to others (including non-humans and the surrounding environment), and throughout time. The levels of intensity can be used to elicit CES through the diverse meanings of the different CES categories based on where concepts get placed along the levels of intensity. More information on prioritization and the trade-offs of concepts or their lack of substitutability of concepts can be understood based on what level or levels concepts get placed in.

Table 2.3 The key findings from the different lenses/tools used in my two-eyed seeing approach to develop an CES elicitation tool.

Gaps/problems	Elicitation needs	Research tool/lens	Key lessons informing what an elicitation tool needs
CES stem from a Dominant worldview/ do not represent diverse worldviews/values Difficult to elicit CES	Concerns for representing/eliciting CES	The strengths and weaknesses of four foundational frameworks in representing diverse values and eliciting CES	Place-based/context specific categories that are relatable to diverse peoples

			Metrics and measures that can recognize priorities and tradeoffs Acknowledges other worldviews and ways of knowing, including reciprocal relationships and the importance of culture
Difficult to elicit CES Inappropriateness of quantitative methods	Qualities needed for a commensurable metric	As monetization is a common method to elicit CES, I looked to economic valuation on what qualities are useful for elicitation and measurement	Near-universal human metric Metrics and measures that can recognize priorities, tradeoffs, and substitutability
CES stem from a Dominant worldview/ do not represent diverse worldviews/values Inappropriateness of quantitative methods Incommensurability of values	Non-quantitative methods and metrics that could be used in an elicitation tool	I looked to relational values and environmental psychology for other methods that could be used as metrics/measurements to elicit CES	Emotional connections/ depth (or intensity of feeling) and types of connections as a measurement unit Acknowledging reciprocity and moving beyond a one-way flow
CES stem from a Dominant worldview/ do not represent diverse worldviews/values Inappropriateness of quantitative methods	Representing Indigenous worldviews, knowledge, and ways of knowing	Applying a Native Hawaiian worldview	The inclusions of time in measurements Place-based and Hawaiʻi specific language and types of connections

Incommensurability of values Injustices and perpetual harms from a lack of representation/ inclusion			

The Levels of Intensity CES Elicitation Tool

The Levels of Intensity CES elicitation tool uses the human body as a metaphor to understand the multiple levels of intensity existing within the range of emotional depth and types of connections. While feelings and emotions are not always easy to articulate or even comprehend, by explaining their depth in terms of how they may be felt or understood in the body, people can think of their personal emotional depth or types of connections to interactions and meanings of nature and how their intensities may differ. Using one's own body may help one to imagine and visualize the connections felt from interactions and meanings of nature and better articulate how these emotional depths and connections are felt and what level they may exist in (See Figure 2.2). In a Hawaiian way of thinking, it is also important to understand that emotions and intelligence are connected just as our body connects us to ʻāina. The naʻau are our intestines or our guts and this is metaphorically where the heart for Hawaiians is found, and when we think it may be in our head but if it turns to wisdom, it also goes through our naʻau (Meyer, 1998). Meyer (1998), notes naʻauao is the Hawaiian word to describe knowledge, wisdom, and intelligence. Naʻau is in the word intelligence because of its key role in the human body for the foundation of intelligence (Meyer, 1998). She also notes the connections between the mind and the body and that feeling, and intelligence are connected. The levels of intensity also uses body delineations to note the connections within us of our body rooting us to ʻāina, connecting us to others, and being the basis for thoughts and emotions. Hawaiian words such as piko and naʻau indicating body parts are also used within the levels of intensity not to add meaning to these words but to draw inspiration from them and use them in conversation while thinking about our connections and Native Hawaiian connections to our surrounding environment. Using

the body also helps to provide an alternative understanding of measurement. Just as limbs and organs may not be comparable or “more valuable” than the other, the levels themselves shouldn’t be thought of as one more important or more valuable than the other. Rather as we move along the body, intensities of feelings may amplify and different or compounding types of connections may be held but this does not mean an increasing value or numerical amount as we may think of with money/quantification. Rather the intensities and connections show diversity and different meanings and pluralistic values of concepts and can highlight their non-substitutability or lack of tradeoffs.

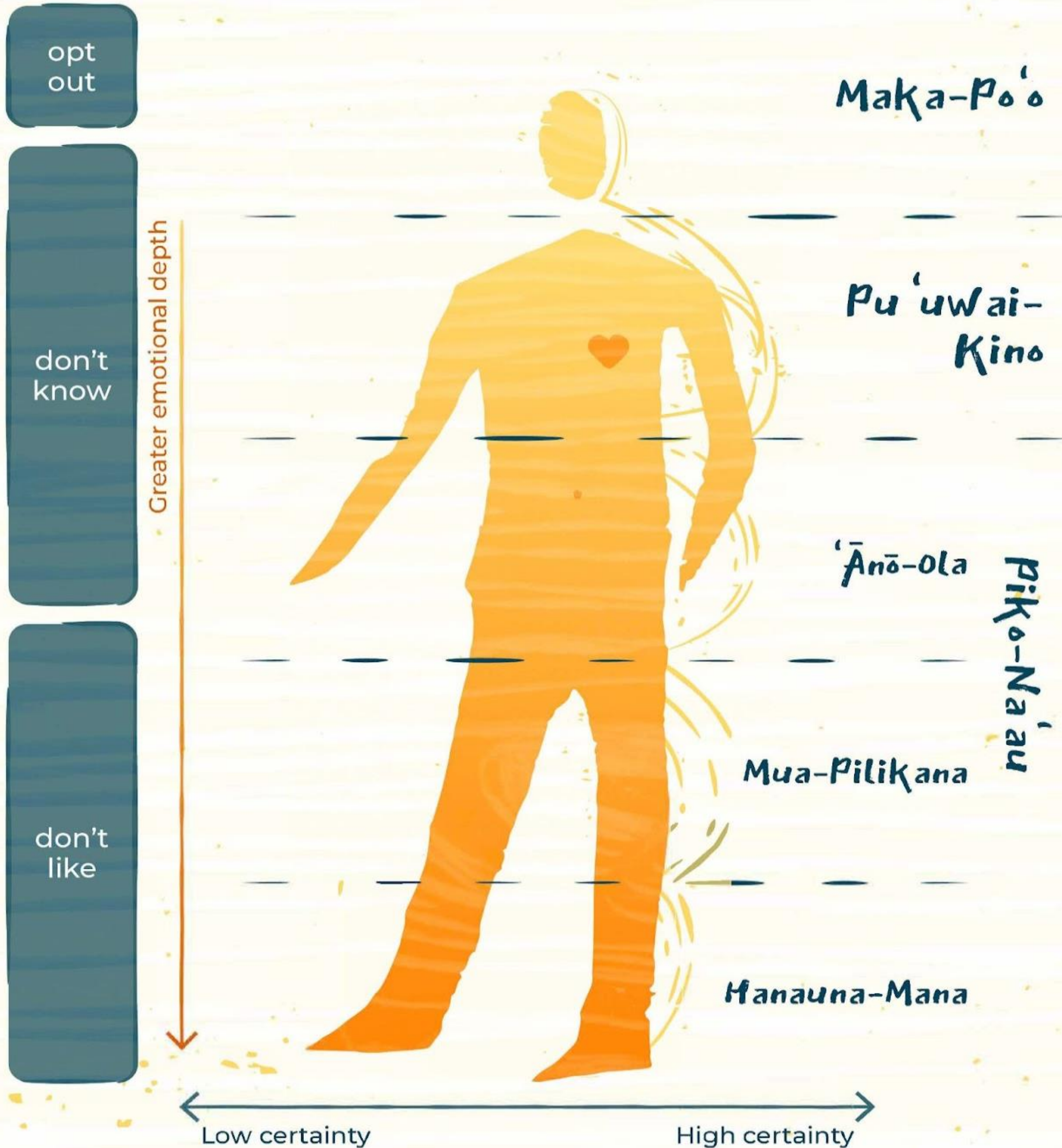

Figure 2.2 The Levels of Intensity CES elicitation tool. This image uses the body as a tangible metaphor to highlight the emotions and types of connections that may be felt or "intensified".

Maka-Poʻo: visible and surface level

Maka translates to eye, face, sight, or view and poʻo translates to head. This level represents the interactions and meanings that can be seen and are valued on a surface level. What this means is that you can care for these interactions and meanings but with minimal emotional attachment. These are often limited to places, activities or opportunities for interactions and meanings that are more replaceable. In other words, you can have interactions and meanings of the same type and weight derived from other places, activities, or opportunities. While you may have a value for these interactions and meanings, it exists largely in your head. Your thoughts may be influenced and feel minimal emotions, but it does not pierce deeper as even with loss those meanings and interactions can still be experienced in some other way. For example, a beach might be perceived to be a connection in this level if you can get the same value and enjoyment from other beaches as well.

Puʻuwai-Kino: Tangible through the senses and personally felt level

Puʻuwai translates to heart and kino translates to body, individual, personal. These are the interactions and meaning of nature that affect the individual person, and that you may have a personal connection to. These emotions and reflections move beyond just existing within a headspace and something that can be visualized (maka-poʻo), and instead move to being felt and affected through the senses of the body. These move to your heart level and provide a sense of emotional attachment but do not move beyond that to encompass emotions and connections that involve more than the individual such as on a spiritual level or a relational level. For example, a beach might be perceived to be a connection in this level if it is an important place to you that you go to connect to yourself and your feelings.

Piko-Naʻau: Relational, time, and "greater than" felt levels

Piko can translate to navel, center, and blood relative, naʻau translates to guts, affections, and feelings. This level gets to deeper emotional connections within yourself and with others. Connecting to your piko and your naʻau can be deeper than just the

body as it can also imply a spiritual connection and relationalities that transcend the self-such as between people and more-than-humans. This level is split into three levels that get at time and relational connections (ʻānō-ola, mua-pilikana, and hanuna-mana).

ʻĀnō-Ola:

ʻĀno translates to now or present and ola translates to life, living, health, and livelihood. These are the interactions and meanings of nature that influence your present life and can have a profound impact on your life, health – both physical and mental – as well as your livelihood. These deepen to emotions and types of connections developed throughout your own lifetime and connect you to your present connections and relationships with others. These move beyond the emotions and sensual connections within yourself as an individual (puʻuwai-kino) to how emotions and connections are impacted and influenced by your relationships/connections in your present life. For example, a beach might be perceived as a connection in this level if it is an important place that you grew up going to and have connections and memories with others such as your family through this place.

Mua-Pilikana

Mua translates to forward, future, more than and pilikana translates to relation, kin, relationship, family. These are the interactions and meanings of nature that can influence and impact not only your own lifetime (ʻānō-ola) but future generations. These also involve interactions and meanings that are greater than the self and are relations that can involve other people or non-human beings and how these may be built or impacted through the future. This level expands those emotions and connections influenced by your relationships/connections in your present to how those relationships/connections expand and are influenced into your future and future generations. For example, a beach might be perceived as a connection in this level if it is an important place to you and that you have connections with the younger generation or may have learned/taught practices to be perpetuated here.

Hanauna-Mana:

Hanauna translates to generation and ancestry and mana translates to divine power and is often thought of as the life force that exists within all things. These are the interactions and meaning of nature that connect people to greater powers and influences as well as your ancestral connections. This level is particularly relevant for Indigenous Peoples and other cultures to be able to be more representative of emotional connections and values. These deepen your relationships and connections built to bring in genealogy. This level acknowledges and makes space for how your genealogy, your past, and your ancestry shape yourself and your beliefs. These influences of your genealogy shape not only your beliefs, connections, and relationships in the present but also in the future. For example, a beach might be perceived as a connection in this level if it is a place that is important to your family and your ancestry such as an ancestral place for spiritual or cultural practices or an ancestral place of residence.

Another way to think of the levels of intensity are 3-D expanding circles. Your spine or pikos of your body are the center point of these circles that connect them vertically while these circles expand out both separately and connected through you. The first circle is that of your head and your thoughts and headspace (maka-poʻo). The circle then expands out to encompass your emotions, feelings and senses of your body (puʻuwai-kino). The next circles expand beyond your body to capture the other connections and relationships you have with others (piko-naʻau). The circle expands out to embrace your current and present relationships and connections you have developed in your lifetime (ʻānō-ola). The circles then expand forward to how those connections and relationships may be further built or impacted in and through the future (mua-pilikana). Finally, the last expanding circles are bringing in your past and your ancestry and how that may shape your present connections and perceptions while also influencing and building your future (hanauna-mana).

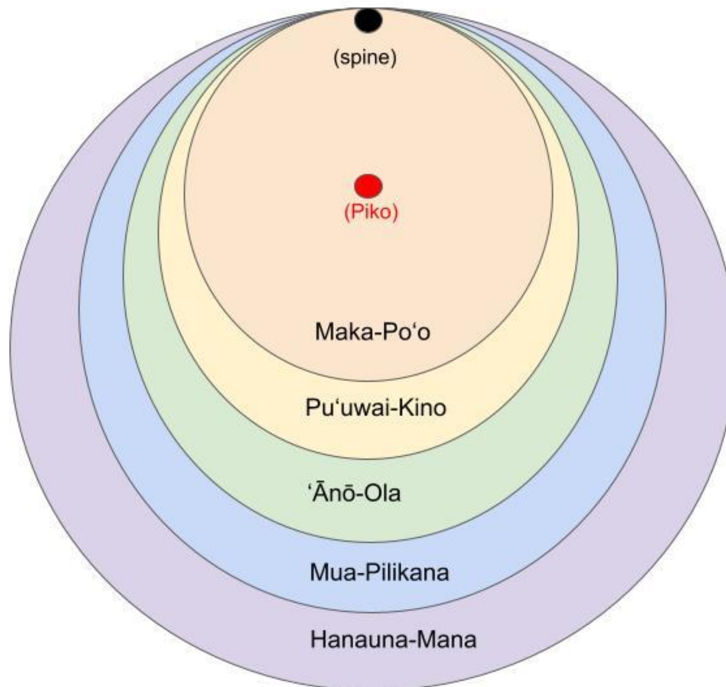

Figure 2.3 The levels of intensity. The levels of intensity can also be thought of as 3 dimensional expanding circles expanding from yourself with your body interconnecting them centering from your head/pikos and your spine.

Using the Levels of Intensity

The levels of intensity tool aims to aid in operationalizing CES and potentially relational values and other research without perpetuating the harms associated with monetization approaches. The levels of intensity tool provides commensurable "metrics" (level placements) that provide information needed for decision making and management processes. While this tool can be used to inform needs within management agencies to enable decision making as well as provide needed descriptive explanations and contextuality of measurable data, it is intended to be used alongside other methods, including monetization. The levels of intensity tool will provide information that narrative, categorical, or monetary methods cannot provide alone, and helps provide place specificity to the broad categories identified in CES frameworks. Narrative, categorical, and monetary methods/data can be used in conjunction with the levels of intensity tool to tell a more complete and diverse story. Social values and well-being (both human and ecological) transcend any one research field and discipline, and as such multiple and mixed method approaches are needed to better understand the

complexities and diversity of social-ecological systems (Eriksson et al., 2019; Horcea-Milcu et al., 2019; Ives and Kendal, 2014; Kenter et al., 2019b; Kronenberg and Andersson, 2019; Partelow and Winkler, 2016; Rawluk et al., 2019).

The levels of intensity tool was developed as an elicitation tool for CES, but could be used by other disciplines or research objectives. My intention with the levels of intensity tool is to ask questions about CES in deliberative workshops. Questions will include specifically what examples or concepts people have of CES and where people perceive them to fit along the levels of intensity diagram. However, other disciplines or research objectives could choose to employ different questions that elicit another topic of focus. In practice, the levels of intensity tool can facilitate deliberative discussions, which is important to this study since creating space for deliberation can allow for a better understanding of differing perspectives and diverse worldviews (Frame and O'Connor, 2011; Lliso et al., 2020). The levels of intensity tool could be used many different ways but will be most beneficial deliberatively or in research interviews for descriptive narrative responses articulating the meanings behind concepts, the reasons for their placement, and reveal more about the substitutability (or lack thereof) of these concepts. This type of knowledge can be used to identify which locally relevant concepts and topics subsequent quantitative studies should focus on.

The levels of intensity tool can aid in revealing more about pluralistic values as the concepts can be placed in certain or multiple levels to reveal more about the diverse functions and meanings of concepts. Concepts placed within multiple levels (but not connected) reveal the different meanings of concepts placed within the different levels that contribute to their incommensurability and intangibility. Concepts placed within multiple connecting levels reveal the diverse functions and breadth of reasons that the concepts may be important. Concepts placed within specific levels can also highlight the specific reasons it may be important to people. The levels of intensity tool also aids in qualitative data analysis such as coding and condensing data into codes, unifying the data, and making patterns out of the data (Galvin, 2015; Glaser and Strauss, 2017; Saldaña and Omasta, 2023). The levels themselves can be used as first order codes to organize data into what level or levels they are placed in. Together, the levels of intensity can provide "metrics" of what level(s) they are placed in along with qualitative descriptions

for a greater understanding of the diverse functions or pluralistic values of concepts, the intensity of importance of concepts, and specific meanings or reasons of importance of a concept.

Further research is needed to better understand the breadth and applicability of the levels of intensity tool. While I anticipate the levels of intensity tool may be useful and applicable with a range of disciplines, I created it specifically with CES in mind. Further research with the levels of intensity is needed to improve and understand its adaptability and applicability to other cultures or disciplines. The levels of intensity tool was developed to accommodate diverse worldviews, with an emphasis on the inclusion of a Native Hawaiian worldview. However, the foundational ideas of looking to find alternative commensurable metrics, centering kincentric relationships, and bringing in an element of time is likely relevant among a breadth of cultures, peoples, and research questions. If employed in a different place, work will need to be done to identify locally relevant concepts, corollaries, or replacements for the specific levels within the tool. Adaptations to the language and contents of the levels themselves may be needed to better fit place-based contextualities and/or specific Indigenous communities. Any research done in other places or with local and/or Indigenous communities should make sure that you are doing research *with* communities and not *on* communities. Researchers should follow common Indigenous Science and social science guidelines for research and take precautions to minimize harm, be representative of perspectives, work to be participatory and benefit communities/stem from community research needs, ensure researcher transparency throughout the process, and reflect on researcher positionality (e.g. Alegado et al., 2021; David-Chavez et al., 2020; Hernandez, 2022 p88-91; "Indigenous Land & Data Stewards Lab," n.d.; "Working Effectively with Indigenous Peoples® Blog," n.d.; Kūlana Noiʻi Working Group, 2021; National Congress of American Indians Policy Research Center, 2009). While further research would be needed, the lessons learned within this study in creating the levels of intensity could be applied broadly for those who may want to adapt the levels of intensity or create other non-quantitative commensurable metrics.

As agencies strive to be more diverse, inclusive, and equitable we need to develop creative methods such as the levels of intensity tool that move away from

perpetuating harms. Monetization and other valuation methods can influence what society deems “important” based on what and how things get identified and valued (Costanza et al., 2014; de Groot et al., 2012; Lazo, 2002; Lliso et al., 2020; Mika et al., 2022). Government and management agencies reinforce how and what gets valued within management processes which can perpetuate injustices as concepts that are not fit for monetization and valuation approaches can get left off the table and consequently deemed valueless (Bacon, 2019; Chan et al., 2012; de Silva, 2022; Ernstson, 2013; Matulis, 2014; Pascua et al., 2017). If management agencies and processes strive to address injustices and inequities through more holistic approaches, such as ecosystem-based management (EBM) and SES, acknowledging and accommodating all inhabitants and worldviews will need more attention. Most agencies and management processes incorporate only limited human dimensions within attempts towards holistic approaches, i.e. monetary/quantified anthropocentric value of nature's contributions to people. Without acknowledging and recognizing the diverse worldviews, knowledges, values, and ways of knowing that comprise a fuller range of the human dimensions in SES we risk perpetuating injustices, continued conflicts, and ineffective/inefficient management processes.

Conclusion

Modern institutions of governance, management, and academia perpetuate a Dominant worldview and way of knowing that rely on methodologies that are ill equipped to represent pluralistic values people hold for their surrounding environment and addressing the incommensurabilities. I developed the levels of intensity CES elicitation tool employing a two eyed seeing approach with one lens with a Native Hawaiian Worldview and the other using disciplines that can be used to broaden assessment of CES (four foundational CES frameworks, economic valuation, environmental psychology, and relational values). I developed this tool with the aim of having a near commensurable metric that is better equipped to represent diverse worldviews and pluralistic values. Having a commensurable metric, aids in prioritization and assessing tradeoffs that are often needed to be operationalized within decision making. I developed the levels of intensity tool to address the harms and challenges

(such as excluding Indigenous worldviews and perpetuating inequities) of Institutions that follow a Dominant paradigm of a top-down approach needing conventional quantitative methods and metrics to engage in decision making. The levels of intensity tool can aid in capturing values and worldviews that conventional quantitative metrics don't cover. For a more holistic approach, diverse methods and perspectives should be applied, and the levels of intensity tool adds another tool that can be used for a better understanding of this dynamic story. Institutions seeking to further efforts of inclusivity, diversity, and justice can also use this tool as part of a shift towards working to gain a more holistic understanding and addressing harms that may be perpetuated through adhering to Dominant paradigms. These efforts can include moving away from a dependence on conventional quantitative metrics to acknowledging and accommodating diverse worldviews and multiple ways of knowing, as well as larger systematic efforts to shift away from a Dominant paradigm such as engaging in land back, bottom up, and decolonial approaches (Fisk et al., 2021; Hernandez, 2022; Smith, 2012).

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Chapter 3. Understanding the deeper meanings of socio-cultural concepts: evolving from Cultural Ecosystem Services

Abstract

A greater understanding of the connections and influences between humans and nature is needed, as researchers and managers seek more inclusive and effective management processes and decision making. Cultural ecosystem services offer a first step to understanding the connections between humans and nature but are still limited in what they can tell us. Dominant CES research does not readily accommodate a diversity of values and rather popularizes a subset of values, such as recreation, aesthetics, and education that are more anthropocentric, reinforcing many equity concerns. In this study, I conduct deliberative workshops with management agencies and community groups involved in management efforts in West Hawaiʻi, using an innovative elicitation tool, the levels of intensity. I developed the levels of intensity from previous research to accommodate diverse worldviews and values of CES. I used deliberative workshops to reveal the diverse meanings, perspectives, and interpretations that management-engaged people in Hawaiʻi ascribe to their connections to the environment. Employing the levels of intensity, I seek to understand the deeper reasons of and meanings behind human-nature interactions and move CES research beyond a one-dimensional categorization. The results offer a glimpse of the diverse values and meanings people hold for CES that contribute to their complexity and difficulty to operationalize. Further research is needed to improve the operationalization of CES within institutions and further evolve CES theory and conceptualization; this tool offers a promising way forward.

Introduction

Since the beginning of the 21st century, human endeavors of environmental management and research have taken great strides to recognize the interconnectedness of humans and our surrounding environment. Researchers have coined the concept of social-ecological systems (SES) to illustrate how humans and the environment are interdependent and interconnected (Berkes et al., 1998; Ciftcioglu,

2018, 2017a, 2017b). In SES, social systems, such as economies, management institutions, and knowledge, are shaped by ecological structures and dynamics, and likewise influence the function and health of ecosystems (Berkes and Berkes, 2009; Ticktin et al., 2018). Cultural Ecosystem Services (CES), which are one component of a larger Ecosystem Service framework, and CES are defined as the intangible benefits humans receive from nature, has aided in describing connections between humans and nature (Fish et al., 2016; Millennium Ecosystem Assessment, 2005), but has been critiqued for representing limited viewpoints. Specifically, CES have stemmed from a dominant anthropocentric worldview and there has been important work to create more place-based framings of CES to accommodate Indigenous and diverse worldviews (e.g. Díaz et al., 2015; Gould et al., 2015; IPBES, 2022; Pascua et al., 2017) but even this research does not explore adequately the deeper meanings and reasons for human-nature connections. CES have also gained popularity in resource management, there have been federal memorandums to include ecosystem services into decision making (e.g. EPA, USDA, USGS), thus research to expand the meaningfulness of the concept and research praxis could have important implications for managers interested in understanding why people connect to nature. My research aims to address some of the limitations by expanding the scope of CES from a description of the types of connections between human and environmental systems to encompass the deeper meanings of and reasons for these connections. My work also seeks to operationalize this “intangible” and “fuzzy” (Kenter et al., 2019) concept of CES for more equitable decision making.

Cultural ecosystem services (CES) help us to understand certain types of human-nature connections within social-ecological systems, but not all types, and not what those connections mean or what drives them. CES research and conceptualization has been dominated by a narrow range of values that are typically anthropocentric and commodifying nature to benefit humans (Chan et al., 2012), so is best suited to answer similarly narrow research and management questions. However, there are a growing number of researchers and efforts to progress away from this narrow and problematic framing (e.g. Díaz et al., 2015; Gould et al., 2015; Pascua et al., 2017; Pascual et al., 2023). There have been many critiques of CES on causes of only acknowledging a

narrow range of values, such as focusing on recreation and aesthetics, that exclude diverse values and worldviews (Bennett et al., 2021; Berghöfer et al., 2022; Calcagni et al., 2019; Chan et al., 2012; Comberti et al., 2015; Gould et al., 2015; Himes et al., 2020; Isacs et al., 2023; Kenter et al., 2019; Kronenberg and Andersson, 2019; Martin et al., 2020, 2016; Sterling et al., 2020). Even if we accept CES as it is, efforts to use CES to examine human-nature interactions have uncovered some key empirical challenges.

To highlight a few of these major critiques, CES often focus on a one-way flow from nature to humans, and does not accommodate two-way or reciprocal connections between humans and our surrounding environments, e.g. humans care for ecosystems which nourish them, a key dimension of human-nature interactions reflective of multiple worldviews and value systems (Calcagni et al., 2019; Chan et al., 2018; Comberti et al., 2015). Common CES elicitation methods do not capture the diverse and multiple values people hold for nature (pluralistic values) well. When CES are elicited, they often focus on quantitative and monetary methods to numerically represent values with the idea this would aid in decision making (Chan and Satterfield, 2020; Gould et al., 2020; Mandle et al., 2021). Other methods include stated preferences or spatial elicitation focusing on narrow values (such as recreation and aesthetics) that are best suitable to those methods (e.g. Adams et al., 2016; Ament et al., 2017; Barbier et al., 2011; Barnes-Mauthe et al., 2015; Sherrouse et al., 2014; Sun et al., 2019; Van Riper and Kyle, 2014). These methods are often sought out for comparable or compatible measurement for analysis. However, values that are not comparable (can be accounted for using identical metrics such as monetary indicators) or compatible (may use different indicators but share common features such as spatial representation) are incommensurable (Pascual et al., 2023). Values and worldviews that do not fit within anthropocentric framing and are not captured with comparable and compatible metrics are commonly left out of CES research and conceptualization.

There have been many researchers that have recognized the limitations of CES research and sought to better accommodate diverse worldviews and values. For example, the Intergovernmental Science-Policy Platform for Biodiversity and Ecosystem Services (IPBES), a major effort with contributions from all over the world has made

important advances in conceptualizing human-nature relationships and proposing a typology of nature's values that highlight the interactions of diverse worldviews and knowledge systems (IPBES, 2022). Additionally, other researchers have sought to recognize diverse and inclusive place-based values and Indigenous Knowledge (Gould et al., 2015; Khunweechuay et al., 2022; Normyle et al., 2023; Pascua et al., 2017; Robinson et al., 2016). Even when CES research seeks to be more inclusive of diverse worldviews and values, CES is moreover mute about the deeper motivations underlying human interactions with nature, limiting it conceptually because we don't understand the human behaviors, thoughts, and feelings that are essential to both personal and management decision-making, conflict resolution, and relationship building (Costanza et al., 2014; de Groot et al., 2012; Lazo, 2002; Lliso et al., 2020; Mika et al., 2022).

This research seeks to contextualize, recategorize, or reframe CES to develop the concept and increase the relevance of research (e.g. Bremer et al., 2018; Gould et al., 2015; Iniesta-Arandia et al., 2014; Kenter et al., 2015; Pascua et al., 2017; Smith et al., 2003). What CES research does well is to create a framework of organizational categories representing types of human-nature interactions. Another relevant discipline to elevate CES and understanding the interconnectedness of humans and nature is relational values. Relational values research often represents types of reciprocal relationships humans may have with nature and how we may relate to nature such as living with, living from, living in, and living as nature (Chan et al., 2016; IPBES, 2022a; Kenter and O'Connor, 2022; O'Connor and Kenter, 2019). This body of work of CES and relational values seeks to describe and understand the different ways the connections between human and environmental systems are expressed including *what* contributes to those connections (i.e. what aspects of human systems and environmental systems contribute to human-nature interactions) and *where* they take place.

These research programs typically stop short of answering *why* and *what* is important about these system connections. To put it another way, the disciplines of relational values and CES often take an observational approach explaining what is happening in SES and how it is happening–what types of human-nature interactions are there (CES), and how are humans and their surrounding environments relating to each

other (relational values). For example, previous research in West Hawaiʻi researchers have categorized CES based on local and Indigenous Knowledge (Ingram, 2019, 2020; Ingram et al., 2018), created a CES framework that incorporates place-based Indigenous relationships (Pascua et al., 2017), and sought to understand how an Indigenous worldview may inform relational values (Gould et al., 2019). However, the disciplines of CES and relational values do not explain *why* humans seek interactions and relations with their surrounding environment and are poor at addressing what is important about the influences of these systems (human and environmental) on each other. CES and relational values still do not address some of the importance of the environment on identity or the foundation of place to worldviews (Gould et al., 2020). For instance, in a Native Hawaiian worldview, knowledge is created from our relationships and experiences with place and our environments inform our understandings, learnings, cultural practices, belief systems, and management structs (Andrade, 2013; Beckwith, 1917; Hoʻomanawanui, 2012; Kame'eleihiwa, 1992; Kealiikanakaoleohaililani et al., 2018; Kikiloi, 2010; Kikiloi et al., 2017; Kurashima et al., 2018).

West Hawaiʻi is an opportune area to explore why and what is important about the connections between humans and our surrounding environment further. Previous research provides a stepping stone for this research and can aid in contextualizing and informing concepts and connections (e.g. Ingram, 2019, 2020; Ingram et al., 2018; Leong et al., 2019; Pascua et al., 2017). Additionally, there are many local community groups within West Hawaiʻi that work to care for various places and resources, while working to engage with management agencies and perpetuate Indigenous Native Hawaiian knowledge and values. Members of these groups and local management agencies provide suitable participants to better understand why they and how they interact with and relate to their surrounding environment. A greater understanding of human-environment connections and a better representation of more diverse values can aid in more informed decision making leading to more efficient and equitable management practices.

My research aims to expand the CES concept and research praxis to include deeper motivations underlying the connections between humans and our surrounding

environments. I will demonstrate how this expansion can start to overcome many of the challenges outlined above. Understanding the reasons why humans interact with nature and the deeper and diverse meanings people ascribe to these interactions within the CES discipline will greatly enhance conceptualizations of human-nature interactions in SES research, making the research more meaningful for managers who are working towards more equitable, efficient, and effective management practices.

In this research, I used deliberative workshops to reveal the diverse meanings, perspectives, and interpretations that management-engaged people in Hawaiʻi ascribe to their connections to the environment. Deliberative methods are participatory where participants thoughtfully discuss, listen, learn, and reflect on options or concepts and collaboratively make decisions about questions (Wouters et al., 2019). I used deliberative methods because they can provide insight into diverse perspectives, accommodate multiple ways of knowing/knowledge systems, and facilitate learning (Eriksson et al., 2019; Kenter et al., 2015; Lliso et al., 2020; Lopes and Videira, 2018; O'Connor and Kenter, 2019; Zimmermann et al., 2021). Deliberative and participatory methods bring in multidimensionality and diverse perspectives into research, and therefore they are well suited to overcoming some of the critiques of CES (Eriksson et al., 2019; Frame and O'Connor, 2011; Kenter et al., 2015; Lliso et al., 2020; Lopes and Videira, 2018). While deliberation can create space for multiple ways of knowing and knowledge systems there is a lot of work such that needs to be done throughout the entire research processes to work to accommodate these knowledges so that diverse peoples are comfortable in sharing and so that multiple ways of knowing/knowledge systems are properly acknowledged, considered, understood, and accurately represented. Deliberation and participatory methods allow participants to engage with each other, learn about the concept being studied, as well as take the time to reflect upon their own perspective (Allen et al., 2021; Kenter et al., 2015; Zimmermann et al., 2021). Deliberation is an important method to use with CES research as this creates an opportunity to understand the diverse meanings and perspectives of CES that contribute to their incommensurability and value pluralism. I targeted participants engaged in management agencies and management-focused community groups as my research hopes to operationalize CES within management processes and encourage

more informed, culturally grounded, and place-based familiarity within these processes and decision making.

I applied the CES-based Levels of Intensity elicitation tool, previously described in Chapter 2 that I designed using a two-eyed seeing approach (Bartlett et al., 2012; Reid et al., 2021). Two-eyed seeing is an approach using the lenses of an Indigenous worldview and select tools from Dominant science without adopting an exploitive worldview in order to benefit all (Kimmerer, 2023). The levels of intensity was developed using a Native Hawaiian worldview alongside key concepts from CES tools and other disciplines (drawing on four foundational CES frameworks, economic valuation, environmental psychology and relational values). The objective of the levels of intensity elicitation tool is to gain an expanded understanding of CES that is more inclusive of diverse worldviews and values not represented by common quantitative monetary metrics that adopt a singular dominant anthropocentric way of knowing. The rest of the paper is organized as follows, a brief background of the levels of intensity elicitation tool, an explanation of the deliberative workshops employing the levels of intensity, followed by the results of those workshops and the deeper meanings and reasons of importance for CES discussed, ending with a discussion of insights on how to further operationalize CES and evolve the discipline beyond one-dimensional categorization.

Methods

Level of Intensity Tool

I used the levels of intensity elicitation tool (see ch 2) during a series of deliberative workshops (n=9) to understand community and manager perceptions of CES. The goal of these workshops was to understand the deeper meanings of CES and reasons why humans interact with nature. The elicitation tool is divided into different levels of emotional depth (the intensity of how we feel) and types of connections. These different levels can be used to understand the diverse meanings of concepts and reasons that they are important (see Table 3.1). I justify the methodology and provide details on workshop procedures and data analysis below.

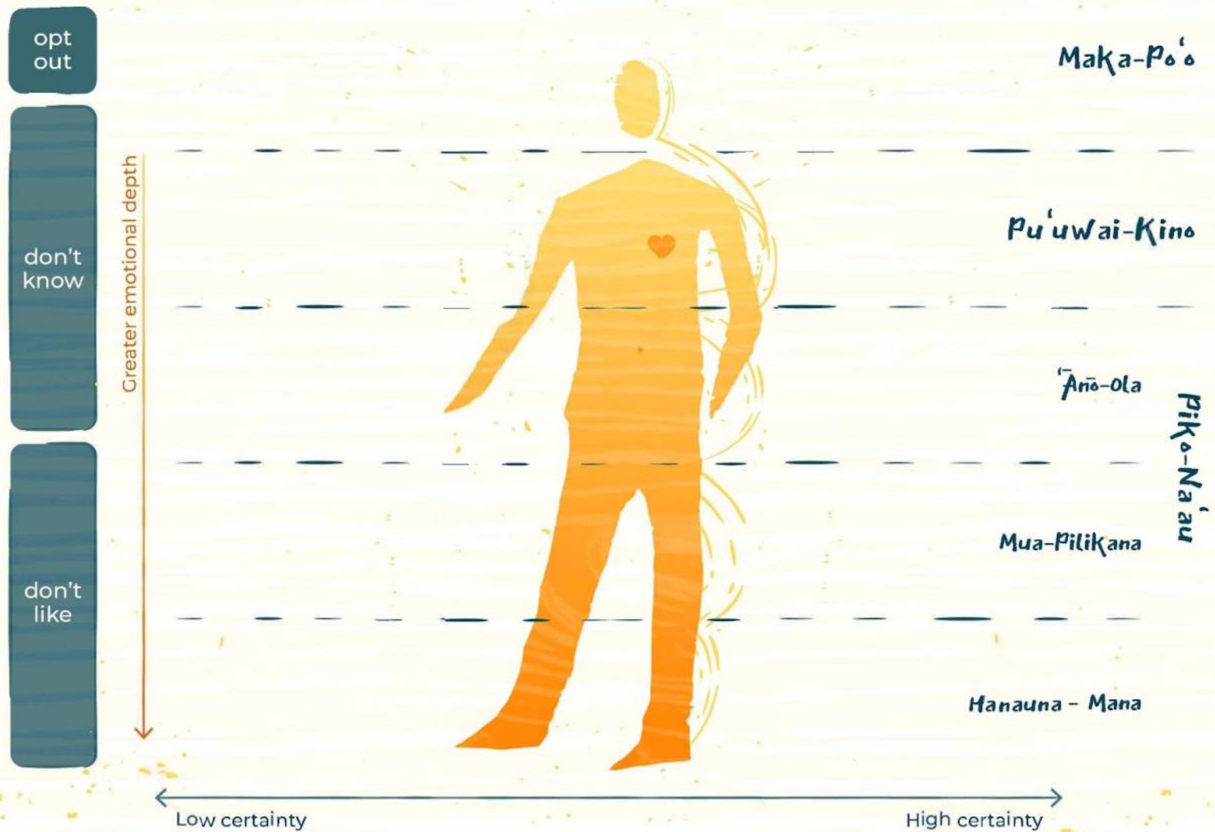


Figure 3.1The levels of intensity elicitation tool for CES. I used the levels of intensity as a "game board" for the workshop activity on Jamboard where participants placed key concepts for the various CES categories along the levels of intensity.

Table 3.1 The levels of intensity and the meanings of each level.

Maka-Po'o: Visible and surface level	Maka translates to eye, face, sight, or view and po'o translates to head. This level represents the interactions and meanings that can be seen and are valued on a surface level. What this means is that you can care for these interactions and meanings but with minimal emotional attachment. These are often limited to places, activities or opportunities for interactions and meanings that are more replaceable. In other words, you can have interactions and meanings of the same sort from other places, activities, or opportunities. While you may have a value for these interactions and meanings it exists largely in your head. Your thoughts may be influenced and feel minimal emotions, but it does not pierce deeper as even with loss they can still be experienced in some other way.

Puʻuwai-Kino: Tangible through the senses and personally felt	Puʻuwai translates to heart and kino translates to body, individual, personal. These are the interactions and meaning of nature that affect the individual person, and that you may have a personal connection to. These emotions and reflections move beyond just existing within a headspace and something that can be visualized but can be felt and affected through the senses of the body. These move to your heart level and provide a sense of emotional attachment but do not move beyond that to encompass emotions and attachments that involve more than the individual such as on a spiritual level or a relational level.
Piko-Naʻau: Tangible, intangible and greater than felt level	Piko can translate to navel, center, and blood relative, naʻau translates to guts, affections, and feelings. This level gets to deeper emotional connections within yourself and with others. Connecting to your piko and your naʻau can be deeper than just the body as it can also imply a spiritual connection and the inter-relations between greater than the self, such as between people and non-human beings. This level is split into three levels that get at time and relational connections.
ʻĀnō-ola	ʻĀnō translates to now or present and ola translates to life, living, health, and livelihood. These are the interactions and meanings of nature that influence your present life and can have an impact on your life, health- both physical and mental, as well as your livelihood. These deepen to emotions and types of connections developed throughout your own lifetime and connect you to your present connections and relationships with others.
Mua-pilikana	Mua translates to forward, future, more than and pilikana translates to relation, kin, relationship, family. These are the interactions and meanings of nature that can influence and impact not only your own lifetime but future generations. These also involve interactions and meanings that are greater than the self and are relations that can involve other people or non-human beings and how these may be built or impacted through the future.
Hanauna-Mana	Hanauna translates to generation and ancestry and mana translates to divine power and is often thought of as the life force that exists within all things. These are the interactions and meaning of nature that connect people to greater powers and influences as well as your ancestral connections. This level is particularly relevant for Indigenous Peoples and perspectives to be able to be more representative of emotional connections and values. These deepen your relationships and connections built to bring in genealogy and how your past and your ancestry shapes yourself and your beliefs today and looking forward.

Pilot Workshop

I ran a 2-hour pilot workshop remotely in August 2020 at the Hawaiʻi Conservation Conference (HCC). I chose to pilot test the workshops at this conference

because its conference hosts researchers and community members with diverse backgrounds and perspectives that could provide valuable insights. The workshop was noted in the conference schedule and was open to anyone to attend. I guided 30 workshop participants through an exercise using Google Jamboard (“Google Jamboard,” 2020) where they were asked to place broad CES categories (Table 3.2) into levels of intensity (Table 3.1) using the diagram depicting the bodily manifestation of the levels (Figure 3.1). I used these categories modified from previous CES research in West Hawaiʻi (Ingram, 2019, 2020; Ingram et al., 2018) as I hope to build off this research that was developed to be representative of CES of West Hawaiʻi, the key study site in this research. The workshop was originally intended to be in person but due to COVID-19 restrictions all gatherings were switched to all remote and this was the first all remote conference for the HCC. The pilot workshop was riddled with technical difficulties due to the online conference platform. No data was analyzed from this workshop, rather it served as a means to gain feedback and improve the exercise and objective of workshops.

Table 3.2 CES categories and definitions used in this study were first developed from previous research by Ingram (2019, 2020) and Ingram et al. (2018).

CES	Definition
Aesthetics (AES)	Satisfaction or meaning from visual characteristics or beauty of the reefs or coast; also includes satisfaction from sensory experiences (e.g. soundscapes, feel of wind, etc.)
Bequest (BEQ)	Importance of reefs for future generations, includes sharing experiences with younger generations
Ceremony (CER)	Importance of reefs (or the greater coastal/marine area) for ceremonies
Education and Knowledge (EDK)	Local knowledge about the coastal and marine environment
Existence (EXI)	The coastal and marine environments matter simply because they exist, because they are a part of Earth, and/or because they have a right to exist
Fulfilling stewardship (FST)	Caring for the coastal and marine environment because it provides benefit/satisfaction; ability to care for resources

Heritage, tradition, and culture (HTC)	Multi-generational interactions/connections with natural resources, connection to cultural traditions, stories, and/or past events; archaeological and historic sites; cultural resources; acceptable historic change
Identity (IDT)	Sense of self, community, personal or communal identity, and/or home in relation to the coastal or marine environment
Inspiration (INS)	Specifically for art or other forms of creative expression; local artistic or creative practices
Recreation (REC)	Playing, leisure, and activities related to coastal and marine environments; includes extractive and non-extractive activities
Sacredness (SAC)	Expressions of coastal and marine environments having sacred or religious significance
Sense of place (SOP)	Reefs or coastal environment contribute to one's sense of belonging or feeling at home; sense of self, community, and/or home related to the coastal and marine environment
Social relations (SOR)	Strengthening ties in family or community; presence of strong social ties or networks; sense of community; trust in neighbors
Spirituality (SPR)	Metaphysical forces larger than oneself or beyond one's comprehension; interacting with the coast/ocean to perpetuate spiritual beliefs and practices (e.g. divine power)

Following the pilot workshop, in October 2020, I sought the expertise of 5 experienced social scientists, 4 of whom also participated in the pilot. The experts provided feedback on how to improve the workshop and collect more useful data. Specifically, instead of placing the CES categories themselves along the levels of intensity, they recommended that instead I ask for examples of these CES and place these along the levels of intensity.

Deliberative workshops

Using the revised methods, I conducted 10 workshops or interviews between January and June 2021. Five workshops were conducted with community members who are part of various community groups that are involved with management efforts in West Hawaiʻi. The community groups are Kai Kuleana – a network connecting various communities across West Hawaiʻi to improve and restore coastal ecosystems, Hui loko -

a network connecting Hawai‘i island communities to improve management of fishponds and anchialine ponds, and the West Hawai‘i Fishery Council – a council to get community input and involvement in management decisions. An additional 4 workshops were conducted with management agencies, 2 with DAR and 2 with NOAA. A Kupuna[4] interview provided input on the levels of intensity and elaborated on meanings of interactions with nature, but this interview was not included in the workshop data as data was collected in a different format. I emailed the various community networks and had open invites to the various workshops I had planned. I emailed DAR representatives and coordinated workshop planning with them, and they invited members they thought would be interested. For the NOAA workshops I invited employees who were involved with work in West Hawai‘i or who were Native Hawaiian to provide input. There was a total of 56 participants overall. The community workshops ranged from 2 to 6 participants. The DAR workshops had 13 participants each time with some being repeat participants for the second workshop. The NOAA workshops had 9 each workshop (with no repeat participants). All workshops had a mix of Hawaiian and non-Hawaiian perspectives. Community workshops were mostly composed of Hawaiians with one workshop being composed of 3 non-Hawaiians involved in management groups. The DAR and NOAA workshops all had Native Hawaiian employees present though they were majority non-Hawaiians (for the DAR workshops where there were 13 participants 3 were Native Hawaiian and for the NOAA workshops where there were 18 participants and 5 were Native Hawaiian).

The workshops took place using the Zoom (“Zoom,” 2020) platform because of the ongoing pandemic and IRB restrictions limiting in person interactions, where I used menti.com (“Mentimeter,” 2020) and Google Jamboard (“Google Jamboard,” 2020) to pose questions and conduct activities. Participants first were shown a PowerPoint presentation that explained the background and objective of this project, what the levels of intensity are, directions for the activity, and definitions of CES used in the activities.

[4] Kupuna can be translated as grandparent, ancestor, or elder relative. Kupuna is often used as a term to reference elders and acknowledge them as a source of vast wisdom and Knowledge.

Rather than using the term "cultural ecosystem services" and explaining this discipline, I explained the CES categories as categories of interactions and meanings with nature. Participants were given supplemental materials with instructions and CES definitions that they could reference throughout the workshops. From the list of definitions (Table 3.2), participants could choose which CES they wanted to discuss and if no specific CES was chosen, I seeded the workshop with the CES in alphabetical or reverse alphabetical order. After each CES, participants were given an opportunity to choose whichever CES they preferred to discuss or continue in the order (alphabetical or reverse alphabetical).

Participants were asked to reflect on the definition of a specific CES. They were asked to use a prepared Menti software ("Mentimeter", 2020) link to enter examples, thoughts, or concepts that the CES and its definition made them think of. Those entered concepts were displayed immediately on a word cloud that everyone could see. If participants saw entries that they also agreed with or also thought of, they could also type that word causing the displayed word to grow larger on the word cloud. As such, the size of a word in the word cloud approximates the number of people who agreed with that entry. Some participants who were not as comfortable or tech savvy were also given the opportunity to say thoughts aloud. Not all workshops used menti, 2 of the 9 workshops chose to just voice concepts aloud. When menti was used and others voiced opinions aloud, I or others within the workshop would type that concept into menti. Based on the word cloud displayed and/or thoughts vocalized, participants were asked to reflect again and decide what concepts or examples they felt best represented the CES category. This resulted in a "short list" of words/terms that progressed to the next step of placing these concepts along the levels of intensity.

Participants were guided to Google Jamboard to place these shortlist concepts along the levels of intensity. For each word/term selected on the shortlist, participants were asked what level or levels that that concept fit in and why. Concepts could be placed in multiple levels (for example, in the maka-poʻo level and in the hanauna-mana levels separately, or in all levels from maka-poʻo to hanauna-mana connecting, or in both the maka-poo and hanauna-mana levels separately and all levels connecting). Concepts could be placed in different levels because they had different meanings to

participants depending on the level or levels, they may have been in. As the facilitator, I added “sticky notes” onto the jamboard with the words/term written on each, and moved them around, or duplicated them, depending on participant input. Along with asking what level or levels concepts belonged in, participants were also asked how certain they were that that concept belonged in that level or levels. Asking for certainty created further deliberation and clarity as to how the same concept may have different meanings in different levels, or the same meaning in connecting levels. The discussion also deepened thinking about the fit or placement of the concept.

Workshop analysis

The workshops were recorded (both video and audio) and transcribed, which I then coded using the software Dedoose (“Dedoose,” 2021). Additional data from the workshops were entered into Microsoft Excel (“Microsoft Excel,” 2020) for further analysis. I transcribed into Microsoft Excel, 1) all the data from Menti, which included the range of concepts that were thought of for each CES for each workshop and the amount of times that concept was chosen (overall, in each workshop, and for each CES); and 2) data from the Jamboards (the overall “shortlist” of concepts (n=128), what CES it represented, what workshop it was from, and what level(s) it was put into).

I coded the transcribed data of the workshops in Dedoose using deductive codes for the CES that were being discussed and the levels concepts were placed in, as well as inductive codes describing the meanings of the concepts introduced. The inductive codes were grouped into parent themes based on similar meanings of the concepts. I then used the online software Kumu.io (“kumu,” 2021) to examine patterns and connections of concepts from the Excel data of the Jamboard results and parent codes of each concept. Kumu.io is an organization tool that can help to map the relationships of complex data including systems mapping, social networking mapping, and concept mapping. I used this software to understand how the different “codes” of concepts (what CES was being discussed, what level(s) they were placed in, and the key code descriptions of the meanings being discussed) may relate or not relate to each other and to better understand patterns within the data.

Results

All 14 categories of CES were discussed, though all categories were not discussed in every workshop. Table 3.3 shows which CES were discussed during each workshop. The range of CES discussed during workshops was four to12 CES per workshop, the average number of CES discussed per workshop was 6.67 and the median and mode number of CES per workshop was five. The CES discussed the least were sacredness and inspiration, which each were only discussed during two workshops. The CES most discussed during workshops were Aesthetics, Bequest, Fulfilling stewardship, and Sense of Place all of which were discussed across six workshops. As mentioned in the methods, respondents chose which CES to discuss or they were discussed in alphabetical or reverse alphabetical order. The alphabetical placement of CES likely influenced the amount of times CES at the beginning or end of the list were discussed.

Table 3.3 This table shows which CES were discussed during each workshop.

CES/WS	1	2	3	4	5	6	7	8	9	Total
Aesthetics	X	X	X		X		X		X	6
Bequest	X	X	X		X	X	X			6
Ceremony	X	X	X							3
Education and knowledge	X	X			X	X	X			5
Existence		X	X			X	X			4
Fulfilling stewardship	X	X	X			X		X	X	6
Heritage, tradition and culture		X	X		X	X				4
Identity		X	X				X		X	4
Inspiration		X				X				2
Recreation		X		X		X		X	X	5
Sacredness			X	X						2
Sense of place		X	X	X	X		X		X	6

Social relations		X	X	X				X		5
Spirituality			X	X				X		3
Total	5	12	11	5	5	7	6	4	5	

Menti

For the nine workshops, only seven used menti to enter concepts for discussion and to determine which concepts would be placed on the levels of intensity. Workshops five and seven did not submit concepts to menti but instead just discussed concepts aloud that were then chosen to be placed along the levels of intensity. The menti results in Figures 3.2 and 3.3 reflect the count and representation of the concepts chosen across the workshops using menti. For consistency, and to not over-represent concepts for workshops with more participants, each concept is only counted once per workshop per CES. Figure 3.2 shows the diversity of different concepts represented for each CES among the different workshops that used menti. Figure 3.3 shows the different concepts represented for the different workshops that used menti for all CES overall. The larger words in Figure 3.3 show the more common concepts chosen throughout the workshops. Table 3.4 shows the top 20 words of the word cloud. For comparison Table 3.5 shows the top 18 words for the workshops that used menti across all CES with the total count of the words including if they were chosen multiple times by different participants for the same CES. As words could get chosen multiple times and the workshops vary in size, Table 3.4 is included to minimize redundancy and have a representative sample where each word is only counted once per CES per workshop. The cells in green of Table 3.4 show the overlapping words, and the majority of words are the same. Many of the words chosen are Hawaiian words. Often, Hawaiian words and phrases do not translate directly into English. For Hawaiian words in the results, I include paraphrase translations with this added note to notify readers that these translations are not the entirety of the meanings of these words.

Aesthetics	**Bequest**
unobscured works natural cool Pristine fortunate unplugging gather Inspired recreation unaltered spaces rejuvenation the life open smell blue alive can toes vibrant grateful limu of artistic connection solitude choke view and in tradition food calm sunset sounds blessed feel iconic stewardship relaxed colors scenic revitalized mo'olelo fish features belonging perspective ahu ko'a breathe salt mahele diversity smells environment happy economy recharged responsibility wonder inspiring peace nature air living healthy beauty calming sheds peaceful uluwehi sand awe clean inspiration picture seascape big landscape panoramic waves	stewardship gather traditions generational knowledge learning hookupu sustainable relations gathering urgency camps lawai'a to altruism family protected respect-reverence teaching footsteps camping foundation connections kuleana classroom perpetuate ecocentric continuity kilo personal building protection Impacts 'ike place survival pono outdoor food sustenance recreation values essential subsistence place-based ko'a subsistence-food connection sustainability
Ceremony	**Education and knowledge**
access connection cleansing pule off lā'au wahi ko'a personal welcoming new hoʻoponopono grieving sacred kala practices point kapu hiʻuwai oli contemplation health seasons freedom lū'au lapa'au ahu cultural lele-jumping hoʻokupu tradition religion source elements pa'akai pana ritual kai faith	sustainability tradition conserving stories teaching information mentors practices experiences model 'ohana ma consistency role ecology generational kilo new adapting resoureces responsibility kupuna research 'ike huaka'i harvesting traditional careers parents retention mo'olelo hana
Existence	**Fulfilling Stewardship**
biodiversity ecosystem intrinsic balance connectivity life mother survival nature inherent respect genealogy aloha climate value pono history kumulipo healthy interdependence regulation coastlines	together volunteering resilience sustainability 'ohana conservation responsibility rehabilitate restoration takes reestablishing globally proactiveness tradition working cleanup commitment will sense feeling pride 'āina pono protection resources self aloha kia'i village than kuleana accomplishment it we laulima connection bigger on care mālama you guardianship future locally tabies muck access life reciprocity management practice generational recreation positivity earth take food purpose nature

Heritage, tradition, and culture

knowledge ʻike part ʻōlelo vital essential respect important noʻeau kaʻao anecdotes kūʻula foundation kūpuna pilina kupuna needed reverance moʻolelo nature integral legends identity traditional protection person

Identity

place history kuleana mālama family relations purpose pilina Kanaloa fisher central attachment roots intimate tradition feed defining happy steward childhood hiʻuwai knowledge personal connection caretaker community heart love core responsibility kiaʻi kamaʻāina moʻolelo individual genealogy ʻohana birth sense memories waterman connectedness groundedness experience

Inspiration

pilina innovation self-expression media moʻolelo ʻupena capturing beauty weaving self-fullfillment connection creativity ʻoli hula visual keeping depiction reverence history shared poems

Recreation

surfing swimming health boating diving snorkeling freediving paddling photography picnic play kayaking gathering fishing fun sleeping bodysurfing relationship access catch-n-release tourism entertainment self-care friend-time not-working awareness spearfish identity relax family beach reading relaxing building boogie-boarding sand air Fishing inspired connection coexistence ʻohana sun peace inspiration wildlife-viewing self-awareness user-conflicts personal-responsibility active discovery enjoyment camping respect bonding walking stewardship mental-health beauty free-time emotional restoration cleanups exercise lifestyle personal restoring stand-up education connections economy physical-health ʻohana-time responsibility community pearfishing

Sacredness

ʻaumakua unseen cleansing deep kin pana wahi hoʻokupu identity current mālama ʻāina limu spirituality momona unknown kapu sustenance reverence stories heiau kanaloa paʻakai legends and folklore noʻeau ʻōlelo kala moʻolelo respect

Sense of Place

connection ʻohana identity home familiarity purpose kuleana relationship roots security wahi-pana soul icebox practices connectedness aloha-ʻāina spirit liberating interconnectedness resources experience sanctuary connectivity providing family-history grounded belonging birth-place integral comfort community subsistence health explore history self ancestral-ties personal-history gather rooted family inviting home-ground peace safety sense-of-place

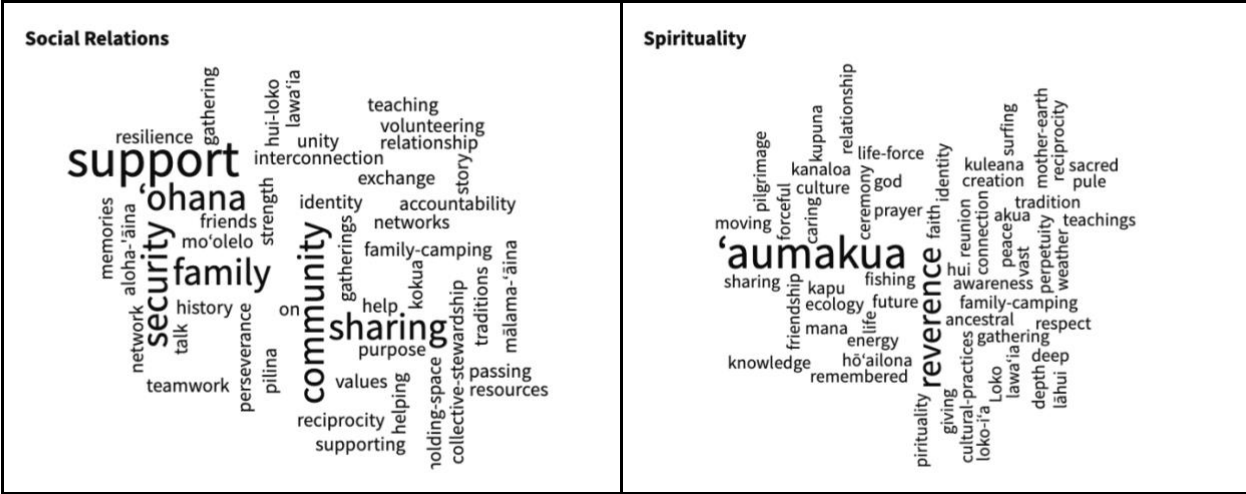


Figure 2.2 Menti results of the diversity of concepts represented for each CES for the various workshops.

Figure 3.3 Cumulative Menti ("Mentimeter," 2020) results of the diversity of concepts raised for all CES discussed across all workshops.

Table 3.4 The total number of times a word was mentioned per CES per workshop and overall, for the top 20 words in the cumulative word cloud. The green cells show the words that are in common.

Word	Word count per workshop	Word	Word count overall
1. Connection	13	1. Kuleana (responsibility/privilege)	28
2. Kuleana (responsibility/privilege)	11	2. Connection	18

3. Family	9	3. ‘Aumakua (ancestral deities)	13
4. ‘Ohana (family)	9	4. Fishing	12
5. Identity	8	5. Community	10
6. Mālama (care)	7	6. Identity	10
7. Mo‘olelo (stories)	7	7. Surfing	10
8. Gathering	6	8. Family	9
9. Respect	6	9. Ohana (family)	9
10. Responsibility	6	10. Peace	9
11. Tradition	6	11. Swimming	9
12. Aloha (love)	5	12. Mo‘olelo (stories)	8
13. Community	5	13. Gathering	7
14. Food	5	14. Ho‘okupu (ceremonial practice/gift)	7
15. Ho‘okupu (ceremonial practice/gift)	5	15. Mālama (care)	7
16. ‘Aumakua (ancestral deities)	5	16. Responsibility	7
17. Peace	5	17. Support	7
18. Relationship	5	18. Sustainability	7
19. Surfing	5		
20. Fishing	5		

Levels of Intensity

As mentioned in the methods, workshop participants chose to discuss in more detail, concepts that they felt were most representative of the CES or that they favored. These chosen concepts were then placed along the levels of intensity and further discussed with the group. The transcripts of these discussions were used to generate codes both inductively and deductively. Deductive codes were generated from the levels that concepts were placed in as well as the cultural ecosystem service being discussed.

Inductive codes were generated based on the deeper meanings and importance revealed in the way participants discussed these concepts and their interactions with nature. These inductive codes represented five parent themes: 1. Actions, 2. Personal feelings, thoughts, and emotions, 3. Human-based connections, 4. Environment-based connection, and 5. Sense of self. The results of the placement of the concepts along the levels of intensity from the workshop discussions were added into kumu.io to understand the relationship and visualization of concepts along with the levels of intensity. The meanings of the concepts discussed and what level of intensity they are placed in are shown in Figure 3.4. The discussions of the meanings and what level of intensity they were placed in separated the concepts into three distinct groupings (Figure 3.5). These three groupings are the individual levels, deep levels, and connectors. Each grouping of the individual, deep, and connectors levels had common discussion threads that the frequency of the parent categories associated with each grouping helps to illuminate (Figure 3.6).

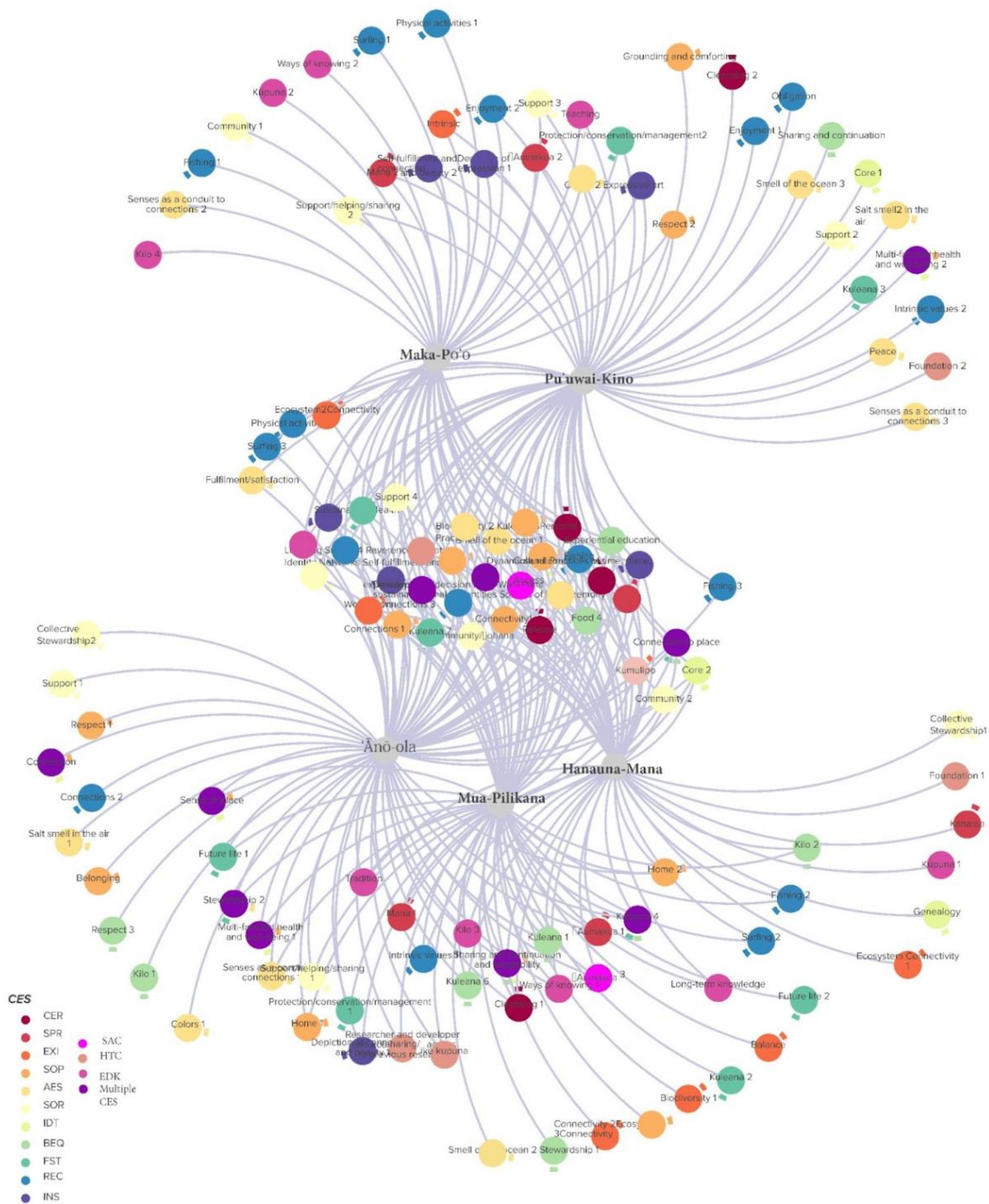


Figure 3.4 Results of the concepts for each workshop that were mapped to the levels of intensity. The gray lines in the figure show the connections between the concept and the level or levels they were placed in, which are the central nodes in larger font. The colored dots represent the CES corresponding to the identified concept.

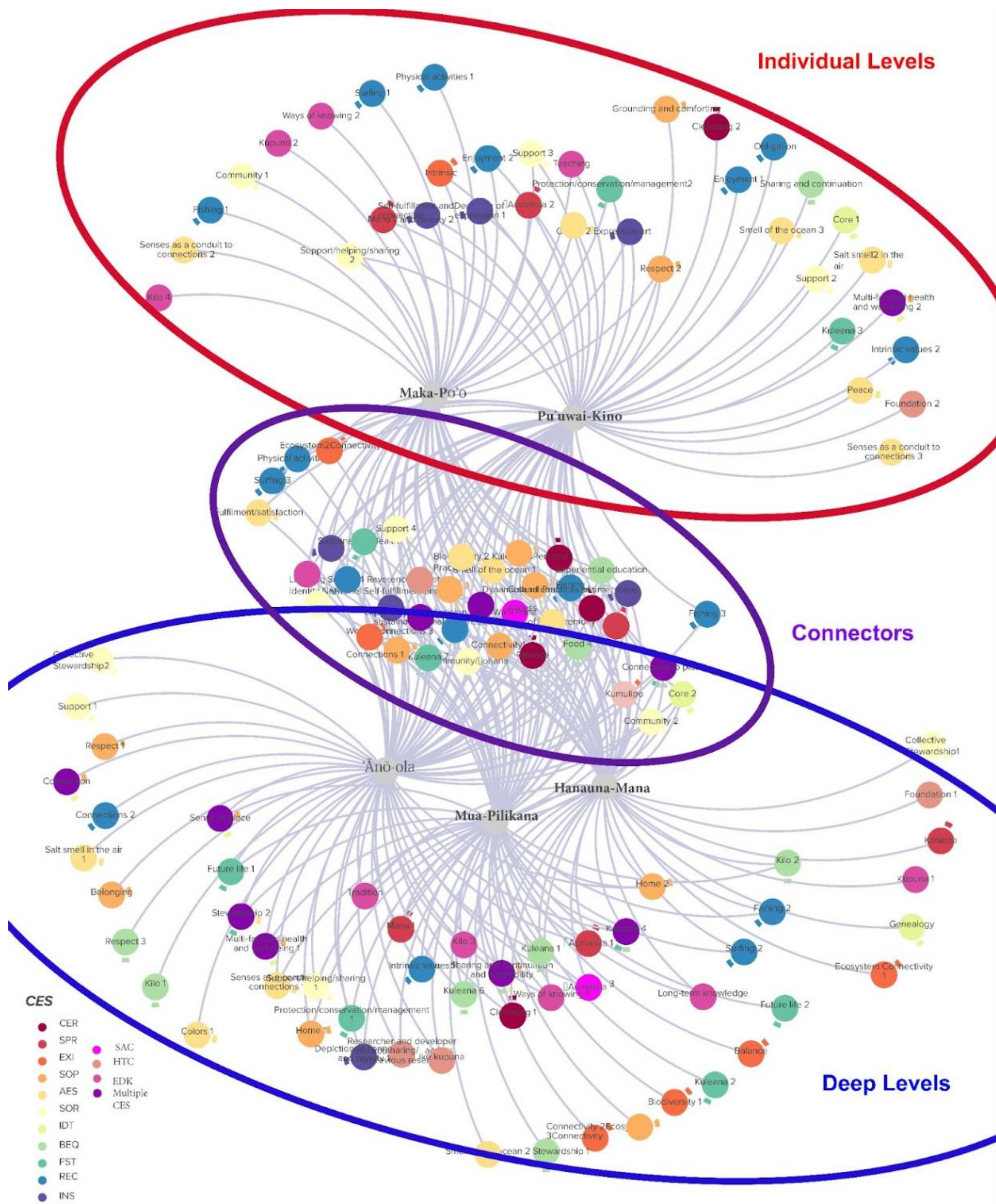


Figure 3.5 This figure highlights the different groupings of concepts mapped in Figure 3.4. The different connections between the concepts and the various levels of intensity created 3

groupings: individual levels, deep levels, and connectors. See Appendix 1 for the list of concepts, their associated CES, levels of intensity, and grouping levels.

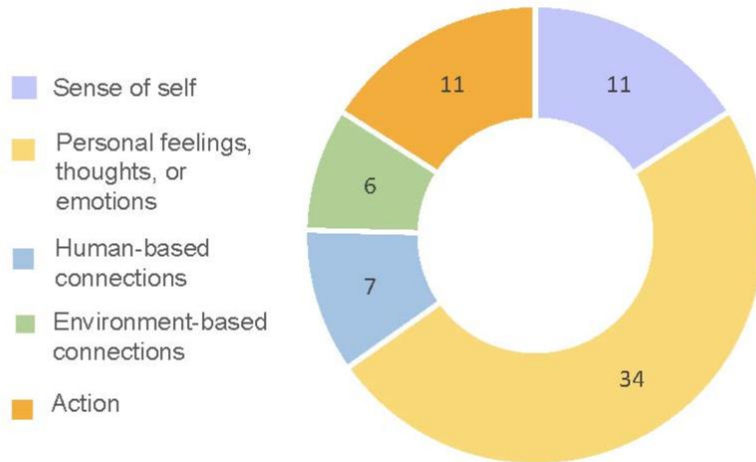
The individual level grouping that resulted are those concepts that are grouped in the maka-poʻo and puʻuwai kino levels of our levels of intensity. At the individual level, the meanings behind these concepts are largely how these interactions are important to the individual and how the concepts are perceived and felt by ourselves even when aspects can involve others, it is your own individual perspective. Other meanings of the individual level are that in-the-moment experience of interactions, and why those in-the-moment interactions are important or meaningful to us, and reasons why we seek out interactions with our surrounding environments. These are often feelings and experiences that we can commonly relate to and as such are easier to talk about. Often, because of the cognitive ease of this level, when CES are actually measured or elicited in studies, it is often limited to the individual levels. In the Individual levels, personal feelings, thoughts, and emotions are the dominant categories in these levels (Figure 3.6A). This highlights how those important in the moment experiences are an important meaning within this grouping.

The deeper level grouping includes the piko-naʻau levels in the levels of intensity. The meaning of the concepts found in these levels are more of how and why interactions with surrounding environments are foundational to you. These levels are deeply personal and intimate to you and your identity, as such, there is less certainty of having a common understanding and can be more difficult to talk to. These feelings and connections can be so profound and known to you, but they are not easy to put into words and thus difficult to ensure accurate translation and understanding to others. Concepts in the deeper levels can also be concepts that are found in the individual levels, but this moves beyond the meanings of how interactions are important in the moment, and reasons to seek them out, to how these interactions and connections are foundational to you and your sense of self or your sense of community. In the deeper levels, especially the deeper you get, the dominant category is environment-based connection followed by human-based connections and sense of self (Figure 3.6B). This

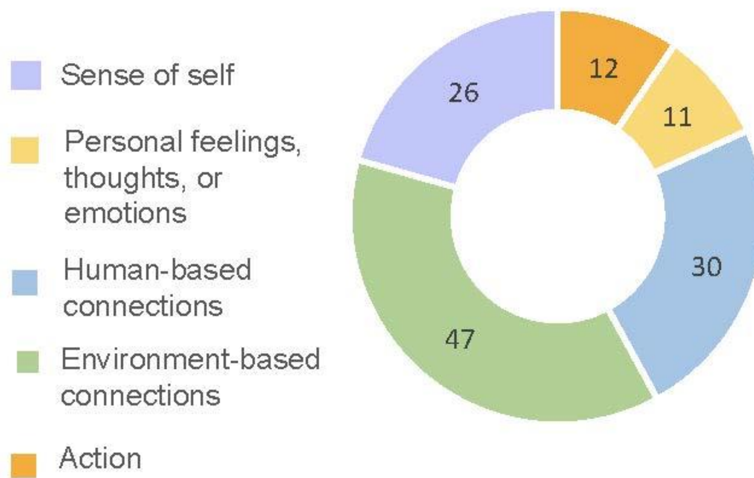
highlights that the meanings of interactions sought out are more about the connections behind them and how these may be foundational to yourself.

The connectors are those concepts that were placed in multiple levels at both the individual and deeper levels at once or at all levels. So, concepts will have different meanings when placed in just the individual levels, and in just the deeper levels but also when they are a connector. The connectors are how we connect that individual in the moment experience to our personal foundations. Or how we connect experiences to others (both human and non-human) or our connections throughout time. This grouping connects our memories and our in-the-moment experiences to our foundations and our core sense of being. In the connecting levels, environment-based connection is still the prevailing category, but this grouping has a more even variation between the different categories than the individual and deeper level groupings (Figure 3.6C). This can help highlight the connections between the meanings at the individual and deeper levels.

There were not necessarily any particular CES associated with particular levels in the levels of intensity. However, the discussions on the meanings and the key codes developed can be seen as correlating meaning with some CES. The code “action” includes physical activities or practices associated with certain CES such as recreation, ceremony, and fulfilling stewardship that all have activities or practices or “actions”. The code human-based connection has similar meaning to social-relations and this connection can also show how the CES social relation would be entwined with other CES that had human-based connections described in their meanings. Environment-based connections had a similar meaning to sense of place, but every CES had an environment-based connection code showing the importance of environment connections to driving meanings for interactions. Lastly, sense of self as a code has a similar meaning to identity so this also shows the connection of this CES to others also coded with sense of self.



N=36



N=52

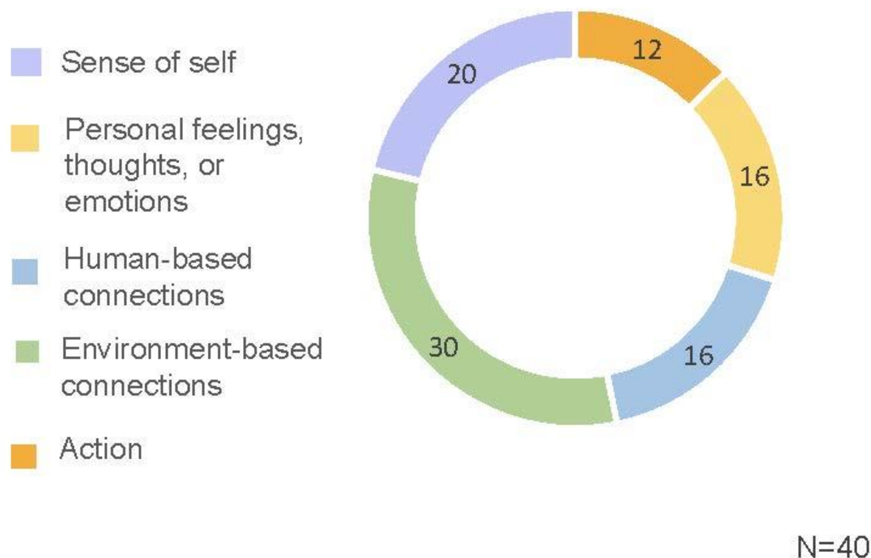


Figure 3.6 This figure shows the codes given to the various concepts and examples within the different groupings. The number within the donut chart represents the number of words/concepts with that code in that grouping and the N at the bottom of each grouping shows the total number of words/concepts for that grouping

Discussion

The menti results of the CES categories (figure 3.2) provide insight into the variety of meanings and perceptions that CES can have, and the implications of this diversity for measurement and comparison. For example, with Aesthetics, meanings range from experiences of the senses (sounds, colors, breathe), psychological states (peace, calm, relaxation, etc.), intrapersonal relations (responsibility, connection, wonder, etc.), to ecological states (sunset, natural, seascape, waves, etc). There is no standard unit or common metric to measure or prioritize these concepts. Further, the meanings of CES, even when defined, varied greatly depending on the person, place, and context and thus they cannot be adequately measured or compared by category definitions alone. These results contribute to previous research that note the challenges of incommensurability and pluralism of CES. Particularly, that CES and their associated values were difficult to put into words let alone assess and thus contribute to limitations to include them in decision making (Calcagni et al., 2019; Gould et al., 2015).

Placing concepts along the levels of intensity gave further insight into that incommensurability. For example, even when the same concept was chosen, such as fishing for the CES recreation, this can have a variation of meanings and importance for different peoples and thus be placed within different levels. To some, fishing may be more of an enjoyable activity that can aid in our physical and mental well-being through the activity itself as well as the nutrition from fish. However, to others, fishing is a foundational cultural practice that can connect them to their heritage and ancestry as well as being an important practice to perpetuate and cultivate to ensure the survival of that practice. Additionally, there are often more practices and teachings connected to fishing to ensure the practice is pono (correct, just, beneficial) and perpetuates reciprocity with ʻāina (the land which feeds). Even the words that are used to describe fishing practices are incommensurable to English terms. While the activity of fishing may seem to be a common activity, the meaning can greatly differ and at times contradict when fishing can mean an enjoyable yet extractive activity to some and to others it is a foundational way of life meant to express care for oneself, one's community, and for the surrounding environment including the target fish population. Comparing or minimizing these meanings of fishing and recreation can be harmful and problematic, especially if it leads to the erasure or prioritization of one Peoples, or knowledge system, over another.

The levels of intensity can also aid in decision making. Placing concepts along the levels of intensity gave insight into incommensurability because it showed that concepts can have different meanings based on the different placements. Thus, together the placements and the meanings can provide useful information to decision making. What level or levels concepts are placed in provide "metrics" or a sort of measurement that has comparability and can show potential changes. Additionally, the meanings and reasonings behind the different placement provides more information on the importance or significance of those concepts. Together this provides some comparability to concepts but also illuminates why comparisons leading to prioritization may be inappropriate. The levels of intensity tool offers an opportunity for a more holistic view of social values and can provide insights that can be used in decision making.

Elevating our understanding of CES through the meanings behind them can aid in operationalizing CES. For instance, the diverse concepts that emerged from the workshops to describe CES could be potential indicators. Indicators are increasingly used in assessment and management to track ecosystem (including human) well-being (Gove et al., 2019; Ingram, 2019; Leong et al., 2019; McCarter et al., 2018; Sterling et al., 2017). Indicators can be used for a variety of different aspects, for example, indicators for SES often illuminate the conditions of social and ecological factors, reveal more about the connections of SES, as well as can show changes, trends, and impacts to the system or specific factors (Dacks et al., 2019). The concepts chosen within the workshops are examples of CES or types of human-nature connections. Using these concepts as indicators may reveal more about the feedback, influences, and connections within social and ecological systems. Further work may be needed to develop these concepts as indicators by either using them as metrics or conditional standards or developing metrics, measurements, or conditions of the concepts. For example, concepts chosen such as "senses as a conduit to connection" or "fulfillment/satisfaction" may be conditions or measurements to see if these aspects are being achieved or the quality of their condition. Whereas concepts such as "fishing" or "long-term knowledge" may need to have further measurements or conditions to assess them such as access to fishing, or ability to engage in practices supporting long-term knowledge, etc. The concepts chosen and discussed not only elevate our understanding of CES by recognizing the diverse meanings, incommensurable meanings, and pluralistic values of CES but can also be used in indicator work.

The deliberative workshops employing the levels of intensity aided in revealing deeper meanings and reasons for human-nature interactions, a current gap of CES. Understanding the deeper meanings or motivations behind CES or relational values can aid in operationalizing them such as by providing indicators to measure qualities, changes to them over time, and how they may be impacted by management or other processes (past, existing, and potential). The research presented in this chapter offers a beginning step to further understanding CES and operationalizing them. The diverse concepts chosen show more about the diverse or pluralistic values of concepts, the key codes and the related parent categories reveal more about the meanings behind CES

or human-nature interactions, and the level groupings reveal more about some of the reasons why humans seek out human-nature interactions. The levels of intensity and deliberation provide insight into the diverse meanings, and the placement of CES concepts along the levels of intensity can help provide insights on measurements and irreplaceability of concepts.

While this research of understanding the deeper meanings of CES may be a beginning step to operationalizing CES research, there is still more work that needs to be done. This research aids in operationalizing CES by providing "measures" of the level they are placed in, provides more qualitative context through the deliberation of concepts, and the outcomes can aid in developing indicators that can further be used in decision making. This research focused on understanding CES in Hawaiʻi among managers and community members engaged in management efforts or community groups working towards co-management efforts. More research would need to be done to understand CES more broadly including in different places in and beyond Hawaiʻi, and with different peoples both within and outside of Hawaiʻi. While this research targeted understanding CES within a management context, there were only 50 participants among the workshops including Native Hawaiians, cultural practitioners, subsistence fishers, commercial fishers, generational locals, long-term and short-term residents, and researchers/managers within management agencies, and many people filled multiple of these roles. The workshops were not meant to be generalizable, and the results should not be treated as such. Further research could be done to understand the perspectives of different user groups, specific management processes, or on other understandings of CES within different places (in Hawaiʻi and beyond).

This research also reveals some aspects of the interconnectedness of CES that can also further our understanding of CES. Other researchers have acknowledged the interconnectedness or bundling of CES that can add to their complexity and incommensurability (Bélisle et al., 2021; Gould et al., 2015; Hernández-Morcillo et al., 2013; Himes et al., 2020). Codes created from the parent themes of discussions around CES reveal some of the complications and difficulties of CES categorizations. All codes (1. Actions, 2. Personal feelings, thoughts, and emotions, 3. Human-based connections, 4. Environment-based connection, and 5. Sense of self) were given to all CES

categories but some codes may be more representative of certain CES. To highlight this, looking at Action, all CES can have “actions” or activities and practices that they can be associated with or are examples of that CES. However, there are some CES that seem to be more entwined and exemplified by actions, in particular the CES recreation (e.g. recreational activities), fulfilling stewardship (e.g. stewardship practices), ceremony (e.g. ceremonial practices), and education and knowledge (e.g. education and learning). But these practices also cannot be separated from other connections stemming from them. For example, the CES education and learning often go hand-in-hand with the CES bequest concepts but could also be connected to stewardship practices (i.e. fulfilling stewardship), and cultural practices (i.e. heritage, tradition, and culture; spirituality; and potentially ceremony). To some, all of these CES in this example could be connected to the same practice or different functions and connections of practices. For example, fishing or a single species of fish could have connections and meanings within every CES category. This also directly critiques the definition that CES are “intangible benefits”, as often intangible meanings found are linked to tangible concepts such as “actions” as well as places, species (plants, animals, others), elements, and natural forces (Berbés-Blázquez et al., 2016; Gould et al., 2022; Velasco-Muñoz et al., 2022). Not only do CES contain tangible and intangible elements, some CES are more representative of meanings behind human-nature interactions, as were represented with the codes created in this study. Additionally, some CES are related to how people may find meanings or reasons to interact with nature. For example, *ceremonies* may be important to perpetuate the *sacredn*ess of *spiritual* practices of peoples’ *heritage, traditions, and cultures*. To some, they may see these different CES as related to being the base pillars needed to hold up their house of cultural practice and perpetuation.

The interconnectedness of humans and nature as well as the interconnectedness of meanings of how humans interact with nature are foundational to Indigenous worldviews that are not well captured in CES and Dominant research. Shawn Wilson states that,

> “Identity for Indigenous peoples is grounded in their relationships with the land, with their ancestors who have retired to the land and with future generations who will come into being on the land. Rather than viewing ourselves as being in

relationship with other people or things, we are the relationships that we hold and are part of." (Wilson, 2008, p. 80).

An Indigenous worldview recognizes the interconnectedness and interrelatedness of everything within the universe from a cellular to a cosmic level (Wilson, 2008). Dr. Jessica Hernandez notes that Dominant research and institutions compartmentalize and separate disciplines and components of SES to be easier to understand or study (Hernandez, 2022). However, through this separation and compartmentalization, research and institutions are missing out on a holistic understanding of these systems that cannot accommodate Indigenous Knowledge (Hernandez, 2022). Dr. Heoli Osorio recognizes the relational foundation of an Indigenous worldview and explains it as an ʻupena of pilina (fishing net of intimacy):

> "The ʻupena of pilina further takes for granted that no matter how seemingly disconnected two or more Kānaka might be, no matter how many hipuʻu (or degrees of separation) lie between them, no matter how far and wide the ʻupena must be cast to touch them all, when pulled tight in the fist of the lawaiʻa, all these hīpuʻu are drawn and bound close together." (Osorio, 2021, p. 66).

While Dr. Osorio creates the metaphor of an ʻupena of pilina for Kānaka (people) if we understand an Indigenous worldview as relational, and how we relate to others living, nonliving, human, and nonhuman within this universe, we can extend this metaphor to include all of our relations within this ʻupena of pilina. As such to understand how CES may be relevant within this ʻupena, each CES category may only be a component of this fishing net, one category may be one knot, another one separate square, and another may just be one edge of a square.

To be inclusive of Indigenous worldviews and diverse knowledge systems we need to continue to evolve CES and move beyond our current conceptualization and understanding of them. The traditional definition of CES as one-dimensional categories of "intangible benefits" does not capture the diversity of meanings of CES and their interconnectedness both with the other CES and with tangible concepts (e.g. activities, places, people, species, elements, and natural forces). To continue with the ʻupena of pilina metaphor, current conceptualization of CES only captures parts (a couple of knots, maybe some separate squares, and some edges of a square here and there) of

the ‘upena spread out flat. We need to continue to evolve our understanding of the interconnectedness and relatedness of SES to see the entire ‘upena laid out flat and then continue to evolve it to understand how the ‘upena may be further interconnected as it gets folded or used and perhaps how this may change depending on who is using it, what it may be being used for, and with different practices.

The ‘upena of pilina metaphor can also be used to understand why current management practices trying to integrate, intertwine, and interweave knowledge systems are insufficient. Trying to interweave Indigenous Knowledge within the discipline of CES or other Dominant research is like trying to fit an entire ‘upena within a couple squares of the net. Unless we make room to accommodate the entire ‘upena of pilina representing Indigenous Knowledge and the diverse ways it can be used, at best research and management can try to understand snapshots of parts of the ‘upena. To truly accommodate Indigenous Knowledge in management, this means overcoming obstacles of continuing injustices and power dynamics such as through landback, decolonization, or at a minimum co-management and co-production.

While a goal of research and evolving CES is to be inclusive of diverse worldviews and knowledge systems to get a more holistic view of SES, researchers also need to take into consideration the current capacity and limitations of research and management. While research and management should continue to strive towards more holistic, equitable, just, and inclusive practices, it is important to recognize this is a process that is ever evolving, may take time, and need vast value and power shifts. Current Dominant research and management practices involve compartmentalization of subjects and separation disciplines (Hernandez, 2022). Understanding this is where research and management are currently at, these institutions need to continue to work towards more holistic approaches that can better accommodate diverse worldviews and knowledge systems. CES research is no exception. There has been a lot of work to rework CES to make them place-based and more context specific to certain needs (e.g. Bremer et al., 2018; Gould et al., 2015; Iniesta-Arandia et al., 2014; Kenter et al., 2015; Pascua et al., 2017; Smith et al., 2003). This work that has been done has its merits such as contextualizing values, but we need to evolve CES beyond recategorizing a one-dimensional framing of them and find other ways to operationalize them and be

more inclusive. While we work to evolve and operationalize CES this needs to take into account and potentially aid in expanding capacities and minimizing limitations of research and management.

There are many ways we can continue to evolve our understanding of and the conceptualization of CES. One of these approaches could be a tiering approach to add dimensionality. In this research, the CES categories and the key codes can be a first step here to tiering our understanding of CES and moving beyond one-dimensional categories. Rather than just one-dimensional categories, tiering can show the connections between and among categories to understand more of the complexities and diverse connections of categories. In this case, it could show the different CES, and the concepts chosen for them as a tier and what code they have (for the meanings) as another tier. The levels of concepts chosen (i.e. menti results) and the levels of intensity placements could further this tiering of CES and begin to recognize the interconnectedness of deepening CES categories. For example, if we think of the objective of operationalizing CES a tiering approach can make sense in this context. To operationalize CES in a management perspective often what you want is the ability to measure changes over time and understand impacts or growth. A start to this tiering approach using the results of this study is shown in Figure 3.7 to show an example of what this could look like. The first tier starts with the CES categories then leads into indicators of them, in this case the “indicators” could be the representative concepts and examples of the CES. From these indicators we can understand reasons why we interact with nature and some of the meanings of these interactions, specifically in this study the key codes created from parent themes of discussions.

In this study, these meanings are not just unique to the representative concepts, but rather are the meanings and reasons for interactions that follow all CES, so this also can give a glimpse into moving into the interconnectedness between tiers. We can then have “measures” for the “indicators” using the levels of intensity to understand changes, impacts or growth, in addition to other relevant metrics. For example, if fishing were an indicator, other important measures could be included instead such as how many people are fishing and where but also use the levels of intensity to understand at what levels are fishing practices accommodating are these levels being impacted from other

aspects (such as development, people present, etc.) and do the levels differ spatially. So, the measures associated with representative concepts or if Indicators chosen are measures themselves, this can provide more information to decision makers about changes and impacts. While I am tiering and parsing out concepts to aid in operationalization, the ultimate interconnectedness within systems of diverse functions and importance of interactions cannot be ignored. As we develop methods and space to understand the interconnectedness within systems, we can become better at embracing and accepting this messiness (Kenter et al., 2019).

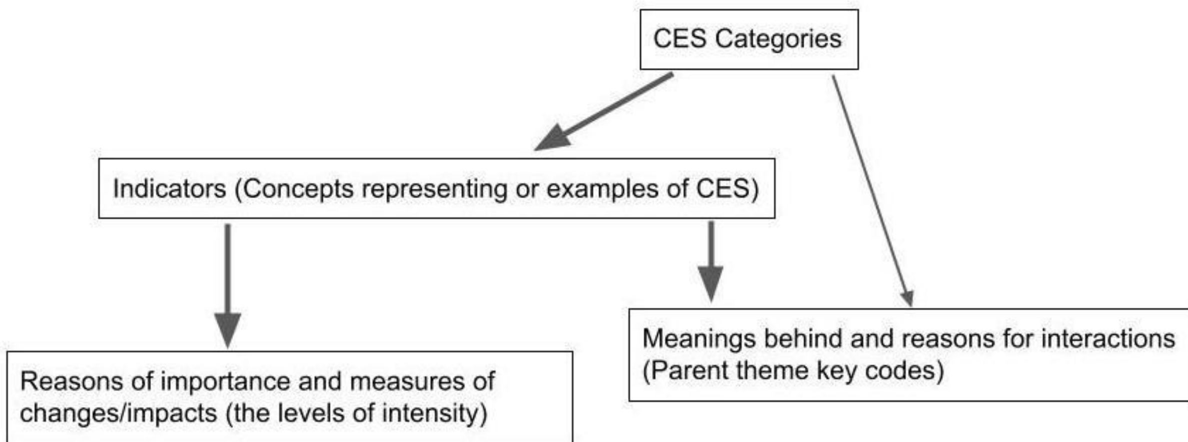


Figure 3.7a Example of tiering CES and moving beyond a one-dimensional framing of categories of human-nature interactions.

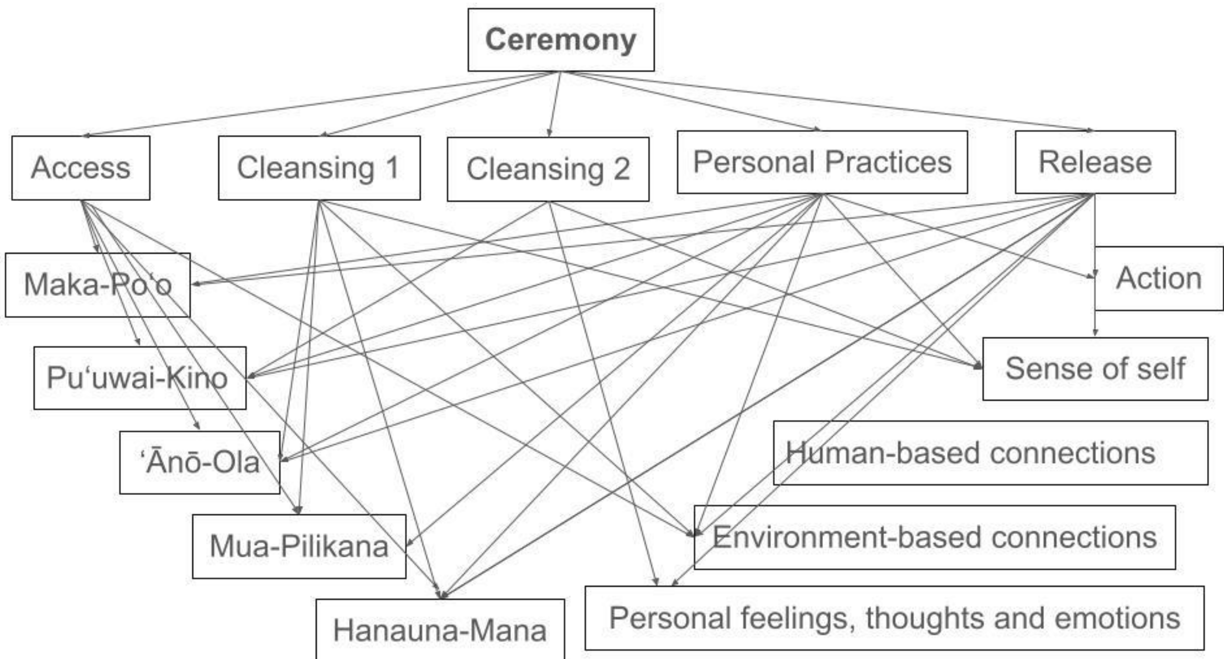


Figure 3.7b Example of tiering CES and moving beyond a one-dimensional framing using the data from this research. This shows the example concepts for the CES ceremony and what level these concepts were placed in and what codes they were given based on d scussions of their meaning.

CES are limited in the information they provide, but a tiering approach can aid in operationalizing them based on management needs and relevance. Indicator work gets us a step closer to evolving CES as we can understand impacts, changes, and growths but can still be limited to the indicators and what metrics are used and often do not capture pluralistic and diverse values. However, indicators can aid in reaching a more tiered approach, we understand impacts and the importance of CES by measuring indicators of them. But we can evolve this further by adding another level or tier by also understanding the meanings and importance of CES and indicators, such as the key codes of parent themes in this work. We can evolve our understanding of CES and the importance of socio-cultural concepts by ensuring indicators are representative of diverse worldviews and perspectives such as has been done with some biocultural indicator work (e.g. Dacks et al., 2019; McCarter et al., 2018; Sterling et al., 2020,

2017). Additionally, research should work to include other measurements or metrics to understand how things are important such as with the levels of intensity.

All tiering approaches can be adapted to be place-based or context specific to fit management needs or certain research questions/objectives and should accommodate research or management capacity. As we elevate our understanding of CES, or the interconnectedness of SES, and research and management capacity improves, we can continue to evolve approaches to represent this interconnectedness. We can move beyond recognizing just components of the ʻupena of pilina, such as CES research currently, to working towards recognizing the entire ʻupena and how it may fold as well to reach a more holistic understanding and include diverse knowledges and worldviews. In a tiering approach, this involves recognizing that the tiers and components of them are also interconnected with each other–visually looking more like a web or an ʻupena. Those concepts with the most or diverse connections within this interconnected ʻupena can be informative of our sociocultural systems. For example, in this research the concepts chosen within the connectors that link the individual levels and deeper levels within the groupings of meanings as well as those concepts chosen across many CES and workshops such as Table 3.4 and 3.5 can be thought of as key concepts and relevant for further indicator work. These key concepts have diverse functions within our socio-cultural system and should be a focal point for future research and management.

Focusing on foundational connectors, such as key concepts in this research, can be a more efficient use of limited capacities. While research and management practices focus on foundational concepts, they should also work to capture the impacts, growths, and changes to those concepts as well as diverse worldviews and pluralistic values to aid in operationalizing socio-cultural concepts, overcoming limited capacities, and being more inclusive.

Conclusion

As researchers and managers seek to make more inclusive and holistic decisions, we need to better understand and accommodate the diverse connections of socio-ecological systems. Cultural ecosystem services provide a great first step in understanding these connections. However, we need to move beyond one-dimensional

categories of human-nature interactions and better understand the meanings, reasons, and importance of those interactions in a way that can be operationalized. Indicators offer a step in this operationalizing, but as researchers and managers, we need to continue to evolve and to be more inclusive of diverse worldviews and pluralistic values. In this study, I sought to understand the deeper meanings behind and reasons why humans interact with nature, as well as why those interactions are important. Discussions from the deliberative workshops created an array of concepts that were representative of the different CES that showed the diversity of values and meanings people may hold for the various CES. This diversity of values, pluralistic values, contribute to problems of commensurability and difficulties measuring CES. The levels of intensity provides a useful tool at encouraging deliberations to capture the diversity of values, while also providing different metrics that can show changes, impacts, and growths through the level placements. The diverse concepts chosen for CES within the workshops also provide other potentials such as serving as indicators. The metric capabilities of the levels of intensity and the indicator potential of concepts can aid in operationalizing CES. While metrics offer a tool to accommodate decision-making needs of management agencies, this tool also offers opportunities to better understand the complexities of socio-cultural systems and management impacts. Management is not just measuring changes and understanding impacts, but management of areas such as in Hawaiʻi, call for place-based pono (right) practices and knowledge. This tool offers a way to accommodate place-based local and Indigenous Knowledge for a more holistic understanding of systems to aid in more effective management. This research also offers insights into the interconnectedness and inseparability of socio-cultural and socio-ecological systems. Foundational key concepts within this interconnectedness offer an opportunity to cover diverse socio-cultural aspects and pluralistic values. Further research should focus on these foundational key concepts or other ways to evolve CES and indicators to be inclusive and operationalize within management. This will likely need both research, to improve our understanding of the interconnectedness of SES, and creative ways to aid in operationalization. Together they are needed, but we also need to overcome many institutional barriers such as increasing institutional

cooperation, as well as inter and cross disciplinary collaboration, to ensure the research being done and management agencies can inform and accommodate each other.

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Appendix 1.

Concept	Workshop	CES	Levels of intensity					Level		
			MP1	PK	ʻĀO	MP2	HM	Individual	Deep	Connector
Community 1	4	SOR								
Fishing 1	8	REC								
Kilo 4	7	EDK								
Kūpuna 2	2	EDK								
Physical activities 1	9	REC								
Senses as a conduit to connections 2	7	AES								
Surfing 1	8	REC								
Ways of knowing 2	7	EDK	MP1					Individual		
Cleansing 2	3	CER								
Core 1	2	IDT								
Enjoyment 1	2	REC								
Foundation 2	2	HTC								
Grounding and comforting	5	SOP								
Intrinsic values 2	9	REC								
Kuleana 3	2	FST								
Multi- faceted health and well-being 2	7	IDT| SOP								
Obligation	2	REC								
Peace	2	AES								
Salt smell in the air 2	3	AES								
Senses as a conduit to connections 3	7	AES								
Sharing and continuation	7	BEQ| EDK		PK				Individual		

Smell of the ocean 3	5	AES								
Support 2	2	SOR								
ʻAumakua 2	8	SPR								
Colors 2	1	AES								
Depiction of connection and beauty 2	6	INS								
Enjoyment 2	4	REC								
Expressive art	2	INS								
Intrinsic	2	EXI								
Mana 2	8	SPR								
Protection/ conservation/ management 2	8	FST								
Respect 2	5	SOP								
Self- fulfillment and expression 1	6	INS								
Support 3	4	SOR								
Support/ helping/ sharing 2	8	SOR								
Teaching	1	EDK	MP1	PK				Individual		
Belonging	9	SOP								
Collective Stewardship 2	3	SOR								
Colors 1	1	AES								
Connection	9	IDT| SOP								
Connections 2	6	REC								
Kilo 1	1	BEQ								
Respect 1	5	SOP								
Respect 3	6	BEQ| EDK								
Salt smell in the air 1	3	AES								
Support 1	2	SOR			ʻĀO				Deep	
Balance	3	EXI				MP2			Deep	

Biodiversity 1	3	EXI								
Connectivity 2	4	SOP								
Ecosystem Connectivity 3	6	EXI								
Future life 2	6	FST								
Kuleana 2	2	FST								
Smell of the ocean 2	5	AES								
Stewardship 1	6	BEQ| EDK								
Depiction of connection and beauty 1	6	INS								
Future life 1	6	FST								
Home 1	9	SOP								
‘ike kupuna	3	HTC								
Multi- faceted health and well-being 1	7	IDT| SOP								
Protection/ conservation/ management 1	8	FST								
Researcher and developer resource sharing/ access to previous research	5	HTC								
Sense of place	9	IDT| SOP								
Senses as a conduit to connections 1	7	AES								
Stewardship 2	9	AES| FST								
Support/ helping/ sharing 1	8	SOR			‘ĀO	MP2			Deep	

Collective Stewardship 1	3	SOR								
Ecosystem Connectivity 1	6	EXI								
Foundation 1	2	HTC								
Genealogy	9	IDT								
Kanaloa	3	SPR								
Kūpuna 1	2	EDK					HM		Deep	
Fishing 2	8	REC								
Kilo 2	1	BEQ								
Long-term knowledge	5	EDK								
Surfing 2	8	REC				MP2	HM		Deep	
‘Aumakua 1	8	SPR								
Cleansing 1	3	CER								
Home 2	9	SOP								
‘Aumakua 3	3	SAC								
Intrinsic values 1	9	REC								
Kilo 3	7	EDK								
Kuleana 1	1	BEQ								
Kuleana 4	3	BEQ| FST								
Kuleana 6	7	BEQ								
Mana 1	8	SPR								
Sharing and continuation and adaptability	7	BEQ| EDK| IDT| SOP								
Tradition	1	EDK								
Ways of knowing 1	7	EDK			‘ĀO	MP2	HM		Deep	
Fishing 3	8	REC								
Fulfillment/ satisfaction	9	AES								
Physical activities 2	9	REC								
Surfing 3	8	REC		PK	‘ĀO					Connector

Ecosystem Connectivity 2	6	EXI	MP1	PK	‘ĀO					Connector
Community 2	4	SOR		PK	‘ĀO	MP2				Connector
Health	6	INS								
Learning	1	EDK								
Networks	2	SOR								
Support 4	4	SOR								
Surfing 4	9	REC								
Sustainability	1	FST	MP1	PK	‘ĀO	MP2				Connector
Connection to place	3	BEQ| FST								
Core 2	2	IDT								
Kumulipo	2	EXI		PK	‘ĀO	MP2	HM			Connector
Access	1	CER								
Biodiversity 2	7	AES								
Ceremony	4	SPR								
Community/‘ohana	8	SOR								
Connections 1	2	SOP								
Connections 3	6	REC								
Connectivity 1	4	SOP								
Cultural Practices	2	INS								
Development/ decision making entities	5	BEQ| EDK| HTC								
Dynamics of time, place, and connections	7	IDT| SOP								
Experiential education	5	BEQ| EDK| HTC								
Fishing	9	REC								
Food 4	2	BEQ								
Food sustainability	5	BEQ| EDK| HTC	MP1	PK	‘ĀO	MP2	HM			Connector

Identity	3	IDT| SOP							
Kuleana 5	4	SOP							
Kuleana 7	8	FST							
Personal Practices	1	CER							
Release	2	CER							
Reverence for nature	6	HTC							
Self-fulfillment and expression 2	6	INS							
Smell of the ocean 1	5	AES							
Sounds of life	1	AES							
Wahi Pana	4	SAC							
Worldviews	7	EXI							

Chapter 4. Spatially representing relationships of Kuleana in West Hawaiʻi

Abstract

Understanding the connections between humans and our surrounding environments is important for more holistic management practices and decision making. Ecological mapping is one research approach to spatially represent human perspectives and ecological features of landscapes. However, common mapping approaches poorly accommodate diverse values and worldviews, such as reciprocal relationships between people and nature and Indigenous worldviews. To explore this gap, in this research, I conducted interviews and participatory mapping with key informants who are Native Hawaiian ancestral descendants and knowledge holders of West Hawaiʻi. In these interviews, I asked key informants about their perceptions of the Native Hawaiian value of kuleana and how they may have spatial connections and relationships due to their kuleana. By mapping kuleana, I build upon common mapping approaches by focusing on relationships and connections to places rather than activities and resources. Exploring the meanings and diverse connections of kuleana, as well as perceived threats and impacts to kuleana, enhances our understanding of Native Hawaiian values and knowledge. Spatial discussions of kuleana revealed types of kuleana that relate to place, including: moʻolelo/wahi pana (storied places), ʻohana/moʻokūʻauhau (geneaological or family connections), hana/mākau (skills and callings), kiaʻi/mālama (stewardship and caretaking), lāhulu/kino lau (species and ecological aspects), ʻike/noʻeau (arts and cultural practices), and aʻo/mau (perpetuation and teaching). Common participant perceptions of threats, impacts, and considerations of kuleana included: climate change/ecological change, development, economics and money, management, food security and land planning, tourism/foreigners, colonization, and perpetuation. A greater understanding of kuleana can provide a more holistic understanding of cultural connections and values of place, as well as impacts from and shortcomings of management agency actions.

Introduction

Mapping socio-culltural ecosystem services for resource management

Researchers and management agencies have recognized the importance of understanding the interconnectedness and influences between humans and our surrounding environment. Understanding the connections within socio-ecological systems (SES, i.e. social systems of management and communities and surrounding environments) can lead to a more holistic understanding and more effective management practices. Researchers have examined social values, defined here as what is important and what matters to people (Kenter et al., 2019, 2015; Rawluk et al., 2019), to understand some of the human connections to nature within complex SES. Ecosystem services (i.e. the benefits humans receive from the environment) fall under the broader umbrella of social values and have gained momentum as a concept to recognize some of the ways humans are dependent on ecosystems (Millennium Ecosystem Assessment, 2005). Cultural ecosystem services are the intangible benefits humans receive from nature (Millennium Ecosystem Assessment, 2005). Cultural ecosystem services are a component of socio-cultural research that helps to understand some of the connections of SES. Socio-cultural concepts refer to the interactions, meanings, and connections that people have with the environment (McLain et al., 2013; Nahuelhual et al., 2016), and help define what people find important (i.e. social values) (Kenter et al., 2019, 2015; Rawluk et al., 2019) such as CES categories (e.g. aesthetics, education, recreation, spirituality, etc.). The complexity of socio-cultural concepts and social values, which can vary spatially and temporally as well as on an individual, familial, community, and cultural level, often leads to their omission in management decisions (Horcea-Milcu et al., 2019; Kenter et al., 2019, 2015; Rawluk et al., 2019).

Spatial information, such as that for social values, is critical for natural resource management. For instance, spatially explicit information related to ecological habitats and nearby human communities can form the basis for management plans and reveal geographical disparities in management outcomes and impacts (Levine and Feinholz, 2015; McLain et al., 2013; Nahuelhual et al., 2016). Within the natural resources field, social value mapping has been used for numerous aims: representing spatial patterns of ecosystem services in and out of national forests (Bagstad et al., 2017); landscape

functionality (Brown, 2013; Dressel et al., 2018); including Cultural Ecosystem Services (CES) as part of the criteria for determining priority conservation areas (Qin et al., 2019); mapping perceived preferences of social values of ecosystem services (Sherrouse et al., 2011); summarizing visitor and recreationalist perceptions of parks (van Riper et al., 2017; Zhang et al., 2019); and locating the perceived CES and disservices of a local landscape (Plieninger et al., 2013). Analytical techniques such as hotspot mapping, using the ecological and socio-cultural information typically contained in social value maps, can help identify important areas and areas that require special attention (Alessa et al., 2008; Sherrouse et al., 2011). However, not all important things can be mapped easily. A wide range of approaches under many names aims to provide spatially explicit socio-cultural data along with ecological data (see McLain et al., 2013 for review). McLain et al. (2013) detail three main approaches to mapping these connections of SES that are increasingly used in natural resource management: (1) tenure and resource use mapping (TRU) focuses on the spatial locations of land and resource tenure and land uses connecting people to place; (2) local ecological knowledge mapping (LEK) aims to capture local groups' understandings of ecological processes and relationships between people and place; and (3) sense of place mapping (SOP) seeks to describe the values and/or meanings that people ascribe to place and activities or resources associated with place. McClain et al. (2013) describe social value mapping or mapping human perspectives on ecosystem services as falling under the category of what they refer to as sense of place mapping. The objective of social value mapping is to represent the relationship of social values (things people find important) to both physical and social contexts in order to inform decision making (Sherrouse et al., 2011). Research using the software tool SolVES is one mapping methodology of social value mapping but there are many other approaches as well (Sherrouse et al., 2014, 2011; Sherrouse and Semmens, 2014; Sun et al., 2019; Zhang et al., 2019).

Social Values for Ecosystem Services (SolVES), specifically seeks to spatially locate ecosystem service values (Sherrouse et al., 2014). Typically, the participatory methods used to elicit SolVES social value maps, include a questionnaire or survey with respondents' perceptions and/or knowledge of the landscape, the values they ascribe to different parts of the landscape, and a ranking of values often achieved via allocating

hypothetical money to social value classifications (Sherrouse et al., 2011; van Riper et al., 2017; Zhang et al., 2019). This type of mapping social value exercise often relies on existing classifications of social values (Table 4.1) (Brown, 2013; Nahuelhual et al., 2016; Qin et al., 2019; Sherrouse et al., 2014, 2011; Sherrouse and Semmens, 2014; van Riper et al., 2017; Zhang et al., 2019) with an aim to mainstream them for use in decision making (Nahuelhual et al., 2016).

There are mapping efforts, such as those employing the software Social Values of Ecosystem Services (SolVES), that spatially allocate a set amount of monetary or quantitative to show priorities or representation of different human perceptions and perspectives of landscapes, including knowledge of the environment, preferences of activities or places, and thoughts on environmental quality or experiences, along with ecological factors (Sherrouse et al., 2014, 2011; Sherrouse and Semmens, 2014). While SolVES research does try to capture cultural ecosystem services (i.e. the intangible benefits humans receive from nature) (Millennium Ecosystem Assessment, 2005), it often focuses on representing tourism, recreation, or aesthetic hotspots, while relying on quantitative and monetary methodologies that do a poor job of accommodating diverse values and worldviews.

Social value mapping often entails using methods such as public participation GIS (PPGIS) (Bagstad et al., 2017). PPGIS is a participatory mapping tool to spatially represent both quantitative and qualitative information on aspects such as human values, perceptions, behaviors, and preferences (Fagerholm et al., 2021; Hasanzadeh, 2022). PPGIS employs a variety of techniques to gather such spatial information, including: photovoice which involves using photos to gather spatial and socio-cultural information (Jelks et al., 2018); recreation and travel information (Laatikainen et al., 2017); crowdsourcing and social media (Depietri et al., 2021; Nummi, 2018); and interviews (Kantola and Tuulentie, 2020). All of these techniques can be used to map social values or other socio-cultural concepts to inform natural resource management. Some natural resource management-focused PPGIS efforts that have been conducted in Hawaiʻi include STEW-MAPs that explore where and why environmental stewardship groups are active (Dacks et al., 2021) and coastal use maps that describe coastal human activities in priority sites (Levine and Feinholz, 2015).

Table 4.1 Common types of existing social value classifications used in SolVES research.

<table>
<tr><th>Social value classifications</th><th>Sources</th></tr>
<tr><td>Aesthetic</td><td rowspan="3">Bagstad et al., 2017; Brown, 2013; Plieninger et al., 2013; Qin et al., 2019; Sherrouse et al., 2011; Zhang et al., 2019</td></tr>
<tr><td>Cultural</td></tr>
<tr><td>Recreation</td></tr>
<tr><td>Economic</td><td>Bagstad et al., 2017; Brown, 2013; Qin et al., 2019; Sherrouse et al., 2011; Zhang et al., 2019</td></tr>
<tr><td>Spiritual</td><td>Bagstad et al., 2017; Brown, 2013; Plieninger et al., 2013; Sherrouse et al., 2011; Zhang et al., 2019</td></tr>
<tr><td>Future</td><td rowspan="2">Bagstad et al., 2017; Brown, 2013; Sherrouse et al., 2011; Zhang et al., 2019</td></tr>
<tr><td>Historic</td></tr>
<tr><td>Intrinsic</td><td>Bagstad et al., 2017; Brown, 2013; Sherrouse et al., 2011</td></tr>
<tr><td>Life sustaining</td><td rowspan="2">Brown, 2013; Sherrouse et al., 2011; Zhang et al., 2019</td></tr>
<tr><td>Biodiversity</td></tr>
<tr><td>Therapeutic</td><td>Bagstad et al., 2017; Brown, 2013; Zhang et al., 2019</td></tr>
<tr><td>Inspiration</td><td>Brown, 2013; Plieninger et al., 2013</td></tr>
<tr><td>Learning</td><td>Bagstad et al., 2017; Sherrouse et al., 2011</td></tr>
<tr><td>Scientific</td><td>Brown, 2013; Sherrouse et al., 2011</td></tr>
<tr><td>Subsistence</td><td>Bagstad et al., 2017; Brown, 2013</td></tr>
<tr><td>Educational</td><td rowspan="3">Plieninger et al., 2013</td></tr>
<tr><td>Sense of place</td></tr>
<tr><td>Social relations</td></tr>
</table>

Human well-being	Qin et al., 2019
Living environment	
Sustainable development	
Wilderness	Brown, 2013

Challenges to social value mapping, including from an Indigenous perspective

While there are many benefits from spatially representing the complex connections between people and place, there are also many limitations and challenges to mapping practices as commonly implemented. First of all, the process of participatory mapping itself can be challenging. In participatory mapping, engaging the community is critical, but to ensure meaningful participation, researchers need to consider and establish trust and comfort among participants throughout the entire process. While best practices in participatory methods emphasize building and maintaining trust and comfort and remaining transparent and reflective throughout the research process, this requires taking the time and developing working relationships with respondents (Levine and Feinholz, 2015; McLain et al., 2013). Research priorities such as funding or publication cycles may not allow for the time needed, or researchers may not be comfortable approaching community members they have not engaged with previously who hold views different from themselves (Berger, 2015; Bryman and Cassell, 2006; David-Chavez et al., 2020; Hoʻomanawanui, 2012; Wiebe, 2020). Sometimes trust and comfort may already be established with existing relationships or "insider" researcher positionalities, which can facilitate mapping processes (Berger, 2015; Dodgson, 2019; Qu and Dumay, 2011). If done well, participatory methods may aid in minimizing power inequities, which can further facilitate trust and comfort (Berger, 2015; Dodgson, 2019). If done poorly, participants may not be comfortable sharing or information shared may be misrepresented and the research process itself may reinforce power dynamics and perpetuate harm, inequity, and discomfort.

Even when maintaining best practices in participatory research, social value mapping has a key limitation and tension, namely, seeking a spatial representation

axiomatically narrows values to those that can be mapped (Nahuelhual et al., 2016). Efforts have been dominated by concepts that are easier to map, such as ecological factors, uses, and activities, and monetary or stated preference methods (Bagstad et al., 2017, 2013; Nahuelhual et al., 2016). Mapping efforts typically are not very good at accommodating diverse values including cultural ecosystem services and relational values (i.e. "important of desirable, meaningful, and often reciprocal relationships" (IPBES, 2022a, p. 19)), or the reciprocal relationship humans have with their surrounding environment (Gould et al., 2019; Kenter and O'Connor, 2022). Many CES frameworks are based on anthropocentric instrumental connections with nature (i.e. "living from" nature framing) (IPBES, 2022a, 2022b; Kenter and O'Connor, 2022; Pascual et al., 2023). Relational values in comparison accommodate more diverse worldviews by acknowledging reciprocity and resonate with Indigenous kincentric worldviews (Gould et al., 2019). Relational values are rarely mapped, and when CES are mapped by focusing on recreation, aesthetics, uses, and activities, these reinforce the instrumental anthropocentric framing of living from nature. Moreover, the type of value, the questions asked, and the way they are asked can further narrow the values represented and may only represent the values of the researchers designing the mapping exercises (Nahuelhual et al., 2016).

While mapping human uses and activities conveys information about which areas are more heavily used, it does not identify the motivation for, nor what gives people meaning from, interacting with the environment. Mapping and quantitative stated preference methods are better suited to accommodating assigned values or those values of their worth, state, or preference (Horcea-Milcu et al., 2019; Kenter et al., 2015). Deeper meanings and connections that reflect social values are not well represented on maps that only ask about the locations where activities take place or places where those perceived values exist (Table 4.1). Assigned values or more of the beliefs and motivations (Horcea-Milcu et al., 2019; Kenter et al., 2015) are not well represented on maps or spatially methodologies. For example, mapping areas where fishing occurs does not show the importance and impacts of fishing to fishing communities, such as what relationships and connections are established and maintained from fishing, the diverse reasons why people may fish, how the community

may benefit from fishing, harms that may come from fishing (such as overfishing or fisher conflicts), and the harms and/or benefits from management on fisheries.

Maps that only reflect certain values can be misleading, even harmful. Incomplete and biased maps that only represent some values or activities can lead to an inaccurate and incomplete representation of place and a skewed representation of reality leading to poor decision making (Nahuelhual et al., 2016; Pascual et al., 2023). Moreover, the values or activities that are mapped become elevated to seem more important than other values that are not mapped, which can reinforce power dynamics and societal beliefs (McLain et al., 2013; Nahuelhual et al., 2016). Resources, activities, and monetary preferences represented on maps are also promoted for consideration in decision making, sometimes at the expense of other important values, like culturally important sites, which can lead to ineffective regulations, public dissatisfaction, biased planning, and user conflict (Hernandez, 2022; Pascua et al., 2017).

Maps from biased social value mapping processes can also cause harm to Indigenous Peoples. Social values can help define people's relationships to the land, but when the way these values are studied does not represent or even ignores Indigenous values, it perpetuates underrepresentation, even erasure, of Indigenous voices and values. This lack of or underrepresentation of Indigenous values and worldviews perpetuates ongoing harms of settler colonization. Wolfe (2006) defines settler colonialism as an ongoing structure continuing harms and injustices from colonizers invading and Indigenous territory to dispossess the people and culture to settle the area in perpetuity. Whether intentional or not, failing to include Indigenous People's way of life and identity as important social values to consider in mapping processes continues the erasure of Indigenous Peoples, reinforcing historic and ongoing traumas and injustices. Understanding Indigenous Knowledge and Indigenous socio-cultural concepts is paramount in resource planning as it can empower resilient but marginalized stakeholder groups, facilitate participation and engagement, lead to deliberation, and result in more informed and holistic decision making and decisions with better outcomes for all (Eriksson et al., 2019; Pascua et al., 2017).

There are growing mapping efforts that include Indigenous communities, however, a large proportion of this research is still done in ways that continue to harm

Indigenous Peoples and their Knowledge. For this reason, this body of research is not cited in my work. Some of the problematic aspects include researchers not being transparent about their positionality; research that does not clearly benefit or articulate ways it minimized harms to Indigenous Peoples; a lack of clarity on whether and how the research was conducted in partnership with communities; and the lack of evidence that the research was approved by Indigenous community, or if it fulfills their wants and needs. Ultimately a large amount of research with Indigenous communities still seems to be done in a way that elevates only the researchers' careers and answers research gaps identified by researchers without approval or partnership with Indigenous communities. While a greater representation and acknowledgement of Indigenous Knowledge and values are needed, reflexivity and considerations should be taken throughout the process. There is a growing body of literature that offers considerations and the ethical ways to engage in research with Indigenous Peoples' (e.g. Alegado et al., 2021; Drugge, 2016; Hernandez, 2022; Kwaymullina, 2016; Smith, 2012). This literature and understanding the need for participatory or Indigenous led research offers hope for change of problematic research practices with Indigenous communities. Some reflexive considerations for research being done with Indigenous communities includes asking why the research is being done, who the research benefiting, whether it stems from the Indigenous community, who is conducting the research, who is benefiting from the research, what are the power dynamics, is any knowledge being co-opted, who has ownership of the data and the research, and are the research outputs inclusive and accessible beyond research and academia (Hernandez, 2022; Smith, 2012).

In this research, I seek to better reflect a Native Hawaiian worldview and the deep genealogical relationships Hawaiians have with ʻāina (land) spatially. I am a Native Hawaiian researcher and use my own background and experiences with Indigenous Knowledge as well as dominant academia to work with my community to map Indigenous values. My previous research has explored the discipline of cultural ecosystem services to understand more about the deeper meanings and reasons humans seek out interactions with our surrounding environments (Chapter 2, 3). CES research often focuses on having generalizable categories that theoretically could be widely applicable. This is also true for mapping efforts using generalizable values as

well. However, these generalizable categories prioritize a narrow range of values and poorly represent reciprocal or relational values that are foundational to Indigenous worldviews (Chan et al., 2012; Comberti et al., 2015; Pascual et al., 2023). I seek to explore creative ways to map Indigenous values with my community in a participatory and reciprocal way to minimize harms as well as better represent the deeper connections and reciprocal relationships humans have to place. I also apply some of previous research from developing the levels of intensity tool to elicit CES and understanding some of the different types of connections and emotional depth that people have with their surrounding environments (Chapter 2, 3). I use the levels of intensity to spatially represent some of the different relational connections to place.

Research aims and approach

In this research, I examine Native Hawaiian worldviews to highlight challenges and perspectives of including Indigenous values in participatory mapping as a way to broaden social values mapping research. Native Hawaiian worldviews are connected to land (including all waters), as the land– or ʻāina– is foundational to Hawaiian identity and Hawaiian well-being; ʻāina is the embodiment of our culture (Kikiloi, 2010). All Indigenous worldviews are unique, yet there are many commonalities that may overlap due to similar cultural foundations based on connections to the land and sea. Neglecting to develop methods that represent Indigenous values gives them an implicit value of zero, leaving them out of management conversations and considerations, and gives the perception that the social values of Indigenous Knowledge are unimportant. In this work, I aim to produce maps that are useful to managers, including spatial representation of Indigenous values and hot spots of these values and their significance, while also still providing in-depth information and a deeper understanding of the meanings behind the values and the maps and ensuring they are created and shared in ways that are approved by Native Hawaiian participants. My aim is to overcome the potential harms to communities from management that is based on missing or inaccurate representations of their social values. While my perspective is uniquely Hawaiian, the research is more broadly useful to Indigenous Peoples advocating for their values to be heard by piloting a method that can be adapted to other places, cultures, and reciprocal values.

I explored one Native Hawaiian value, kuleana, that emerged in previous research as an important connection and value for people and their surrounding environment (Chapter 3). While exploring seemingly "one" value, I reveal more about the diverse connections, practices, Knowledge, and values stemming from kuleana. Existing social value classifications (Table 4.1) do not accommodate or acknowledge Native Hawaiian values, yet my previous research suggests that relationships of kuleana encompass many important values and connections outlined in established social value and CES classifications. Kuleana is a Native Hawaiian cultural value that highlights Indigenous relationships to place from a sense of responsibility and privilege. Kuleana also highlights and informs understanding of relational values. Relational values specifically recognize reciprocal relationships between humans and nature (Berghöfer et al., 2022; Chan et al., 2018, 2012; Comberti et al., 2015; Gould et al., 2019; Kenter and O'Connor, 2022) and are recently emerging as important social values to be explored and included in resource management. Gould et al. (2019) recognize kuleana, described as a Native Hawaiian value that embodies human-nature relationships, into the relational values research field, noting that the concept can elevate our understanding of the connections and influences between humans and our environment in socio-ecological systems. Additionally, Gould et al. (2019) note that the concept of relational values has the potential to accommodate and represent Indigenous values such as kuleana. Many other scholars have also noted the relational and reciprocal foundations of kuleana. Some ways scholars have described kuleana include as a relational guideline and action (de Silva, 2022), as a concept it "includes the sense of obligation as well as the honor of the relationship therein" (Kaʻanehe, 2020, p. 75), understanding the familial relationships with our surrounding environment we must care for and be cared for in return (Reyes, 2018), as an "authority and obligation based on interdependence and community" (Goodyear-Kaopua, 2011, p. 131), and as a methodologic concept to inspire relational ethics (George and Wiebe, 2020). A greater understanding of kuleana has the potential to inform and improve resource management and also elevate and inform many research disciplines.

As management agencies seek to understand the connections within SES through concepts such as ecosystem services, especially as there have been federal memorandums to include ecosystem services into decision making (e.g. EPA, USDA, USGS), methodologies to understand these connections currently are limited in their ability to represent diverse values and worldviews. This research is a part of NOAA's West Hawaiʻi Integrated Ecosystem Assessment, a nation-wide effort of place-based assessment to elevate ecosystem-based fisheries management efforts (Monaco et al., 2021). My initial research prompt for this project was to spatially represent social values for the NOAA West Hawaiʻi IEA to better understand some of the human perceptions and socio-cultural importance of place. I sought to design and carry out a mapping effort to better accommodate Indigenous knowledge and diverse values of cultural ecosystem services and relational values.

Why map kuleana

The relational aspect of kuleana and the diverse relationships and value connections of kuleana lend themselves to mapping. Recalling the types of human ecology mapping outlined by McLain et al. (2013), mapping kuleana has the potential to cross all three types of human ecology mappings. Mapping kuleana will identify spatial relationships of culturally important areas, activities, and resources, which is the objective of sense of place mapping. Understanding participants' relationships of kuleana (presently, ancestrally, and genealogically) and those activities and practices related to kuleana supports the objectives of local ecological knowledge mapping. Land ownership was not a concept to Native Hawaiians until foreign contact. Kuleana and the corresponding sense of responsibility was and still is our connection to the land and implies a sense of authority or "ownership" (though without land titles) and as such this supports objectives of the final type, tenure and resource mapping.

Kuleana embodies the reciprocal familial relationships Native Hawaiians have with ʻāina and all its inhabitants (Beamer, 2014; Gould et al., 2019; Kameʻeleihiwa, 1992; Reyes, 2018). Kuleana is a deep and broad concept that crosses many disciplines including political science and sovereignty (Case, 2021; Noenoe K Silva, 2004; Osorio, 2021), education (Kaʻanehe, 2020; Meyer, 1998; Reyes, 2018), and

resource management (Gould et al., 2019; Osorio, 2021; Vaughan, 2018; Vaughan et al., 2017). Many scholars have mentioned kuleana as a value in their work or as part of a description though have not explored the concept in depth. While kuleana offers an opportunity to provide more understanding and representation of Native Hawaiian values and relational values, it is important to note that just like most other Hawaiian words and concepts, kuleana does not have a commensurable, or equal, translation in English. As defined in the Hawaiian dictionary, kuleana can mean right, privilege, concern, responsibility, title, business, property, estate, portion, jurisdiction, authority, liability, interest, claim, ownership, tenure, affair, province, reason, cause, function, justification, and relative ("kuleana — Wehe²wiki² Hawaiian Language Dictionaries," n.d.; Pukui and Elbert, 1986). In this chapter, some Hawaiian words are given paraphrased translations to add in some understanding but readers should acknowledge that their whole and true meaning are not captured well in English. For more Hawaiian translation and definitions, the website wehewehe can be used as a resource ("Wehe²wiki² Hawaiian Language Dictionaries," n.d.).

I chose to map kuleana because it embodies a diversity of meanings and significance. As is elaborated in the results section, when used today, kuleana is often translated as responsibility. Kuleana, like responsibility, can have a weight to it and can be either a gift or a burden, or both. Kuleana can be cherished to some and to others it is not always wanted. Kuleana can also mean authority or ownership. Osorio (2021) cautions that some of these definitions such as "property", "estate", "title", "claim", and "ownership" show how the "term and value of kuleana have been appropriated and commodified to assist in creating and maintaining the US occupation and settler colonialism in Hawaiʻi" (pg. 126). It is important to recognize these changing and commodified meanings of kuleana and understand that before foreign contact Hawaiians did not have land ownership. Rather we had kuleana to places and its inhabitants. To this day, even when Native Hawaiians do not own land, they still have kuleana. Kuleana means more to Hawaiians than ownership ever could and this kuleana and authority of kuleana persists despite conflicting land value and management systems. Native Hawaiians today have many obstacles to maintaining their kuleana including inaccessibility to areas from land ownership and modern

management systems (Ayers et al., 2018; de Silva, 2022; Goodyear-Kaopua, 2011; Osorio, 2021).

Another reason I chose to map kuleana is due to its prevalence in the results of my workshops exploring Cultural Ecosystem Services (CES) (see Chapter 3). In these workshops, participants were asked to list concepts that came to mind under 14 different CES categories (see table 4.2). Participants mentioned kuleana in seven out of nine workshops. In six (bequest, ceremony, fulfilling stewardship, identity, sense of place, and spirituality) out of the 14 CES categories, kuleana was cited as an important concept. Participants elevated kuleana to a key concept for three CES (bequest, fulfilling stewardship, and sense of place), meaning that participants felt that kuleana was a representative and significant concept for the CES. Key concepts were further discussed and used during the workshop activity (for more on the workshops see chapter 3). Kuleana was also the most frequently chosen concept out of all the concepts over all the workshops (chosen 28 times overall) and was a concept that represented the most CES overall implying that kuleana is one of the most representative, important, or all-encompassing concepts for CES for my workshops.

Table 4.2 CES categories and their definitions used in my workshops in chapter 2. These definitions come from research done by Ingram and others conducting interviews to understand CES in West Hawaiʻi (Ingram, 2019, 2020; Ingram et al., 2018; Leong et al., 2019). The green cells highlight the categories that kuleana was listed as an example concept. Those CES that are bolded are those that kuleana was further chosen as a key representative concept for that CES.

CES	Definition
Aesthetics (AES)	Satisfaction or meaning from visual characteristics or beauty of the reefs or coast; also includes satisfaction from sensory experiences (e.g. soundscapes, feel of wind, etc.)
Bequest (BEQ)	**Importance of reefs for future generations, includes sharing experiences with younger generations**
Ceremony (CER)	Importance of reefs (or the greater coastal/marine area) for ceremonies
Education and Knowledge (EDK)	Local knowledge about the coastal and marine environment

Existence (EXI)	The coastal and marine environments matter simply because they exist, because they are a part of Earth, and/or because they have a right to exist
Fulfilling stewardship (FST)	**Caring for the coastal and marine environment because it provides benefit/satisfaction; ability to care for resources**
Heritage, tradition, and culture (HTC)	Multi-generational interactions/connections with natural resources, connection to cultural traditions, stories, and/or past events; archaeological and historic sites; cultural resources; acceptable historic change
Identity (IDT)	Sense of self, community, personal or communal identity, and/or home in relation to the coastal or marine environment
Inspiration (INS)	Specifically for art or other forms of creative expression; local artistic or creative practices
Recreation (REC)	Playing, leisure, and activities related to coastal and marine environments; includes extractive and non-extractive activities
Sacredness (SAC)	Expressions of coastal and marine environments having sacred or religious significance
Sense of place (SOP)	**Reefs or coastal environment contribute to one‘s sense of belonging or feeling at home; sense of self, community, and/or home related to the coastal and marine environment**
Social relations (SOR)	Strengthening ties in family or community; presence of strong social ties or networks; sense of community; trust in neighbors
Spirituality (SPR)	Metaphysical forces larger than oneself or beyond one’s comprehension; interacting with the coast/ocean to perpetuate spiritual beliefs and practices (e.g. divine power)

My choice to map kuleana is also based on the concept’s embodiment of relational and reciprocal practices foundational both in connecting humans and their surrounding environment and to Indigenous worldviews. Relational values have proven to be a promising area of research for exploring the connections between humans and our environments but the intangibility of concepts, relative newness of the research area, and even disagreements about the definitions of relational values have added to difficulties of operationalizing these concepts. Spatially representing kuleana has the potential to elevate our understanding of relational values and in turn the disciplines of

social values and CES by providing a more tangible spatial relation of this value. A prominent critique of CES as a representation of how humans value nature is that CES (and ecosystem services in general) only depicts a one-way flow of benefits from nature to humans and does not acknowledge the reciprocity between humans and nature (Calcagni et al., 2019; Chan et al., 2012; Comberti et al., 2015). Kuleana overcomes this challenge, as it represents the reciprocity between humans and nature through our diverse connections and stewardship with our environment. Kuleana highlights relational values as it often describes a relationship to place and a need to care for and in turn be cared for (Gould et al., 2015).

The nuances of kuleana provide a meaningful research opportunity in identifying culturally important areas, practices, and species of the nearshore environment. These aspects are what managers tend to focus on in management decisions, but I present these relationships to place in new ways to accommodate Indigenous worldviews and Knowledge. I argue that knowing the areas for which people hold a sense of kuleana, can contribute to a more holistic representation of the social values that people place on the coastal marine environment. This, in turn, can build a better understanding of how management practices may interact with or impact the community.

Methods

This study is a part of the West Hawai’i Integrated Ecosystem Assessment (IEA) and I focus on key informants within the study area of West Hawai‘i (extending from ‘Upolu point to Ka Lae) (Figure 4.1).

Figure 4.1 Map of the general study area from Ka Lae to 'Upolu point with the areas of kuleana identified by participants shaded.

I conducted key informant interviews using participatory mapping to better understand and represent an Indigenous Native Hawaiian worldview and relationships to place. Key informants included highly skilled professionals and people with substantial experience not possessed by others (Aguinis and Solarino, 2019). I sought participants who are community leaders, ancestral descendants with genealogical relationships to West Hawaiʻi, and those with extensive knowledge and relationships with certain places within West Hawaiʻi. Some participants were a combination of those aspects with deep connections and kuleana to West Hawaiʻi. Based on these criteria, I identified an initial set of 29 individuals and families I believed had the knowledge and relationships to place. I identified these individuals from my own relationships and knowledge of individuals as a community member and from my previous work and research with community groups engaged in place-based management. Of those that were interviewed, they were also asked who they felt should be included in this study with that understanding. In total 15 interviews were conducted with 24 individuals overall. Interviews were done with individuals, duos, and the largest as a family with 6 interviewees at once. Majority of the interviewees were kupuna (>50 years old) with only 5 interviewees being under 50. 15 interviewees were male or masculine presenting and 9 were female or feminine presenting. I did not ask for gender identity during the interview, but no interviewees referred to themselves individually in words or pronouns other than feminine or masculine.

A brief explanation of a Native Hawaiian worldview is needed to explain why I sought key informants and spoke to them of their relationships of kuleana. This explanation may also help to explain that not everyone has the authority to speak on cultural identities of places even if they are Native Hawaiian. Knowledge holders may be perceived as the leaders and authorities to speak on cultural identities. Knowledge holders are those individuals of Indigenous or local communities that are understood as experts of certain knowledge or practices from their community (IPBES, 2022b). In Hawaiʻi, the land and place is foundational to a Hawaiian worldview and to Hawaiian culture, identity, and well-being (Kikiloi, 2010; Kurashima et al., 2018; Pascua et al., 2017). The land, or ʻāina, represents an ongoing relationship to place, to emotions, to

memory, to culture, to ancestors, to genealogy, and to akua (gods/deities) that persist through time (Andrade, 2013; Hoʻomanawanui, 2012; Kikiloi, 2010; Kikiloi et al., 2017; Kurashima et al., 2018). To better understand the significance of place and the meanings of place to people requires spending time in place, listening to place, listening to others, reflecting, remembering, looking at various data sources, looking to forgotten sources, and taking time to know and digest a Hawaiian worldview (Hoʻomanawanui, 2012). To understand a Hawaiian worldview you need to understand the genealogy of place and the Hawaiian genealogical relationship to place, you need to learn from the land, learn from those who learn from the land, and you need to recognize the Hawaiian familial bond to the world, to their akua, to their ʻaumakua (ancestral deities/guardians) and to all elements and living beings in the world (Andrade, 2013).

Participants of Hawaiian ancestry with generational or deep connections to place are foundational to understanding a Hawaiian worldview and the history and socio-cultural significance of West Hawaiʻi. The participants of this study helped represent the deep history of place and helped to identify how this genealogical connection is foundational to the cultural identity of place. In addition, participants have extensive knowledge of the places they have kuleana with and learn from the land. Participatory mapping exercises explored participants' relationship to place through their kuleana to gather an in-depth understanding of their relationship, genealogy, ancestry, emotion, memory, and spirituality to place and all that that may entail. As mentioned previously, the participants of this study have connections to different ahupuaʻa (land divisions) spread throughout West Hawaiʻi that developed through their lifetime and/or genealogical connection. Participants are also leaders of a diversity of practices within these places including ceremony, hula, fishing, moʻolelo, education, poetry/language, and geography.

Positionality and ethics

Care and consideration are needed in any participatory research and especially with mapping as various harms, such as the exploitation of areas, can come from spatially representing information. As any good researcher would, I strove to be transparent and reflexive throughout the research process. One strong advantage I

have in this research is that I am a Native Hawaiian Indigenous scientist doing research with my own community to represent their and our kuleana to place. Being Native Hawaiian and working with my community gives me insider knowledge about the place, context, histories and social dynamics that help me understand my participants' perspective and to accurately portray their beliefs and experiences. I have further kuleana working with my community as I feel a strong responsibility towards them to ensure I minimize harms to participants, accurately represent information, and aid in uplifting my community‘s voices and concerns. There may be some disadvantages to being an insider such as assumed knowledge and a lack of consideration of knowledge gaps or needs from others. However, I also have “outsider” training through academic education and working with a management agency for this project. As such, I was able to apply an outsider lens from an academic and management perspective to understand where there may be limits in knowledge and how I can serve as a bridge and translator for Indigenous Knowledge and values in an academic and management setting.

By virtue of being a Native Hawaiian Indigenous researcher doing a study with and in my community, I am telling my story and perspective along with my participants in this work. I will not contribute to harms of appropriation that might occur if an outsider conducted the research. I am still aware of sensitivities and harms of co-opting knowledge and took many steps to ensure reciprocity throughout my research process. One of the biggest challenges and harms when doing research with Indigenous communities is that Indigenous Knowledge is often co-opted and appropriated by researchers (Hernandez, 2022). I worked to ensure participants had ownership of their own data and knowledge (reinforced with the consent form) and ensured I minimized harms to my participants by taking a participatory approach and considering potential harms from mapping. While there are a lot of harms that can come from spatially representing information, which, unfortunately, many of my participants themselves have experienced, I tried to make sure no one felt forced to map and that mapping itself was completely voluntary. While there are also potential harms from excluding knowledge and information, having knowledge known about spatial areas such as species composition, population density, and movement of species can lead to their

exploitation. Similarly, the accessibility of knowledge of locations and the resources of areas can lead to overuse and exploitation.

I strove to ensure reciprocity to overcome the power imbalances and extractiveness that can come with research. While participants may consent to participating in the research process, the researcher ultimately controls the narrative of what is shared, how, and with whom. All of which can contribute to and can create inequities. Transparency and participation throughout the research process can aid in addressing some of these inequities. I also took further steps where possible to address inequities and make the research process more reciprocal. The first step comes with consent and IRB approval (#19449 and #18268) in the research. See Appendix 1 for the consent form to participate in my research. Within my consent form and for participants participating within my research, they have the authority to share only what they want shared and the consent form addresses that they are the owners and authority of their own data and knowledge and not me as the researcher. What that means is whatever they share, they have the authority to approve what can be shared out from the research. I as the researcher also sign the consent form to acknowledge their authority and my own responsibility to my participants to accurately reflect their perspectives, only share what they approve, and to minimize harms to the best of my ability. Following on the consent forms contents, the interviews themselves were recorded and transcribed. These recordings and transcriptions were shared back with participants as well as draft maps and highlights of key points from their interviews that contributed to themes and meanings of kuleana. Participants then could give further input on these maps and key points shared or approve or disprove anything to be shared/used or not.

Interviews and participatory mapping

The key informant interviews started with an overview of the project, going over the consent forms, and checking in with the participant(s)'s understanding and comfort. After the initial consultation, when participants were ready to start the interview, I led the semi-structured interview with the question: "What does kuleana mean to you?". Follow up questions included: what types of kuleana do they have; where do they have kuleana; what changes have happened, if any, to their kuleana; what are some positive

or negative impacts to their kuleana; and what threats may there be to their past, present and future kuleana (see Appendix 2 for the entire interview guide). When asked where they have kuleana, as well as at different times throughout the interview and during end wrap up questions, if deemed appropriate, I asked participants if they wanted to draw areas on the map (on the island of Hawaiʻi using ArcGIS Earth ("3D Earth Map | Earth App for Desktop & Mobile | ArcGIS Earth," n.d.) where they perceived they have kuleana. I had printed maps available, but no participants used those. To map, I had ArcGIS Earth on a computer and, if possible, in the interview location, projected on a screen. Participants would tell me, point, or use a pointer to show areas they mapped while I physically drew the areas on the computer using ArcGIS Earth. Participants could see the areas while they were being drawn and we could edit them or change them as needed. While I asked if they wanted to map, I also reassured them that they did not have to. I also gave them the option, if they were comfortable, for me to map areas for them after the interview and to send to them to approve or disapprove. Not everyone actively physically mapped with me, but I did create maps approved by the participants for every interview. For five interviews, participants did not actively map but instead verbally told me areas to be mapped or other maps to reference. In each interview, the participants mapped multiple areas and in the different areas they discussed the different relationships and connections to that area and why they mapped them.

Mapping analysis

I recorded, transcribed, organized, and coded the interviews. I uploaded and coded the interviews in a qualitative data analysis software, Dedoose ("Dedoose," 2021). Coding is an approach to where researchers create conceptual relationships from data (Glaser, 1967). Coding is essentially organizing texts, in this case from interview transcripts, to organize and aggregate them to make sense of things and realize themes to understand the data (Deterding and Waters, 2021). I created first order codes of themes based on interview questions, and second order codes on key meanings discussed during the interviews. Specifically, I created first order codes on the (i) meaning of kuleana, (ii) types of kuleana, (iii) changes in kuleana, and (iv) impacts,

threats, and considerations of kuleana. Based on the discussions and codes I created second level codes for the meaning of kuleana describing more on its nuances and how kuleana is important to identity but also has physical expressions of it as well. I created further second level codes on the impacts, threats and considerations of kuleana outlining the specific aspects participants discussed in their interviews (development, money and economics, tourism/foreigners, management, food security and land planning, colonization, and perpetuation).

Mapping discussions informed second level codes for types of kuleana and the levels of intensity. From the mapping discussions I created specific categories for types of kuleana (moʻolelo/wahi pana, ʻohana/moʻokūʻauhau, hana/mākau, kiaʻi/mālama, lahulu/kino lau, ʻike/noʻeau, and aʻo/mau). Once I created these types of kuleana from all the interview mapping discussions, I then went back to each interview to review discussions around spatial connections to kuleana. If participants discussed aspects of the types of kuleana, I assigned that type to the mapped area being discussed. I also inferred meanings for the levels of intensity based on the mapping discussions. The levels of intensity is a tool I created previously (see chapter 2 and 3) to reveal more about the types of connections and meanings people have with their surrounding environment. If participants spoke about specific connections or relationships, they had to the areas they mapped, I assigned those levels to the mapped areas.

Participatory mapping resulted in mapped areas of various sizes and specificity. For example, some participants pinpointed small exact areas and others mapped entire ahupuaʻa boundaries or other large swaths of land. The initial mapped areas from the mapping exercise were buffered (adding a unit of distance to increase the mapped size) using the buffering tool in ArcGIS (ArcGIS Pro, n.d.), the scale of the buffer differed depending on the area and type of figure mapped (point, line, polygon). I used buffering to create more uniform sized mapped areas–make the smaller specified points larger to be closer in size to the large swaths of land though still significant smaller to maintain their meaning–as well as obscure sensitive areas. Mapped areas of similar sizes or types were given more uniform buffering where appropriate. For example, a specific uniformity was given to ahupuaʻas. Many participants discussed kuleana in ahupuaʻa boundaries, yet my base map only extended to the coastline. Many participants noted

that ahupuaʻas extends into the ocean to a certain depth or distance, so I created a uniform buffer for the ahupuaʻa boundaries. The overall buffered amounts are not specified to protect the sensitive information of both the participants and the mapped areas (Koch, 2020; Mattern, 2015). Sensitive areas are protected so that these areas are not exploited or disrespected. These geospatial practices are not new and have been used in other cases, e.g. not revealing the exact location of endangered or sensitive species so they do not get harmed (Chapman, 2020; "iNaturalist," n.d.).

I inferred types of kuleana and levels of intensity for the mapped polygons. I assigned mapped areas with these kuleana types and intensities if participants discussed aspects of their meanings (for example if participants discussed areas where they have family lands or ancestral connections to that mapped area was coded with the kuleana type "ʻohana/moʻokūʻauhau). I added the data in the attribute table into GIS with the table noting the mapped polygons and the presence or absence of the various types of kuleana and levels of intensity. The attribute table of the polygons was used to create hot spot maps of the various kuleana types and levels of intensity. These hot spots are areas where participants identified types of kuleana and levels of intensity, but it is important to note that areas that were not identified in interviews are not devoid of values or kuleana, so should not be thought of as "cold spots".

When polygons were buffered, this resulted in polygons overlapping for the individual interviews. So, when the polygons of the same interview overlapped, the polygons and their corresponding kuleana types were then combined into one polygon. To clarify, if two polygons overlapped and were coded with Polygon A having ʻohana/moʻokūʻauhau and Polygon B having ʻohana/moʻokūʻauhau and hana/mākau they would be combined into Polygon AB with ʻohana/moʻokūʻauhau and hana/mākau. This was done so as to not seemingly double count kuleana for the same interview. Additionally, the kuleana that participants may have can cross multiple areas even if mapped in different polygons. When the buffering and combination of polygons was complete each interview would then not have overlapping polygons. When the maps are shown for each kuleana type (Figure 3-9) if polygons overlap and show a brighter color on the map this means that multiple interviews mapped that kuleana type for that area. The brighter the color, the more interviews discussed that kuleana type for that area.

Results

Meaning of kuleana

This first section explores the nuances of how the participants described the meaning of kuleana. While other researchers and academics have applied or described kuleana (e.g. Case, 2021; Kaʻanehe, 2020; Noenoe K Silva, 2004; Osorio, 2021; Reyes, 2018), as a Hawaiian value representative of human-nature connections, they have not unpacked detailed perceptions and meanings of kuleana. This section outlines an in-depth exploration of the nuances of meanings and connections that kuleana has as a foundational Native Hawaiian value.

Discussion from the interviews indicated that kuleana differs among people and can be a conceptually complex value that is very personal/familial. Participants reported diverse meanings of kuleana based on having different types of kuleana or different kuleana to different areas, resources, and activities. The complexity of kuleana is driven by the fact that it can be a feeling or a state of being; it is innate, a way of life; and it can be physical and actionable. It is all of those things at once and can have different expressions based on the person and aspect of kuleana. Moreover, despite having a personal and familial meaning and drive, it is also a force that emanates connections of how our kuleana, if properly understood and recognized, connects us to each other and all inhabitants and forces of this universe. However, there are strong common threads throughout discussions on the meanings of kuleana and the sections below outline some of these commonalities.

Kuleana and responsibility

Every interview participant recognized that part of the meaning of kuleana is responsibility, which is a commonly used definition of the word. As one interviewee noted, the connection of kuleana and responsibility:

> “Kuleana means to me, it’s what I've been given and what I need to steward and be responsible for. It’s something more intimate than not. So kuleana to me is an intimacy.” (ID: 22240708)

Participants also elaborated on how responsibility still does not quite capture the meaning of kuleana. Part of this meaning and understanding is also recognizing our identity and what it means to be Hawaiian. The meaning of kuleana differs depending on our identity as well as how we need to understand our sense of place. One kupuna explains,

> "Kuleana is more than just life. It's more than just being purposeful or existing is what I'm saying. That is why I said 'responsibility' as a whole. When you talk about kuleana with the kānaka, then that's altogether a different category. But when you just say the word 'kuleana', the interpretation of that is different [from responsibility]. It's a totally different thing. The description. It [kuleana] becomes a descriptive word rather than being a definitive word… It's not a responsibility that is a task. But it becomes descriptive because us as kanakas, being a race, and being with kuleana, it becomes a descriptive word." (ID: 22240714)

In describing kuleana as "descriptive" this kupuna is noting how kuleana is also part of Hawaiian identity and is inherent in our being. Kuleana is not just a word you can define but is also part of Hawaiians as people and as culture.

Reciprocity

Part of the discussions about kuleana and its meaning and complications were also surrounding the reciprocal foundations of kuleana. The reciprocity aspect also helped to explain how the meaning of kuleana is different and more than responsibility. Examples of this reciprocity as explained by interviewees:

> "Kuleana is the reciprocal relationship that we have as kamaʻāina—children of the land, including the waters of it—with ʻāina… It's not a metaphor, it's an actual physical relationship. ʻĀina supports the weight of our lives from birth until we're committed back to it at the end of our waking lives. So, it's that reciprocal relationship" (ID: 22120630).

> "I think [it] is broader in it, just simply more than responsibility. It's the pilina and the relationship of what is entailed with that responsibility. Ya know, so the give and take." (ID: 22240708)

The reciprocity of kuleana is also understanding our own role and our place in society and the world. This recognizes the gifts we receive and how kuleana itself can be a gift but can also be a burden and take sacrifices as this interviewee elaborates:

> “But, to me, the word kuleana has more weight than just responsibility. It’s sort of like… I don’t know. Like a mantle you take up. A code that you put yourself to. Because it’s not just something you’re inheriting. Like, it’s a two-way street, like, it’s taking up that mantle from your ancestors but also it can come at personal sacrifice. You know what I mean? So, many people think it’s like right and responsibility are hand-in-hand. But to me, it’s like kuleana is something that’s called upon you and you have to answer it through your own blood. Through your own sacrifice. And, you’re blessed for it. But it’s not something that is just given. It is earned and you continue to pay it.” (ID: 22240616)

Kuleana as a burden and a gift

Kuleana is often described as a burden and a gift but it is also explained as being a privilege. One participant notes kuleana being a gift and a privilege through knowing our place in the world:

> “Kuleana is a privilege more so than what might be thought of as a right. I have a right to this; I have a right to that. It is a privilege and honor, it's a gift. And so, we should treat it as such. Treat your kuleana as if it were that privilege, a privilege, and that you, with all of those knowings your interactions, your actions, your reactions are as they should be. And I think it's about not being out of place or out of step with anything, but rather being in step with something again, whatever it might be. Natural processes, seasons, knowing how to, when to, when not to” (ID: 22120819).

Another elaborates more on kuleana being a burden as:

> “What the word kuleana means, you know, being an honor, but understanding what they meant in that definition [of kuleana] being a burden. Like, you wouldn’t even want to give that burden away to someone else, even in your family, because at an emotional level it is something I know was mine” (ID: 22120711).

Despite the heaviness and dauntingness that kuleana can have, during explanations one participant talks about kuleana being not heavy laden but joy laden and being profound, deep but also fun. Another explains more about how kuleana is a gift and is not heavy:

> “And then it's really about stewardship and what is my part in it. And it's a continual moving and changing. Yeah, kuleana to me doesn't feel heavy. That's one thing I do know. When it's a kuleana, it doesn't feel heavy because it's a gift. It's like a gift. It has more. It gives me more than I give back into. These words that say stewardship or responsibility. And, you know, of course the Hawaiian words capture it much, much better than those English ones that I'm using right now. But on the mālama and all of that, it's just all a part of the aloha. That is part

of the gift. The ‘āina. So, it's that whole recognition that makes kuleana a gift. So, you just, kind of like it's part of loving back into what's been given or and then what is the living in on top of that” (ID: 22120813)

Expressing kuleana

Further conversations about kuleana reveal that it is innate and a state of being but it can also have different expressions. Along with kuleana being a deep, profound, and complex term many participants also noted kuleana as being actionable and physical. Discussions about kuleana being actionable included:

> “So kuleana also, is an actionable item. So, you can have kuleana for something, you know, and feel like you need to take care of it, but you need to also put some action behind them, I think. And that's been the most difficult thing because not everybody has the same feelings [on] what kuleana should be.” (ID: 22120706)

Others commented on how kuleana can be physical

> “I mean, kuleana, sometimes it’s a physical task of taking care of something or having responsibility for” (ID: 22120711).

> “[Kuleana is] physical. As soon as I hear the word kuleana I see when I grew up, you clearly saw physical manifestations of kuleana because there were very low rock walls, there is kuleana. And he always knew, oh, that's his kuleana that's so-and-so's kuleana. You immediately knew, you know, you had physical awareness of it. But I'm also talking about kuleana that's a responsibility in us that requires action.” (ID: 22120813)

Some other actionable expressions of kuleana include sharing and teaching. Some participants noted:

> “Kuleana would be sharing knowledge, teaching principles, perpetuating tradition in my family. And that’s more of defined in responsibility. But, for kuleana, for Hawaiian, it’s teaching my mo’opuna what I know that has been handed down from my father, what he knew by his father. That is kuleana. When we transfer our knowledge. What I know, to the next generation. And that’s my responsibility, to just do that. Not necessarily what I know, but to just transfer.” (ID: 22240714)

> “Kuleana means helping each other out. Even in the environment that has been taught by mākua, our elders, and living their dreams and passing it on. You know, sharing, that’s what it is.” (ID: 22460809)

As part of being actionable, knowing how and when to act or not to act is also another important aspect of kuleana as one participant said:

> "And in those interactions, when do I say something? When do words come out of my mouth? When there is a time to have hāmau ka leo to not be speaking, to rather observe, to watch, to listen, to receive, to feel. So, any of those interactions, I think there's kuleana all the way around" (ID: 22120819

Authority and sense of place

Part of the physical aspects of kuleana is the sense of place or place attachment that can come with kuleana. When discussing physical and spatial kuleana, especially during mapping discussions, all interviewees explained that kuleana is extensive and far reaching. Some noted the global and universal aspects of kuleana as we are a universe connected in different ways, and those connections have kuleana with them. However, spatially, there are different ways kuleana can be strengthened and where we live, work or frequent is where we have greater kuleana.

All participants in this study noted that they have connections to the entirety of West Hawaiʻi and that their kuleana extends to the whole pae ʻāina (archipelago). These are still deep and profound connections of kuleana. However, the authority of our kuleana does not necessarily extend throughout the entirety of West Hawaiʻi or the pae ʻāina. One kupuna noted, "The ʻāina, that we as kamaʻāina have kuleana for, far exceeds our authority over." (ID: 22120630). In addition, our kuleana can be carried with us and can extend beyond where we frequent as another kupuna talked on how we have kuleana to "mālama the places even if we don't spend the time there" (ID: 22120629). We also carry our kuleana with us as we go other places and while our kuleana may differ in different places we still have kuleana. One interviewee said:

> "So, the Kuleana also has a very strong sense of place for me. I certainly wouldn't feel the same kuleana if I were, let's say, traveling to California or someplace because I'm thinking there are people there who have that kuleana and should be taking action on it. But I certainly wouldn't go somewhere else and mistreat it either. So that's the personal kuleana that I carry for me, for myself or with myself or with my family." (ID: 22120706)

Another aspect of authority and kuleana is noting the collective kuleana we in Hawaiʻi have, and how we also have each other to lean on. While our kuleana from place to place can differ, there are those from that area that may have a stronger authority that we have to that area, it is also our kuleana to support them and have them as support. With that support we know that they are taking care of their area so we can

take care of our own areas and vice versa. This also extends to species and knowledge/learning. There are those that have more authority over certain practices or stewarding certain species and these can all connect and overlap and extend throughout the pae ʻāina. There is the reciprocal understanding that we have kuleana to support each other and be supported to continue our own kuleana. As one participant notes that these practices, knowledge, and learnings can be so vast that not one person can take it all in. So, there is comfort and kuleana in being able to support each other and help perpetuate knowledge and practices forward by recognizing the roles we all fill.

Types of kuleana

While there are many broad connections and relationships of kuleana as described above, I describe in this section the types of kuleana that emerged during discussions during mapping. As mentioned in the methods, these "types" of kuleana were coded based on how participants discussed their kuleana spatially. After I coded these types of kuleana I then went back through the mapped areas and assigned the types of kuleana to the mapped areas if participants discussed attributes of the types of kuleana when spatially mapping areas. Besides these types of kuleana discussed spatially, some participants did describe other meanings and expressions of kuleana. Some types of kuleana that were explained by interviews included the prioritization of kuleana depending on the closeness or social relation of kuleana particularly to the individual (personal), family, and to the community/environment. One participant explained how these kuleana are connected "in a basic term, [kuleana is] just our responsibility to ourselves, to our place, our community, and finally to our culture" (ID: 22120826). Another explained the types of kuleana and how the priority must be to ourselves as well:

> "There's kuleana to self, first and foremost, what is like kuleana to me, that is one variation, if you will, or one type of kuleana. Then I have a kuleana to my ʻohana. I have a kuleana to my environment, my surroundings, my kulāiwi, my homelands [of] Hawaiʻi, my island home. I have a kuleana to my community, immediate community and otherwise there's right, they also look at kuleana as roles and responsibilities, functions. I have a function as a daughter, a sister, a māmā, a wife, a friend, a peer, a hoa ʻāina. I think those are some of the types of kuleana I might have" (ID: 22120819).

Knowing your function and relationship is important in the kuleana you have, and your place whether it be in your family, in your community, or in what skills you have. One participant explained:

> “Depending on what your role in society is. My role as a father, my role as a husband, my role as a brother, uncle. Those relationships, and then for my role in the greater society, there’s my role in the community. Although I have certain skills, certain knowledge, and using those skills and knowledge to help my community. You know, to make it a safer, better place for all of us to live. And it expands from there, and whatever environment I happen to be in, we all have a certain kuleana” (ID: 22120802).

In addition to the various relationships that drive kuleana, mapping kuleana revealed other spatial expressions of kuleana. These are what were coded as “types of kuleana” and reflect on the meaning of kuleana and how it was discussed spatially and on what aspects of kuleana were mapped. The types of kuleana described here are also descriptions of the mapped types of kuleana (see Figure 4.2). These types of kuleana and the meanings of them remain broad with diverse components among them to also minimize harms and specifics on mapping. I will explain each type of kuleana briefly but the types of kuleana as were inferred from mapping with interviewees are: moʻolelo/wahi pana, ʻohana/moʻokuauhau, hana/mākau, kiaʻi/mālama, lāhulu/kino lau, ʻike/noʻeau, and aʻo/mau.

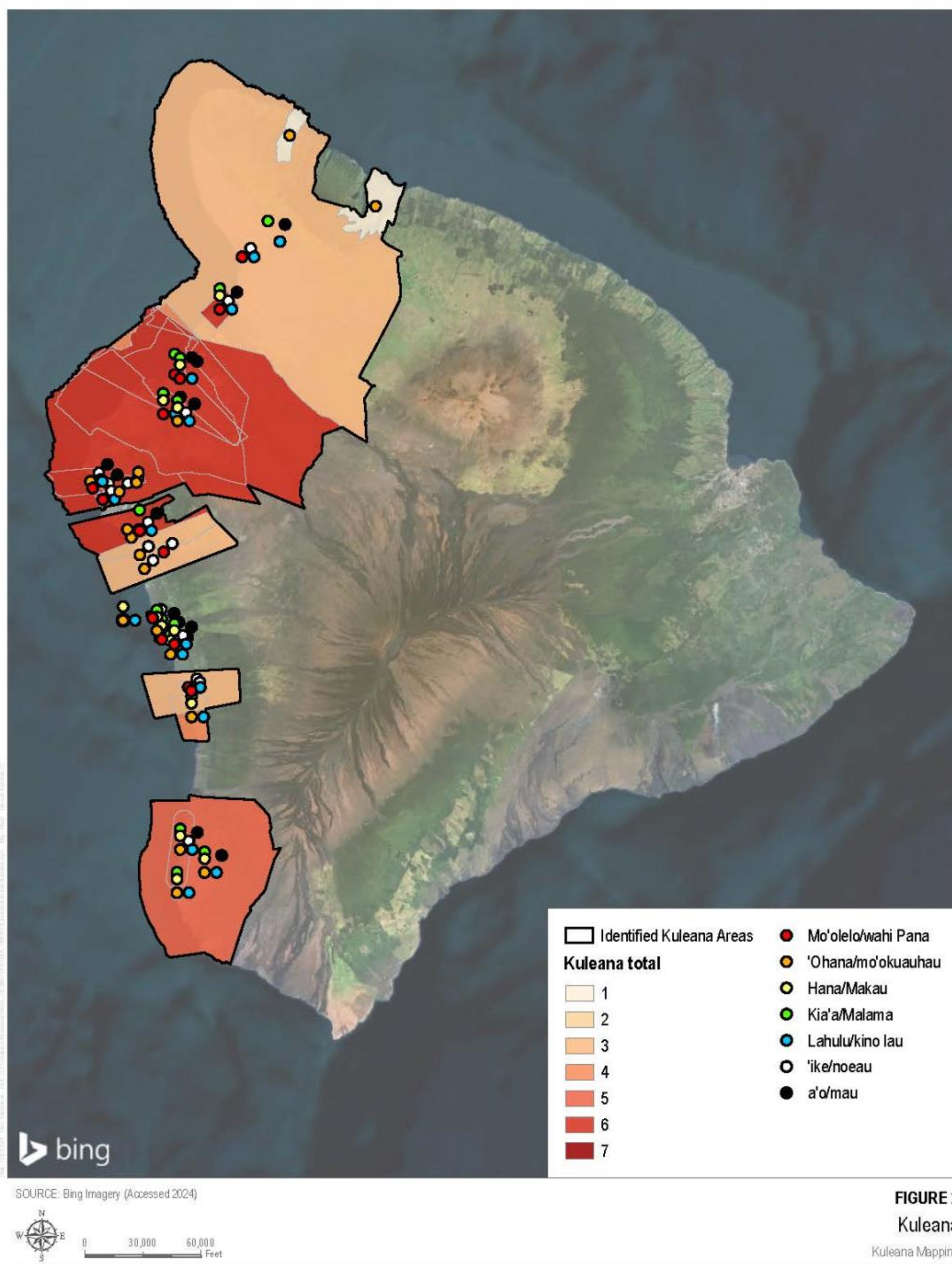

Figure 4.2 Map of kuleana areas and types. Polygons represent areas where participants identified holding kuleana. A more opaque/brighter shading indicates more types of kuleana. Colored dots located in the center of each polygon, indicate the types of kuleana for that polygon. This map only shows the different types of kuleana chosen and the number of different kuleana types chosen. The maps in the following sections show where multiple interviews chose the same kuleana type in brighter areas.

Moʻolelo/wahi pana

When discussing kuleana spatially, an important connection to kuleana are moʻolelo and wahi pana. Moʻolelo are the stories of our culture and the history of our place and wahi pana are often-storied places or places of significance. Areas that are indicated as moʻolelo/wahi pana areas are those areas with well-known Native Hawaiian moʻolelo, historic cultural figures, and important place names (see Figure 4.3). Examples of an area that may have been identified as moʻolelo/wahi pana are places where participants had known ancestors that were aliʻi (chiefs) or accompanied aliʻi or areas of their residence or activities. Many participants are generational descendants and knowledge holders of the places they were discussing and mapping. Many place names they know and discuss are those that are not widely known or recognized. Knowing place names and having them recognized and on maps is important. One kupuna said:

> "I always say that if you cut the name short, you lose the story, you lose the mo'olelo, you lose the mana of the name. And, in time, that name will be forgotten in antiquity, and that would be a sad time. Hawaiians always had reason for giving place names." (ID: 22120629)

Important in recognizing these mapped areas is the knowledge of the moʻolelo and the wahi pana and keeping those known and continued. As one interviewee noted:

> "And so, there's, there's a responsibility to the upkeep of knowledge, which for me is about place names, whether it be mauka, makai, the summit, the oceans, the divisions of the oceans. There's a responsibility to knowledge, to place names to moʻolelo and those that span it all." (ID: 22120819)

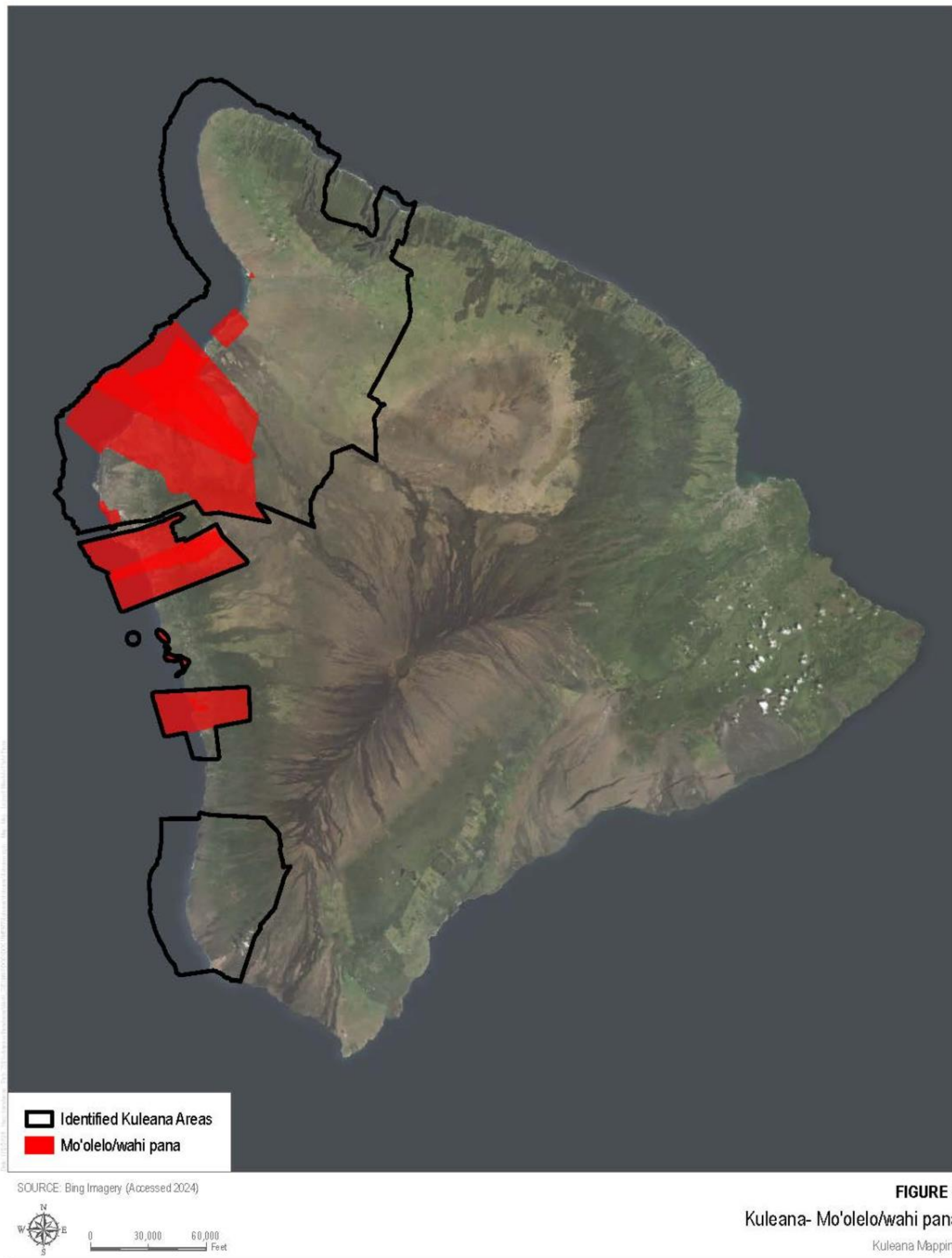

Figure 4.3 Mapped area of the kuleana type moʻolelo/wahi pana. This map shows where all the areas for this type of kuleana are. The brighter/more opaque red areas show where multiple individuals/families identified this type of kuleana in that area.

ʻOhana/moʻokūʻauhau

All of the discussions about the meanings and priorities of kuleana described generational/familial kuleana that is passed down. ʻOhana can be known as family and moʻokūʻauhau is often known as genealogy. One participant described:

> "Kuleana awakens mana[5]. I feel like both the mana and the kuleana and the moʻokūʻauhau, it's all kind of passed down. Or, like, the kuleana I hold most dear has been." (ID: 22240616).

Areas that were delineated as ʻohana/moʻokūʻauhau are areas with generational skills and kuleana passed down including cultural practices, knowledge and stewardship (see figure 4.4). The areas delineated as ʻohana/moʻokūʻauhau can also be family lands and houses that they care for currently and/or grew up on as well as areas where participants are generational descendents of. Family lands and areas the family care take often have a strong kuleana and these lands can also contain very sensitive burial areas as well.

[5] The participant here is quoting other discussions about kuleana that someone else said publicly.

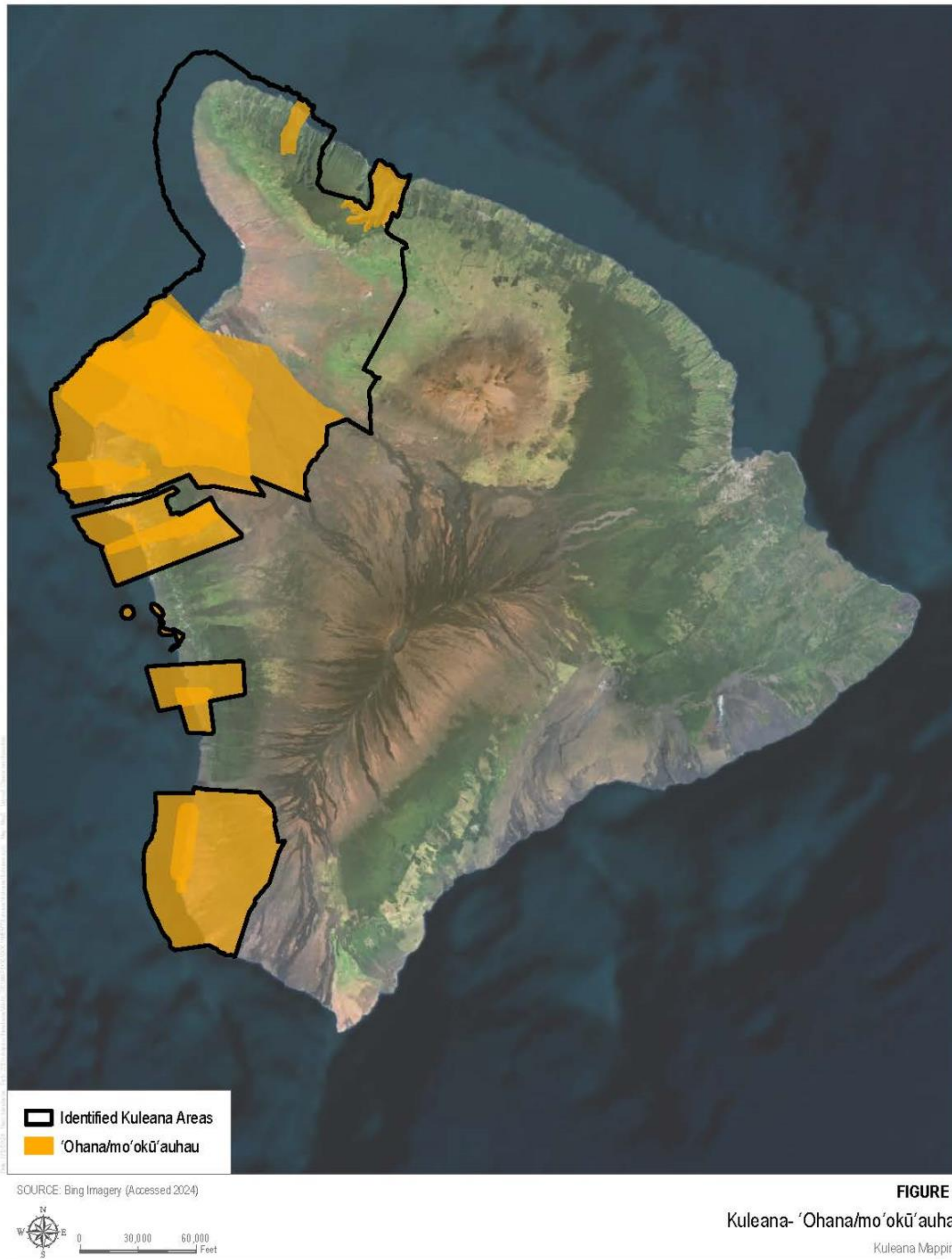

Figure 4.4 Mapped area of the kuleana type ʻohana/moʻokūauhau. This map shows where all the areas for this type of kuleana are. The brighter/more opaque orange areas show where multiple individuals/families identified this type of kuleana for that area.

Hana/mākau

Discussions on the meanings of kuleana had a large focus on understanding our role and function within our areas and our community. Hana can be known as work and mākau can be known as skill. Important to this is recognizing the skills and callings that we have as individuals and ensuring that we work to develop them and fulfill them. Some of these skills and callings may also be extensions of our ʻohana/generational kuleana as well, whether it is our own skills that we have to help fulfill familial kuleana or that familial kuleana we work to develop or that we may continue on. Other skills and callings can be those that are part of your job or how you develop them as part of your life that are expressed and fulfilled in different ways. Some participants explaining these callings and understanding our individual skills and functions finding our role within society included:

> "So kuleana goes way beyond you know you're just called it is something that you have to say this is our place, this is our kuleana." (ID: 22120813)

> "It is a kākoʻo kind of lift and by kākoʻo I mean other people. Whomever they might work for, are involved with. So other family members, to agency folks, to whomever is called to the responsibility, called to the kuleana, called by kuleana. So, it's that sort of a lift. So, when I talk about my kuleana, I am one among many, many, many, many, many, right?" (ID: 22120819)

Additionally, when discussing callings, participants talked about the certain skills or jobs they have and how those aids in their function or is part of their role of kuleana. These skills and callings include teaching, fishing, making and maintaining ʻupena, building heiau, poetry and writing, teaching, geography, genealogy, facilitating, etc. Areas identified as hana/mākau are those that were foundational to expressing, learning, or building any of these skills for example areas for fishing, of heiaus, or of sources of inspiration for poetry and writing. Additionally, this type of kuleana includes callings to different areas whether it be to express skills, fulfill ʻohana kuleana, or to mālama and steward those areas (see Figure 4.5).

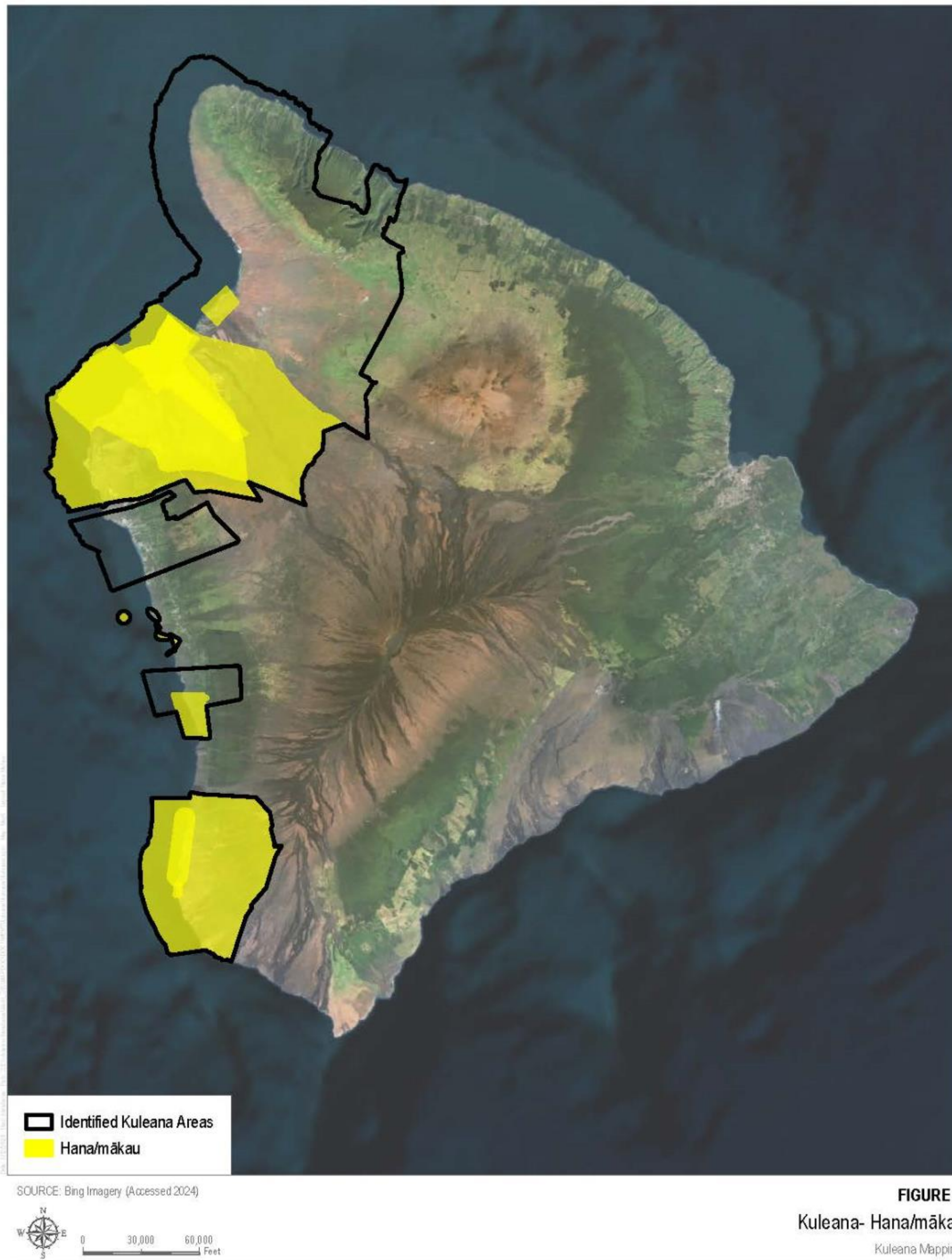

Figure 4.5 Mapped area of the kuleana type hana/mākau. This map shows where all the areas for this type of kuleana are. The brighter/more opaque yellow areas show where multiple individuals/families identified this type of kuleana for that area.

Kiaʻi/mālama

Related to hana/mākau and ʻohana/moʻokūʻauhau is kiaʻi and mālama. Kiaʻi can be known as protector and mālama can be known as to care for. Discussions about the actionable and physical aspects of kuleana are also foundational to this type of kuleana. Areas mapped with this kuleana are those where the participants are stewards of, where they take care of, and those places and areas of practices/resources that they have a kuleana to protect and care for (see Figure 4.7). Those places where you live and where you frequent are often where participants have a kuleana as a kiaʻi and to mālama as one kupuna noted:

> "Home has to be the biggest kuleana. I mean, it just has to be because that's your space. That's where you are. That's where you put your roots in. And if you have your roots in a place, then that should be the most important place for you. And I'm talking about kuleana in terms of taking care of. It's the things that you see on a regular, a daily basis, that you touch, that touches you." (ID: 22120706)

He also explained that a kuleana to mālama comes from learning and interacting with practices that can be extractive in how there is a need to mālama and be reciprocal:

> "That's when I began to understand that. That what I was harvesting was something that I also need to give back to, in a way of managing or not taking too much, you know. So that was the sort of like the foundation I think of myself beginning to interpret what Kuleana meant." (ID: 22120706)

This type of kuleana typically follow areas where participants steward either familial, as part of their work and cultural practices, and land that they live or care for.

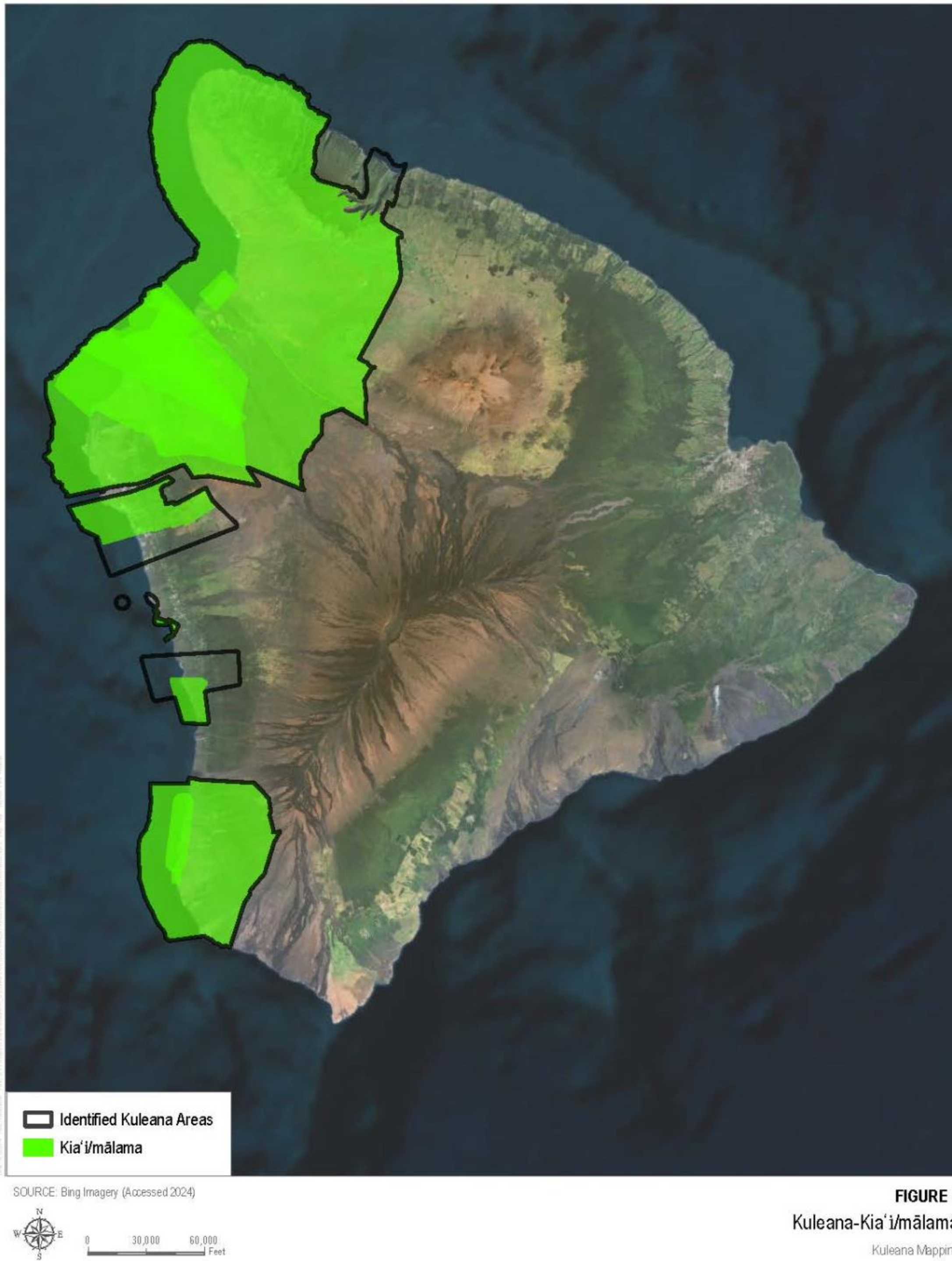

Figure 4.6 Mapped area of the kuleana type kiaʻi/mālama. This map shows where all the areas for this type of kuleana are. The brighter/more opaque green areas show where multiple individuals/families identified this type of kuleana for that area.

Lāhulu/kino lau

When participants discussed kuleana spatially it followed a lot of ecological aspects. Lāhulu can be known as species and kino lau are the physical embodiments of akua. This kuleana of lāhulu/kino lau is a broad category that captures the ecological functions and connections to kuleana. This category includes areas of elemental or ecological importance, ecological wonders and embodiments or expressions of akua, areas of harvest and gathering, or cultural practices with species (see Figure 4.7). Species and ecological aspects mentioned by multiple interviewees include loko iʻa (fishponds), springs and freshwater, lava flows, koholā (whales), rays, manō (sharks), ʻōpelu (mackerel scad), limu (seaweed), and paʻa kai (salt). Mapped areas in this category are areas where participants note important species or ecological factors or practices that are connected to species and ecological factors.

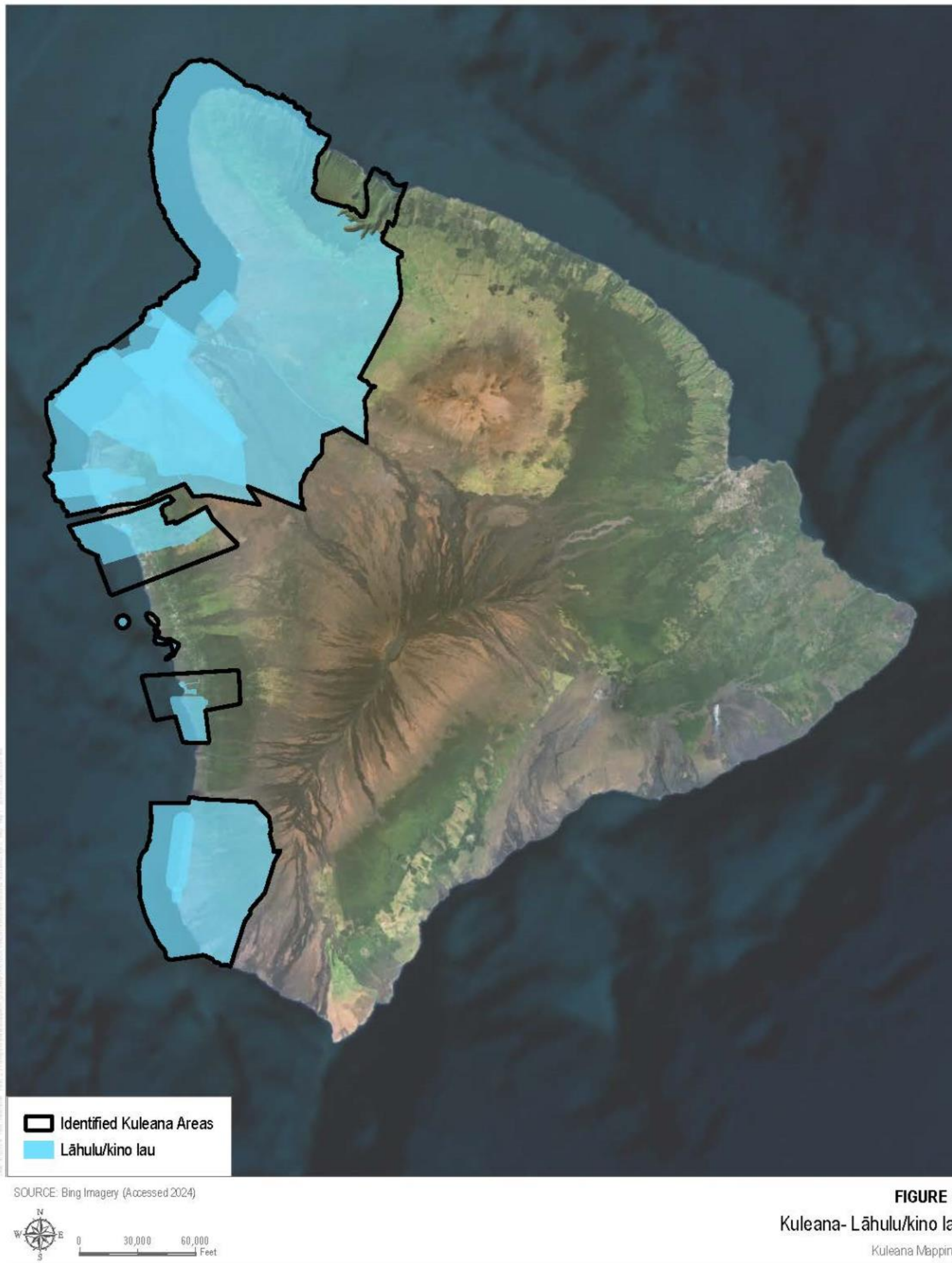

Figure 4.7 Mapped area of the kuleana type lāhulu/kino lau. This map shows where all the areas for this type of kuleana are. The brighter/more opaque blue areas show where multiple individuals/families identified this type of kuleana for that area.

‘Ike/no‘eau

Areas of kuleana with ‘ike/no‘eau are those areas important in cultural practices, arts, and ceremony. ‘Ike can be known as knowledge and no‘eau as art or skill. Similar to mo‘olelo/wahi pana and lāhulu/kino lau these are often spatial areas of connections to specific knowledge or practices. Often these areas are connected to cultural practices such as those in lāhulu/kino lau or stories and figures of mo‘olelo (see Figure 4.8). Examples of areas identified in this kuleana type include areas of art, navigation points, and areas of practice or ceremony such as hula, oli, cultural hale, canoe landings, ahus and heiaus.

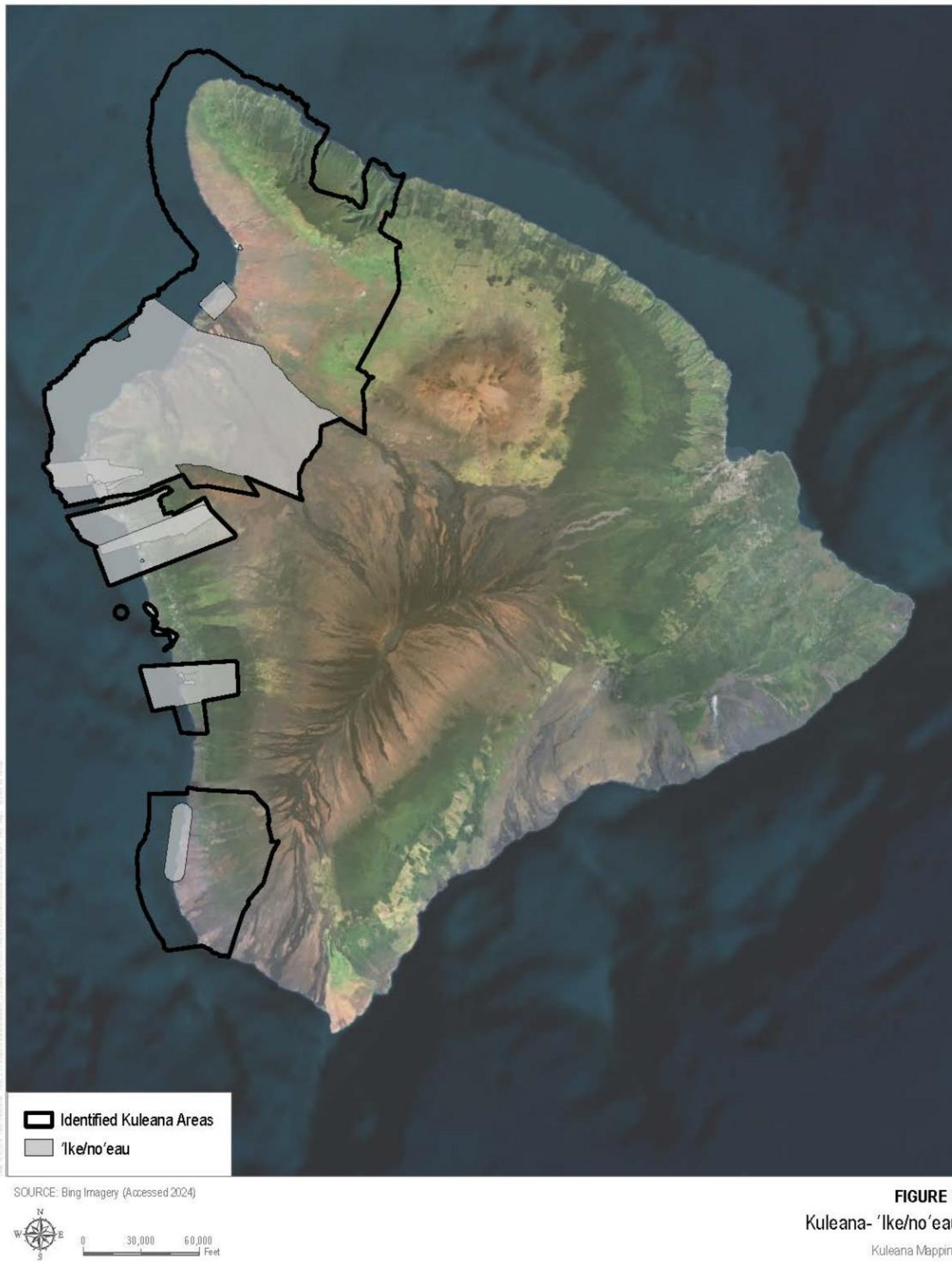

Figure 4.8 Mapped area of the kuleana type ʻike/noʻeau. This map shows where all the areas for this type of kuleana are. The brighter/more opaque white areas show where multiple individuals/families chose this type of kuleana for that area.

A‘o/mau

The final type of kuleana is a‘o/mau. A‘o can be known as teaching and mau can be known as continuing/perpetuation. As sharing and perpetuating knowledge was such a huge component for many of the participants this type of kuleana was added. Areas of a‘o/mau are linked to nearly every other type of kuleana but are only included spatially in areas where participants discussed sharing knowledge or perpetuating practices as part of the kuleana of place. These mapped areas can be part of sharing the stories of place, keeping the place names and history alive, as well as continuing and perpetuating practices (see Figure 4.9). One kupuna explained how this sharing and perpetuation of kuleana is linked to the land as:

> “And if you cannot speak the language, stay on the land. Those was all our alternatives of teaching our culture. Was to keep them on the land, to keep the traditions of our family, hunting, living off the land, fishing, knowing place names, knowing its history, knowing our ancestors and how…who they were and how they were connected to place. That was our method of teaching Hawaiian. Our way was to stay connected to the land. Stay connected to the environment. Stay connected to the resources. And, staying is literally teaching. Plant by moon, go fish by moon, do this. Everything was as much as we knew.” (ID: 22240714)

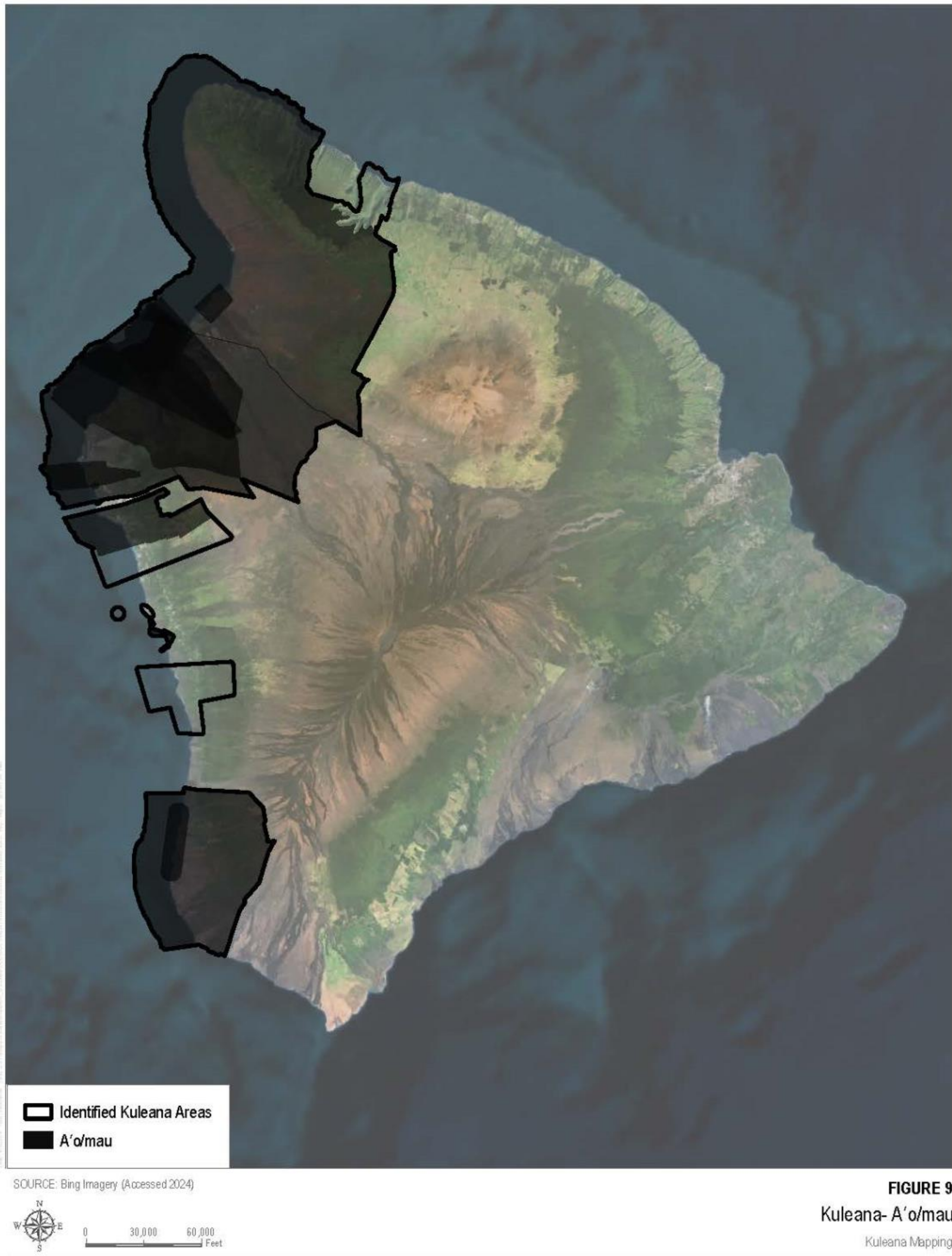

Figure 4.9 Mapped area of the kuleana type aʻo/mau. This map shows where all the areas for this type of kuleana are. The brighter/more opaque black areas show where multiple individuals/families identified this type of kuleana for that area.

Levels of intensity

In addition to spatially representing the kuleana types inferred from mapping discussions, I also inferred levels of intensity for mapped areas based on the definitions for levels developed in Chapter 2 and 3. I inferred meanings for the levels of intensity based on the ways participants discussed their kuleana spatially (see Figure 4.10). If participants discussed certain attributes, those mapped areas were assigned specific levels of intensity. Specifically: areas with visual connections and mental connections were assigned with the maka/poʻo level; personal emotional connections or connections to the senses were assigned with the puʻuwai/kino level; connections to their present life, livelihood, or lifestyle were assigned with ʻānō/ola; connections to descendants, future generations, or perpetuation were assigned with mua/pilikana; and spiritual connections and connections to their ancestry and genealogy were assigned with haunana/mana.

The mapped areas were assigned meanings with types of kuleana and associated levels of intensity. Table 4.3 shows the number of polygons participants drew for each type of kuleana (columns) and the level of intensity (rows) combination. The table shows the number of polygons that were coded with the same level of intensity and type of kuleana. The total number of levels of intensity are the number of polygons coded with that level and the total number of kuleana are the total number of polygons coded with that kuleana type.

The levels of intensity help differentiate the types of kuleana from being more of a part of participant identity versus an expression of kuleana. The levels of intensity help to describe the types of connections and relationships that people have. Kuleana types associated with expressions of kuleana or physical actions (hana/mākau, kiaʻi/mālama, lahulu/kino lau, aʻo/mau) were experienced across all levels of intensity. By contrast, the piko/nāʻau levels (ʻānō/ola, mua/pilikana, and hanauna/mana) were evoked by kuleana types associated with knowledge and identity (moʻolelo/wahi pana, ʻohana/moʻokūʻauhau, and ʻike/noʻeau).

Table 4.3 The number of polygons participants assigned for each type of kuleana and each type of level of intensity combination (total polygons = 36). The numbers in each cell represent the number of polygons that were coded with the corresponding level of intensity and kuleana type. Kuleana types associated more with knowledge and identity were more strongly associated with piko nāʻau levels, the levels and kuleana types bolded. The Total LOI column shows how many polygons were coded with that level of intensity for each LOI, while the Total Kuleana row sums up the number of polygons across LOI for each kuleana type. The total kuleana represents the amount of polygons coded with that kuleana type

		Kuleana types							
		Mo'olelo/ wahi pana	**Ohana/ mo'okūʻauhau**	**ʻIke/ noʻeau**	Hana/ makau	Kia'i/ mālama	Lahulu/ kino lau	Ao/ mau	TOTAL LOI
Levels of Intensity	Maka/ po'o	7	14	9	12	14	15	14	17
	Pu'uwai/ kino	7	14	9	12	14	15	14	17
	ʻĀnō/ola	**11**	**27**	**14**	13	15	17	15	30
	Mua/ pilikana	**15**	**28**	**18**	13	15	20	15	34
	Hanauna/mana	**15**	**29**	**18**	12	13	18	14	34
	TOTAL KULEANA	15	30	18	13	15	20	15	

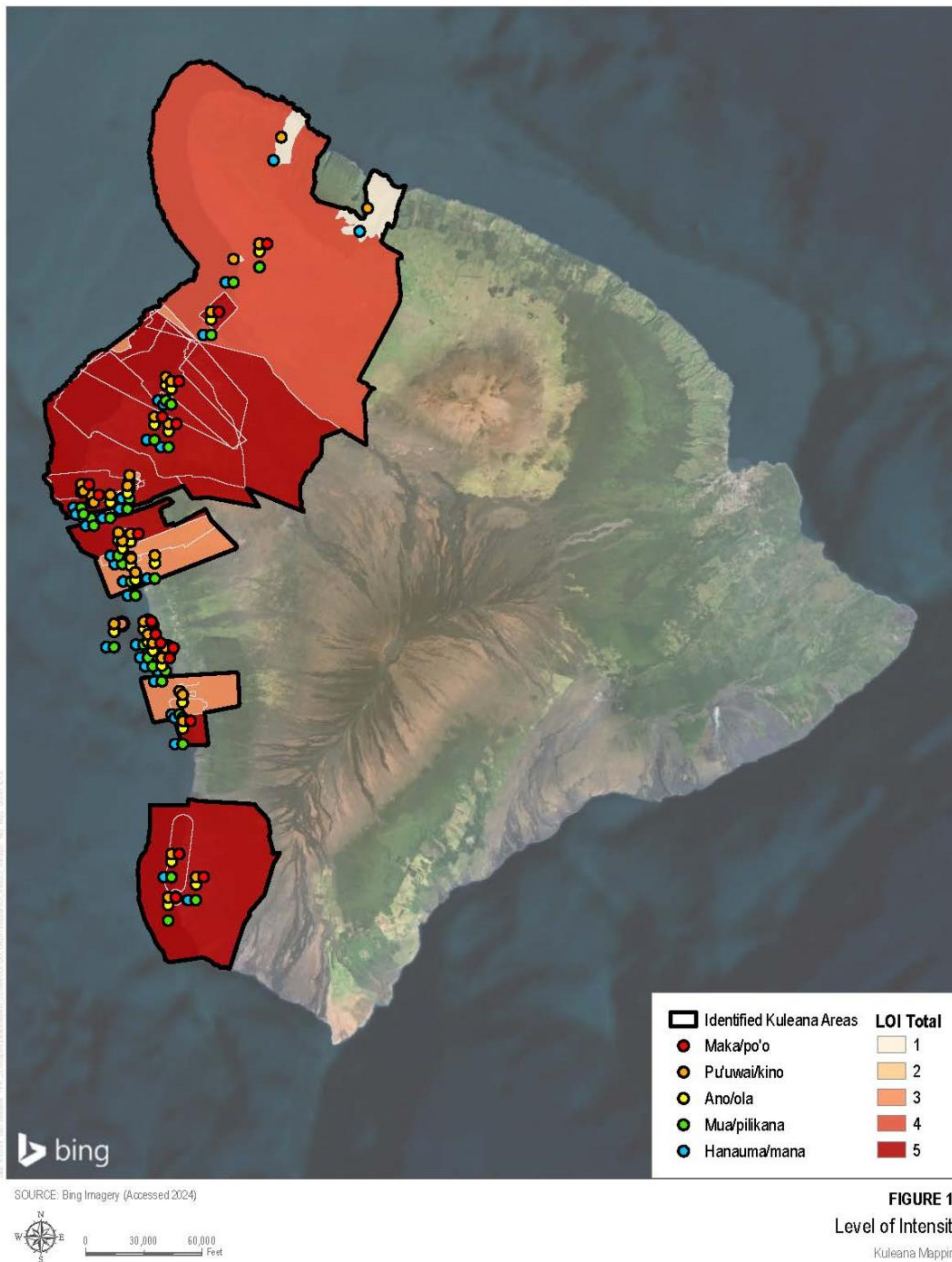

Figure 4.10 Map of levels of intensities. Polygons represent areas where participants identified holding kuleana. A more opaque/brighter shading indicates more types of levels of intensity for that area. Colored dots located in the center of each polygon, indicate the types of level of intensity for that polygon.

Changes in kuleana

Another question asked during the interviews was how their kuleana has changed. Many discussions stemmed from this question, but some participants felt that the kuleana itself does not change but rather the expression of it does. One kupuna noted:

> "But it [kuleana] hasn't [changed]. Just the media of expression change through the different generations. But it's always, always, *always* with that intention. Like a mantra: mahalo, mālama, aloha." (ID: 22120630).

For example, the way that the expression may change may be that there are different threats or concerns for each generation that take different actions or skills to build. Or the kuleana may be to a certain area but as the area may change whether from land development or ecological factors, your expression may change as you need to learn new skills or take up new practices to continue that kuleana to place.

Participants noted the adaptability of kuleana and how we may take up different callings, actions, or ways of expressing or fulfilling kuleana that may come with change. This change can be social, ecological, or physical. As some participants noted:

> "So, my kuleana now looks different from the past because it's changed. It's essentially the same. But we're dealing with a lot more a lot of pressures that weren't there in the past." (ID: 22120813)

> "That's part of kuleana. So, my role of kuleana, you know, changed" (ID: 22120711)

Additionally, many commented on how kuleana changes or the expressions of kuleana may change with your age:

> "And then, as I matured, the word itself [kuleana] in the meaning of the word kind of matured, too, you know. It's a responsibility, I think, one takes personal responsibilities for oneself. And in doing that also takes responsibility for all the things that you impact, that you have the ability to either care for. If you have that ability or to address when you understand that it's not being cared for properly. But it's always been something that's personal." (ID: 22120706)

> "So, the work of a child is different from the work of an elder. The work of a child is to learn and to bring enjoyment and to laugh and be curious. They're those years when we grow and we're blessed with either or and perhaps both

> intellectual, artistic, physical curiosities. Where, you know, some folks are going to expand their thinking, some folks are going to expand their expression, and some folks are going to expand their physical strengths and capabilities. But it's kind of age appropriate…your kuleana evolves and you evolve" (ID: 22120819)

Threats, impacts, and considerations

Along with how their kuleana changed, I asked interviewees about impacts, threats, and considerations to their kuleana. This resulted in different discussions with some common themes that nearly every participant discussed, including ecological change/climate change, development, economics and money, management, food security and land planning, tourism and foreigners, colonization, and perpetuating kuleana. These are elaborated below.

Climate change/ecological change

Similar to the discussion about how kuleana has changed, ecological and climate change concerns impact kuleana, or create needed modifications and adaptability to our kuleana. Some participants noted how the impacts of ecological changes and climate change affect restoration efforts or their kiaʻi/mālama kuleana:

> "Environmental changes have really affected our continuation of replanting. So, we've had over a hundred years, my whole lifetime. When we would come, you'd always replant. So, [an] old coconut tree died, you replant right next to it and you continue to do that. You just continue to replant your areas, whatever it was. And we're having a really hard time in the last two decades of replanting… And it's because of the rising [sea] levels, because in our replanting next to the shorelines, especially where we are, is a certain place you dig down because the high tide brings it up to a certain place, and then you kind of dig down to um just you just can see it. You know, you look at the tides, you know, when the high tide low tide you know when to plant. And so, we still, we're using the same practices. But then it was changing, you know, so it's [sea level rise] killing our babies." (ID: 22120813)

> "So, we're dealing with things now that maybe kupuna never did have to deal with, but herein lies our abilities to be resilient, to be adaptive, to evolve as ʻāina evolves, as natural processes come in, as tidal waves come, as lava flows come, as storms come, how do we rebuild? How are we resilient? What happens with our fishponds now that we're dealing with things like sea level rise? But so, how

> do we adjust? How do we adjust? How do we hang on to tradition and traditional practices, traditional ways, knowing that ʻāina is evolving?" (ID: 22120819)

Climate change impacts or other ecological impacts will change our kuleana or strengthen it as awareness strengthens or as we have different callings with these changes. For example, one participant noted that the coral bleaching event in 2015 spurred new callings and urgency to kuleana that they felt. Others noted how these impacts or other impacts such as those discussed more below in development and management can spur further actions and callings. For example, one interviewee noted how areas may become more prevalent or a larger priority to our kuleana with change and impacts:

> "You know, like maybe a tiny spot down in Kaʻū that we pass by but don't visit very often, may not be on the forefront of our brain but, say, a koholā washes up there. But then it becomes very forefront. And it's just like issues like Red Hill, Mauna Kea, that come up." (ID: 22240616)

As threats and impacts come up, our kuleana becomes more of a priority to those areas. And as awareness or kāhea are raised, our kuleana for those priorities and issues may strengthen as well.

Development

Land development has had a big impact to kuleana and continues to be a looming threat to areas where people have kuleana. Development can impact how kuleana can be expressed and maintained, as well as access and quality of practices and areas of kuleana. When development has occurred in areas, it has been drastic and devastating. Often participants expressed they wish it didn't happen or there was a better way to stop it and fight it. But when development does happen, your kuleana and connections to place are too strong so you cannot just ignore it. While participants wished development didn't happen, they also acknowledged there were new ways they could manifest their kuleana to place. So, there are positives that can come out of development and new connections that can be made. This does not justify or validate the land development and should not be an encouragement of development, but rather a praise for the people of place being resilient and perpetuating their kuleana in the face of whatever may come. On the flip side, participants also noted how development can

defeat people, and so while they have family that are descendants of that place and have strong kuleana, they will never return to that place that has been changed and devastated from development. One noted of the hurt they felt from the development while still persisting through to have a relationship with that space:

> "And, to me, that gave me heart when [place name] was changing so drastically. Because it's right in front of my house. I tried to avert my eyes. But it just wasn't practical. Leave the drapes drawn all the time. But it was ʻeha, it was kaumaha because if we continue that metaphor, it was like someone was peeling back mom's skin." (ID: 22120630)

As she further explained, your kuleana and love for ʻāina does not change even as ʻāina gets drastically impacted. So, she couldn't ignore it but had to continue her kuleana in face of pain and find a way to find a new happiness there even though it was forever changed and in some ways lost.

Many commented that other past impacts were not only drastically changing the places but also changing the access. A huge impact to a vast area of places in West Hawaiʻi was the development and opening of the Queen Kaʻahumanu highway that created access to all these areas and coastal resources that people were not able to access before. In ways this helped some with kuleana access places more easily, but it also opened access to those without an authority of kuleana to those areas. So, pressures increased just as you had more people accessing as well as harvesting and gathering and while some may be respectful, some were not and it created problems. Many resources were impacted and the access that families of authority for those areas previously were also changed with an increase in people and impact to resources.

A looming concern and threat to many interviewees is potential development. With so many ongoing impacts seen from development there are more and more looming threats of development as one interviewee noted:

> "The potential threat it [development] makes, we are already seeing it, there is no limu in [place name]. And, as well as, we think there's a reduction in freshwater, could be from drilling of wells upland that's rediverting the freshwater that used to produce a lot more limu. And then have a lot more fish that would come in and grow in that loko, as well as near where the park is. We know that there's a lot of concerns for the pollution in [beach name] because of the effluent coming out of the development" (ID: 22120711).

A threat that often goes hand in hand with land development is commercialization as well. One participant explains that there is so much commercialization in West Hawaiʻi and there are few places that are not commercialized. She noted it is crucial to protect those places that are not commercialized to keep it "wild" (ID: 22120813).

With any development there needs to be more education and a better understanding of place. One kupuna stated:

> "Knowing our places, whether we're children of them or planners given authority over them, or incurious or curious landowners, knowing our places and the astounding variety among them will make our living efficiently and effectively on them an easier goal to accomplish" (ID: 22120630)

Another kupuna (ID: 22120629) explained that developers need to know the place before they do anything and need to go in there with respect to the place, its stories, and its histories. He explains this means sitting with lineal descendants and getting their thoughts and knowledge and the respect the place deserves, keeping the places of burials protected, and thinking about the future generations yet to come and how they will be affected by the decisions and choices of the present. Whatever development is planned the developers need to make sure they are doing it with respect to the place and its past and future (and he explains Hawaiians would think of the impacts to at least seven future generations).

Economics and money

All of the interviewees noted how a huge impact to place, including development, are often rooted in the prioritizations of economic benefits and the influence of money. The prioritization of capitalistic economic values and money conflicts with Hawaiian cultural values and a Native Hawaiian way of life. One kupuna noted:

> "You know, it was about money! Once the Hawaiian Queen Liliuokalani was dethroned, the concept of a people totally changed. It wasn't about people now. It was about money" (ID: 22240714).

Additionally, money prioritizations can get in the way or create obstacles for cultural practices and expressing kuleana. As another kupuna said:

> “And we feel that the threat from that and continuously, you know, our state, our Hawaiʻi is still being so much on, and specific economical engines and majority is not pono to what we're trying to do here” (ID: 22120826).

While there is a recognition of the economic realities of today and the role money plays in governance and in the world, participants express that there needs to be a greater awareness of the costs as well. As one kupuna expressed:

> “I recognize economic realities. But those economic realities do not always need to be pursued at the maximum cost to kānaka culture.” (ID: 22120630).

Another common expression that is well known in Hawaiʻi is just being priced out. As noted in the quotes above, the governance and management of Hawaiʻi prioritizes economic endeavors over people, especially Hawaiian people. Hawaiians just trying to exist in Hawaiʻi and express their kuleana have their own individual or familial conflicts and hardships just trying to survive living here. This sentiment was echoed in many interviews, for example:

> “And I'm sick and tired of seeing our Hawaiian people cannot survive. And it's like a lot of it. It's so high. The price [of the] cost of living now. So that is a lot more than ever before in the last couple of years. And I'm very worried that we're going to be, I feel for Hawaiian people in general, we are getting pushed more and more to just, I feel like we're going to lose more and more because of the fact that we cannot survive in the Hawaiʻi of today.” (ID: 22120826)

In addition, the economic realities can create personal conflicts to an individual’s kuleana. Fulfilling kuleana can come at a financial sacrifice or you may need to take jobs that can pull you away from being able to express or fulfill some of your kuleana as well.

Others note the power dynamics of money and how that creates obstacles and barriers to Hawaiians being able to have more say and control of ʻāina. (ID: 22120629) One kupuna expressed that if people of place had the money to stop development a lot of the developed areas wouldn’t have been changed. But money is a huge obstacle and barrier because the people of place cannot afford to compete. Additionally, there needs to be more economic opportunities for the people of place to stay in place and keep them in place so we can protect and maintain the kuleana of those areas. One interviewee elaborated:

> “So, it's just a continual talking and being able to bring people back into place with kala (money) because they have to support their families. But that's a huge part of moving forward in aloha ʻāina in kuleana. It's you have to have people in place that are going to be there. Whether, you know, people with really really good knowledge and stuff come and go because that's not their kuleana and it's great when they're there, but they go and we're going to be there forever” (ID: 22120813).

Management

Discussions about kuleana describe some of the opportunities and the many obstacles or failings of management (non-community-based agencies at all levels). Management in Hawaiʻi has taken on the kuleana to care for ʻāina and the cultural resource of Hawaiʻi and nearly all interviews discussed the failings of management to upkeep their kuleana. As one kupuna said:

> “Well, again, we go back to the state and government agencies. I mean, they take an oath, you know in terms of their kuleana and most often, many times they just failed to act on it. And they concede I guess, you know, to, they will act upon things and take action on things that are actually contrary to their kuleana because they feel they have an obligation to this governmental agency” (ID: 22120706).

Management processes also have provided different avenues and opportunities for participants to express and develop their kuleana as well. For example, a few participants discussed the importance of civic engagement. One kupuna elaborates that management processes “provide a media for me to express my kuleana” (ID: 22120630). She noted that civic engagement is a kuleana we all have and with civic engagement:

> “The citizens have to be curious enough and think critically enough and be willing to be engaged enough to be the change that they want to see!”

Many interviewees are also involved in co-management efforts in West Hawaiʻi and note some of the difficulties and shortcomings of management in that aspect as well. When explaining the processes of going through co-management efforts it is a huge burden on the community for time, money, and emotional costs. One interviewee explained some of the hardships with co-management:

> “When we joined into negotiations to create the CBSFA, that has been in the works for 20 plus years. We weren't trying to come in and be part of the state system. We were really coming in to change it, create this space and psychologically to remind us, because we live there. We understand the place the most and the state doesn't know a lot of these things because they don't come here. They don't live here. They don't know. But they're the ones that have the rules and they don't really have done a good job protecting resources in general. A lot of us fear we feel we don't have a good feeling when it comes to talking to any type of government” (ID: 22120826)

This can also be met with a lack of respect or lack of understanding especially as the people you have to work with are getting paid for their time and may not understand the connections, kuleana, and knowledge that the people of place hold. When explaining more on the co-management processes another interviewee explains that as a community, they decided to share knowledge they never wanted to share beyond their family, but they felt they had no other options and that they had to try and get their ‘āina more protections. Another source of conflict and disrespect from management is a lack of accommodating communities’ time and understanding that practices and the needs of place do not stick to a nine to five work schedule that agency sticks to. Additionally, the knowledge holders of place may not be those with degrees, but the intimacy and literacy of place deserves the same respect so called experts with degrees are given.

In a similar sentiment to co-management, other interviewees noted the need to have more opportunities for the people of place to inform management and be more empowered in decision making capabilities. For example, one participant said:

> “But I almost feel like we're the answer to the big departments [referring to the department of land and natural resources] too. So, at some point they should probably start funding community managed places in partnership with them because that's called real time. That's not just owning that's being ma’a to place.” (ID: 22120813)

She went on to explain:

> “But there are a lot of things that should be. Should have power in just people in place to be able to kapu something because of what they're seeing in real time and takes too many years to change a rule. So, if you know, there's that kind of thing too, especially in traditional knowledge plus scientific data that kind of pulls that little, little window together to say, oh, this is the best thing to do now and be able to do that.”

With all the pressures and threats there needs to be more collaboration and partnership especially with the people on the ground. Many participants note that management agencies are often too disconnected or too spread out to know what is happening on the ground in these dynamic systems overrun with outsiders. So there needs to be more partnerships or a greater empowerment of the people of place to share what is happening and be able to make decisions on these places they intimately know and are seeing real time impacts to.

Food security and land planning

Many interviewees believe that a better place-based understanding is needed in management and for more effective land planning and increased food security. This is seen as a collective kuleana to ensure that the environment is healthy, can feed the people, and can be sustained through the future. Some participants noted on the collective kuleana:

> “So, there's a kuleana to my place. And that extends to places that are not necessarily mine. And these would be the public spaces, I suppose. I think people who have their own private lands, it's up to them how to manage or not manage, but they have a kuleana to the greater community. They shouldn't be polluting, they shouldn't be, you know, running operations on the land that are harmful to the land itself to around here. But the public spaces, I think is all of our kuleana, you know. We have a responsibility to make sure that the health of the environment, its, you know, its ability to, to regenerate itself and not be diminished by, over usage.” (ID: 22120706)

Perpetuating kuleana and increasing resiliency means not depending on imports by increasing our own productivity by looking to Native Hawaiian Knowledge and ways of life. One interviewee talked about the importance of Indigenous Knowledge:

> “But always for me, it is always a kawa ma hope kawa ma mua, peering back to peer forward to look back to know what's going to happen forward and looking very closely at that the value systems that that we were raised in and how that is still applicable today as it was 500 years ago. And how it's still going to be applicable a hundred years from now.” (ID: 22120819)

These Indigenous ways of life have always been about feeding the people and caring for place as one kupuna talked about Hawaiians being cultivators:

> “When we go back to history of our people, there was only two dynamic lifestyles. One of a fisherman, and one of a farmer. And when we talk about today being people one with the place, the farmers and the fishermen, they were the cultivators. They cultivated the ocean. They fished. I’a. Limu. They cultivated the land ‘uala, kala ‘ae, kalo.” (ID: 22240714)

These practices are important as we need to increase resilience among existing and looming threats of climate change. Food security is a major part of this as well as one participant explained:

> “Where I think that ninety percent (90%) of our food is imported, so at least growing more of our own food, maybe fifty percent (50%) and forty percent (40%) import in a way, just becoming more self-reliant so we’re not so dependent on the outside…Resources fed people, it wasn’t a commodity like today, it becomes a commodity. But when we talk about self-reliance, when we talk about food security, when we talk about something that I’m really concerned about is ‘food sovereignty’ they call it now, being able to have access to those foods that were, you know, that our Indigenous ancestors ate, and, you know, I think we need to spend more attention on that.” (ID: 22120802)

Increasing resilience and minimizing harm requires more knowledge and attention given to place. One kupuna explained how everyone in Hawai‘i needs to be familiar with their place:

> “Knowing our places, whether we’re children of them or planners given authority over them, or incurious or curious landowners, knowing our places and the astounding variety among them will make our living efficiently and effectively on them an easier goal to accomplish.” (ID: 22120630)

Taking care of Hawai‘i, building resilience, and minimizing harms and impacts is a collective kuleana. All people in Hawai‘i–residents, visitors, locals, and Hawaiians as well as management agencies have a kuleana and a role to fulfill to support and uplift sustainability efforts.

Tourism/foreigners

A big hindrance to better understanding place and the kuleana to care for place is that there are so many people visiting or who have moved to Hawai‘i who are not from here. As interviewees explained:

> "Why do you think all the people move to Hawaiʻi? Because they want our lifestyle! But, when they come here, and they don't really understand and know, they're the problems". (ID: 22240714)

> "I think for [place name] we can see already the changes because of the community that kind of comes down [place name]. It is all mostly people not from here. So that already is enough to see that the pressure is so close, and we may think we're isolated, but we realize that people are coming here because they don't have, they want to have what we have. So, they want to be able to have that connection and relationship to the place. And their place is not as beautiful as [place name] because we have not, so hard to make sure we stay here, and we continue to live on the resource and take care of it because we are the only ones that know how." (ID: 22120826)

The increase of people has also created more pressures and impacts to the place and to Native Hawaiians.

> "You know, our community has been changing, right? Since we were born. So, with influx of people, influx of houses, more tourists, just more, more, more, more. It kind of drives us to know how limited the resources that we've always known and may have taken advantage of how it's not limitless." (ID: 22460809)

The lack of awareness of tourists in particular and the added kuleana for the people of place to educate is a common occurrence among interviewees. As one kupuna says:

> "But I don't know that you can expect a tourist to embody all the things that we feel because we're from here. And so, one of our kuleanas, I guess, has to be patient with those folks and then try to educate them if we can, you know, change their behavior" (ID: 22120706)

Even with the problems access can create, allowing everyone into places, many noted we don't have to outright prevent people from visiting or accessing but there needs to be more education and more respect:

> "I wouldn't preclude having public, you know, visit the place, but there has to be the right condition and that there has to be an educational component that comes along with it. Yeah. And there really are none" (ID: 22120706)

> "You need to ask permissions to go inside.' Any historical areas. You know, I think it's only right that people acknowledge that, gotta acknowledge that again. But they forget! You know, the question, of the question that says: How do we instill that information that we do have to share with the malihini, because they're gonna come. You can kick them off there, you can't kick them off the island.

> They're gonna come. It's real easy to direct them if you explain to them." (ID: 22460809)

Despite a want and a need to educate and be patient with tourists and foreigners residing in Hawaiʻi there is a lot of anger and frustration as well. There is a frustration of all the impacts that are happening in place with nothing really done about it. There is an anger and a sadness as these cultural and familial spaces are getting overrun with outsiders that Hawaiians cannot continue the same type or quality of practices there. At worst they do not feel welcome or do not feel the same joy and fulfillment in their familial or generational lands. And in other cases, there is also anger from the harms of appropriation even appropriation and misuse of kuleana, as one interviewee explained:

> "And then you have someone who drops the word kuleana. Who has no moʻokūʻauhau. Who is a malihini to this place. They talk about their kuleana. Our kuleana gets stolen by people like him who then extort that word and use it for their own benefit personally, within the community. They don't understand [the meaning] so, I kinda, you get kind of bummed when people like that guy mentions the word kuleana, and he doesn't. He's making it his kuleana, without having asked permission, without even doing certain things. Maybe he asked, but it wasn't granted." (ID: 22240616)

While everyone in Hawaiʻi does have a role and a kuleana to support Hawaiʻi and all its Native inhabitants, kuleana has a deeper meaning and process. For Native Hawaiians, kuleana can be far reaching but as noted in the meaning of kuleana, our kuleana exceeds our authority. To ensure a proper understanding of kuleana and prevent misuse we need to understand the authority of kuleana. Those with authority of kuleana are the kiaʻi and stewards of place or practices. It is everyone's kuleana to make sure we uplift the well-being of Hawaiʻi and to respect and uplift the voices of those with authority of kuleana so that we can be proper residents, visitors, and guests. For example, a generational descendent, kiaʻi and steward of an ahupuaʻa on Hawaiʻi island has the authority to speak on behalf of that ahupuaʻa and should be respected and listened to as a knowledge holder. That same individual may have some advice and input to another ancestral descendent and kiaʻi of an ahupuaʻa on a different island such as Kauaʻi but that Kauaʻi kiaʻi would be the authority of that ahupuaʻa that the Hawaiʻi kiaʻi would respect and listen to to speak on behalf of that Kauaʻi ahupuaʻa. Similarly, residents of Hawaiʻi who are not Indigenous to place may have a deep appreciation for

place and care to be kiaʻi. They can offer thoughts and input if they have relevant knowledge but should respect the Native Hawaiian kiaʻi and cultural descendents of the different ahupuaʻa to speak on behalf of their own ahupuaʻa and uplift the Indigenous voices and support and listen to them. Residents and other Native Hawaiians who are not descents or kiaʻi of the place can speak for an area, practice, or resources only if the community, kiaʻi, and ancestral descendants grant them the authority to speak on their behalf. If not granted permission or given authority, to be good residents, guests, and visitors we need to respect those with the authority to not overstep, be disrespectful, or appropriate kuleana.

Colonization

All the impacts, threats, and considerations listed in this section above are all harms rooted in settler colonialism. All of the points previously explained could be in this subsection. However, some participants directly called out these harms stemming from colonization and continued with settler colonialism. These harms include overpopulation of foreigners and the marginalization of Hawaiians:

> "Recolonization, we see it everywhere. The people who are of the place, they are no longer of the place. The people who are not of the place, they feel like they are the ones from there. The outsiders make the insiders feel, it's a reverse." (ID: 22240714)

As well as imperialism, development, capitalism and contemporary governance systems:

> "You know, how even if you're talking about kuleana to ʻāina, how it's changed because of imperialism and all of that, you know what I mean? Like, you know, we had such a successful management of resources, of ʻāina, you know, maybe less so of people. But that governance and that management was successful. Think of the millions that were fed without impacting the resources so heavily. And when you switch that to the whole system because a Western, or what they considered to be modern you know, now you have what they consider to be progress, even if it's irreversible damage to those systems. You know, construction and industry. And now you have laws that are the teeth and a different form of government and capitalism that changed the whole system. And that kuleana was still there, it may have traded hands in this new system. It's now, the government enforcement who now becomes responsible for carrying

out that kuleana and just like he said, it has failed. People have gotten rich who have no ties to Hawai'i. Now the people who are from here can hardly afford to live here. And the whole idea of kuleana has shifted to now. There are so many people with their hands in the cookie jar, everyone's either for their own pleasure or their own profit. And you have now left kuleana to the few who are giving up their own chance at both pleasure and profit, to assume this kuleana" (ID: 22240616)

Despite the vast and deep harms from and continued with settler colonialism, participants note the resilience and strength of Native Hawaiians:

"We're not gonna continue to say, look what the colonizers have done and continue to blame all of that. We're going to continue our narrative and work as the middle of it. So, when we move forward, that story is going to be of prosperity. That story is going to be of pride, of answering that kuleana, delivering that kuleana and, you know, making it pa'a so that just that we laid that foundation down and now we've got to start seeing that return to what our kupuna did because this is from them. This is all the 'ike they can give us to create what we feel is, you know, what can help us preserve and make sure not only our 'ohana, who knows the place the most takes care of it, but anybody who comes here, they don't know how to act when they come in, [place name]. And that's critical." (ID: 22120826)

"We still have a lāhui. We still have a kingdom. They may have stole the Islands. But a tutu once said, they 'gon come over, they're 'gon do what they like do. But they're not 'gon be able to take the land. The land will always remain here. We still have a lāhui. We still are a kingdom. We will never, never disband" (ID: 22240714)

This enduring care, strength, and resilience of Hawaiians is why so many continue on perpetuating and working to fulfill their kuleana despite impacts and burdens. This is often the reason why so many co-management efforts persist and succeed because giving up is not an option. There can be feelings of defeat and burn out but 'āina and kuleana are irreplaceable and unsubstitutable and that burns bright and deep, instilling resilience no matter the obstacles faced.

Perpetuation

While there are many entangled threats and considerations to fulfilling and expressing kuleana, many also worry about perpetuating and continuing kuleana. There

is both a lot of hope and worry in instilling and perpetuating kuleana in the younger generations. As some participants explained:

> "The prayer would be that our kids would take it up. And the revelation is that what they do in their way is probably closer to the mark than I give us credit for." (ID: 22120630)

> "So, I think the biggest challenge is getting the youth to get to carry on, you know, and that's not something, how do I say it, it's something I wish upon the youth. I just hope that they understand it for themselves because I think it would be, their lives, I think would be much enriched when they reach my age. Yeah, because it takes a long, to develop it, but I think it takes a long while to watch it develop." (ID: 22120706)

Perpetuating kuleana and knowledge is foundational and a kuleana itself as is represented in aʻo/mau. Many interviewees discussed this importance of passing on knowledge in their kuleana:

> "Sharing the knowledge with the children, making sure that they know it and instill it in them, so you know it keeps carrying on, you know? Especially when we gone from here, you know, that really, they understand that the ʻohana way, you gotta know how to do that already. You know what I mean? It's a must to keep carrying it. Because once it gets forgotten, everything, there's gonna be changing." (ID: 22460809)

> "And so that's a real that's kind of a place where you're now in, in kuleana it was like that was kind of where we are navigating right now with, you know in 50 years from now, we want to be able to see Kanaka being able to come and still be teaching their children how to throw net that their children [know] how to catch fish, how much is enough, you know, so it's it's that balance that we do [not] want to see that lifestyle go away." (ID: 22120813)

Discussion

This research set out to better represent the breadth of relationships between humans and surrounding environments, including Indigenous values of place, to address the problem that spatial methodologies, as commonly practiced, are often limited to narrow values such as activities and uses. This research largely achieved its aims of acknowledging and creating a greater understanding of the diverse connections and relationships to place by mapping the Native Hawaiian value of kuleana with Native Hawaiian key informants who are ancestral descendants and knowledge holders of

West Hawaiʻi. Below I discuss three main insights from this work. First, how understanding the deeper meaning of kuleana can provide a more holistic understanding of Indigenous knowledge and values. Second, how mapping kuleana can elevate mapping approaches. Finally, I address considerations for mapping learned through the process of this research.

Meaning of kuleana

Understanding and representing kuleana can aid managers and researchers to accommodate Native Hawaiian values and knowledge in research, management processes, and decision making. The descriptions of the concept of kuleana that other scholars have used are similar to those expressed in this research endeavor. These various descriptions of kuleana from this work and others aid in understanding how kuleana and ʻāina are intertwined, and why this Native Hawaiian concept is vital for effective resource management.

Osorio (2021) explores the concept of kuleana in depth and describes more on the obligations and connections that can stem from the reciprocal relationships of kuleana. She notes that kuleana has a role in moving society and our community forward through inspiring sovereignty from our pilina (relationships) to each other. Osorio (2021) offers other considerations of the meaning of kuleana as well. In particular, moʻolelo on Hiʻiaka informs that kuleana can be maintained by those no longer living in a place. Even when Hiʻiaka leaves Kīlauea her kuleana and pilina to Kīlauea, remains. This offers more insight into the complexity of kuleana as a concept and also reflects similar sentiments of interviewees who note that they take kuleana with them wherever they go but also always have kuleana to the places they live or have any of the types of kuleana described in this study. She also relates kuleana to positionality for those who may be unfamiliar with Hawaiian values struggling to understand kuleana:

> "This cultural studies concept [positionality] offers a framework for beginning to grasp something as dynamic as kuleana because, like positionality, kuleana involved as tremendous amount of personal and community awareness and a well-formed familiarity with systematic power structures such as white supremacy and setter colonialism. Kuleana however, is more dynamic, less fixed set of

> authorities, responsibilities and privileges that shift within a complex ʻupena of pilina" (pg. 128).

Other descriptions of kuleana by scholars resonate with the types of kuleana in this study. Kuleana is described as a value that needs to be instilled in the younger generation (similar to aʻo mau and perpetuation) to give back to the community, make change, and contribute to Lāhui (Kaʻanehe, 2020). Just as participants in this study noted the connectivity of kuleana and understanding our role in society, Meyer (1998) states:

> "Understanding our kuleana develops our human potential because it ties us to our function and our function ties us to our people [reflected in hana/mākau]. It is this sequence because we value what we must do in order to continue to steward our language, our oceans, our lands. We must because we have that responsibility. Knowing who we are, then, becomes a prerequisite to know how best we can serve" pg. 13.

Reyes (2018) familial relationship of kuleana (ʻohana/moʻokūʻauhau) reinforces the need to care for ʻāina (kiaʻi mālama).

Other scholars have connected the concept of kuleana to ʻāina and management. Kuleana has been related to aloha ʻāina (love of the land), another Hawaiian concept and practice that has philosophical and political underpinnings that, in the most basic sense, means caring for the land (Case, 2021; Hobart, 2022; Meyer, 1998; Teves, 2018). The ways kuleana has been connected to aloha ʻāina is as an ecological relationship that is both relational and spatial (Fujikane, 2021; Hobart, 2022), from understanding our familial relationships including to ʻāina as our living ancestor (Case, 2021), and as a genealogical and custodial relationship to care for the land (Teves, 2018). These relationships, nuances, and care are captured and reflected in the participant discussions on the meanings of kuleana and its complexity as a concept as a state of being, a way of life, and as actionable.

This study offers a deeper understanding of the nuances of kuleana and the relationships and meanings of kuleana. Participants elaborated on the nuances and depth of meaning of the common translations of kuleana as well as the elaborate pilina of kuleana. By spatially describing the pilina of kuleana this also helps to understand

and connect the tangible aspects of the pilina of kuleana and both the held and assigned values that kuleana has. Mapping kuleana and the overlapping values of kuleana reveals the complexity of values and relationships that people have and the interwovenness of intangibility and tangibility as well as sort of expressions (assigned values) and beliefs (held values).

Spatially representing kuleana

The kuleana maps produced in this study only offer a glimpse and a partial understanding of the cultural functions of place, which refers to all the different cultural resources, activities, values, behaviors, beliefs, and practices. As shown in the map and in the descriptions, there are multiple types of kuleana for the same areas and there are some kuleana types that often correlate. For example, areas that are important moʻolelo areas usually correspond with aʻo/mau as these are storied areas that go together with perpetuating and sharing knowledge. Additionally, many participants have their own skills or callings (hana/mākau) that are part of their kuleana to fulfill, but these can overlap or be part of their ʻohana/moʻokūʻauhau skills and kuleana as well. These particular skills can also involve aspects of kiaʻi/mālama of stewarding and caring for. Or, these may also be skills or practices involving certain species or ecological aspects and thus can overlap with lāhulu/kino lau.

The maps generated in this research should be interpreted carefully. Some of the overlap in the maps generated may be an artifact of buffering that was done to obscure locations of sensitive areas. When regarding these maps it is important to understand that the areas of the same kuleana type have diverse meanings. For example, if different areas are all coded as lāhulu/kino lau the different areas may all be referencing different species or ecological factors, one area may be a species of fish, another a different fish, another one could be rays, and another could be a spring. Additionally, even areas with just one type of kuleana may have many different aspects of that kuleana in just one area. Looking at lāhulu/kino lau, one area may be coded as that kuleana type and have multiple different species and ecological aspects in that one area such as all the different species and a spring as listed above but in one area instead of different polygons.

The mapping process and the resulting kuleana maps can reveal insights about the vulnerabilities of and impacts to these areas. The kuleana maps highlight the diverse cultural functions of the areas. However, when discussing kuleana, participants also talked about the vast impacts to these areas. People reported that activities across West Hawaiʻi are impacting and threatening people and their kuleana: development, over tourism and foreign influence, capitalism and prioritizing money/profit, and inefficient or harmful land management. When regarding the maps it is important to understand that all areas are being threatened by some aspect and more management effort needs to be done to keep people of place in place and to better educate all who interact with and access these lands. Further efforts can be done to note threatened areas. More specific insights could be derived by overlaying areas where development has occurred, where development is planned, as well as ecological layers to understand threats and vulnerabilities in these areas. Areas with diverse ecological functions and cultural functions, area outlined in the kuleana maps could be a start for mapped cultural functions, could indicate resilient areas or bioculturally diverse areas, where protections and stewardship should increase and/or continue. Kuleana can provide a great insight to further management effort and could be a useful inclusion for Environment Impact Statements (EIS) or Cultural Assessments. Understanding the kuleana of other places could be done by conducting similar interviews with Native Hawaiian ancestral descendants, community leaders, and knowledge holders of different areas or resources to understand the kuleana and some of the relationships of kuleana for that place or resource.

The kuleana maps also reveal connections to management areas. Figure 4.11 shows the kuleana areas along with other management areas in West Hawaiʻi, including ahupuaʻa divisions, DAR management areas such as fishery replenishment areas, and some of their spatial regulations of community-based subsistence fisheries areas. Many of the mapped kuleana areas follow ahupuaʻa divisions as participants often have kuleana for certain ahupuaʻa whether having callings there (hana/mākau), stewarding (kiaʻi/mālama), and/or as ʻohana and ancestral kuleana (ʻohana/moʻokūauhau). Other kuleana areas represent specific areas where participants are involved in community-based management efforts. In many cases, participants' kuleana either got established

through those efforts and/or they got involved because they had existing kuleana for those areas. This shows that the kuleana maps can be used in conjunction with management efforts and the kuleana maps can reveal more about the cultural functions from the relationships and connections of kuleana to the areas. Many participants also prioritized acting on their kuleana for areas with these management efforts and are dedicating their time and efforts towards these areas, especially those that are part of co-management initiatives.

The participants of this study were sought for their expertise and relationship to place, but there are many more individuals with cultural connections in this place with important expertise and relationships to place. Expanding the number of people would undoubtedly expand the understanding of kuleana, while mapping other cultural values beyond kuleana would deepen our understanding of place. Other cultural values or practices that could be studied further that were mentioned in my workshops (and some are also used as descriptor in the types of kuleana as well, shown in **bold**) include: **mālama**, pono, hoʻokupu, hiʻuwai, **ʻike, moʻolelo**, and **kiaʻi**. These maps could be compared to the maps created in this project to explore similarities and differences, which might provide deeper theoretical implications. For example, this might create a better understanding of the interconnectedness and spatial representation of intangible and tangible as well as held and assigned values. Additionally, the cultural values and connections represented in these maps are likely still underrepresented. There are likely even more types of kuleana and connections from kuleana that can be derived for places and there are aspects represented in this research that cannot be represented spatially and the maps do not capture those or the dynamic nature of kuleana well.

The kuleana maps can also contribute to a more holistic view of place. These kuleana maps can provide more information on different aspects than other mapping efforts. These kuleana maps can be used with mapping of other social-cultural aspects such as maps of areas stewarded by communities (i.e. stew-maps; Dacks et al., 2021) and coastal uses (Levine and Feinholz, 2015). Some of the information and benefits of these maps are that stew-maps provide information about the social connections and the networks created from activities and how these contribute to human well-being (Dacks et al., 2021). Coastal use mapping provides more information about the specific

activities and uses of an area and where they take place (Levine and Feinholz, 2015). In comparison, the kuleana maps reveal more about the relationships people have with place and some of the spatial connections that stem from kuleana. All of these maps provide different information that together can inform a better understanding of the influences and connections of socio-ecological systems. However, these maps should not be compared or measured against each other to make decisions. For example, the activities outlined in stew-maps should not be compared to types of kuleana as they are measuring conceptually different ideas and practices, but together they can provide a richer understanding of the diverse connections and interactions of a place. The maps created in this study were developed from intensive in-depth interviews with a small sample size. The other mapping efforts of stew-maps and coastal use used other methodologies with different targeted participants and different objectives.

Mapping kuleana can also aid in a greater understanding of relational values and how to operationalize them. Understanding kuleana provides more insight into how humans find meaning and relate to our surrounding environment contributing to our way of life and well-being (i.e. relational values) (Gould et al., 2019; Kenter and O’Connor, 2022; O’Connor and Kenter, 2019). Studying even just one Native Hawaiian value can provide insights for a greater understanding of the nuances of human-nature connections that can inform and elevate Cultural Ecosystem Services and relational values. Just this one Indigenous cultural value provides a greater understanding of how these relationships form the basis of identities (personal, familial, and communal), practices, and places. The grounding of kuleana in spatial representations also creates a “tangibility” to some of the relational aspects that can aid as a stepping stone to operationalizing relational values and providing a means for these values to be taken up in management. Relational values are vast and deeply nuanced due to the many connections and meaning that stem from and are interconnected. Connecting the levels of intensity to mapped kuleana areas also provides more information on the types of connections and relational connections (with your own mind and senses, with others both human and greater than human, and connections through time) people have to place as the levels of intensity use emotional depth and types of connections to explain the meanings of human-nature interactions and relationships.

Mapping kuleana provides more information about the socio-cultural relationships of place than common mapping methodologies. Mapping kuleana moves beyond just mapping those aspects that are easier to spatially represent, such as activities as resources, and instead focuses on the relationships and significance connected to kuleana. The description of the types of kuleana reveal the diverse ecological factors, knowledges, practices, and relational connections of kuleana. Further information on the meanings of kuleana and the threats, impacts and considerations of kuleana provide important considerations for managers. Contemporary management agencies do not adequately acknowledge Indigenous values and knowledge of place. Exploring kuleana revealed some of these shortcomings but also avenues for improvement. As mentioned previously, kuleana greatly exceeds our authority as Native Hawaiians, generational descendants, residents or visitors of Hawaiʻi. We have deep and far reaching kuleana but where or what we have authority for is much smaller. However, the mapped areas of kuleana are areas that participants have some aspect of authority of kuleana over (whether it be genealogical or familial, through relationships or practices, stewardship or restoration efforts, as an elder or knowledge holder, etc.). This authority of people of place and kuleana is not recognized by managers and are areas of contention. All the aspects of threats, impacts, and considerations of kuleana are not new and the management consideration section outlines issues that have been ongoing for decades (Ayers, 2016; Ayers et al., 2018; Fisk, 2021; Friedlander et al., 2014; Tissot et al., 2009). Understanding and recognizing kuleana can provide a greater understanding of the values and connections to place. Management agencies can seek to overcome some shortcomings by having a greater recognition of the authority of kuleana of people of place, removing obstacles of co-management, empowering people of place in bottom-up management approaches, and hiring people of place within agencies as well.

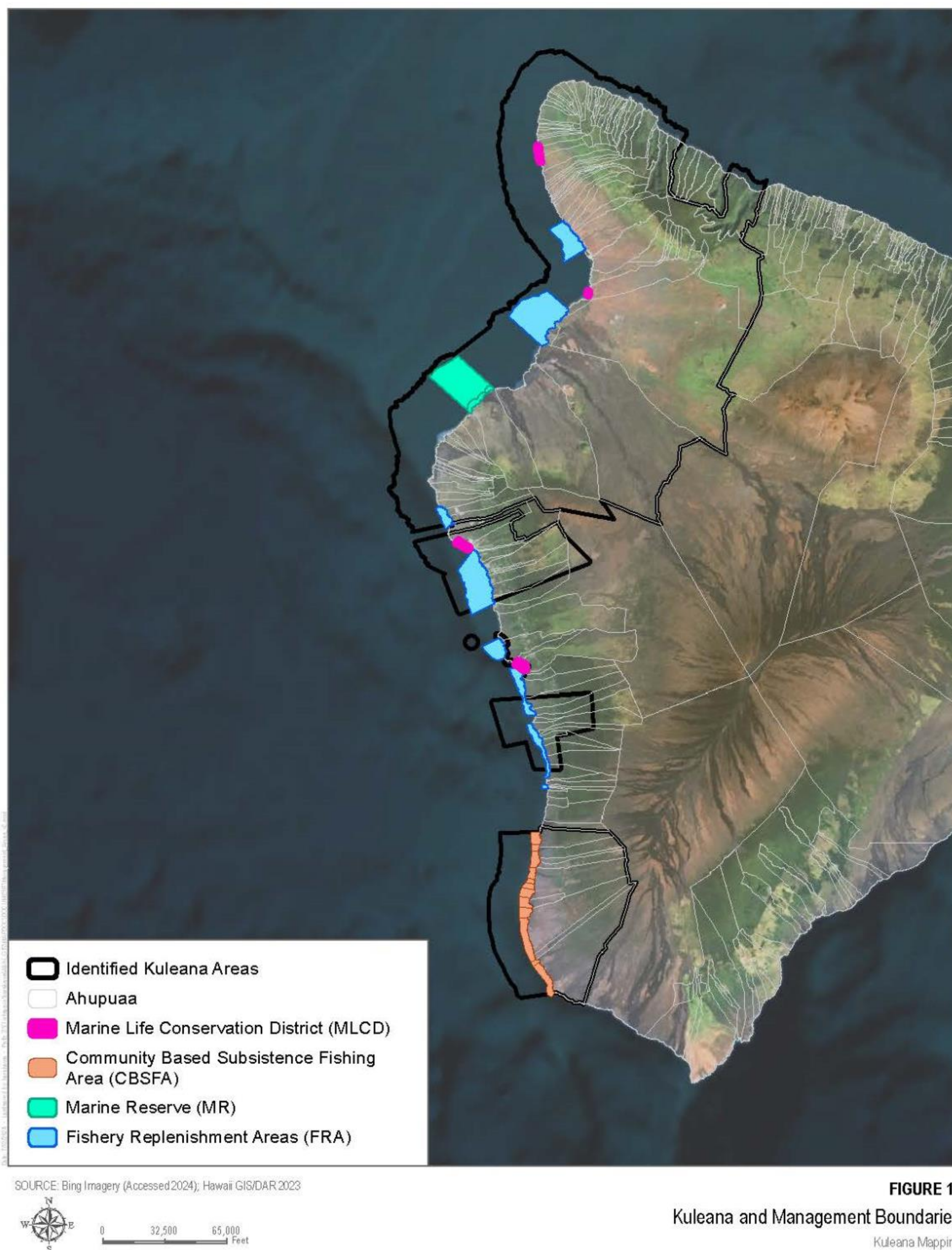

Figure 4.11 This figure shows the kuleana areas identified in this study (the black outlined areas) as well as DAR management areas and ahupuaʻa divisions.

Mapping considerations

While social representation and mapping of Indigenous Knowledge may have many benefits such as a greater understanding and acknowledgment of Indigenous worldviews, mapping and participatory research with Indigenous communities can also perpetuate harms. Indigenous communities are often careful of who they share their knowledge with as there are many examples and experiences of knowledge being co-opted, stolen, appropriated, or exploited (Hernandez, 2022). Any information spatially represented such as species, activities, or habitats can perpetuate harms such as displacing Indigenous peoples and co-opting Indigenous Knowledge. Spatial information may also be unwanted by local and Indigenous Peoples of the area as this can increase access to others that can lead to overcrowding, decreased ability of practices, pushing out of peoples, and exploitation to those areas, species, and habitats. However, mapping kuleana may provide more insights about the people and activities that are impacted as well. In Hawaiʻi it is a common experience for the local and Indigenous communities to be pushed out of areas due to over tourism and have relatively private or secluded areas over exploited with exposure from social media.

When working to map anything it is important to question whether this information needs to be mapped, how maps will be used, and how to map in a way to ensure that the local community (and/or species/habitat) that is being mapped can benefit from this information, or at the very least minimize harms that can come from the information being shared. While spatial representation of Indigenous Knowledge and socio-cultural concepts can be beneficial to acknowledge Indigenous worldviews in management processes and decision making it is important to make sure the mapping is done in a way that is wanted and approved by Indigenous communities. How, why, and for whom are important considerations when working to map anything. Participants in this study were willing to work and map with me because I am a member of their community, and my objective was to uplift their voices to provide a greater understanding of Indigenous values and knowledge. There is still hesitation and worry about mapping, but participants also recognized the need to have better recognition of the impacts and values of place. Maps created do not reveal specific details of place

such as species or resource locations that can contribute to their exploitation. Participants were also given the authority to approve and agree to share the maps they created. I had trust as an insider with similar knowledge and values to participants in this study and I worked to make the process reciprocal. As such, not only would I do my best to elevate a greater understanding of these values and knowledge I would continue to support other ongoing efforts with my research as well.

There needs to be a lot of care and consideration when mapping with Indigenous communities. When building trust and relationships with Indigenous communities an important consideration is the harms and impacts to the place and people depending on how information may be extracted or used. While there can be perceived benefits from understanding more specific and sensitive information, the harms and impacts to those areas and communities should be prioritized and that information should not be revealed. As such, this study was designed as a participatory place-based method for representing relational values, which to date are rarely mapped. Further, the maps in this project seek to protect that sensitive information by providing broader categories and spaces that still reveal more on the cultural functions of place. The maps themselves provide more information about the relationships and connections of places that can also provide a greater understanding of existing and potential harms that may exist such as those threats identified above (e.g. development, tourism, capitalistic values, climate change, and management).

Conclusion

This research worked to map connections of social-ecological systems and reveal more on the relational values of place moving away from common mapping methodologies showing uses and activities. From participatory mapping interviews on kuleana, I revealed nuances of the meaning of kuleana, the diverse spatial relationships and connections to kuleana, and more on the threats, impacts, and considerations of kuleana. In addition, the kuleana maps, which describe a dimension of cultural function of place, provide the opportunity for further spatial analysis for a better understanding of place, while providing tools for spatial planning. Mapping and exploring the meaning of kuleana provides a more holistic understanding of Indigenous Native Hawaiian

knowledge and values in West Hawaiʻi and reveals more avenues for improvements and efficiencies by management agencies. This includes a better recognition of Indigenous values such as kuleana and the authority of people of place as knowledge holders and authorities of kuleana.

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Appendix 1. Researcher responsibility and participant consent form

Consent/Researcher Responsibility Form

Project Overview

This research project will pilot mapping social values for the coastal and marine environment in West Hawaiʻi. By conducting interviews and mapping exercises, we will document participant kuleana to ʻāina and kai and provide guidance on how to spatially represent social and cultural values. This includes creating an understanding of what can be mapped, what may be appropriate to be mapped, and what should not be included in maps so that maps can be beneficial and not harmful to community.

Participation

Participation in this research project is completely voluntary. Participants are free to withdraw at any time during the duration of the project without penalty, or loss of benefit. Participation in the project consists of one mapping interview and either a follow-up interview or workshop where we can verify accurate representation of responses. Interview questions will focus on participant kuleana from within the coastal and marine environment, types of kuleana that participants may have, impacts to kuleana or access over time and by management, and participant desires for future management efforts or protections for kuleana. A copy of this consent form will be provided to participants.

Data management and confidentiality

Research data will be confidential to the extent allowed by NOAA policies and federal laws. Research records and data will be securely stored in a locked filing cabinet or encrypted on a password protected computer. We will take care to ensure that any reports or publications will not attribute quotes or stories to you without your consent. The interview may be edited into audio and video products.

Maps

Participants will be consulted for all maps and outputs created by map data. Due to the sensitivity of maps created and the data used participants will have the authority to approve or not approve of any maps created and data shared.

Risks

We believe that there is little or no risk involved with participating in this cooperative research project. As the researcher, I will also strive to make this process as risk free as possible. While participation may not benefit participants directly, the results of this project could enable better understanding and inclusion of social and cultural information into marine research and management in West Hawaiʻi and beyond.

Compensation

There is no compensation for your time spent participating in this research project..

Researcher consent

I, the researcher, understand my responsibilities to the participants in my research project entitled “Pilot mapping social values for West Hawaiʻi”. I understand that I am entrusted with sensitive and personal information by participants. I will ensure that audio/video recordings, along with its written transcripts, images/videos in which participants appear will be used only in

ways that participants consent to. I understand that content that is created by participants consent may be used by the National Oceanic and Atmospheric Administration (NOAA), its assigns, or successors, in whatever way they desire. I, as the researcher, will ensure that participants are consulted for outputs created by the interviews and data and that they approve of any outputs created. I will to the best of my ability and knowledge at the time ensure that any output and content created will not be harmful to my participants.

Participant Signature(s) for Consent
I, being of legal age, hereby agree to participate in the research project entitled, "Pilot mapping social values for West Hawai'i" given the details outlined above. I consent that my name, audio/video recording, along with its written transcripts, electronic images in which I appear, may be used by the National Oceanic and Atmospheric Administration (NOAA), its assigns or successors, in whatever way they desire. Furthermore, I hereby consent that such recordings, written transcripts, photographs, and/or software from which they are made shall be the property of NOAA, and they shall have the right to duplicate, reproduce and make other use of such recordings, transcripts, photographs, maps, and software as they may desire free and clear of any claim whatsoever on my part.

Pacific Islands Model Release Form

Date(s) of photo/filming, recording, etc.: ____
File ID(s): ____
Location: ____
Photographer/Producer: Alohi Nakachi
Activity: West Hawai'i Integrated Ecosystem Assessment Community Interview

Intended Use of Product: Communication (including media), outreach, manuscripts, and education products of the NOAA Fisheries Service intended to promote an awareness and appreciation of the ocean environment.

Participant Consent Please initial next to either "Yes" or "No" to the following:	**Researcher Acknowledgment** Initial to acknowledge
_____ Yes _____ No I consent to be audio-recorded during this interview for research analysis purposes.	
_____ Yes _____ No I consent to be video-recorded during this interview for research analysis purposes.	
_____ Yes _____ No I acknowledge that I have the right to approve or disprove any maps or outputs using mapping data created	
_____ Yes _____ No I consent to outputs of this interview (audio, photos, etc.) to be used as potential products as outlined in **Intended Use of Product** above.	
_____ Yes _____ No I would like to be completely anonymous in any outputs or reports created	
_____ Yes _____ No I would like to be acknowledged and my name included in any outputs or reports created	
_____ Yes _____ No I would like to receive authorship, as applicable, for any reports or outputs created	
	________ I acknowledge that I will do my best to ensure that any output and content created will not be harmful to my participants

Name of Participant (Print): ____

Address:____

City:_____________________________ State: ________________ Zip Code:______________

Phone Number: (__)___________________ Email: __________________________________

Participant's Signature ____

Name of Researcher (Print):____

Researcher's Signature ____

Appendix 2. Semi-structured interview guide

Mapping interview question guide

Project Overview
This research project will pilot mapping social values for the coastal and marine environment in West Hawaiʻi. By conducting interviews and mapping exercises we will document participant kuleana to ʻāina and kai and provide guidance on how to spatially represent social and cultural values. This includes creating an understanding of what can be mapped, what may be appropriate to be mapped, and what should not be included in maps so that maps can be beneficial and not harmful to community.

Questions will be asked along with a map of West Hawaiʻi to map areas if the exercise makes sense participants and participants are willing to map areas. Mapping will focus on coastal areas/resources/practices of West Hawaiʻi for the project but I will not limit participants to that focus there if they wish to discuss other places/etc.

What does kuleana mean to you?

Where do you have kuleana in West Hawaiʻi?

What types of kuleana do you have?

What kuleana do you have in resources/activities/places in West Hawaiʻi?
    What other resources/activities/places are connected to that kuleana?

(If it makes sense to use/for discussion) What level of intensity or intensities would this/these kuleana be?

How has your kuleana changed over time?

How has your kuleana (or how have you) been impacted?
    How has your kuleana been impacted by management?
    How has your kuleana been impacted by land or environmental changes?
    What would you want managers to know or how would you want management to change?

What changes would you like to see to protect or perpetuate your kuleana?
    How would you ideal manage your kuleana or like to see these places/resources/activities managed/protect/etc.

What current or future threats are there to your kuleana (if any)?

What places of cultural or social significance that were not mentioned but should be (if any)?

What final thoughts do you have, or would like to reiterate, or what have we not talked about but should?

Are there others to talk about...

Will you send any documents, songs, poems, pictures, etc. that help to show or embody your kuleana etc.

Chapter 5. Management operationalization tool for diverse and pluralistic values of CES: a draft survey

Abstract

Understanding the diverse connections between people and their environment is important but this research is not well included in decision making. In this research, I seek to assess the benefits and limitations of qualitative and quantitative methods to understand the diverse meanings and interactions people have with their surrounding environments. I explore different methods from lessons learned from my previous qualitative work, and using that to develop a more quantitative approach of a draft survey. This research was supported and built off of a larger NOAA wide effort to develop a compendium of questions in a question bank. To develop the question bank, a team of researchers used our individual expertise as well as a review of agency surveys reviewing how questions are asked, what questions are currently being answered in agency survey research, and what questions or areas of research are not currently being researched. With our background knowledge, survey review, and literature support, we developed questions and areas of research that management is not currently exploring well. The draft survey was created from similar questions in the question bank but with the objective of seeking to develop a survey for Hawaiʻi to understand some of the meanings and interactions people have with the environment. My previous research has focused on a nuanced and in-depth understanding of Indigenous perspectives of Cultural Ecosystem Services. I look at some of the benefits and limitations of an in-depth understanding of connections between people and their environment compared to broadening this out in other methods such as surveys. I used lessons learned from my previous research on cultural ecosystem services to understand more on what information management agencies may want to understand and how to ask questions or what information may be needed to capture diverse values and worldviews, particularly Indigenous worldviews. I created a draft survey with this objective and offer insights into the benefits and limitations of surveys as a research tool as well as considerations for representative samples of surveys but also targeting certain groups and knowledge holders.

Introduction

The importance of understanding the diverse socio-cultural connections between humans and our surrounding environment within management is widely recognized (Arias-Arévalo et al., 2017; Bagstad et al., 2013; Berkes et al., 1998; Kenter et al., 2019; Schumacher et al., 2020; Sherrouse et al., 2014). With a greater understanding of the connections that exist within a social-ecological system (SES), managers and researchers can make more informed decisions and strive to improve management processes (Berkes et al., 1998; Hernández-Morcillo et al., 2013; Pascual et al., 2023). A socio-ecological systems approach to management involves a broad range of peoples and worldviews, often with conflicting interests and values (Hernández-Morcillo et al., 2013; Pascua et al., 2017; Pascual et al., 2023). Striving for a more holistic understanding of SES, research assessments and methodologies need to capture broad perspectives and worldviews (Berghöfer et al., 2022; Gould et al., 2019; Velasco-Muñoz et al., 2022). A greater understanding is needed of diverse peoples and their knowledge and connections to their surrounding environments, particularly from underrepresented peoples, such as Indigenous Peoples (Berghöfer et al., 2022; Chan et al., 2012; Comberti et al., 2015; Fish et al., 2016; Gould et al., 2019; Kenter et al., 2019; Kosanic and Petzold, 2020; Kronenberg and Andersson, 2019; Massenberg, 2019; Raymond et al., 2019; Velasco-Muñoz et al., 2022).

My previous work has focused on representing diverse values and worldviews in research and management. I created and adapted methodologies to elicit and map Cultural Ecosystem Services (CES) that are also representative of place-based Indigenous Knowledge (see chapter 2, 3, and 4). While these methodologies are necessary and beneficial to provide more in-depth, place-based information for a more holistic understanding of place and knowledge, they are limited to a small number of participants and a narrow focus. Often this research is focused on getting a deep understanding of a narrow focus of a particular phenomenon, activity, resource, spatial area, etc. Building on past efforts, here, I seek to use the lessons learned from accommodating Indigenous Knowledge to design a method that can capture a broader audience using standard management methods for data collection. As such, I explore the benefits and limitations of potential approaches, with a focus on expanding one of

the more common methods, i.e. structured surveys, to accommodate diverse values and worldviews, particularly Indigenous worldviews.

Coordinating ecosystem service research with management efforts is increasingly important, particularly in light of a recent national policy memorandum calling for Federal agencies to incorporate ecosystem services into decision making (Donovon et al., 2015). Research methods that accommodate diverse values and worldviews often do so at a place-based scale. Small sample groups with narrow spatial focuses are often necessary to capture the nuances and complexities of place-based values and socio-cultural connections. However, decision making, and management agencies still rely on broader scale management practices and processes. While management agencies desire a greater accommodation of place-based practices and decision-making, current research and management practices are limited and appropriate methodologies for broader scale applications are needed.

CES surveys offer an opportunity to bridge the gap between ecosystem service research and resource management and decision making but have often been developed without explicit attention to Indigenous worldviews. Cultural ecosystem services are defined as the intangible benefits humans receive from nature (Millennium Ecosystem Assessment, 2005). I have focused on exploring CES to better accommodate Indigenous worldviews and diverse values. In chapter 2, I develop an elicitation tool for CES to qualitatively acknowledge the connections and the importance of the connections between humans and our surrounding environment. Chapter 3, I employ that tool in deliberative workshops to understand why and what is important to human-nature connections to expand beyond CES research that looks at just how humans are connected to environmental systems. In Chapter 4, I map the relationships and connections of kuleana (a Native Hawaiian value commonly referred to as responsibility) Native Hawaiian knowledge holders in West Hawaiʻi. My research has focused on largely qualitative place-based explorations and nuances of connections and relationships humans have with their environments. However, management agency applications of CES still largely rely on quantitative methodologies. Quantitative and monetary methods can still dominate CES framings (Chan et al., 2012; Gould et al., 2020; Mandle et al., 2021) which is problematic because these methods only

acknowledge a narrow range of values and exclude diverse values and worldviews which can contribute to inequalities and inefficient management (Bennett et al., 2021; Berghöfer et al., 2022; Calcagni et al., 2019; Chan et al., 2012; Comberti et al., 2015; Gould et al., 2015; Himes et al., 2020; Isacs et al., 2023; Kenter et al., 2019; Kronenberg and Andersson, 2019; Martin et al., 2016; Sterling et al., 2020). In this research, I seek to understand the limits and benefits of developing questions based on my research to broaden to a larger audience in a more quantitative approach, a draft survey. In this survey, I seek to develop questions for a survey to capture more diverse values and worldviews and assess what information we may be able to gather from a broader approach and what information we just cannot get.

Surveys are a useful tool employed commonly by management agencies and also within CES research. While there are many methods to better understand social values, or what people find important, management agencies often are limited in capacity, time, and funding. Surveys are beneficial in terms of their ease to send, relative low cost, speed of delivery and response, ability to reach a large number of potential respondents, and ease of data cleaning and analysis (Sills and Song, 2002; Van Selm and Jankowski, 2006). Government agencies often rely on surveys as a form of data collection to gather representative data from a large sample size at a fairly low cost. Examples range from large scale efforts, such as the US American Community Survey, to small-scale, e.g. local opinion surveys. Surveys have also commonly been used within the ecosystem services field to gather information on perspectives and preferences regarding CES, as well as spatial representations of CES (e.g. Bagstad et al., 2017, 2016; Brown, 2013; Chen et al., 2015; Nahuelhual et al., 2016; Sherrouse et al., 2014; Sherrouse and Semmens, 2014, 2014; van Riper et al., 2017, 2012; Zhang et al., 2019). While surveys are a useful tool, there are limitations to what kind of knowledge and the quality of knowledge that can be obtained from surveys. Surveys are best suited for obtaining quantitative metrics for questions, especially when an understanding of the relative numbers of people who hold certain beliefs or preferences is desired (Dillman, 2007; Phillips et al., 2013; Van Selm and Jankowski, 2006; Wolf et al., 2016).

A substantial challenge with CES research is that people hold diverse and broad values for their surrounding environment leading to ambiguities and asymmetries around values for nature (Kenter et al., 2019; Kronenberg and Andersson, 2019; Massenberg, 2019; Pascual et al., 2017; Raymond et al., 2019). Deliberative or narrative methodologies such as interviews, workshops, and storytelling are more suitable to understand the nuances, diverse perspectives, and multiple knowledge systems of the values people hold for their surrounding environments (Eriksson et al., 2019; Kenter et al., 2015; Lliso et al., 2020; Lopes and Videira, 2018; O'Connor and Kenter, 2019; Zimmermann et al., 2021). A key limitation of small sample-size qualitative methods is that they will not illustrate the degree to which others in the community hold these perspectives.

Surveys could be useful subsequent to qualitative efforts to reach a broader audience at a greater scale. Reaching a broader audience and scale is useful from a management perspective. The trade-off is that looking at information on CES at a broader scale can compromise a deeper and greater understanding of some of the important concepts and nuances behind CES and how humans interact with and relate to their surrounding environment. Further, while surveys are meant to be representative of some population, there are knowledges and perspectives that can get overlooked as they may be smaller percentages of the population, for example Indigenous voices because these identities may get subsumed into larger populations. Therefore, it is important to critically consider survey design and implementation.

In this chapter, I seek to explore how to broaden our understanding of the connections between humans and their environments by adapting and applying insights from my in-depth qualitative work to a structured survey to try to capture diverse perspectives that can still be inclusive and representative of different peoples and ways of knowing. In drafting this survey, I explore what are some of the benefits and limitations of a more in-depth understanding such as from my previous research, and what are some benefits and limitations of trying to broaden out this understanding to reach a wider target audience.

Similar to my place-based research, the proposed structured approach to reach a broader audience seeks to better understand human connections to their surrounding

environment, framing these connections as meanings and interactions that are important to people. This draft survey seeks to understand what types of connections people have with their surrounding environment, what some of the motivations are of human-environment interactions, where interactions occur, and some of the reasons why these interactions are important. I sought to expand previous research that is less inclusive of Indigenous worldviews, namely agency surveys and CES surveys such as SolVES. The Social Values for Ecosystem Services Program (SolVES) is an example of a social value mapping tool developed by the United States Geological Survey that uses surveys to collect data on CES preferences, perspectives, and spatial representations.

The draft survey was created with the intention to be used in Hawai'i to broadly understand diverse perspectives, recognize multiple worldviews particularly Indigenous worldviews, and learn more about the influences and connections within socio-ecological systems (SES). I develop questions to capture diverse values and offer space for respondents to add their own perspectives and expand upon their reasonings and move away from a narrow-predetermined value set and quantitative valuation. The narrow-predetermined values in more common SolVES and Public Participation GIS (PPGIS) (participatory mapping) approaches focus mainly on perceived values of biodiversity and aesthetic, recreational, and therapeutic value, defined via dominant management perspectives (Bagstad et al., 2016; Sherrouse et al., 2014; van Riper et al., 2017, 2012; Zhang et al., 2019), which may not represent meanings or interactions important to people with other worldviews. When mapping has been employed in CES survey research, map outcomes typically convey values as measures of species diversity, richness, abundance, and/or rarity (Nahuelhual et al., 2016; Sherrouse et al., 2014). I aim to have questions that will enable maps showing areas with the presence and absence of a diverse range of meanings and interactions people have with the area. Ideally map outcomes from the draft survey will also show the diversity of functions of the different meanings and interactions among various peoples, user groups, and knowledge holders.

The remainder of this chapter is structured as follows, first I will present a brief explanation of the methods used to develop the draft survey. Then I will go into what the

draft survey entails with justification and explanations of why some questions are asked. Finally, I will go over some of the benefits and limitations of the draft survey as well as expected uses of the draft survey.

Methods

I first started by reviewing structured survey instruments that have been used to examine management concerns and perspectives of CES. This review showed how questions are typically asked and what surveys have been used for and what information is gathered. A team of researchers including myself sought to develop questions that we perceived would aid in ecosystem-based management efforts providing a more holistic understanding of social-ecological systems and the diverse connections and influences between humans and our surrounding environment. Together, we used our backgrounds and expertise, including women and gender studies, small-scale fisheries, subsistence fisheries equity and environmental justice, and Indigenous Knowledge, to develop questions that would be beneficial to management and accommodate diverse peoples and practices (Frangoudes et al., 2019; Green et al., 2021; Kleiber et al., 2018, 2017; Lawless et al., 2021; Selgrath et al., 2018, 2018; Selgrath et al., 2007). We developed questions specifically with the goal of finding information or answering questions that management agencies currently do not understand well and do not collect much if any data on.

Surveys we first looked at included existing agency surveys such as NOAA West Coast Fisheries Participation Survey (0648-0749), NOAA Socio-Economic Survey: Manell-Geus (Guam) (0648-0723), NOAA GRNMS KAP (0648-0625), and NPS Pool of Known Questions (NPS 1024-0224). We reviewed these surveys to see what questions have been asked, how they have been asked, and what types of questions have been approved by the office of management and budget (OMB). We used these existing surveys to support and justify questions asked and help to provide guidelines for how to ask questions but we also looked at existing surveys to understand what information is missing as well. From this, we developed areas of questions to ask that would support agency research and management decision making using our background and literature to develop questions. Topics we developed questions for included

demographic/respondent characteristics, respondent relationship and connections to place, motivations for visiting or recreation, respondent knowledge and perceptions, human-wildlife interactions, relational values, perception of management, environmental equity and justice, accessibility, food security, nutrition, well-being, connections to place, heritage and culture, and Indigenous Knowledge. I used my background as an Indigenous researcher and my previous research to aid in developing questions, particularly those on relational values, well-being, connections to place, heritage and culture, and Indigenous knowledge.

This review resulted in a compendium of survey questions that can be used as a tool to streamline survey approval within the agency. When NOAA conducts structured information collections, such as surveys, the questions need to be approved through the Office of Management and Budget (OMB). The process to get approval can be lengthy but having a pre-approved question bank can streamline the approval process for surveys that draw primarily from the pre-approved questions. This serves as a resource for researchers who could pull or modify questions as needed for research and survey needs and these pre-approved questions would aid in speeding up the OMB and research process. The question bank is currently moving through the OMB approval process and will be made available via the Office of National Marine Sanctuaries once approved.

From the question bank, I then selected questions to develop a draft survey that might be used to understand spatial characteristics of CES in ways that represent diverse worldviews and pluralistic values of our surrounding environment. To develop questions as part of the question bank and to develop this survey I used lessons learned from literature reviews as well as my previous research–developing a near commensurable metric for CES (Chapter 2), understanding and revealing more about the deeper meanings of CES and reasons why people interact with nature (Chapter 3), and spatially representing a relational cultural value to place (Chapter 4). Informative literature includes social-ecological systems, relational values, cultural ecosystem services, and SolVES. To develop this draft survey, SolVES research was particularly informative as this research has been acknowledged by management agencies to support a greater understanding of human perceptions and interactions with

landscapes. The structure and types of questions asked in SolVES surveys served as a guideline for questions asked and I used lessons learned from my previous research to expand and modify questions to be more inclusive of diverse worldviews, such as Indigenous worldviews, and values and acknowledge human-nature connections and influences that are not well acknowledged with standard and common existing surveys. Lessons learned from reviewing agency surveys and developing questions as part of the questions also informed this draft survey particularly the demographic and place sections to understand what questions. From these lessons learned, I developed a draft survey to elicit CES, understand what makes CES important to people, what are the important connections of/from CES, and spatially represent those connections. Spatial representations that aggregate responses (e.g. hotspot maps) could be useful for identifying management synergies and tradeoffs, conflicts among peoples (Alessa et al., 2008; Bagstad et al., 2017, 2016; Sherrouse et al., 2014, 2011), vulnerable areas, as well as areas with diverse functions and importance. They can also help reveal gaps in communication/collaboration, and opportunities for overlap with other management goals (Bagstad et al., 2017).

Results

The objective of this draft survey is to create questions and provide information to aid in understanding how social and ecological systems are connected and what makes the surrounding environment important to humans. The draft survey can be found in Appendix 1. Table 5.1 provides a breakdown of the questions included in this draft survey, what sources these questions were created from, and the reasoning of why these questions were included. In this section, I will break down the various sections and questions within the survey to explain why they were chosen for the survey and important to understand the connections within SES.

Table 5.1 This table lists the questions from the question bank, the sources of where these questions were derived from, and the reasoning of why these questions were included and created for the question bank.

Question(s)	Source	Reasoning
Demographic 1-10	CES and agency surveys- identification questions for representative sampling	Demographic questions are added to understand the representativeness of the survey respondents
Place 1-6	CES and agency surveys- identification questions and preference groupings Chapter 2- place-based knowledge Chapter 4- key informants having unique skills and knowledge, participant relationships to place	Place questions are added to understand participants' relationships they have to place and specific knowledge or skills they may have relevant to relating to place. These questions can also be used as identifier groupers that can compare different groups of identities/ knowledge holders
CES 1 and 2	CES surveys- types of CES participants value and if they are experienced in a certain area Chapter 2- how participants find meaning and importance in the surrounding environment Chapter 3- how participants find meaning and importance in the surrounding environment, the connections between CES	These questions seek to understand what categories of CES may be experiences, how they may be important to the participant, and provide more information on how CES categories may also be connected or bundled (through similar reasonings for importance)
CES 3	CES surveys- types of CES participants value and if they are experienced in a certain area Chapter 2- specific examples of how people find meaning and interact with their surrounding environment Chapter 3- foundational or key concepts that connect humans to their surrounding environment	This question gives participants the opportunity to list any other connections they have with place that might not have been captured by CES or those connections that are particularly representative of their connections that can provide more information on the influences within social-ecological systems

Question(s)	Source	Reasoning
CES 4	CES surveys- types of CES participants value and their importance Chapter 2- prioritizations of CES but also their non substitutability. Chapter 3- prioritizations of CES but also their non substitutability.	This question seeks to understand prioritization of people's interactions. However, it also provides the option to opt out of ranking interactions or provide certainty of their ranking allowing a better understanding of the importance and accuracy of their prioritizations.
Map 1-4	CES surveys- where CES are experienced Chapter 3- how people find meaning and interact with their surrounding environment Chapter 4- relationships participants have with place and the meanings of these relationships	These questions seek to understand areas where participants may interact with or find meaning with their environment, why they chose what they chose to map, and how certain they are of what they mapped. These questions can provide more information about the accuracy of their maps as well as the importance of mapped areas.
Map 5 and 6	CES surveys- where CES are experienced Chapter 4- relationships people have with place and spatial components that are important to those relationships	These questions seek to understand what other spatial aspects may be important to how humans interact and find meaning in their environment as well as how these spatial aspects may influence SES.

Demographics

An important benefit of surveys is that they can reach a large, ideally representative or targeted sample size even with limited research capacity. Demographic questions are important to understand the representation of the survey and ensure that representativeness is obtained from the survey (Axinn et al., 2011; Fernandez et al., 2016; Rashawn, 2020). Examples of core demographic questions are included in the draft survey including gender, age, race/ethnicity, education, occupation, income, and geographic area and relationships (Axinn et al., 2011; Rashawn, 2020). With demographic information, researchers can understand the representativeness of the data, make comparisons among populations, and understand more about groups who have been left out of the data collection process (Rashawn, 2020; Kleiber, 2022

unpublished). While representativeness is a benefit and one benefit and potential objective of surveys, there is also a benefit in having and understanding particular target populations. Demographic information can also provide information to see if you are gathering information from specific target groups. In this case, representativeness of people of Hawaiʻi, particularly Native Hawaiians and underserved communities, have been underrepresented so I also developed questions that have the potential to assess relationships and connections to place and understand the demographics of respondents but also knowledge and relationships of respondents that can provide necessary information to assess if target groups are being reached as well. Demographic questions, as well as questions in the next section "Place", are also informative to assess not only representativeness, but groupings for target groups including Indigenous Peoples and knowledge holders of place.

Place

There are additional questions to these core demographic questions to ensure that participants of the survey are representative of all target populations. In addition to typical geographic residence questions, there are Hawaiʻi relevant questions such as what ahupuaʻa do you reside in and/or what ahupuaʻas do you have connections with. Ahupuaʻa are Native Hawaiian land divisions that are used today to delineate areas of residence but are also important in noting your ancestry and genealogical connections (Gonschor and Beamer, 2014; Kame'eleihiwa, 1992; Morishige et al., 2018). Ahupuaʻa is included in the draft survey as an addition or alternative to zip codes to note important places to the respondent. In addition to areas of connections the survey includes questions about participants' relationship to the areas. This is important as there are many different types of residents of Hawaiʻi including Native Hawaiians, Hawaiian ancestral descendants of place, non-Hawaiian generational descendants, long-time residents, and part-time residents. With these questions of areas of connection as well as relationship to the areas more information can be known about the type of resident participants may be.

There are additional questions that can be used to help understand participants' preferences and groupings. For more holistic decision making, more effective and

equitable management it is paramount to understand diverse values and worldviews, particularly those of Indigenous and underrepresented Peoples (Bennett et al., 2021; Dawson et al., 2021; Phelan et al., 2022; Vallet et al., 2019). As such, a target group for this study is Indigenous Peoples and knowledge holders so there are questions within the survey asking about Indigenous identification and types of knowledge people may have. For example, there are questions about how participants are connected to the place or how they may find the place important to them including how they may be connected to the place ancestrally. There are additional questions to understand how participants relate to the surrounding environment and if they have any special knowledge within the areas (community leaders, ancestral descendant, cultural practitioner, researcher, etc.). These questions can be used to group knowledge holders similarly to how other surveys may ask preference questions to group people into user groups or “environmentally minded” groupings. Other questions could be added to understand user preferences and groupings that may be relevant to the study objective and for comparisons such as environmentalist/conservationist beliefs, recreational activity participants, commercial hunters/fishers, etc.

CES

The center of this draft survey is to understand the various ways SES are connected in the ways humans and their surrounding environment influence one another. To understand the connections between social and ecological systems, this survey draws inspiration and learns from previous CES mapping surveys, particularly those employing SolVES (e.g. Sherrouse et al., 2014, 2014, 2011; Sherrouse and Semmens, 2014; Sun et al., 2019; Zhang et al., 2019). In many of these studies, the surveys have standard CES definitions that then ask respondents if they value the area/landscape/scenery for those different groupings (e.g. aesthetic, recreation, biodiversity, economic, etc.). The surveys then ask respondents to allocate a hypothetical amount of money or quantity to aid in understanding the significance of those values as well perceived areas representing those values on a map. Similarly, this survey uses CES to understand how humans connect with and find importance in their environment. However, this draft survey aims to start the beginning steps of

moving beyond a one-dimensional understanding of CES to understanding the diverse connections and reasons ecological systems are important to people. This draft survey uses CES developed by previous research within Hawaiʻi understanding the connections between humans and their surrounding environment (Ingram, 2019, 2020; Ingram et al., 2018; Leong et al., 2019).

In this draft survey, CES are not framed as "values" but rather as ways humans interact with and find meaning with their surrounding environment. While some researchers may frame CES as values, CES are really categories of interactions. What CES research does not acknowledge well are the meanings people get from interactions and the reasons why they interact with their surrounding environment. I frame CES as meanings and ways of interaction, to better understand the connections and influences within SES. The categories are still flexible to account for multiple meanings, however, the draft survey also offers open-ended questions for respondents to list specific examples of these interactions and meanings to ensure responses are interpreted properly in analysis. While open-ended questions can make analysis more difficult, the opportunity to list examples can give more insight into the diverse and pluralistic values that people hold for nature and that are important for how people interact with and find meaning in their surrounding environment. Part of the difficulty of understanding CES is that people can have different assumptions and meanings placed on definitions, offering respondents chances to explain or respond with their interpretations can give further insight to these pluralistic meanings people hold for their interactions and CES.

An indication of the importance of CES, and the connections among SES elements, can aid in decision making and understanding the impacts of potential management actions. In many CES surveys, there are questions about how much of hypothetical money or quantity of some other payment people would allocate to certain services, which is meant to represent their personal preferences/services. This can help understand the prioritization and importance of certain values but does little to inform more on the ambiguity of categories and reasons why CES may be important. As such, this draft survey asks why the various categories of interactions and meanings people find with their surrounding environment are important to them. The various reasons

listed are those that have been developed from previous research particularly (Ch 2) of different types of connections people may have with their surrounding environment that are part of the categories of the levels of intensity, and (Ch 3) of some of the key meanings people discussed of reasons why interacting with the surrounding environment is important to them. Listing the various reasons gives more insight into why the interactions and meanings are important to people as well as may give insight into the connections between the meanings and interactions. Choosing the same reasons that meanings and interactions are seen as important can imply connections and dimensionality between them. In addition to reasons why the interactions and meanings are important, participants are also asked to rank those interactions and meanings or their own specific examples of them. This ranking can create a better understanding of importance and prioritization, however, there is also an option not to rank them and to explain why or why they didn't rank them. To some, ranking these meanings and interactions may be meaningless or inappropriate so asking why or how they ranked them can give insight into their level of importance, the appropriateness of ranking them, how much effort may have been put into their ranking, as well as how definitive their rankings may be.

Mapping

Lastly, the draft survey aims to understand the spatial locations of the connections with SES. While ideally respondents could mark all the areas supporting their interactions and meanings of nature that could be extremely time consuming and cognitively challenging. As such, the draft survey asks respondents to choose general areas for their interactions and meanings, or up to five interactions and meanings, or up to five of their specific examples to map. This can give insight into what areas are important to people, and their interactions and meanings with the surrounding environment, as well as where specific interactions and meanings may occur. Respondents are then also asked why they chose to map what they mapped and how certain they are of what they mapped. This can illuminate the importance of areas, respondent mapping literacy, and the appropriateness of mapping. In addition, further

questions are asked to understand what other attributes of the area or spatial components may contribute to or detract from their interactions and meanings.

Discussion

Socio-cultural valuation and understanding the diverse connections between people and their environment are important, but this research often lacks formalization, which limits its applicability in assessments and decision making (Schmidt et al., 2017). This draft survey offers a first step of an approach of an assessment that can be used to formalize research and broaden the scale of my previous research on the connection between humans and their environment to be used by management agencies. To understand the nuances and connections within SES management agencies should adapt to more place-based practices and decision-making. However, methodologies for decision making on a broad scale can also be adapted to accommodate management agencies' need for easy, broad instruments that fit current management capacity and limitations. The draft survey developed here offers a methodology for capturing some of the diverse meanings and interactions people have with environments at a broad scale. This draft survey provides insights into 1) some of the benefits of surveys from reaching a broad representative audience but also considerations for targeting specific groups and knowledge holders; 2) questions and considerations to elevate our understanding of CES and the connections between humans and their environment; and 3) considerations and limitations of surveys and this draft survey as well.

Representation and target populations

While surveys are a useful methodological tool to understand general representative samples, as institutions strive towards equity, inclusion, and representing diverse worldviews, targeting specific populations or communities may also be needed. Perceptions of the environment is subjective and differs among individuals and knowledge groups (Sun et al., 2019). To understand the linkages and influences within social-ecological systems, more emphasis needs to be placed on demographic and cultural factors (Sherrouse et al., 2011). Dr. Jessica Hernandez advises that we must seek out the Indigenous Peoples of places who know that place best through

generational knowledge, ancestral memory, and kincentric relationships to manage and inform us of the place/land (Hernandez, 2022). When conducting or developing surveys it is important to consider what information may be wanted from the surveys, as well as what expertise, in addition to representation may be important. Representative and specific samples of Indigenous communities should be sought out including key informants. Just as we would seek out informants from experts, there are people with particular skills, knowledge, and expertise whose perspectives we may want to highlight and compare how others may differ. The demographic information sought within the study seeks to understand different knowledge holders and user groups beyond just differing recreational and environmentalist groups

Scaling up my research

My previous research has focused on better acknowledging Indigenous Knowledge within CES through their elicitation and spatial representation. I developed an elicitation tool, the levels of intensity. The levels of intensity was developed from lessons from economic valuation, relational values, and environmental psychology and uses emotional depth and types of connections to highlight some of the reasons humans seek environmental interactions are why these interactions are important. When I applied the levels of intensity in deliberative workshops, these workshops revealed some of the diverse reasons people interact with their environment and highlighted the pluralistic values people hold for CES and the environment. These workshops also provided insights into some of the reasons why human-nature interactions are important including actions, sense of self, personal feelings or emotions, human-based connections, and environmental connections. To broaden out my research I tried to include aspects of the levels and intensity and reasons why human-nature interactions are important into the survey. Not all aspects of the levels of intensity could be included in a survey as emotional depth does not translate well into a survey and a survey is not equipped to capture all diverse connections and interpretation of types of connections. Workshops and interviews are beneficial as they provide opportunities to better understand some of the different interpretations and perspectives people hold. Surveys, in comparison, need an assumption that

respondents will have a similar interpretation of questions which can be limiting and problematic particularly when researching diverse and pluralistic perspectives.

To understand diverse perspectives and environmental values, many researchers recognize the importance of mixed methods (Berbés-Blázquez, 2012; Eriksson et al., 2019; Isacs et al., 2023). Mixed methods use both qualitative research methods and quantitative research methods to study a phenomenon for greater insights and understanding that that could not be gained by just using a quantitative or qualitative method (Venkatesh et al., 2013). My previous research conducting workshops using the levels of intensity and interviews to spatially represent some of the relationships of kuleana Native Hawaiian knowledge holders have in West Hawai'i provided a deeper understanding of the connections between humans and their surrounding environments. This is a qualitative approach that focuses more on particulars of participant perspectives, or more on the depth of concepts being explored. Surveys in comparison are a quantitative approach that focus mainly on the amount or breadth of respondents answering a question or having a certain perspective such as some of the connections participants have to their environments. Surveys can contain qualitative data but these responses still capture breadth of responses or interesting or outlier responses. Studying a more diverse and representative range of peoples can provide insights into what connections may be well understood, what connections are not, and where further research may be needed. By doing a more in-depth qualitative approach first, this also provided a base-line of understanding for types of connections people have with their environment and reasons why these connections are important. Surveying a broader population can also provide more insights if these connections and reasons resonate with a larger audience as well. Surveys are beneficial in reaching a broad audience but they are limited to time, attention, and cognitive capacity. My previous research focused on understanding some of the nuances of CES and human-environmental connections. Surveys do not hold the capacity to understand nuances and instead rely on broader, generalizable categories that can have ambiguous interpretations. However, open-ended questions offer the opportunity for respondents to provide more insights into their responses. It is also difficult for surveys to capture some of the harder to articulate connections or reasons for human-nature interactions. As such, this may limit responses

to those easier to articulate and commonly referenced responses that may already be known. Check-in questions as to how people answered questions and their perspectives and certainty of answers (e.g. they were very certain of their answers, their answers would change over time, they are not sure of their answers, did not put much thought into their answers, answered the question but did not resonate with it, etc.) may offer more insights into the cognitive limitations of survey answers.

Overall, this draft survey offers an opportunity to understand how some of the reasons humans interact with their environment and the importance of human-nature connections resonate with a broad audience. This survey and quantitative methods are limited with respect to capturing the deeper and diverse reasons for interactions and connections. But this survey can aid in identifying peoples or areas of research such as certain types of connections or reasons for interactions that should be researched further.

Elevating CES research

Many studies focus on the positive contribution of ecosystems to human well-being but not many studies look at the synergy or conflicts between CES (Brown, 2013; Gould et al., 2015; Hamann et al., 2015; Hernández-Morcillo et al., 2013; Howe et al., 2014; Plieninger et al., 2013; Velasco-Muñoz et al., 2022). Looking at the different ways people find meaning or interact with the environment, and how these are perceived as important, can give some information into the connectivity (positive and negative) between CES or the synergies and potential conflicts between them. For example, in this draft survey, in the CES questions (particularly CES 1 and 2), if CES (meanings and interactions) are chosen to have the same reasons for importance, this can be seen as synergies and connections between those CES from that individual's perspective. The more connections, or having the same reasons of importance for different CES by more participants in the survey, can illuminate more on the strength or breadth of synergies for those CES. Conflicts may be a little bit more difficult to determine among individuals but on a community scale, conflicts could occur when meanings and interactions and their importance differ among different peoples.

Negative perceptions or disservices are not well studied and have been noted as a gap in the literature (Fischer and Eastwood, 2016; Plieninger et al., 2013; Velasco-Muñoz et al., 2022). Due to time and cognitive limitations of long surveys, I chose not to explore negative perceptions or influences of the surrounding environment even though they were an important part of discussions in Chapter 4. However, some other questions could be included or changed in this survey to understand more about "disservices". One question included in the draft survey asks if there are aspects that detract from interacting or finding meanings with the surrounding environment which could be used to understand part of these negative aspects. However, further questions or research could be done to look at more of the negative aspects. Some suggestions added at the end of the draft survey include possibly asking about threats to peoples' mental health/well-being as well as mapping threatening or uncomfortable areas on the map.

Considerations of scaling up

This research seeks to better acknowledge diverse perspectives and pluralistic values of the surrounding environment. A survey was developed as one way to gain insights on the connections between humans and their environments. This survey is focused on asking questions in different ways to better understand perceptions and in identifying differing peoples and knowledge groups. Open-ended questions are a useful way to gain more insights from respondents but can have more difficulties in analysis which can create some challenges to formalization. With implementation or further input on the draft survey, more attention will need to be given to analysis potentials and formalization. This can include looking at the applicability of other analysis and software tools such as SolVES.

Open-ended questions and asking people to map locations of values can also place a high cognitive burden on respondents which can limit the accuracy of the maps (Bagstad et al., 2017, 2016; Nahuelhual et al., 2016). Nahuelhual et al. (2016) suggests that mapping processes should be adapted to respondents' capacities and knowledge. In this draft survey, there are questions asking people about their meanings and interactions with the surrounding environment could be seen as creating a large

cognitive burden on respondents. On the other hand, because many of the meanings and interactions being explored may not fit neatly with previous categories, it may be cognitively easier for respondents to explain their reasoning rather than try to fit their responses in categories that are not representative of their worldviews. To create room for the diverse interactions and meanings people have, there are open-ended questions giving flexibility to respondents to answer differently from each other, as well as reflection questions added into the survey to gain more insight in respondents accuracy, beliefs, and certainty. These reflection questions may create a greater understanding of the varying accuracy of respondent's maps, as well as some of the burdens the survey may create. The reflection questions were added as well so that respondents do not need to list every single meaning and connection with their environment, but the reflection questions can give insight into why some meanings and connections were chosen. These reflection questions do not guarantee that this will limit the cognitive burden on participants depending on how much thought and time they spend on the questions. As such, there may need to be further research on the draft question to see its applicability in terms of time consumption and cognitive burdens on participants, and questions may need to be modified to minimize the burdens on participants. Pilot testing the draft survey was not yet conducted and would be an important next step to understand how the question format resonates with respondents, and other potential issues such as cognitive load, or understanding mapping instructions.

Standard survey practices and methodologies do not accommodate pluralistic values and diverse worldviews well. To have surveys to accommodate pluralistic values will require creativity. In this draft survey, I creatively applied insights from my previous qualitative research to better understand some of the diverse perspectives and connections people have with their surrounding environment. This includes long repetitive questions to understand diverse values and connections as well as open ended questions to offer more opportunities for clarification on participants' thoughts and perspectives. Ideally, all of the questions in this survey could be answered to understand more on the participants identity and relationship to place (demographics and place), the types of connections people have with their environment and some of the reasons these connections are important (CES), as well as areas and spatial factors

that are important to people connecting with their surrounding environment (mapping). However, asking the draft survey in its entirety would likely require a lengthy amount of time and cognitive effort that does not fit into ideal survey practices. Asking the questions in their entirety could create unideal results if questions are not answered or participants give up on the survey. This draft survey needs further testing and piloting to see the length of time the survey would take, as well as more on the understanding and comprehension of questions, and how participants may answer questions. Seeking to fulfill management objectives and answer management questions, using this draft survey will require researchers to balance the tradeoffs of the questions. This includes either prioritizing certain questions based on what management needs may be to fit structured survey practices and analysis, or moving away from relying on structured quantitative instruments to get more diverse and robust responses.

Further testing of this draft survey would also be needed before it could be implemented. Focus groups or workshops with diverse respondents and targeted demographics of this survey should be conducted to check how questions may be perceived by respondents. Questions can be modified or added to, to better accommodate participant needs and understandings. This includes asking further identifying or perception questions to ensure that the target audiences and the knowledge and expertise that are being sought can be captured and sorted based on the questions. Testing the questions and the draft survey can also provide further insight to whether some of the questions are valuable and if further understanding is provided from some of the more difficult questions such as the lengthy repetitive CES questions, the open-ended questions, and the questions asking for ranking and prioritizations. Additionally, testing the draft survey can provide more understanding as to whether asking the question bank in its entirety is realistic in terms of timing and cognitive effort, or if the responses may be valuable enough information to managers that asking the questions in their entirety may be worth steering from best survey practices.

Conclusion

In this research, I developed a draft survey to better understand the connections and influences within SES to be used within agency research and decision making. In

addition to creating a draft survey, I explore some of the benefits and limitations of surveys. Surveys are beneficial and often used because they can reach a broad audience with minimal research and financial burden to agencies. However, while surveys can be representative of populations, who and how surveys are representative, needs to be considered as well. While surveys may reach a broad audience, depending on the objective of the survey and where the research is being conducted research should also target and represent specific groups and knowledge holders. This draft survey offers the opportunity to understand more about the diverse meanings and interactions people have with their surrounding environments than previously developed CES surveys, and thus can elevate our understanding of CES and SES. Creating space in this survey to acknowledge what meanings and interactions people have, can illuminate more on the connections and influences within SES. Understanding the meanings and interactions people have, as well as why these are important, can reveal more about the types of CES people may find important and how they find them important and can begin to reveal synergies or conflicts between different types of CES. Further research would need to be done to understand the applicability and limitations of this draft survey and may need to be modified further before implementation. Additionally, there are still some values and deeper meanings and connections that surveys do not accommodate well, which should be included using different research approaches. Survey research should be used with other methodologies and research for a more holistic understanding of SES and the diverse and deep meanings, interactions, and reasons people have for interacting with their surrounding environment.

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Appendix 1- Draft CES survey

Demographics

Dem 1

What gender do you identify as? (check all that apply)

- Female
- Male
- Non-binary
- Trangender
- Trans-masc
- Trans-fem
- Other
- Prefer not to answer

Dem 2

What is your age? _______

Dem 3

What categories describe you? (check all that apply)

- White
- Black or African American
- American Indian or Alaskan Indian
- Hispanic, Latino, or Spanish Origin
- Chinese
- Filipino
- Asian Indian
- Vietnamese
- Korean
- Japanese
- Other Asian
- Native Hawaiian
- Samoan
- Chamorro
- Unlisted Pacific Islander
- Unlisted Category

Dem4

Are you Indigenous or First persons?

- If yes please list your Nation, Tribe, Kingdom, etc.

Dem 5

What is the highest level of education you have completed?
- Less than 9th grade
- Some high school (no diploma)
- High school graduate (including GED)
- Some college (no degree)
- Associates degree or technical school
- College graduate (bachelor degree)
- Masters degree
- Professional degree
- Doctoral degree
- Other, specify_________________

Dem 6

Are you currently employed?
- Employed full-time (one job)
- Employed full-time (multiple jobs)
- Employed part-time (one job)
- Employed part-time (multiple jobs)
- Homemaker/caregiver
- Student (full time)
- Student (part time)
- Retired
- Note currently employed
- Other, specify_____________

Dem 7

If you are employed, what is your primary occupation:_____________

Dem 8

How many types of [jobs/livelihoods] do you have in a typical year?
- I have always had the same job
- I do not work
- 2
- 3-4
- 5-7
- 7-10
- More than 10

Dem 9

How many people live in your household?
- 1 (I live alone)
- 2
- 3-4
- 5-7
- 7-10
- More than 10

Dem 10

What is your approximate household income?

Place

Place 1

Where is your primary place of residence?
- Zipcode:______________
- Ahupuaʻa:_____________

Place 2a

What other areas are important to you or do you have connections to?
- Zip codes: _______________
    - _______________
    - _______________
    - _______________
    - _______________
- Ahupuaʻa:_______________
    - _______________
    - _______________
    - _______________
    - _______________
    - _______________

Place 2b

Why are these areas important to you or what connections do you have to them? [check all that apply]
- Area of work
- Areas for certain practices and activities
- Areas with familial connections
- Areas with genealogical or ancestral connections
- Other (please describe)

Place 2c

If these are areas of familial, genealogical, or ancestral connections, how many generations of your family are connected to this area?
____

Place 3

What is your relationship to the areas you have connections to [or specific location]? (Check all that apply)

Long-term relationship
a. I was born and raised [in/near] [location]
b. I moved [to/near] [location] as a child and have lived here since
c. I moved [to/near] [location] as a child, left for a while, and returned.
Number of years _____
d. I moved [to/near] [location] as an adult. Number of years in [area] _____
e. I have never lived [in/near] [location]

Current housing relationship
f. I live [in/near] [location] full time
g. I live [in/near] [location] part time or seasonally (returning annually for 1-6 months)
h. I work [in/near] [location] and live in another place
i. I used to live [in/near] [location], but I currently live outside this area
j. I would like to live here full time or part time, but housing is not available
k. I would like to live here full time or part time, but housing is not affordable
l. I would like to live here full time or part time, but employment is not available
m. I would like to live here full time or part time, but it is not safe due to [risks e.g. tsunami]

Family/history relationship
j. I currently have family [in/near] [location]
k. I have family that used to live [in/near] [location], but now have moved elsewhere
l. I have ancestral/family history connections [in/near] [location]
m. I have Indigenous cultural connections [in/near] [location]
n. None of my family members have ever lived [in/near] [location]

Visiting relationship
o. I visit here at least once a year
p. I visit here sometimes, but less than once a year
q. This is my first time here

Other relationships
r. [Other reason]

s. [Other reason]
t. [Other reason]
u. Other:_________________

Place 4

How much time do you spend in the surrounding environment when in [location]?

- Daily
- Several times per week
- Several times per month
- Several times per year
- Once a year
- Never
- I don‘t know
- Prefer not to answer

Place 5a

What reasons do you spend time in the surrounding environment in [location]? (check all that apply)

- I live there/nearby
- For work
- For school
- For educational purposes
- For extracurricular activities
- For leisure
- For fun
- To spend time with family
- To spend time with friends or other people
- For cultural practices or other cultural reasons
- For spiritual practices or other spiritual reasons
- For ceremonial practices or other ceremonial reasons
- To connect with the surrounding environment, its inhabitants, elements, and/or natural forces
- For my mental or physical health
- For subsistence
- To hunt, fish, or gather
- For inspiration or artistic reasons
- To volunteer
- To care for or steward
- Other, specify__________________

Place 5b

Please specify any specific examples for reasons why you spend time in the surrounding environment: ______________________________

Place 6

Do you have any specific expertise or knowledge of the surrounding environment in area? [check all that apply]

- I am an Indigenous ancestral descendant of the area
- I am a generational descendant of area
- I am an Indigenous elder of the area
- I am an elder of the area
- I was born and raised in the area
- I am a tradesperson in the area
    - What trade (e.g. fishing, hunting, art)?
- I am an Indigenous cultural practitioner of the area
- I am an Indigenous cultural leader of the area
- I am a community leader of the area
- I am an educator in the area
- I am a student in the area
- I volunteer or steward in the area
- I spend a lot of time in the area for practices/activities
    - What practices/activities?
- I study the area for work or school
- I study the area for fun
- Other, specify:

CES questions

CES 1

What reasons do you, your family, and/or community **interact with or find meaning** with the surrounding environment (or X environment)? (Check all that apply)

- To enjoy the scenery and beauty or other sensory experiences (such as sounds and the feel of winds) (Ingram et al. 2018) (Aesthetics)
- Because it is important for future generations (Bequest)
- Because it is an important place or source for ceremonial practices (Ingram et al. 2018) (Ceremony)
- To acquire or share knowledge. (Ingram et al. 2018; NOAA Sanctuaries) (Education and knowledge)
- Simply because the surrounding environment [or X landscape] and its inhabitants exist and have a right to exist (Ingram et al. 2018) (Existence)
- Because it is an important place for multi-generational or cultural interactions (Dacks et al. 2019; Ingram et al. 2018; NOAA Sanctuaries) (Heritage, tradition, and culture)
- To connect to or maintain my genealogy, ancestry, or family (Dacks et al. 2019; Ingram et al. 2018; NOAA Sanctuaries) (Heritage, tradition, and culture)

- Because it is important for artistic and/or creative expression (Ingram et al. 2018) (Inspiration)
- For leisure time, sports, or to enjoy activities related to the surrounding environment and/or its inhabitants/resources (Ingram et al. 2018; NOAA Sanctuaries) (Recreation)
- To improve or maintain my mental or physical health (Ingram et al. 2018; NOAA Sanctuaries) (Recreation/health)
- Because this landscape and/or its inhabitants/resources have sacred significance to me, my family, and/or my community. (Ingram et al. 2018) (Sacredness)
- Because it is important to my own, my family's, and/or my community's identity or gives me a sense of self or a sense of belonging (a sense of self, community, and/or home) (sense of place/Identity)
- Because it provides the opportunity to strengthen ties within my family, community or networks. (Dacks et al. 2019; Ingram et al 2018) (social relations)
- It is a source of or place for divine, elemental, or metaphysical forces (Ingram et al. 2018; NOAA Sanctuaries) (Spirituality)
- To care for or be a steward of the landscape and/or resources (Ingram et al. 2018) (stewardship)
- To view/interact/connect with artifacts or important heritage/cultural sites (Ingram et al. 2018; NOAA Sanctuaries) (Tangible culture/heritage tradition and culture)
- Because specific species, elements, and/or natural forces are
- important to me, my family, and/or my community

CES 2

Why are the various interactions with or meanings of the surrounding environment [or X environment] important to you, your family, and/or your community?

Interactions	Circle all that apply
Overall interactions	• They are important to my sense of self and personal identity • They are important to my familial, cultural, or community identity • They are important to build or maintain my connections with other humans • They are important to build or maintain my ancestral connections • They are important to build or maintain my cultural or spiritual connections • They are important to build or maintain my connection with places and/or elemental and natural forces • They are important to build or maintain my connections with other more than human beings

	• They are important to build or maintain specific practices and activities • They are important to my mental and physical well-being • They are important to elicit emotions, thoughts, and feelings • They are important for future generations • They are not important • Other/none of the above
Aesthetics: to enjoy the scenery and beauty or other sensory experiences (such as sounds and the feel of winds)	• They are important to my sense of self and personal identity • They are important to my familial, cultural, or community identity • They are important to build or maintain my connections with other humans • They are important to build or maintain my ancestral connections • They are important to build or maintain my cultural or spiritual connections • They are important to build or maintain my connection with places and/or elemental and natural forces • They are important to build or maintain my connections with other more than human beings • They are important to build or maintain specific practices and activities • They are important to my mental and physical well-being • They are important to elicit emotions, thoughts, and feelings • They are important for future generations • They are not important • Other/none of the above
Bequest: for future generations	• They are important to my sense of self and personal identity • They are important to my familial, cultural, or community identity • They are important to build or maintain my connections with other humans

	• They are important to build or maintain my ancestral connections • They are important to build or maintain my cultural or spiritual connections • They are important to build or maintain my connection with places and/or elemental and natural forces • They are important to build or maintain my connections with other more than human beings • They are important to build or maintain specific practices and activities • They are important to my mental and physical well-being • They are important to elicit emotions, thoughts, and feelings • They are not important • Other/none of the above
Ceremony: ceremonial practices	• They are important to my sense of self and personal identity • They are important to my familial, cultural, or community identity • They are important to build or maintain my connections with other humans • They are important to build or maintain my ancestral connections • They are important to build or maintain my cultural or spiritual connections • They are important to build or maintain my connection with places and/or elemental and natural forces • They are important to build or maintain my connections with other more than human beings • They are important to build or maintain specific practices and activities • They are important to my mental and physical well-being • They are important to elicit emotions, thoughts, and feelings • They are important for future generations • They are not important

	• Other/none of the above
Education and knowledge: to learn or teach from/with and/or as a source of knowledge	• They are important to my sense of self and personal identity • They are important to my familial, cultural, or community identity • They are important to build or maintain my connections with other humans • They are important to build or maintain my ancestral connections • They are important to build or maintain my cultural or spiritual connections • They are important to build or maintain my connection with places and/or elemental and natural forces • They are important to build or maintain my connections with other more than human beings • They are important to build or maintain specific practices and activities • They are important to my mental and physical well-being • They are important to elicit emotions, thoughts, and feelings • They are important for future generations • They are not important • Other/none of the above
Existence: The surrounding environment and its inhabitants have a right to exist	• They are important to my sense of self and personal identity • They are important to my familial, cultural, or community identity • They are important to build or maintain my connections with other humans • They are important to build or maintain my ancestral connections • They are important to build or maintain my cultural or spiritual connections • They are important to build or maintain my connection with places and/or elemental and natural forces • They are important to build or maintain my connections with other more than human beings

	• They are important to build or maintain specific practices and activities • They are important to my mental and physical well-being • They are important to elicit emotions, thoughts, and feelings • They are important for future generations • They are not important • Other/none of the above
Heritage, tradition, and culture: multigenerational or cultural interactions	• They are important to my sense of self and personal identity • They are important to my familial, cultural, or community identity • They are important to build or maintain my connections with other humans • They are important to build or maintain my ancestral connections • They are important to build or maintain my cultural or spiritual connections • They are important to build or maintain my connection with places and/or elemental and natural forces • They are important to build or maintain my connections with other more than human beings • They are important to build or maintain specific practices and activities • They are important to my mental and physical well-being • They are important to elicit emotions, thoughts, and feelings • They are important for future generations • They are not important • Other/none of the above
Inspiration: artistic and/or creative expression	• They are important to my sense of self and personal identity • They are important to my familial, cultural, or community identity • They are important to build or maintain my connections with other humans

	• They are important to build or maintain my ancestral connections • They are important to build or maintain my cultural or spiritual connections • They are important to build or maintain my connection with places and/or elemental and natural forces • They are important to build or maintain my connections with other more than human beings • They are important to build or maintain specific practices and activities • They are important to my mental and physical well-being • They are important to elicit emotions, thoughts, and feelings • They are important for future generations • They are not important • Other/none of the above
Recreation: Leisure, sports, enjoyment	• They are important to my sense of self and personal identity • They are important to my familial, cultural, or community identity • They are important to build or maintain my connections with other humans • They are important to build or maintain my ancestral connections • They are important to build or maintain my cultural or spiritual connections • They are important to build or maintain my connection with places and/or elemental and natural forces • They are important to build or maintain my connections with other more than human beings • They are important to build or maintain specific practices and activities • They are important to my mental and physical well-being • They are important to elicit emotions, thoughts, and feelings

	• They are important for future generations • They are not important • Other/none of the above
Sacredness: sacred significance of the landscape and/or its inhabitants/resources	• They are important to my sense of self and personal identity • They are important to my familial, cultural, or community identity • They are important to build or maintain my connections with other humans • They are important to build or maintain my ancestral connections • They are important to build or maintain my cultural or spiritual connections • They are important to build or maintain my connection with places and/or elemental and natural forces • They are important to build or maintain my connections with other more than human beings • They are important to build or maintain specific practices and activities • They are important to my mental and physical well-being • They are important to elicit emotions, thoughts, and feelings • They are important for future generations • They are not important • Other/none of the above
Sense of place/Identity: a sense of belonging, self, community, and/or home	• They are important to my sense of self and personal identity • They are important to my familial, cultural, or community identity • They are important to build or maintain my connections with other humans • They are important to build or maintain my ancestral connections • They are important to build or maintain my cultural or spiritual connections • They are important to build or maintain my connection with places and/or elemental and natural forces

	• They are important to build or maintain my connections with other more than human beings • They are important to build or maintain specific practices and activities • They are important to my mental and physical well-being • They are important to elicit emotions, thoughts, and feelings • They are important for future generations • They are not important • Other/none of the above
Social relations: strengthening or maintaining ties with family, community, or networks	• They are important to my sense of self and personal identity • They are important to my familial, cultural, or community identity • They are important to build or maintain my connections with other humans • They are important to build or maintain my ancestral connections • They are important to build or maintain my cultural or spiritual connections • They are important to build or maintain my connection with places and/or elemental and natural forces • They are important to build or maintain my connections with other more than human beings • They are important to build or maintain specific practices and activities • They are important to my mental and physical well-being • They are important to elicit emotions, thoughts, and feelings • They are important for future generations • They are not important • Other/none of the above
Spirituality: diving, elemental, or metaphysical forces	• They are important to my sense of self and personal identity • They are important to my familial, cultural, or community identity

	• They are important to build or maintain my connections with other humans • They are important to build or maintain my ancestral connections • They are important to build or maintain my cultural or spiritual connections • They are important to build or maintain my connection with places and/or elemental and natural forces • They are important to build or maintain my connections with other more than human beings • They are important to build or maintain specific practices and activities • They are important to my mental and physical well-being • They are important to elicit emotions, thoughts, and feelings • They are important for future generations • They are not important • Other/none of the above
Stewardship: caring for or stewarding the landscape and/or its inhabitants.resources	• They are important to my sense of self and personal identity • They are important to my familial, cultural, or community identity • They are important to build or maintain my connections with other humans • They are important to build or maintain my ancestral connections • They are important to build or maintain my cultural or spiritual connections • They are important to build or maintain my connection with places and/or elemental and natural forces • They are important to build or maintain my connections with other more than human beings • They are important to build or maintain specific practices and activities • They are important to my mental and physical well-being

	• They are important to elicit emotions, thoughts, and feelings • They are important for future generations • They are not important • Other/none of the above
Tangible culture/heritage, tradition, and culture: artifacts or heritage/cultural sites/places/resources	• They are important to my sense of self and personal identity • They are important to my familial, cultural, or community identity • They are important to build or maintain my connections with other humans • They are important to build or maintain my ancestral connections • They are important to build or maintain my cultural or spiritual connections • They are important to build or maintain my connection with places and/or elemental and natural forces • They are important to build or maintain my connections with other more than human beings • They are important to build or maintain specific practices and activities • They are important to my mental and physical well-being • They are important to elicit emotions, thoughts, and feelings • They are important for future generations • They are not important • Other/none of the above
Specific species, elements, and/or natural forces	• They are important to my sense of self and personal identity • They are important to my familial, cultural, or community identity • They are important to build or maintain my connections with other humans • They are important to build or maintain my ancestral connections • They are important to build or maintain my cultural or spiritual connections

	• They are important to build or maintain my connection with places and/or elemental and natural forces • They are important to build or maintain my connections with other more than human beings • They are important to build or maintain specific practices and activities • They are important to my mental and physical well-being • They are important to elicit emotions, thoughts, and feelings • They are important for future generations • They are not important • Other/none of the above

CES 3

Are there specific examples of interactions, connections, or meanings you have with your surrounding environment, if so please list up to 10 of them. Additionally if these are examples or representative of any of the interactions listed in the previous questions, please put those as well. (Please try to keep the response as simple as possible such as fishing, family outings, peace, art, etc.)

Specific example of interactions, connections, or meanings:	Previous interactions/meanings these are examples of

CES 4a.

What interactions or examples of interactions are most important to you? (Rank in the order below)

1. ______________________________
2. ______________________________
3. ______________________________

4. ____________________________
5. ____________________________
6. ____________________________
7. ____________________________
- Cannot rank (circle why below)
    - It is to difficult for me to think about ranking them
    - It does not make sense to me to rank them
    - It seems inappropriate to me to rank them

CES 4b.

(If you ranked interactions): Of my rankings of these interactions:
- I am very certain in my ranking of these interactions
- I ranked these interactions but my ranking would likely change over time, depending on my mood, or depending on how I think about them
- I ranked them but I do not necessarily think this ranking is lasting or well representative of my feelings
- I ranked these interactions but do not think I put much thought or effort into it
- I ranked these interactions but do not think the ranking of them is representative of their significance to me
- I ranked these interactions but do not necessarily think the ranking of them is appropriate

Mapping

Map 1.

On the map of X landscape or specific area, please locate areas where you interact with or find meaning with the surrounding environment. Please either put points, lines, or polygons representing either general areas you connect with the surrounding environment and up to 5 specific types of interactions or meanings from the previous list (CES 1 or CES 2) or up to 5 specific examples of interactions, connections, or meanings from your list in CES 3.

Map 2

If you mapped specific types of interactions with or meanings of the surrounding environment or your own specific examples, why did you map them? [check all that apply]
- They are the most important or relevant to me
- They were the easiest to think of
- They were the first that came to mind

Map 3

Of the areas you mapped: [check all that apply]

- I am very certain of my placement of things
- These are best estimate locations but are likely inaccurate
- These are approximate locations but would likely change over time, depending on my mood, or depending on how I think about them
- I located areas but not necessarily think these locations are lasting or well representative
- I located these areas but do not think I put much thought or effort into it
- I located areas but do not think the ranking of them is representative of their significance to me
- I located areas but do not necessarily think locating them is appropriate
- I chose not to locate certain areas because of its significance and sensitivity of areas that should not be known or exploited

Map 4

Please use the following space to add any explanations of why the areas you located on the map were chosen and how these areas may be important to your interactions with or finding meaning of the surrounding environment.

Map 5a

What are other aspects that contribute to interacting with or finding meaning of the surrounding environment? (check all that apply)

- Past events
- Historical sites
- Archaeological properties
- Good environmental state
- Biodiversity
- Landscape changes
- Fitness areas
- Hiking trails
- Facilities (restrooms, meeting areas, picnic tables, etc.)
- Parks
- Ports
- People
- Specific species, elements, or natural features
- Other

Map 5 b

Of the choices selected in Map 5a, please list any specific examples if they are relevant and you are able to:

Map 6a

What are other aspects that detract to interacting with or finding meaning of the surrounding environment? (check all that apply)

- Past events
- Historical sites
- Archaeological properties
- Poor environmental state

Declining or changing biodiversity

- Landscape changes
- Fitness areas
- Hiking trails
- Facilities (restrooms, meeting areas, picnic tables, etc.)
- Parks
- Ports
- People
- Specific species, elements, or natural features
- Other

Map 6b

Of the choices selected in Map 6a, please list any specific examples if they are relevant and you are able to:

Other types of questions to ask depending on research objectives

- Importance of environmental changes and management objectives in the area
- Importance of specific relevant activities to research/management objectives
- What activities and how frequently they participate in those activities in specific locations
- Reasons and motivations for visiting locations
- Reasons and motivations for living in areas
- Accessibility to locations and/or activities
- Travel time and/or cost to locations and activities
- Influences in participating in activities or going to locations
- Species, elements, and natural forces specific questions and reasons they may be important
- Indicate any areas on the map where they feel unsafe or uncomfortable and why
- Mental and physical health specific questions and benefits of spending time in nature
- If they wish they could spend more time in the surrounding environment and if so what prevents them from doing so
- What aspects of your/your family/your community's wellbeing have been impacted from loss of nature or loss of access to nature
- What threats impact your mental health/well being
- Impacts of specific management actions to the location and their interactions with or meanings of the surrounding environment
- Opinions on the current environmental state/environmental quality of the area
    - Perceived changes (in time e.g. past year) to environmental state/quality

- Observed changes in the environment/its inhabitants/elements/natural forces in the past [amount of time]
- What types of [Indigenous and/or traditional] cultural connections do you/your family have to the surrounding environment of [location]

Chapter 6. Conclusion

Introduction- ka hopena o kēia hana

This chapter serves as a synthesis of my dissertation. I will provide some concluding remarks and overall considerations from the research findings. My dissertation has explored the connections and relationships between humans and their surrounding environments. The connections and relationships people have with their environment depends on their background and experiences, ways of knowing, and worldviews. Throughout my dissertation, I sought to develop creative methodologies to accommodate and recognize the diverse connections people have to their surrounding environments as well as diverse worldviews particularly Indigenous worldviews. Accommodating and recognizing diverse human-nature connections and worldviews is important for a more holistic understanding that can support more informed decision making and more efficient and effective management practices. In my dissertation I: created a tool to better acknowledge diverse worldviews and meanings and interactions people have with their environments (Chapter 2); explore what are our reasons for interacting with nature and what meanings do we ascribe to our surrounding environments (Chapter 3); spatially express a Native Hawaiian value and the relational connections Native Hawaiian key informants have to place (Chapter 4); and develop a draft survey with for broad-scale data to understand the diverse values for nature and our reasonings and meanings for interacting with nature (Chapter 5).

Research and literature groundings

There are many research efforts and fields that seek to acknowledge or understand the connections and influences between humans and environments. There are a few disciplines that greatly shaped and influenced my research: socio-ecological systems, social values, cultural ecosystem services, and relational values. Socio-ecological systems (SES) acknowledge that social systems such as management and knowledge are shaped by ecological structures and dynamics and these social systems in turn may influence the function and health of ecosystems (Berkes and Berkes, 2009; Ticktin et al., 2018). Research supporting SES seeks to acknowledge and understand

the diverse connections and influences between humans and our surrounding environments. Part of this research is understanding human values, behaviors, and motivations with environments. Social values are one avenue to understand human systems, and social values are essentially what is important and what matters to people (Kenter et al., 2019, 2015; Rawluk et al., 2019). There are many fields that seek to understand what is important to people, as well as how human and natural systems are influenced and interconnected including anthropology, psychology, philosophy, environmental management/sustainability, geography, and economics. One research field that directly acknowledges the connections of human values to environments is ecosystem services. The goal of ecosystem service research is to identify, describe, and quantify the importance of nature that provides essential and beneficial services for human well-being (Brown, 2013; Chan et al., 2012; Gould et al., 2015; Millennium Ecosystem Assessment, 2005). Cultural Ecosystem Services (CES) are a category within Ecosystem Service research. The MEA (2005) defines CES as the ‘non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experience’.

My research has largely focused on elevating and exploring the discipline of CES because it seeks to understand more of the diverse connection between humans and environments. I was also motivated to research CES as there is a national policy memorandum calling for Federal agencies to incorporate ecosystem services into decision making, many management agencies are relying on the Ecosystem Services framework (e.g. EPA, USDA, USGS). My research was funded by NOAA as part of NOAA’s Integrated Ecosystem Assessment program. NOAA’s IEA program is a nationwide ecosystem-based management program aimed at providing metrics for all components of an ecosystem, including human dimensions and this program is actively researching and incorporating CES (Gove et al., 2019; Levin et al., 2009; Monaco et al., 2021). CES was an important discipline for me to explore as it is a discipline recognized by management agencies and is a discipline that explores the social importance of environments rather than more of the ecological influences that the other ecosystem services focus on (provisioning, regulating, and supporting services). While management agencies recognize CES, there are many critiques to common and

standard practices for CES that limits its inclusion of diverse values and worldviews. Prominent critiques and concerns include that CES: stem from a Dominant anthropocentric worldview and value system (Berghöfer et al., 2022; Chan et al., 2012; Comberti et al., 2015; Fish et al., 2016; Gould et al., 2019; Kenter et al., 2019; Kosanic and Petzold, 2020; Kronenberg and Andersson, 2019; Massenberg, 2019; Raymond et al., 2019); categories are incommensurable and incomparable due to their ambiguity (Calcagni et al., 2019; Chan et al., 2012; Gould et al., 2015; Himes et al., 2020; Irvine et al., 2016; Raymond et al., 2014); research relies on quantitative and monetary methods (Bennett et al., 2021; Berghöfer et al., 2022; Calcagni et al., 2019; Chan et al., 2012; Comberti et al., 2015; Gould et al., 2015; Himes et al., 2020; Isacs et al., 2023; Kenter et al., 2019; Kronenberg and Andersson, 2019; Martin et al., 2020; Sterling et al., 2020); and they largely implies one-way flow from nature to humans (Berghöfer et al., 2022; Comberti et al., 2015; Gould et al., 2019; Kenter and O’Connor, 2022; O’Connor and Kenter, 2019; Pascua et al., 2017). All of these critiques contribute to excluding diverse values and worldviews. By only recognizing and standardizing a narrow range of values that only accommodates a Dominant anthropocentric worldview within research and decision making, this contributes to inequities, injustices, and inefficient and ineffective management practices (Hernandez, 2022; Hernández-Morcillo et al., 2013; Nahuelhual et al., 2016; Pascua et al., 2017; Pascual et al., 2023).

There has been a large movement by researchers and the evolution of other disciplines such as relational values to address some of these critiques. The Intergovernmental Science-Policy Platform for Biodiversity and Ecosystem Services (IPBES) is a major effort with contributions from all over the world has made important advances in conceptualizing human-nature relationships and proposing a typology of nature’s values that highlight the interactions of diverse worldviews and knowledge systems (IPBES, 2022). Other researchers have also sought to recognize diverse and inclusive place-based values and Indigenous Knowledge within CES research (Gould et al., 2015; Khunweechuay et al., 2022; Normyle et al., 2023; Pascua et al., 2017; Robinson et al., 2016). The concept of relational values emerged from the false dichotomy between instrumental and intrinsic values and in part in response to critiques of CES and value typologies. Relational values move beyond the one-way framing of

CES to recognize reciprocal relationships between humans and nature (Berghöfer et al., 2022; Chan et al., 2018, 2012; Comberti et al., 2015; Gould et al., 2019; Kenter and O'Connor, 2022). Some researchers note that relational values have the potential to better accommodate and represent Indigenous values (Gould et al., 2019). While my research does focus on exploring and elevating CES relational values research played a foundational role in my research as well.

My research also focused on better acknowledging Indigenous worldviews and diverse values into CES research, as such Indigenous Knowledge and research were foundational to my research. Indigenous research is rooted in the knowledge and worldviews that shape the Indigenous Peoples who are conducting research reflecting the places that shape those Indigenous value and knowledge systems (Martin et al., 2020; Oliveira and Wright, 2016; Wilson, 2008). I am a Native Hawaiian Indigenous researcher and have worked throughout my dissertation to better accommodate and represent Indigenous Knowledge and worldviews within research, management, and in various research fields but CES in particular. Indigenous knowledge and research greatly informed my own work and is foundational to my own research practices, however, my research stems mainly from management objectives and seeks to elevate research, management, and academia and as such I would hesitate to call this work Indigenous research.

Takeaways and lessons learned

The rest of this chapter will be reflections on my experience within my PhD and some takeaways and highlights from conducting my research. At the end of this journey, many ask if I am happy to be done and if getting a PhD is worth it. But I honestly do not know how to answer those questions. I am very proud of the work I have done and do not know what I even would have done instead, but this PhD journey has been some of the hardest times of my life. This journey has been one full of stress, frustration, heartbreak, and sacrifice. It has also had moments of great joy, love, support, and community. I still do not know how I feel about the PhD journey or if it will feel "worth it", I know I sacrificed time and unique experiences with my family, endured lock downs

while also struggling to figure out how to do social science while isolated in a pandemic, felt the isolation and loneliness of research, and lost loved ones along the way. This journey also gifted me with the unique experience to spend time with my community and be entrusted with their knowledge and teachings, I was welcomed and built connections and networks in both academic and Indigenous spaces, shared in learning and stewardship, grew new friendships, and I got to grow and learn a lot about myself in ways I may have never gotten to without this experience. In each chapter, I gained new insights and built research experiences that helped me grow as an academic, an Individual, and hopefully contribute to new understandings in the various research fields explored.

At the beginning of my PhD path and the first of my research, my beginning chapter and work was rife with struggle. I used a two-eyed seeing approach to develop an elicitation tool for CES to capture the diverse and pluralistic values people hold for the environment. A two eyed seeing approach looks through an Indigenous worldview while also using tools from Dominant science for a greater understanding and the betterment of all (Bartlett et al., 2012; Kimmerer, 2023). As I started to explore an academic path from an Indigenous perspective, it seemed like the clash of two incommensurable worlds. Academia relies on an understanding of written literature to inform methods that need to be validated by previous work. Academia historically is an institution that has been dominated by white males in a way that upholds the power and betterment of white males. In comparison, Indigenous worldviews and practices, in this case Native Hawaiian practices are rooted in oral histories that uphold and steward ʻāina as our guide and source. Navigating these two worlds I was trying to walk also brought out internal identity struggles. Could I survive in this academic world that, while full of people that support and welcome me, was created and exists in a way that seems totally unfit for me. Navigating academia and the literature I constantly felt dumb, not good enough, and confused. Even navigating my own Indigeneity, in the occupied lands of Hawaiʻi with the ongoing impacts of settler colonialism, I was not sure I was even Indigenous enough to represent my identity. While I have taken classes in ʻōlelo Hawaiʻi I am far from fluent, and our language has also changed and evolved both from our own cultural evolving and from the impacts of colonization. I have so much to learn about my

own history, practices, and moʻolelo. While I have been lucky to have opportunities to learn and learn from many kumu, my research had me constantly questioning if I can adequately represent Hawaiian worldviews and knowledge. I continued to struggle but my stubbornness of asking myself if not me, who, and if not now, when, pushed me to keep going. It is also important to know that asking myself if I am Indigenous enough is also one of the many ongoing impacts of settler colonialism that can keep many Indigenous Peoples disempowered. But knowing I do not know everything, is ok and many other Indigenous Peoples face similar struggles. I can keep learning from others, keep elevating, and do my best to follow the teachings and the knowledges that have been passed down to me to guide me. These thoughts also fueled my stubbornness.

I was able to create the levels of intensity CES elicitation tools by sitting with my struggles. I sat with the literature to understand what CES are and what may be needed to understand and create an elicitation tool. But what really drove the levels of intensity was sitting in my Indigenous identity and asking myself how do I relate to the environment and what do I need or what can help me articulate that. Sitting and talking both with peers, advisors, kumu, friends, and my family helped me to also understand the different relationships and connections that can express the importance of our surrounding environments. Also important in an Indigenous worldview and practices is connecting with ourselves, and our feelings and emotions. Meyer (1998) connects that our wisdom, naʻauao, is rooted and connected to our bodies and our feelings through our naʻau. To create the levels of intensity, I had to think of how to relate and express our feelings, intelligence, emotions, and connections through this tool. But importantly, I spent a lot of time thinking and feeling and sitting with myself and looking within to see what felt right to express myself and create this tool. As I am not a cultural expert, historian, or fluent speaker, I also struggled to know if this tool could represent others' thoughts, ideas, and expressions as well.

In Chapter 3, I conducted deliberative workshops employing the tool to see how it may aid in expressing the meanings and connections people have from their surrounding environments. By applying the levels of intensity tool, I was able to assess if it made sense to others, and whether it allowed managers and community members to represent and help articulate their own connections and relationships to their

surrounding environments. I conducted workshops with management agencies (DAR and NOAA) as well as community groups engaged in co-management or related efforts (Kai Kuleana Network and West Hawaiʻi Fisheries Council). These workshops also gave me some insights about the disconnect and tensions between silos, such as academia, management, and community.

In my role as an academic researcher, I worked to understand and represent community perspectives in a way that can also aid management efforts. My work, funded by a management agency, also sought to apply learnings from academia to engage and apply best management practices with communities. While my workshops may have had the intention of using CES to inform best management practices, CES reaches across many fields and disciplines within academia which can create many different interpretations of what CES can be. Management agencies and individuals from these organizations who participated in my workshops either did not previously engage with or really have any experience with CES, while others may have a limited and narrow engagement and understanding of CES. Most people did not use concepts of CES but were interested in greater understanding and terminology to aid in communicating with researchers and management. While I do see value in furthering our understanding of the connections between humans and our surrounding environments and think CES is a great field of research, I still have many tensions and struggles with it. How can we still use this field of research and operationalize it if agencies and individuals only have a limited and narrow understanding of it? Does CES help us represent community connections and perspectives of their surrounding environment if this is not how they even articulate and express their connections and the importance of the environment to them? Even if there are mandates or research objectives with CES, is the CES framework still useful to engage with for community engagement and management efforts particularly those with communities?

The workshops themselves helped me to engage in these questions and understandings of representing community perspectives on the meanings and reasons the environment is important to them. In the workshops, I used various categories of cultural ecosystem services and asked participants for examples, thoughts, and concepts that come to mind for that category. This prompted a better understanding of

the diverse meanings and reasons the environment is important. This also supported the understanding of the diverse and pluralistic values people hold for CES. The levels of intensity helped to illuminate more of the reasons concepts were important and the emotional depth and types of connections people had for those concepts. The reasons why concepts are important, and the meanings of concepts can be difficult to articulate and discuss so the levels of intensity served as a tool to aid participants in discussing how and why things were important and to articulate differences in meanings and reasons for importance between participants. I had a range of participants–Native Hawaiians, generational descendants, long term residents, and short-term residents. All were seemingly able to relate to the levels of intensity no matter their background and articulate their connections and differences in opinions. The levels of intensity also helped participants to articulate more of why that level resonated with their connections so that others could understand even if they had different opinions and feelings of their own connections. The deeper levels in the levels of intensity are typically on aspects and connections that are more difficult to talk about, but helped participants talk about the connections participants felt belonged in that level. Regardless of background and belief, the common types of connections created an understanding that crossed different cultures, beliefs, and personal backgrounds.

The workshops revealed information about concepts representing community connections and relationships to the environment, but the approach still stemmed from an academic framing that sought to develop, understand, and elevate CES. Some of the barriers and inaccessibility of management and academia are these top-down approaches and narrow focus and practices that fit and continue research and organizational wants and needs but are limited in accommodating and representing the community. CES is a research field to understand what is important about the environment, but this is not a commonly known concept or everyday topic of conversation to discuss environmental connections. There are increasing participatory research and management practices that will hopefully continue to remove barriers and better represent and accommodate communities. Additionally, CES as it gains popularity is becoming more of a common term, but it still can have many interpretations depending on how it is used. More research and management practices should push to

remove barriers and be more accessible to be used and applied by community. While still very much from an academic approach and riddled with academic terms, in chapter 3 I sought to better understand the connections and relationships people have and describe in their own way.

In chapter 4, I used the top concept of the deliberative workshops, kuleana, to spatially represent relationships and connections people have to place. While I sought to better understand kuleana for a greater understanding of the connections and relationships between humans and our surrounding environments, I also sought to represent it in a way that can also be understood and used in academia and research. The relationships and connections of kuleana revealed the nuances of human-nature relationships and the complexity we have with both held and assigned values, as well as the interconnectedness of the tangible and intangible. These nuances and complexity can provide a better understanding and inform CES and relational values. Spatially representing kuleana also presents my research in a way that can be further used in future research and management efforts.

Participants expressed the benefits of the maps and their perspectives on kuleana as beneficial so that others including researchers and managers can have a better understanding of Indigenous knowledge. Participants discussed the benefit of talking about kuleana and thinking about it and articulating their thoughts on it that they may never have been able to without this interview. However, despite their willingness to share there is also concern that their perspectives can still get misunderstood, ignored, or invalidated. There is a benefit to having tools and research that can share Indigenous Knowledge but limitations remain if there is no room in institutions, such as academia and management, to accommodate Indigenous Knowledge and People.

Gathering this knowledge is a burdensome process on the participants. It takes a lot of time and cognitive effort for community members to engage in research efforts. In addition, a lot of harms can come from mapping, including co-opting and appropriating knowledge, revealing sensitive areas and resources making them more vulnerable to exploitation. My participants discussed having previously worked to map areas to mitigate development issues, only to have nothing come from the effort. Their voices were ignored, and impacts occurred despite their input.

In my final chapter, I took the lessons from the previous chapters to explore representing community perspectives and the meanings and interactions with surrounding environments in a draft survey. I compared the benefits of the more in-depth place-based methods used in my previous chapters to a broader, more quantitative method. This chapter further highlighted my own personal tensions as well as the tensions between management, research, and community.

Qualitative, place-based, narrative methods have more room to accommodate community perspectives and Indigenous Knowledge. This can aid in research and can be beneficial to the community if the research is co-developed and stems from community needs. One acute tension was that my research questions stemmed from management needs, although I used qualitative methods to better understand the connections between humans and their surrounding environments and accommodate Indigenous Knowledge. Qualitative methods are not widely used in management practices and decision making, which typically rely on quantitative, spatial methods.

The survey provides an opportunity to fulfill management needs and answer research questions while reaching a broad population. Surveys can provide information on the breadth and quantity of perspectives but are constrained in length and content. Surveys are best suited to general concepts and terms that researchers are confident will be understood consistently by respondents (though still may not be). They also do not provide a lot of room for explanations or depth of perspectives. The draft survey created in this chapter was designed to gather more perspectives on the types of connections people have with their surrounding environment and reasons why the environment and these connections are important to people. However, my previous chapters revealed that many of the concepts related to CES and kuleana, let alone other types of relational values need to be researched further. I sought to draw from these concepts to develop structured questions that all respondents are likely to interpret in the same way. But there are some questions that just cannot be asked in a closed-ended question format or be fully understood without dialogue. The levels of intensity uses emotional depth as a way to articulate importance but feelings and emotions can be very personal and do not translate well in a survey format. Similarly, cultural connections and beliefs, when limited to general concepts and assumptions,

can remove a lot of meaning and importance from them. So, as an academic, the information and data we can get from surveys is intriguing, but as an Indigenous scientist, the assumptions and lack of space for nuance and clarity make me uncomfortable, especially with CES categories such as spirituality and heritage whose meanings may vary greatly by individual.

As we seek to elevate our knowledge and understandings of human-nature relationships, diverse knowledge and Indigenous worldviews are foundational. As we accommodate diversity and people of place this will bring in other Knowledge, ways of knowing, and creativity that can elevate our understanding and institutions. To better represent and understand Indigenous worldviews we need more Indigenous academics, Indigenous Peoples, and peoples of place within institutions such as academia and management. Additionally, as we seek to better understand socio-ecological systems, there need to be more approaches that don't fit the continued mold of academia. We can learn from previous methods and work but need to push these further and accept creative methods that do not rely on a Dominant worldview or way of thinking. We need more thinking outside of the box and diverse perspectives and ideas. However, academia does not easily support these thinkers and often there are many obstacles to academia in general. Some of the sacrifices and barriers in academia include time, financial cost, and distance. Academia does not often support out of the box ideas and diverse perspective because of the historic and existing structure of academia. To engage in this space, you need to learn and rely on existing methods and literature that have been dominated by white male thinkers. I am grateful for those before me who entered a space not suited for them so that we have other research and authors to cite today. Creativity in methods and thinking is also not a straightforward path and will likely be rife with struggles and frustrations that make the path longer and more challenging. While I am proud of the research I have done and think it can make a lot of great contributions to my community and academia, and has potential to be used by management, the academic path I chose and outlined above was far from easy. Out of the box thinkers will likely face obstacles and difficulties. I hope my experience and reflections can lead to change in institutions to remove barriers and make these paths in

academia more accessible. I hope the institutions of academia and management can continue to work to go to people of place and accommodate them to further efforts of inclusion and equity.

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