Including Human Well-Being in Resource Management with Cultural Ecosystem Services

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Executive Summary

In this study, we investigated the complex ways in which human well-being is related to the coastal and marine environment by looking closely at the ways communities impact, rely on, and steward the West Hawai‘i region. We endeavored to understand how people in West Hawai‘i experience and value cultural ecosystem services (CES) and how those CES influence human well-being. Ultimately, we sought to understand how resource management can include information about human well-being to support and enhance management practices.

We collected data by conducting in-depth, semi-structured interviews with community members in West Hawai‘i. Community collaboration was an essential part of this work to ensure that indicators are relevant, appropriate, and represent local values and beliefs. Interviews framed questions in a manner that prompted interviewees to discuss what CES they experience, connect with, benefit from, and value.

This research aimed to enhance ecosystem assessments specifically by creating place-based, biocultural indicators of CES. Our literature review and interview data informed the creation of a set of place-based indicators focused on representing CES and human well-being within the West Hawai‘i Integrated Ecosystem Assessment program.

In addition to identifying indicators, our study investigated the diverse ways that people discuss CES in relation to human well-being. We observed the frequency that each CES was mentioned during interviews and how they were bundled together rather than discussed separately from one another. Interviews revealed perspectives on changes in the environment and social system and how those changes related to human well-being. Certain changes were credited with impacting access to and creating barriers to CES. Recreation, a CES discussed in about 80% of all interviews, was notable in how it provided access to a multitude of other CES. Our results also highlight that human well-being depends not only on abundant ecosystems, but also on the opportunity for reciprocity between people and place.

In our discussion, we consider the importance of how interviewees intertwined CES during interview conversations, an important concept called “bundling.” We then discuss how our analysis shaped a robust framework for monitoring CES. Our framework has three overlapping segments: ecological foundation of CES; community values, beliefs, and perspectives; and creating and conserving access to CES for communities.

We conclude that our study has helped in finding ways to better integrate CES and human well-being into resource management. Our study brings clarity to the different ways that CES and human well-being can be better utilized in contemporary resource management.

Introduction

Cultural ecosystem services (CES), commonly referred to as non-material benefits received from the environment, are critical to human well-being yet are largely excluded from resource management (Chan et al. 2012; Fish et al. 2016b; Infield et al. 2015; Millennium Ecosystem Assessment 2005b; Pascua et al. 2017). Destruction or reduction of CES can cause harm to human well-being, which can lead to a potential reduction in community resilience to social-ecological changes (Infield et al. 2015). Due to the importance of CES to human well-being, identifying how to better include them in resource management is paramount.

NOAA's West Hawai'i Integrated Ecosystem Assessment

The West Hawai'i Integrated Ecosystem Assessment (IEA), a National Oceanic and Atmospheric Administration (NOAA) program, is part of NOAA's efforts to implement ecosystem-based management throughout multiple regions. In the Pacific Islands Region, the IEA encompasses the west coast of Hawai'i Island (Figure 1). The overarching goal of an IEA is to understand a region's social-ecological system via monitoring indicators in order to inform science-based strategies of resource management (Gove et al. 2019; Levin et al. 2009).

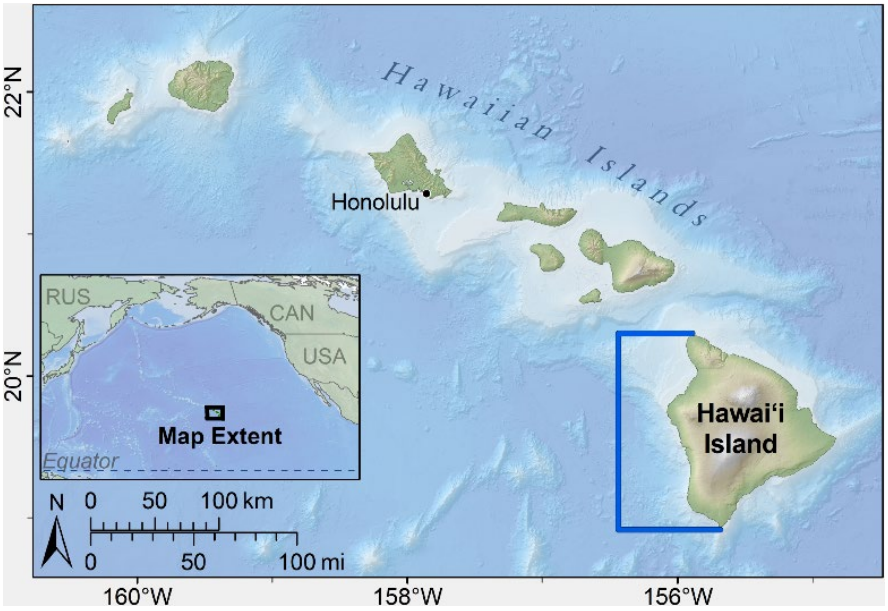

Figure 1. Geographic boundaries (blue line) of the West Hawai'i Integrated Ecosystem Assessment within the Hawaiian Islands. Map created by Joey Lecky.

The productive marine ecosystem and engaged communities of West Hawai'i are the backbone of the region. However, the ecological processes underlying this dynamic region are increasingly being altered. Local stressors such as population increase, coastal development, land-based sources of pollution (e.g., wastewater), fishing pressure, and damaging impacts from tourism (e.g., habitat destruction, sunscreen pollution, and animal harassment) are undermining marine ecosystem function (Downs et al. 2016; Friedlander et al. 2008; Gove et al. 2019; State of Hawaii 2010). Impacts of climate change, such as increasing sea surface temperatures and rising sea levels, are exacerbating these local stressors and contributing to the overall decline in the

condition of coral reef ecosystems in West Hawai‘i (Maynard et al. 2019). For example, elevated ocean temperatures in 2014 and 2015 led to the most destructive coral reef bleaching ever recorded in this region (Department of Aquatic Resources 2017). Ultimately, these threats compromise the numerous services, goods, and benefits that the marine ecosystem provides, such as opportunities for fishing and gathering, social cohesion, and cultural practices. Society depends on and values opportunities such as these, so it is important to understand how society is responding (in both positive and negative ways) to these threats and how they impact human well-being.

IEAs have begun expanding focus to encompass human well-being (Harvey et al. 2016; Levin et al. 2016) and incorporate human dimension indicators in relation to regional management goals (Dillard et al. 2013). However, the large majority of human dimension indicators used in marine resource management, including IEAs, monitor economic rather than sociocultural factors (Hornborg et al. 2019). Current efforts within the West Hawai‘i IEA include filling this gap by investigating how human well-being is related to the coastal and marine environment.

Diverse communities of place and interest thrive in West Hawai‘i. For our study purposes, we looked closely at communities oriented around marine environmental stewardship, conservation, and management. We believe that by working with these community members, we can encompass a broad range of values, beliefs, and perspectives that the larger population of West Hawai‘i may share.

Cultural Ecosystem Services Support Human Well-Being

Ecosystems are fundamentally intertwined with human well-being (Ash et al. 2012), or the ability of people to live a life that they value (Wongbusarakum et al. 2014). Human well-being can be defined as “a state of being with others and the environment, which arises when human needs are met, when individuals and communities can act meaningfully to pursue their goals, and when individuals and communities enjoy a satisfactory quality of life” (Breslow et al. 2016). The exact definition of human well-being changes according to regional nuances and local values (Wongbusarakum et al. 2014), emphasizing the need for place-based focus when exploring the topic. Ecosystem contributions to human well-being are both material and non-material, including physical, spiritual, social, and/or emotional aspects (Amberson et al. 2016; Chan et al. 2012).

There is a clear need to understand how changes in ecosystem dynamics impact human well-being (Hernández-Morcillo et al. 2013). Ignoring connections between ecosystems and human well-being can undermine the sustainability of the region and resource management goals (Ash et al. 2012) by excluding critical information, including how society is positively influencing ecosystems.

Ecosystem assessments have begun incorporating human well-being in various ways, largely including it through economic and secondary data. A less common way to incorporate human well-being in ecosystem assessments is through CES, a category within the ecosystem service framework (Millennium Ecosystem Assessment 2005a). CES have been defined as non-material benefits that people derive through their relationship with an ecosystem, such as spiritual values, social relations, and emotional experiences (Chan et al. 2011; Millennium Ecosystem Assessment 2005b). CES are critical to a person’s well-being; among other reasons, they foster

and maintain connections to place, identity, values, and experiences (Chan et al. 2012; Fish et al. 2016a; Infield et al. 2015). In recent studies, West Hawai‘i stakeholders perceive CES as vital (McMillen et al. 2017; Pascua et al. 2017), yet also the most vulnerable to ecosystem change (Ingram et al. 2018). This calls attention to the need to better understand how CES can be incorporated into management.

Cultural Ecosystem Services in Resource Management

Resource management would benefit from research that can explain the intricacies of how communities are identifying, appreciating, and interacting with ecosystem services, and this is especially true for cultural services (Pascua et al. 2017). Although difficult, CES have been included in resource management in various ways, including directly integrating indigenous knowledge (Tipa and Nelson 2008), building place-based indicators grounded in indigenous knowledge (Pascua et al. 2017), applying indigenous knowledge to understand the CES present in a geographic region (Gould et al. 2015), and applying local knowledge and perceptions to understand how different groups of society interact with a place (Biedenweg et al. 2017). Investigating CES helps ensure they are considered in decision-making alongside other regularly included services (Gould et al. 2015); however, difficulties with integration still remain prevalent.

Participants in early stages of this research described human well-being and ecosystems as a holistic system in which people are both environmental stressors and stewards rather than thinking about components of an ecosystem as separate entities as some researchers or resource managers typically do (Leong et al. 2019). However, without teasing apart components of the system, crucial considerations related to CES and human well-being run the risk of being overlooked by management. In an effort to develop strategies that balance both of these perspectives, our research uses ecosystem monitoring indicators to incorporate CES and human well-being specifically.

Indicator suites can be used to elucidate social-ecological system conditions and dynamics and speak to whether the system is doing better or worse according to a decided metric (Rice and Rochet 2005). Selecting indicators for any assessment can be precarious since, as Hicks et al. (2016) states, indicators “describe what exists, and in doing so, they define what is important.” Management can therefore carry a huge influence within a place simply based on which indicators are selected for monitoring. Including only indicators of ecological, biological, and physical conditions may not be representative of the social conditions.

Hundreds of biophysical and ecological indicators have been suggested in ecosystem assessments, but indicators that represent non-economic social dynamics are largely lacking (Breslow et al. 2017; Hornborg et al. 2019). Connections between human well-being and ecosystem services are also missing (Dillard et al. 2013), including indicators that measure the impact of CES on human well-being (Hernández-Morcillo et al. 2013). In a recent review, Rodrigues and Kruse (2017) reviewed 72 studies focused on marine and coastal CES and found that just over half of all studies linked CES to human well-being, only two studies created indicators that could potentially measure this link, and no studies actually measured the contributions of CES to human well-being (Rodrigues and Kruse 2017).

Current indicators that focus on the social dimension of social-ecological systems largely focus on economic or easily quantified aspects of the system (Figure 2; Breslow et al. 2016; Dacks et al. 2019). The social indicators that the West Hawai‘i IEA currently monitor include population, tourism, shoreline modification, new development, on-site waste disposal systems, and fishing pressure (Gove et al. 2019). Of these indicators, it is unknown which and by what magnitude they are monitoring ecosystem contributions to CES or human well-being in West Hawai‘i. This unknown is not uncommon; the link between measurable, usually biophysical, indicator values and how much that value actually matters to or affects people is widely understudied (Olander et al. 2018).

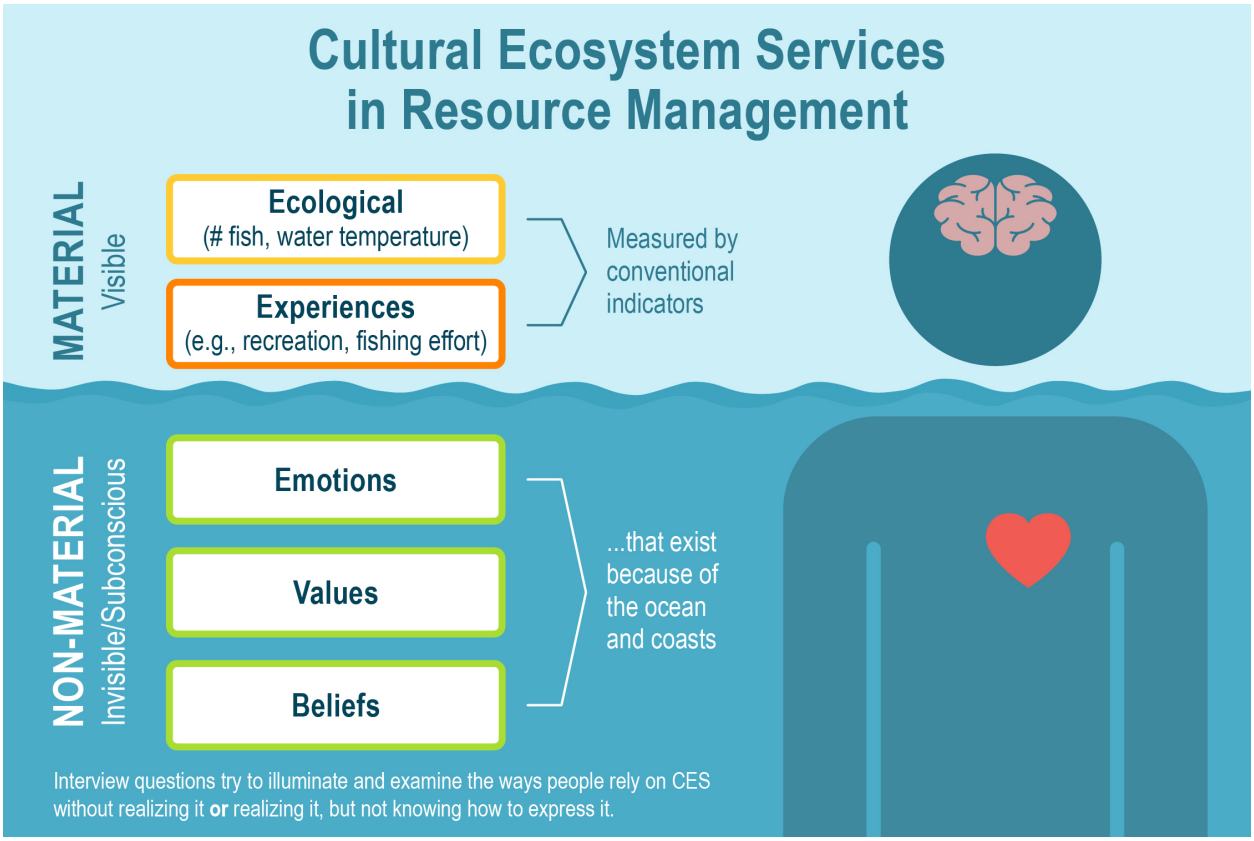

Figure 2. Cultural Ecosystem Services in Resource Management

Indicators that measure CES and human well-being are more robust when developed through a participatory process (Biedenweg et al. 2016; Breslow et al. 2016; Hernández-Morcillo et al. 2013; Pascua et al. 2017). When indicators are developed through a local, participatory process, community members are more likely to understand, accept, and support both the process and the use of indicators in management (Sterling et al. 2017b). Locally developed indicators can also lead to challenges, as indicators suggested by community members may be substantially harder to monitor due to time commitment, costs, and feasibility of having locally scaled indicators (Sterling et al. 2017b). Despite these challenges, though, locally developed indicators are more likely to reflect community member values and the entire social-ecological system.

More often than not, CES do not exist separately from each other or other services, but are interwoven with them (Chan et al. 2011; Klain et al. 2014; Pascua et al. 2017). This leads to

difficulty in managing for CES specifically and individually without accounting for other provisioning or regulating services (Chan et al. 2012; Gould et al. 2015). For example, fishing in Hawai‘i contributes to multiple ecosystem services at once, including subsistence (provisioning), knowledge transmission (cultural), and social cohesion (cultural) (Grafeld et al. 2017). One way to address this is by defining and assessing CES at a local level which can address the complex nature of CES and their frequent overlap and relationship with other ecosystem service categories (Infield et al. 2015).

Our approach to developing CES indicators is rooted in local community values and beliefs for managing social-ecological systems. Our method for developing indicators used open-ended, in-depth interviews since this requires local community input. These types of interviews are an effective way to approach indicator development because it allows people to freely list ideas and potential indicators in a way that is less structured or influenced by a researcher's methods or strategies (Gould et al. 2015). This type of approach, often referred to as biocultural, will lead to indicators that are place-based, culturally grounded, and reflect both human well-being and the resilience of the associated ecosystem (Sterling et al. 2017b).

Research Objective

In this study, we investigated community values, beliefs, and perspectives in order to develop place-based, biocultural indicators of coastal and marine based CES in relation to human well-being. Specifically, we investigated how community members understand and experience CES, how that relates to their well-being, and how this understanding can inform place-based ecosystem monitoring indicators.

Methods

We invoked a qualitative, mixed inductive and deductive approach to complete this research.

Data Collection

A detailed literature review, input from field experts, group discussions, and pilot interviews were conducted to guide the development of the semi-structured, in-depth interviews used in this research (see Leong et al. (2019) and Ingram et al. (2019) for detailed review). Interview materials included a consent form, a set of guiding questions, and interviewer prompts including a list of human well-being domains pertaining to CES, examples of corresponding attributes for each domain, and examples of question prompts for each domain (for copies of these materials see Ingram et al. (2019)).

Our previous work identified key considerations that guided our selection of interviewees; including cultural, community, research, and governance/management conditions (Leong et al. 2019). We choose interview participants using purposive sampling for key informants (Palinkas et al. 2015) involved in West Hawai‘i ocean-based conservation. This was the most appropriate sampling style for this research since we were seeking informants with a high level of specific knowledge on certain topics. Snowball sampling was also utilized, which identified an additional 7 interviewees.

We used two semi-structured interview guides (Appendices A and B) during the interviewing process; one oriented towards community leaders (Appendix A) and one oriented towards individuals in paid resource management roles (Appendix B). Both interview guides addressed research questions directly and indirectly. Question prompts from interview guides were only used if the interviewee had not already discussed a CES or human well-being domain. No interview followed the guide specifically and no interview was identical. The depth and scope of any given topic varied depending on the interviewee's expertise and interests.

We conducted interviews between April 23, 2018 and March 20, 2019 (this includes pilot interviews mentioned above). A total of 24 interviews were completed with 31 people. Three interviews were group interviews (group sizes: 2, 4, and 5). One interviewee was interviewed twice, both within a group and individually due to this interviewee's multiple roles in the community and a lack of time to explore those roles in the group interview. All interviews were conducted by one interviewer.

Interviews lasted from 45 minutes to 2.5 hours, took place in a mutually agreed upon location (e.g., interviewee's house, coffee shops, public park), and were audio-recorded. Detailed notes on interviews were written up within 48 hours of interview completion. The interviewer transcribed 7 interviews, and 17 interviews were transcribed by a professional transcriptionist. The interviewer checked all the transcripts for accuracy. Interviewees were also sent a copy of their transcribed interview to review for accuracy and inform the interviewer of any necessary redactions.

Data Analysis

We created an initial codebook prior to coding interviews using a deductive process based on research questions (Saldaña, 2013). The codebook consisted of a list of human well-being domains, a list of CES, and other topics related to human well-being. We used multiple sources to create this codebook: key references (Biedenweg et al. 2016; Breslow et al. 2016; Dillard et al. 2013; Gould et al. 2014; Michalos et al. 2011; Millennium Ecosystem Assessment 2005a, 2005b; Pascua et al. 2017; Smith and Clay 2010; Smith et al. 2013; Wongbusarakum et al. 2014); preliminary research (Leong et al. 2019 and Ingram et al. 2018); and collaboration with similar research being conducted separately from this work but in the same timeline (Adams et al. 2018). The codebook went through multiple iterations during this process.

All audio files were imported into NVivo software for analysis (version 12 Pro, QSR International, Inc.). We conducted an initial phase of coding by identifying relevant sections of each interview that corresponded to pre-identified codes in the codebook and attaching the appropriate codes (i.e., selecting and labeling text). New codes were inductively added to the codebook as needed for any new concepts or themes that arose during initial coding (Saldaña, 2013). New codes included new concepts (e.g., "everything or life") and codes named after the actual words used by interviewees (identified as "in vivo codes").

Next, we completed a comprehensive coding phase. This consisted of reading through each interview to verify the accuracy of existing coded sections, discover any sections of text that were missing codes, or re-code sections based on the updated codebook. This process allowed for any single section of an interview transcript to have multiple codes attributed to it, which is also known as a co-occurrence.

We structured the final codebook in multiple levels. A level one code is a main category and may have "sub-codes" nested underneath it. Similarly, a nested level two code may have "sub-codes" nested underneath it as well. The final codebook had 30 level one codes, 47 level two codes, 100 level three codes, 44 level four codes, and 1 level five code (Appendix C). One of the 30 level one codes included, "well-being," under which the domains of human well-being listed in Leong et al. (2019) became sub-codes. "Well-being" also included the sub-code "CES," which included all CES and their associated sub-codes.

After completing the coding process for all interviews, we had the final list of CES to explore during analysis (Table 1; see Appendix C for CES sub-codes). The final list of CES did not include any novel CES that we had not previously read in literature (largely due to the exploration of West Hawai‘i CES in Pascua et al. (2017)). Metadata for this project and the resulting data set with codes by interview are available through NOAA's InPort enterprise management system (PIFSC 2020). Additional details for co-occurrences of codes and development of potential cultural ecosystem service indicators are included in the supplemental material file.

After analysis, we virtually presented our findings to available interviewees to ensure that our interpretation captured interviewee meaning and correctly portrayed interviewee perspectives and beliefs, a process called member-checking (Glesne 2011). This process also ensured that we did not reveal more information than they intended to be public (Glesne 2011; Seidman 2006).

Table 1. CES codebook definitions in relation to coastal and marine areas

aesthetics	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.)
bequest	mention of importance of reefs for future generations; includes sharing experiences with children and grandchildren
ceremony	mention of importance of reefs (or greater coastal/marine area) for ceremonies
education and knowledge	local knowledge about the coastal and marine environment
existence	implication that 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	caring for coastal and marine environment because it provides benefit/satisfaction to a person; ability to care for resources and environment
heritage, tradition, culture	multi-generational interactions/connections with natural resources; connection to cultural traditions, stories, and/or past events; archaeological and historic sites; cultural resources; acceptable historical change
identity	sense of self, community, personal or communal identity, and/or home in relation to the coastal or marine environment
inspiration	specifically, for art or other forms of creative expression; local artistic or creative practices
recreation	playing, leisure, and activities related to coastal and marine environment; includes extractive and non-extractive activities
sacred	expressions of coastal and marine environment having sacred or religious significance
sense of place	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	strengthening ties in family or community; presence of strong social ties or networks; sense of community; trust in neighbors
spirituality	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)

Human Subjects Review

This study was carried out in accordance with the recommendations of the University of Hawai‘i Institutional Review Board with written informed consent from all subjects. All subjects gave written informed consent in accordance with the Declaration of Helsinki. The project has exempt status for Human Subjects Research from the University of Hawai‘i Committee on Human Studies under the exempt project 19449, Socioeconomics of Western Pacific Fisheries. All consent forms, raw data, and transcripts are stored electronically and are password-protected.

Results

Interviewees' ages ranged from 25 to 86 years old (Table 2). Out of 31 interviewees, 21 were born in Hawai‘i (9 born in West Hawai‘i specifically). All interviewees had spent a minimum of 10 years cumulatively living in West Hawai‘i.

All interviewees were involved in environmental conservation, most were involved via multiple routes (e.g., one interviewee was a resource manager and a volunteer for another organization). The following totals will not equal 24 due to this overlap in roles. A total of 10 interviewees were currently in or retired from a state or federal resource management position. A total of 7 interviewees worked for non-governmental resource management organizations. A total of 9 interviewees worked for a private sector company that has a large focus on ocean conservation. A total of 12 interviewees are a member of an organization/network focused on place-based marine conservation in West Hawai‘i, called the Kai Kuleana Network.

Table 2. Ages of interviewees by decade

Decade	# of interviewees
20s	2
30s	11
40s	2
50s	3
60s	8
70s	4
80s	1

Cultural Ecosystem Service Frequencies and Co-Occurrences

To determine results, CES that had sub-codes were aggregated with their sub-codes to avoid double counting. For example, the code Social Relations was aggregated with its two sub-codes, Family Specifically and Sharing, to become one single code. Where relevant, sub-code meanings and nuances are teased apart and explored in Results: Emergent Themes.

Out of the 24 interviews conducted, a total of 6 CES (out of 14) were mentioned during the most interviews: Fulfilling Stewardship (88%); Heritage, Tradition, Culture (83%); Recreation (79%); Sense of Place (79%); Social Relations (79%); and Spirituality (79%) (Table 3). These six CES also had the highest number of coded sections within interviews. Identity was the only CES mentioned in over half of interviews that also had a high number of coded sections. This was due to 2 interviews having a higher than average number of coded sections for Identity (10 and 7 versus the average of 2–3 coded sections).

Table 3. Percentage of interviews that discussed each CES and total number of coded sections for each CES in all interviews. Blue boxes represent the most frequently mentioned CES.

Cultural Ecosystem Service	# of interviews	# coded sections
Fulfilling Stewardship	88%	67
Heritage, Tradition, Culture	83%	98
Recreation	79%	56
Sense of Place	79%	69
Social Relations	79%	55
Spirituality	79%	47
Education and Knowledge	58%	26
Identity	58%	49
Bequest	54%	24
Aesthetics	42%	15
Existence	38%	12
Sacred	17%	5
Inspiration	8%	2
Ceremony	4%	4
*Identity was the only CES with a high # of sections coded that was not a part of the most frequently coded CES.		

Relationships can be determined by looking closely at individual segments of text that have multiple codes, also known as a co-occurrence. A co-occurrence exists when a single portion of the interview text is given more than one code. For example, multiple codes (e.g., provisioning services and fulfilling stewardship) are represented in the following quote:

> *We have to* ʻai[1] *of this place in order to understand its value to us. Without that, why take care of a place, yeah? If you cannot eat from it.* (23FB)

Co-occurrences were examined between individual CES and all codes that exist in the code book, which amounted to 421 co-occurrences (Figure 3). This was done in order to better understand which concepts (i.e., codes) are associated with CES, whether there are CES that do/do not get discussed individually versus together and illuminate which concepts may be a part of larger constructs. The CES with the highest number of co-occurrences were Sense of Place (67); Heritage, Tradition, Culture (64); Recreation (48); Identity (43); and Social Relations (42). Many of the co-occurrences consisted between two CES (e.g., Sense of Place and Recreation),

[1] *ʻAi:* to eat or food

but co-occurrences also existed between CES and non-CES codes (e.g., Fulfilling Stewardship and Reciprocity).

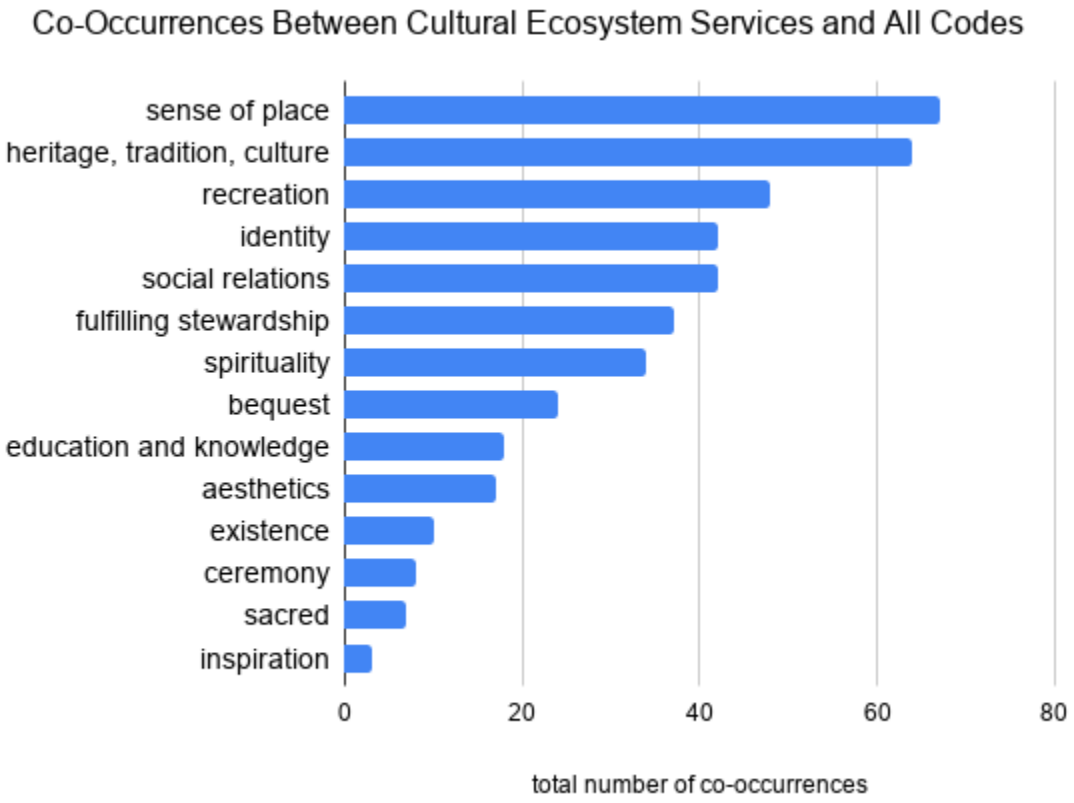

Figure 3. Relative number of co-occurrences between each CES and all other codes.

All co-occurrences with a frequency greater than 10 were between a CES and another CES (i.e., co-occurrences between CES and non-CES codes, or non-CES codes and other non-CES codes, all had a frequency of less than 10). While many CES co-occurred with another CES at least one time, only six specific co-occurrences happened 10 times or more: Heritage, Tradition, Culture/Spirituality (11 co-occurrences); Sense of Place/Identity (12); Heritage, Tradition, Culture/Identity (13); Heritage, Tradition, Culture/Social Relations (15); Heritage, Tradition, Culture/Fulfilling Stewardship (17); and Heritage, Tradition, Culture/Sense of Place (23). This could imply a strong relationship between these CES specifically, which is relevant when creating indicators.

Additionally, the total number of times that each CES co-occurred with another CES ranged from 2–11. This understanding can imply that one indicator may be able to monitor multiple CES successfully. Four CES co-occurred with 11 other CES (Fulfilling Stewardship; Heritage, Tradition, Culture; Sense of Place; and Social Relation) suggesting that these four CES encapsulate many other cultural services, goods, and benefits (Figure 4).

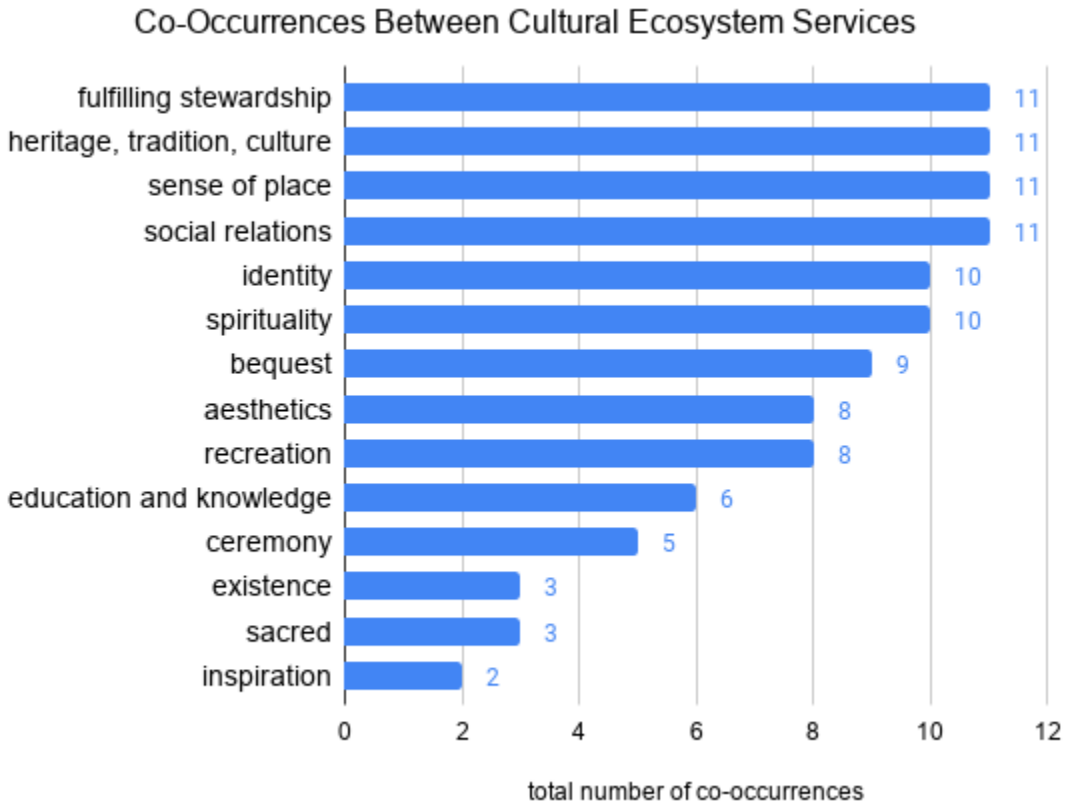

Figure 4. Total number of co-occurrences between CES and other CES only (e.g., Aesthetics co-occurring with Spirituality is counted; Aesthetics co-occurring with Positive Emotions is not counted).

We expected each CES to be mentioned at least once per interview given our attempt to prompt for every CES specifically. It is important to recognize that of 24 interviews, 6 CES were mentioned in over 75% of interviews: Fulfilling Stewardship; Heritage, Tradition, Culture; Recreation; Sense of Place; Social Relations; and Spirituality. These CES were also mentioned the most frequently (i.e., more than once) during interviews, along with Identity. Since this subset of CES was brought up more often than others, we can attempt to understand why and the significance of this in relation to management. The less frequently mentioned/discussed CES may be more difficult to talk about, or could be related to the way that interviewees are currently valuing CES (which can change easily depending on the context, conversation, and current events). Understanding these nuances is important for informing future work by ensuring that nothing gets left out of management decisions despite a tendency for the topic to be left undiscussed.

Place-based Indicators

We created a place-based list of potential indicators of CES using literature and interviews (see Supplementary Information). Creating the list began by compiling all existing indicators related to human well-being in relation to marine CES from literature. Using that as a starting point, the analyzed interview data were used to identify the relevant indicators, and quotes or concepts next

to each indicator were added. Some quotes or concepts stood out as important but did not yet have a matching indicator, so a unique indicator was created. The final list includes over 90 indicators and identifies what ecosystem service or human well-being domain is represented by each indicator. An important aspect of this list is the identification of which ecosystem service and human well-being domain is represented by each indicator since that identifies which indicators may be capable of monitoring multiple CES and human well-being domains.

Many indicators support multiple ecosystem services and human well-being domains rather than just one. For example, knowing the percentage of residents who express a positive connection to the coastal and marine environment could indicate levels of their mental health, sense of place, identity, inspiration, and social relations. While literature was used as a reference for identifying indicators, interviews alone were used to identify cross-cutting connections to keep the list as place-based as possible.

To ensure the list is practical and useful for multiple unique purposes (e.g., cost effective, can represent diverse objectives), a method to assist with selecting a smaller set of indicators was included. Categories were created to prioritize indicator selection for individual needs (e.g., resource managers, scientific assessments, community initiatives) (Table 4).

Categories take advantage of guidance that emerged from interview data. Literature on indicator suites and ranking was used to inform the categories initially; however, most literature was not meant to be informative for qualitative indicators of social values or cultural services. Therefore, while literature influenced the development, the most crucial aspect of this prioritization was the utilization of interview data.

Table 4. Categories and explanations for indicator prioritization spreadsheet. Categories for prioritization are in the form of "Yes/No" questions.

Cross-Spanning/Bundled: Does the indicator measure or tell about the status of at least 3 different ecosystem services/human well-being domains?	Indicators that can represent multiple CES or human well-being domains can be useful when the number of total indicators in a suite is limited (due to capacity, funding, time restraints, etc.). This may result in an indicator clouding or unequally representing one service/domain over another; this can be acceptable so long as that is acknowledged upfront and the overall objective can still be addressed. In contrast, if an objective is to track one particular service, then the desired answer to this category might be 'No.'
Top CES Mentioned in Interviews: Is the represented CES in the top 6 mentioned CES in interviews?	A 'Yes' means the subject matter of the indicator (e.g., ecosystem service, ecological resource) was among the most frequently mentioned in interviews. This is useful to objectives that want to include indicators that *might* be more salient in West Hawai'i. While the relationship between frequency of mentions and salience is a hypothesis, it provides a starting point informed by community members in West Hawai'i rather than similar but not place-based studies from a different or global study.

Literature Presence: Has the indicator been identified/discussed in other studies or management areas to track CES previously?	Indicators that have been identified or discussed in other places or in theory may be desirable to an objective if that equates to guidance on data collection, understanding the data, etc. In contrast, if an indicator has not been in other studies or management areas (i.e., a 'No') it is a novel indicator that might provide insight differently than other indicators, warrant further exploration, and identify the unique contributions of this work.
Data: Do supporting data already exist? Is the data set temporal (or can it be)? Is the data set spatial (or can it be)?	Determines if data already exist to monitor this indicator. Additionally, can be used to identify data gaps for future work.

Using these categories, a list of CES indicators with existing data was compiled (see Supplementary Information). The indicator was labeled as "direct" if interviews identified a connection between the particular CES and that indicator's concept. The indicator was considered to be a "proxy" if no connection was found between the CES and indicator from interviews, but a co-occurrence existed between the CES and another CES that is directly related to the indicator. It is important to note here that the "direct" indicators should still be considered less informative than an indicator that uses primary, qualitative data (e.g., surveys).

Emergent Themes

Common themes emerged during the interview coding process from interview data, field notes, and interviewer observations. These themes include connections to CES and human well-being domains and are therefore considered relevant here.

Interviewee perspectives on changes in environmental condition

Interview questions prompted discussions of the condition of the coastal and marine environment. When interviewees discussed coral reef and ocean characteristics, the most commonly discussed elements were coral specifically (42% interviews), marine species abundance (50% interviews), coral reefs in general (25% interviews), and the shoreline in general (29% interviews). The extreme coral bleaching event that happened in West Hawai‘i during 2014 and 2015 was mentioned in seven different interviews despite no specific prompting.

When interviewees discussed changes in coral reef and ocean characteristics, the interviewer responded by asking for perspectives on the underlying cause of those changes. Table 5 displays interviewee identified causes of environmental changes. Changes in coral health were almost exclusively attributed to climate. Changes in marine species abundance were attributed to the highest and most diverse set of causes. Changes in coral reefs and shorelines in general had a total of seven unique causes.

Table 5. Interviewee identified causes for changes in coral reef and ocean characteristics. Each number is out of the 24 total interviews. Empty boxes represent 0 interviews.

	coral health	marine species abundance	coral reef generally	shoreline generally
commercial fishing		2	1	
overfishing		3	2	1
certain fishing practices		1		
access issues		2	1	1
climate	6	1	1	
development		4	1	3
invasive species	1			
management/regulations		1		
pollution			1	
population increase		1		
tsunami			1	1

Interviewees who see coral reefs frequently (e.g., through diving or snorkeling for work or recreation) spoke about changes they had observed. Interviewees used the following words/phrases to describe coral observations regarding climate change: rubblefication, die back, bleaching, loss, degraded, and damage. One interviewee describes the coral reef that she is most familiar with:

> *Well, when I first moved here in [1990], I would swim like 200 days a year. I would be, I was out there. And the coral health was so much better. It's pretty much a dead wasteland out there now. Even along… And, you know, part of that's tsunami, part of that's cesspools, part of that is, when I first moved here there were no kayaks.* (15FA)

Multiple interviewees also brought up negative feelings that the declines in coral health prompted, particularly the coral bleaching events, describing how it affected them directly. Words that interviewees used to describe their emotional response to coral health decline include fear, sadness, anger, heartbreaking, depressing, and frustrating. One interviewee describes a reaction that he sees commonly amongst West Hawai‘i marine scientists:

> *I think on the emotional level, there has to be some kind of an impact that reflects what's happening ecologically. I mean, I know for scientists there are people who are going through stages of grief. For our team, absolutely. You know, there's an emotional toll that it takes when it was 50 percent of your coral in a few months. It's significant. And then you get in the water at the same place and you see that it looks totally different and it's hard. And then you're hoping for recovery after one year. You get in the water a year*

later, and it's worse. There's an emotional toll for all of that, and you kind of have to either ignore or reconcile, somehow. So, for scientists, major emotional impact. (19MB)

Despite this observed negative impact, no one reported observing any behavior changes. One interviewee explained the recognition that it was an unprecedented event, yet he did not notice behaviors within the general population change in response:

The coral bleaching, though, I thought would be like a big wake-up call and like warning bells for everyone. Everyone who got in the water saw that, whether we were spearfishing or counting fish, we noticed something mega had happened and nobody had seen it before. It wasn't in any of the kūpuna[2] *accounts. Like, there's no evidence that that ever happened before. But if we were to look at the actual change in behavior from that, it would be pretty minimal, I think. I don't think people register this is really strange and unusual, but the reason that I came here is still valid and so I'm going to do what I came here to do anyway. So there wasn't this kind of massive recognition that something urgent needs to be done outside of the management circles. You know, the Division of Aquatic Resources was trying to act with urgency, some of them.* (19MB)

A behavior change might have been expected since so many people in West Hawai'i view the coral reef as part of their community. For example, one interviewee spoke of the coral reef as part of her neighborhood when she said, *"We had coral bleaching a couple years ago that was pretty bad, so when you look at the bay it is not what it was"* (15FA). This interviewee was intentionally including the coral reef as part of her community by using the word "we."

Interviewees discussed a decrease in marine species abundance (i.e., fish, *'opihi*[3], *limu*[4]), and some did have examples of how their actions have shifted in response. One interviewee gave a detailed description of the changes she noticed where she frequently fished, swam, and snorkeled:

We would always go and I mean, you could find everything. Angel's fish–Potter's fish[5]*. Now it's like, you're lucky if you might see, besides tang*[6]*, you'll see a few butterfly fish*[7]*. It's really rare I see parrotfish. Like, this last year, I've been in the water more out here and I'm like, it's just gone. Gone. I mean, like, you used to see damselfish*[8]*, you used to see the* āholehole[9]*, you saw all the stuff that you don't see. The* weke[10]*, you don't even see* weke*. You can find pufferfish*[11] *off one of the walls, they're still around. Some of the*

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[2] *Kūpuna*: (plural form of *kupuna*) grandparent, ancestor, relative or close friend of the grandparents' generation; also starting point, source; growing
[3] *'Opihi*: Limpets in the *Cellana* family (multiple species exist in West Hawai'i)
[4] *Limu*: General name for all kinds of plants living under water, salt and fresh. Also, algae growing in any damp places such as ground or rocks.
[5] Potter's angelfish: *Centropyge potteri*
[6] Yellow tang: *Zebrasoma flavescens*
[7] Butterfly fish: *Chaetodontidae* family, various species are present in West Hawai'i
[8] Damselfish: *Pomacentridae* family, various species are present in West Hawai'i
[9] *Āholehole*: Hawaiian flagtail*, Kuhlia sandvicensis*
[10] *Weke:* full name *weke 'ula*, Yellowfin goatfish, *Mulloidichthys vanicolensis*
[11] Pufferfish: *Diodon hystrix* and *Diodon holocanthus*

> weke *is still down in the, um, like he talks about the* ku‘una[12]*, they hang in certain areas where there’s current.* (15FA)

One interviewee explains how this decline in observed abundance has changed his behavior in regard to gathering *‘opihi*:

> *You know, when I was young enough I could go to places where there was so much* ‘opihi *that you would take what you need and not worry that you were denting it. Now when you look, sometimes it’s just so little there, you don’t feel good about taking because it’s almost like now you’re… it’s at a place of, you know, a point of being depleted as [opposed to a] point of being thriving, and being abundant.* (4MA)

Another interviewee discussed activities that she and her family do near the ocean, and mentioned the decline:

> *We, technically, take the kids to play in the water and to fish, just pretend fish. We never really fish. Um, from what I’ve heard from fisherman, the fish are dwindling, they’re not as easy to catch, they’re smarter, they’ve been overfished.* (13FA)

Multiple interviewees attributed increased shoreline access to increased resource use (i.e., fishing and gathering) and a decline in marine species. One interviewee stated that before the Queen Kaahumanu Highway was built in 1975 it was very difficult, and therefore less common, to visit the shoreline, “*So that gave the [fishing] grounds time to rest, to recover. But now there are so many people, there are so many boats, you know. The resources don’t get chances to recover”* (7MA).

This same interviewee shared that now it is not uncommon to observe almost 600 cars along a particular stretch of shoreline on any given weekend. Another interviewee directly connected increased shoreline access with fishery declines:

> *Access to the beach was mainly through the ranchers, like Pu‘uwa‘awa‘a, down to Kīholo, everything was through the ranch land. If you had a boat, then you can come by shoreline, by ocean, you could come inside. Everything was—everything was done through the ranch land, and once Queen K[13] opened up, you know, it became accessible to the shoreline, very easily. And you know, we started to see the fish population started to dwindle. And limpet, which is the* ‘opihi*, you know.* (6MA)

Many interviewee’s value and trust perspectives from *kupuna* in regard to fishery decline. An interviewee said that while she had seen some declines herself, her biggest reason for believing in these species declines was from talking with *kūpuna*. She said, *“In terms of fisheries decline, it’s the talking story with the* kūpuna *that tell me it’s not normal what we’re seeing”* (21FB). Another example comes from an interviewee who many look to as a *kupuna*, yet they still gave examples of going to *kūpuna* for insight:

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[12] Ku‘una: a place where a net is set in the ocean; interviewee refers to this place regardless of the presence of a net
[13] “Queen K” refers to the Queen Ka‘ahumanu Highway

> *He's an elder cousin of mine and the numbers he puts at fish down here in the 40s and 50s is just astounding. And I'd ask him, 'Really? That many thousands of fish?' And he says, 'Certainly.'* (10MA)

At times, interviewees would discuss species' decline without attributing a specific reason but instead talked about the impacts of the decline on their lifestyle. For example, one interviewee discussed that now he has to work harder when he goes shoreline fishing, which influences him to take home his entire catch rather than throwing certain fish back as he used to commonly do:

> *Normally, I throw those back because people use it for bait for* ulua[14]*, and stuff, slide bait. I took it home because, you know, I walked all the way, that way. What I caught I took back.* (6MA)

These are examples of observations or beliefs in marine abundance declines from interviewees; however, it is important to note that one interviewee shared an opposite perspective. He said that he had not noticed any species declines during his 30 years of fishing off of West Hawai'i. He had observed changes in ocean currents, weather patterns, fish life cycles, and human impacts, but had never noticed a permanent decrease in fish or catch, only expected cyclical declines.

Interviewees also noted changes to coral reefs and the shoreline generally and attributed changes to multiple causes. The diversity in causes is likely due to interviewees discussing different locations, species, and activities with which they are most familiar.

Social system changes create barriers to CES

The topic of access (i.e., increasing/decreasing, access related issues, or generally) was mentioned directly during 11 interviews, a total of 24 times, and co-occurred with 46 other codes. Access was described in relation to one or more of the following: a physical location, an activity, an experience, an emotion, and related values. Sometimes access was used to directly refer to a location where a CES was obtained (e.g., a beach provides Recreation and Social Relations). Other times, an interviewee described accessing a CES without referring to a specific location. For example, one interviewee answered what he would miss about the ocean, in general if it were taken away, was access to its existence:

> *If I were to miss anything now, immediately right now… is… um… really, access, I guess. Through that tranquility and peaceful side of it, that's what I would miss. I'm not looking at any one particular resource, it's just having [the ocean] there.* (4MA)

Interviewees discussed how access to the coastal and marine environment in West Hawai'i has changed over time. Examples of changes they mentioned included the development of the Queen Ka'ahumanu Highway, mandated public shoreline accesses, changes in land ownership, guidebooks, and social media. Most interviewees who discussed these changes connected them to overuse of and negative impacts to marine resources.

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[14] *Ulua*: Certain species of Carangidae (crevalle, jack, or pompano), the most common is the giant trevally (*Caranx ignobilis*)

The drastic change in access related to the opening of Queen Kaʻahumanu Highway was mentioned by 4 interviewees who were alive when it was developed (younger interviewees did not mention the highway). These 4 interviewees described how access was more difficult before the highway opened because you either had to cross a large amount of difficult terrain or have a boat (as described in the previous section). Beyond negatively impacting resources, which interviewees described can directly decrease access to CES, one interviewee described another way that the increased access impacted his well-being through unintentional lack of respect for another person's place:

> *When the road gets put in, Kaʻahumanu Highway in '75. New airport, [newcomers], everyone in the new harbor gets put in, you know, all of those changes coastal-wise have dramatically changed. So then when I think about how that impact, naturally you're talking about a lot more residents, tenants, jobs, you know, it's a good thing. But, then, the other thing is that no one took into account is that once you create that* puka[15]*, here comes [NAME 1] for his baby luau, and we grabbed 300 pounds of* heʻe[16] *for their thing. […] That resource is directly impacted. Did I ask permission? Did I go to [NAME 2]? Did I go to [NAME 3]? Did I go to [NAME 4]? So, that creates a guilty conscience in my head. Because I was brought up the right way. I should have asked permission before I went to someone's* kuleana[17] *and went and impacted their thing.* (14MA)

One interviewee expressed disappointment in the lack of management provided by the State of Hawaiʻi after the Queen Kaʻahumanu Highway was opened, which demonstrates her value of taking care of places within her responsibility (related to the Hawaiian concept of *kuleana*):

> *[The State of Hawaiʻi] offered no commitment or contribution to the managing of the resources. When you're opening up a previously, you know, maybe optimally exploited fishery, then you open it to just relentless pressure. Um, I'm disappointed that as a first line of intervention the County didn't engage. Since they're the ones that are requiring the access. Even if it would have been just as simple as putting up sign and helping with signage, you know? Just small measures that if they had been in place when the accesses were opened, might've done more to inform people.* (10MA)

This perspective was shared by multiple interviewees and is a concept explored further in the upcoming section, Reciprocity.

Another form of access mentioned by multiple interviewees was the public shoreline access points created by hotels and resorts due to legal requirements. Interviewees discussed how these have impacted marine resources. One interviewee describes the early impacts of these access points opening:

> *Then, ironically, the building of hotels, so, plenty of people in the community might not like the hotels but maybe they worked at the hotels while they were under construction.*

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[15] *Puka:* hole; door, entrance, gate, slit, vent, opening
[16] *Heʻe*: Octopus (Polypus spp.)
[17] *Kuleana*: Right, privilege, concern, responsibility, title, jurisdiction, authority, ownership; reason, cause, function, justification; small piece of property

> *They're in the construction industry. And saw the reefs and would come back by boat or whatever and pound the reef.* (10MA)

Changes in land ownership was a topic also brought up by some interviewees when discussing diverse changes in access. Interviewees pointed out that the many institutional changes that took place over the past century took away many of the ways that people were used to purposefully or accidentally connecting with their place. Regarding land ownership relating to someone's identity and sense of place, one interviewee said:

> *You had that change in how you perceive land, how you perceive yourself, and how you're connected to this place, and if that's cut off, then you know, you're alienated from the land. And you don't have as much care as you would if you felt like you were of a place.* (8MA)

One interviewee discussed how changes in his neighborhood shifted his daily routine of walking the shoreline and interacting with neighbors, *"Yeah, even if you still can walk [the shoreline] you don't wanna walk it because of all the actions going on there" (2MA).* When he uses the word "actions," he is referring to aspects of the neighborhood that he views as dangerous and uninviting. One interviewee described how he cannot go to places that are special to him any longer, *"So I would love to go back. I would love to show my daughter all the places, you know, fishing hole, and stuff like that. But access is limited" (6MA).* Another interviewee said his community is very careful about how they manage their property to ensure that they do not lose "control" and thus access to the value of their place:

> *We have religious connection to that [area]. We have a spiritual connection to that area. So as much as possible we don't like to commercialize that area. So before, we had a lot of people that want to have weddings, and stuff like that. So we don't allow that for that reason, once you open that door, you know, then you're like commercializing it. […] You would lose control over your own property that you've been raised on, yeah.* (11MA)

A few other interviewees mentioned (directly and indirectly) a shift in how people cared for their place when the State of Hawai‘i took ownership of coastal areas and restricted access to certain places. Some of these interviewees were upset because they felt the lack of access due to change in ownership severed their connection to the place. Several interviewees described ways that they are actively working with land owners (State of Hawai‘i and private) to create ways to reestablish or maintain physical access to specific locations so that their communities can maintain access to cultural benefits (e.g., bequest, ceremony, sense of place, spirituality).

During five interviews (including two group interviews), guidebooks and social media were specifically mentioned to have all but eliminated any difficulties that may have existed in finding a location. According to interviewees, this results in overcrowding, exposure of any remaining "secret spots," and an unrelenting pressure on resources. One interviewee describes:

> *Beaches and what used to be pretty good kept secret spots are now like extremely publicized and because of that, you know, people get hurt and then there comes the need for creating safety, easier access, and showers and toilets.* (26MB)

The negative impacts of this increased pressure on coastal and marine resources, results in impacts to CES. While explaining this, one interviewee said, *"*Aloha [18]*has been exploited. You know? [...] In a negative way that then affects* kama'āina[19]*, and then affects sense of place"* (14MA).

Two additional ways that increased access to physical locations were using boats to access secluded areas with limited or no shoreline access and paving beach entry roads to make driving to the beach easier.

Interviewees discussed how changes/impacts to physical access, governance and regulations, marine tourism, and environmental conditions create barriers between themselves and CES, which affect their well-being (Table 6). In the examples below, interviewees describe ways that the condition of the ecological system directly impacts their access to CES and human well-being.

Table 6. Interviewees described how changes in land use and ownership impacted their access and created barriers to CES and human well-being, as exemplified in supporting quotes.

	Changes/Impacts	**Quotes**
Physical access	• creation of shoreline access points • paved roads to beaches • overcrowded beaches, dive sites, or fishing spots • avoiding or changing frequently visited locations	"Yeah, even if you still can walk [the shoreline] you don't wanna walk it because of all the actions going on there." (2MA)
Governance & Regulations	• marine management area • fishery closures • changing ownership of shoreline property • contemporary management	"...A practice is then lost because of modern day management systems." (14MA)
Marine tourism	• increases in tour operations • crowded and unsafe boat ramps • increase in tourists present; creating overcrowding of sites and overuse of resources	"I went away to college for four or five years. And, the number of operators, the number of boats, I mean, nearly doubled in that time. The impacts that they bring and the attitudes that they've shifted was so, um, strong and so palpable, that when we came home it definitely felt like a different

[18] *Aloha:* love, affection, compassion, mercy, sympathy, pity, kindness, grace; greeting, salutation, regards; to love, be fond of; to show kindness, mercy, pity, charity, affection; to venerate; to remember with affection; to greet.
[19] *Kama'āina*: Native-born, one born in a place; lit. land child

	Changes/Impacts	Quotes
	• negative impacts on marine resources	place. And the beings that share the space with us, definitely have changed their attitude as well. It's almost defensive." (31MB)
Environmental conditions	• declines in marine species abundance (*'opihi*, *limu*, reef fish) • poor water quality (due to wastewater and runoff) • coral bleaching • human population increase • coastal development changing shoreline • climate related ocean changes (temperatures, wind, currents)	"I think the overuse of areas limit what we choose to go to. We used to fish a lot more. We used to access the ocean a lot more. But knowing that it is being overfished, that all *'opihi* are being overharvested, we have not, we have decided or chose not to fish anymore. We don't go pick *'opihi* anymore. So it limits what we can do, and it's kind of frustrating because those who are trying to do right are being impacted by those who choose not to. So where is that, you know, that where everybody should be equal kind of thing. If everybody takes their *kuleana* then everybody could harvest and have, right?" (13FA) "Well, I mean just even going to the beach up there. I mean, now, or whatever, you're like—you just know what's in the water now, you know what I mean. Better not have any cuts on me." (21FB) "Yes, [the hotel] provided jobs but it also desecrated cultural sites and ran over kūpuna *iwi*[20] in this process of the development of the old Kona lagoon to this [hotel]. And seeing those development and hotels come down, and restoring our *wahi pani*[21], or sacred sites, and *heiau*[22], to help advise us as to the function of these spaces, yeah? Better understanding, yeah?" (23FB)

[20] *Kūpuna iwi*: bones of *kūpuna*; can be referring to burial grounds
[21] *Wahi pana*: legendary place
[22] *Heiau*: Pre-Christian place of worship, shrine; some *heiau* were elaborately constructed stone platforms, others simple earth terraces. Many are preserved today.

Most interviewees agreed that the changes discussed above were having negative impacts. Those who did not label the impacts as negative specifically said that it was not their place to decide how the general public was affected. However, some did provide ways that it negatively impacted their own well-being at other points in the interview. One interviewee responded by saying:

> *It makes me sad. It makes me sad. And I know that it makes other people frustrated and, you know, these personal relationships that I have, I hear frustration, I hear anger. And all of us are sad because it's not healthy and balanced and there's not respect. And it's frustrating because everybody's trying to do something about it but it's really hard to get other people who aren't interested to listen or to do it. So yes, there's a lot of frustration and anger and sadness, I would say, around what we see going on or feel going on.* (28FB)

The timeline for these changes and their resulting impacts was not always discussed, and when it was it was broad/diverse. However, two generalizations can be made. Physical access to shorelines and marine regulation tend to have exact dates of creation. As one interviewee described, they are the *"pulses of intensity"* that have created openings to resources that were previously very difficult to get to (e.g., Queen Kaʻahumanu Highway, public shoreline accesses built as a requirement of coastal development projects, the creation of Honokohau Harbor). In contrast, changes in marine tourism and environmental conditions happened over a longer period of time, usually with impacts gradually building.

In a drastic contrast to the negative impacts listed above, it is crucial to report that one interviewee pointed out that an increase in access to the coastal and marine environment could create a deeper connection between a person and place. This interviewee discussed how the Queen Kaʻahumanu Highway allowed a greater amount of access for her children:

> *So, in some ways, [my children have] been more shaped by the coastline than I was because they were immersed in it from when they were little. And when they were little, we spent a lot of time down there. Because we knew the changes were coming.* (10MA)

Recreation provides access to cultural ecosystem services and human well-being

Recreation stood out as a conduit between interviewees and other CES. Recreation was mentioned in 19 interviews, a total of 56 times, and co-occurred with 48 other codes. Recreation was most commonly co-coded with Social Relations (10 co-occurrences); Connection (8), Physical Health (8), fish as a provisioning service (8), decreases related to well-being (7), and Spirituality (5). Interviewees mentioned recreation alongside 8 other CES: Social Relations (10), Spirituality (5), Bequest (4), Sense of Place (4), Identity (3), Heritage, Tradition, Culture (3), Fulfilling Stewardship (2), and Existence (1). Additionally, Recreation was coded with mental and emotional health (4), positive emotions (4), and negative emotions (3). The high number of diverse co-occurrences is evidence that recreation cannot be teased apart from other CES or human well-being domains.

When interviewees spoke of recreational activities, they frequently bundled their discussion with other CES and human well-being domains. In the following examples, interviewees weave

together multiple CES and human well-being benefits (bolded within quotes) that they obtain via recreational activities:

- *So, paddling… It's **recreational**, it can be **sporting**, [NAMES] often invite me to **pray** on their canoe races, before the race begins. So it's a great medium for both **physical and spiritual connection**.* (10MA)
- *So, paddling, um, is a way to, like, **connect with the ocean** and also, like, **exercise**. And, paddling is a **huge family thing**, too. And now it's probably going to be a little bit more because our great Uncle and then Papa's brother-in-law just passed away. So, coming back to the ocean, and then also when like [NAME] passed away, they all went back into the ocean. So it's **a way to connect**. With **family**, too.* (30FB)
- *"So there's definitely a **connection** now, more **emotional** than just water **sports activity**."* (29FB)
- *Well, from a **family's** perspective it really brings us close together because everybody has a duty when you go **camping**, you know? My son and I catch all the **fish**, the girls clean them. And then my son and I do the **cooking**. The girls kind of like, they **take care** of the campsite, and what have you. But the girl's connection is really one of more **relaxation**. For them it's a chance to get away, it's a chance to kind of, let themselves, let their hair down, you know? Just get away from things.* (4MA)
- *I need to go visit Dr. Ocean for **mental health**, but as well as, I think, **spiritual—spiritual health and mental health**, similar. But you know, **physically**, too, sometimes.* (22MB)
- *I do **swim**, I do **freedive**. I do **paddle**, not quite as much as [NAME]. Um, but like I said, the majority of my time in the ocean is spent **enjoying** it, yes, but **maintaining and cultivating those connections**.* (31MB)
- *It's special for **[the kids] to get out there**. And, since I, I personally like that experience, I want them to have that experience. That **joy** of going out there and, uh, kind of getting the salt on you and **catching a fish**, maybe, and just all of that. And, I think a lot of them **enjoy** that. I mean, there's a lot of **smiles**. It's a **fun activity**.* (10MA)
- *Mostly **just getting in the water and swimming**. I wear goggles, I can see what's going on. And the other thing that I'm very **interested** in, I just like the environment between the ocean and the land.* (3MA)
- *So, I mean that's why I love **surfing** because I can't think about anything else. It fully just **clears your mind**, like you said, and you just **focus on breath**.* (27MB)
- *The **love** of just going in, **investigating** the ocean. Um, and **sharing** it.* (17MB)
- *There's like a heightened awareness of how beautiful and special that place is, that carries beyond just the awesomeness of that morning. But there's even an awareness and heightened consciousness about each other, and each other's well-being, which then translates into the well-being of that place.* (26MB)
- *And, just the **mana**[23] that was there that morning and the people who are in **the lineup** and the conditions and the size and the fact that I **didn't get to pounded**. You know, those*

[23] *Mana*: Supernatural or divine power, miraculous power; a powerful nation, authority; to make powerful; to have power, authority; authorization, privilege; miraculous, divinely powerful, spiritual.

*things come together to instill or really, like, mark me with such a fondness, such a **deep love** that births a deeper **kuleana** to really want to **take care of that place**.* (26MB)

The examples above exemplify ways that the condition of the ecological system is directly impacting the ways interviewees obtain CES and enhance their well-being.

Interviewees expressed ways that ecological or social changes in West Hawai‘i have resulted in changes to their recreational behavior and can be linked to negative impacts to their well-being. In these ways, the access that recreation provided to other CES is diminished for these interviewees. Examples provided by interviewees:

- *After the die-off I stopped diving for fun, and that was something—I didn't—I mean, it's tricky because I also bought a house. So, I was busy. But, I used to plan to dive, and now I just—I don't—I haven't done that since the bleaching event, and it just—yeah, it feels a lot different. (20FB)*
- *I used to be drawn to more ocean activities, like personally and spiritually. And now—I mean, yeah, I'll go surfing, but I also just go to the pool because I don't want to see it—or because there's people or because I know there's like brown water and there's chemicals. I don't know. (24FB)*
- *I've noticed the changes. Just in Kahalu‘u. And it's only a short period of time that I've been around and I remember, there's a lot more people in Kahalu‘u. It's so inundated. You don't see the Hawaiian families like before, that would go down to the beach. You don't see that. That's one change I notice in my short time that I've been paying attention. Again, it's all our family around, but in those times that we would come for family reunions or birthday parties, I notice that as one change. I don't see them going* holoholo[24] *as they used to. You would usually see one person out there with those glasses that they wear to kind of see through the water, with the throw net up and back. I used to see people, you know, Hawaiians doing that when I was here when I was younger. But I don't see that anymore. (23FB)*
- *[My family doesn't] come swim that much, fish, and stuff like that. So those are some of the changes, yeah. I'm not sure if it's because of accessibility, trying to get down, yeah. Because now you're going to have to go to public access. (6MA)*
- *I do surf and I used to swim a lot more in the ocean. I don't as often anymore. I used to snorkel. […] Um, probably for swimming, it's mostly like ease of access and parking and like, life of convenience. Like, it's a lot quicker for me to just pop into the pool and like shower off and come back to work on a lunch hour. And snorkeling is just because it's depressing and it's not like—you know, when I was 16 or 17 and kicking around at Ho‘okena every other day, you know, envisioning the… Just what I know now, like, both academically and just watching the things shift and change and being immersed in like the feeling of documenting the decline for the last so many years. It's, it's not an outlet anymore. (24FB)*
- *Ways in which I used to, you know, whether with friends,* ‘ohana[25]*, or by myself go to the beach to go surf, like before or after work. All of a sudden, you know, there is a paved*

[24] *Holoholo*: To go for a walk, ride, or sail; to go out for pleasure, stroll.
[25] *‘Ohana:* Means family, relative, kin group.

walkway or there is an extension of a parking lot. Now, they have, like, parking fees for a lot of places, which ultimately feeds back into the system to, ideally, take care. But just like, you know, if you build it they will come. It's like an extremely large parking lot was built and I can't really get into places because there's no place to park. (26MB)

Governance and Management

All interviews included questions pertaining to the governance and management of marine resources. Exact questions varied due to how the interviewee was involved in marine management (e.g., state manager, owner of/involved in conservation non-profit or business) and the unstructured nature of each particular interview. Interviewees expressed many ways in which their community participates in conservation through governmental and management processes.

Five interviews included discussions of adaptive management. One interviewee defined it as, *"the ability—well, to use the best information available to us to make decisions when managing the resource, whether things go off limit or there's closed seasons or closed areas"* (24FB). Interviewees said that adaptive management was either necessary or desirable for several reasons, including the greater perceived potential for it to mitigate impacts of a larger population, the ability to react much faster in regulation or rule-making, and the ability to be proactive rather than reactive.

Many interviewees participate in government processes related to managing resources, expressing that it was necessary to participate in governing their places rather than leave it entirely up to government agencies. Interviewees had different specific goals in relation to management, but all were related to protecting natural resources that their communities rely on. Multiple people explained that their community was attempting or had a desire to work with the State of Hawai‘i to improve management.

One interviewee explained how the State of Hawai‘i is another level of community. While this interviewee was the only one to state this directly, the idea or concept was expressed indirectly by multiple interviewees. In every instance, seeing the State of Hawai‘i as another level of community was connected to co-management of resources or communities. The interviewee who directly stated this concept explains:

I wouldn't call them, I wouldn't describe them as the same community that, you know, you live in. But it is a community of people, as well. And those people have a responsibility to look after the community. Community. And, they play a really important role because they the rule-makers. We've delegated some of our community's responsibility to manage our own resources, we've delegated to the state. The State needs help. And, the way that we can help them is to inform them of what's important to us. Help them, uh, have rules that then support what we would like to see in our community. And, help them actually enforce it if they had to. Um, they not gonna delegate too much of the enforcement to us, ah, not yet, but that's not to say it's out of the question. But, when we start thinking and when the state starts to think along the lines the community thinks, then I think we become, you know, closer in terms of our working relationship. I'm not, it's not competitive, it's not adversarial, but it's not actually how a community or a family would work together, you know. But, I consider them to be a very important

> *community to us. And, they should be family, because we've pretty much relegated to them a lot of rule-making authority over our own resources.* (4MA)

One interviewee explained why community co-management has become prevalent today:

> *I think the drive for community co-management really came from the fact that there was a loss of confidence in the agencies responsible for management, DAR, doing what needed to be done. And it was like, we have to do it ourselves at this local scale because they're not going to do it on that larger scale.* (5MA)

One interviewee described why it is critical to allow for co-management, or in the least some level of community connection with resources, saying that without it, *"then the connection can be further eroded. So it's a negative feedback loop that gets created if the ability for people to feel empowered and participate goes away"* (19MB).

Another interviewee touched on this same topic of land ownership affecting connection to place, but in their community they were affected by changes in land ownership (specifically, family owned land becoming state owned land) which negatively impacted their connection to their coastal place. The loss of access to their connection to a place that held many benefits and values for them, such as sense of place and ancestral connection, motivated them to create co-management agreements. Through co-management, the community is able to take care of their place, and the community has been focused on *"reestablishing that connection to the beach"* (4MA):

> *So the families are now returning to the land, and taking care of it. So ownerships not, doesn't matter. It's their connection to the place. So, all the people that we have working there, they have a direct connection to the place.* (4MA)

Another interviewee described the purpose and value that guides his work in a similar regard: "It's really about: people are part of the ecosystem, and if you take them out of the equation then you're impairing the system" (8MA).

Importantly, another interviewee also added to this narrative that it is not about pushing anyone out or not being inclusive. She said:

> *I think that we do our work a disservice when we dismiss the opposition out of hand. I think understanding everybody, to the extent that we're able, improves the quality of the conversation.* (10MA)

While that interviewee was specifically describing rule and decision-making processes, another interviewee echoed this idea in a different way:

> *We worked together collaboratively with representatives for the previous landowner and establishing a plan not only for our family but for the community to enjoy this space with that understanding of place and space and its importance to not only the family but to the community that uses the space.* (23FB)

Due to the importance to interviewees of having community involved in the governance of place, including indicators of resource management was important. As one interviewee said in reference to community and management entities working together, "*It's a good thing. No better people to be managing the resources than the very community that* is it*."* (26MB). Using interview data, we developed indicators that could be used to track community involvement and satisfaction with governance of resources and resource management (Table 7).

Table 7. Indicators related to governance and resource management, identified via interview analysis. Supporting quotes represent evidence of why each indicator was suggested.

Indicator	Supporting Quote
Community perceptions of the condition of the marine environment (i.e., are things better, worse, the same)	Interviewee 1: "Right? So, I think, like, coupled with the decline in resources and impact of the reef, you also have this decline in memories, decline in that connection. And, to me it's sad, but it also makes those places-" Interviewee 2: "More and more special." Interviewee 1: "Well, it… worth protecting."
Community feels that its voice is heard in management processes; opportunities for participation and equity	"You know, it's like, [they] don't listen. It's a one-way transmission, right? Their ears don't work. It's like, you're wasting time. You turn around and walk out. [...] Ok. That's a wasted meeting. [...] Yeah. So, to make a difference, you have to be a moderate. Otherwise you don't get listened to." (10MA) "We were talking about that draft environmental assessment that occurred. And you know, it's just really widely circulated in the people that I kind of, like, network with. It's all, where's the cultural impact statements, who did they talk to? You know, they didn't talk to any one of us. And I think that's really lacking. And I think the State should be saying to them, before they accept any environmental assessment or statement, well, which communities did you talk to? That's the State, I see that as the State looking after the community in its responsibility." (4MA) "It is, it's a good thing. It's a good thing. No better people to be managing the resources than the very community that is it." (26MB) "You know, that's part of why I want to be involved, because I want to do more than just hope for it to go well and for good decisions to be made." (22MB)
Community perspectives (support, confusion, satisfaction, etc.) on marine managed areas	"I have every, you know, every intention, hope, and prayer that it's gonna get better. So we have an opportunity to influence the condition of the fishery but not the human population." (10MA)

Indicator	Supporting Quote
Community opportunities for marine education	"You know, you have to educate the locals because they're not one that goes to meetings. When the law changes, you have to educate the locals, because they've been doing it for years. And all of a sudden, oh, I cannot spear? No, no, you cannot spear, the law changed, yeah. And the net size, because they keep it—well, they kept it at their house for the longest time, don't know that the mesh size changes, yeah? And thinking that it's okay because they did it before." (6MA)
Community perspectives (support, confusion, satisfaction, etc.) on regulation and enforcement	"I think that the current regulations and requirements are necessary, but I don't think that they're applied effectively. […] Does that make sense? So, I know we need regulations because a community this diverse will not self-regulate because of the drastically different interests even though it may all be tied to ocean there are different goals with the ocean inspiration. And I see that the regulations are pushed through or that they are applied, but there is no enforcement and a lot of the times it feels when they're being established uninclusive (Arkema et al.) where a lot of community members feel unheard, where they don't care to follow them." (28FB) "And now it's like there is no taking care. There is no… it's pure harvest and it's pure recreation. So it's… These places have been passed down in their importance, like I said, culturally and ecologically, yes. And, we are blessed enough to be able to continue our practice of not just having fun and viewing the area but continuing the practice of caring for it to our degree. But there's only so much you can care for a place if every other person who uses it does not do the same."
Community trusts in "experts" and government agencies that manage marine environments	"I felt, like, really disheartened and scared because I got really concerned and, like, I don't want to say hopelessness, but it almost felt… like I just thought the entire world was going to change after that. Um, and then, not from a bleaching, but I lost a lot of faith in government after that. Because I was involved in the [process]. And it was supposed to be a time of kind of like adaptive management and getting something out within the year. And two years go by, nothing. And, still yet, nothing. […] So, if you have such a huge disaster like that and can't really do anything different, it's super disheartening." (30FB) "I think a lot of management is actually about relationship. It's not about rules. […] If everybody's thinking alike, and knows what to expect from other folks, and respects, then I think the rules become less, uh, less important." (4MA)
Funding availability for co-management initiatives	"Volunteerism [sic] is important but people have… They've got to feed their families. They can't just do that." (4MA)

Indicator	Supporting Quote
Infusing contemporary management with heritage, traditional practices, and culture (e.g., *kapu* practices)	"But you get stuck in this legislative wheel of 'this is how things are done,' but that whole system is built upon the rubble of an older system that worked. You know what I mean? And then you get agencies and government where it's, 'Here's our laws, here's our mission.' Our mission is for the betterment of the resources and the culture. […] But, all of those things are being trumped by their current management systems where it's: 'I want to take that tax and that percent of all these companies,' instead of managing them so the resources and culture don't take a hit. So, it's, it's a strange balance of today's system that doesn't make sense to me." (31MB)
Fish consumption advisories (e.g., *pono* practices)	"Because now it's all about protection of the fish and protect… We wouldn't have to be protecting it if we knew how for use it properly. It's a privilege to gather and feed our families. And taking what we're going to eat is enough. That is what has stopped, I think. That practice of being able to take what you're going to eat. And you know, if, whatever, if you just so happened you catch more, you share. Not go sell them to the market for make money, but to feed." (23FB)

Social Networks

"Together we're stronger" (21FB)

Informal and formal social networks exist in West Hawai'i and one in particular, the Kai Kuleana Network, was formed with a focus on restoring abundance to coastal and marine environments. Because of this focus, members of this network comprised a large portion of our interviewees. This afforded the option to ask this subset of interviewees some additional questions to understand how conservation-oriented networks might be having a positive impact on the environment.

Sixteen interviewees were members of or affiliated with Kai Kuleana Network. These interviews all included at least one question about the Kai Kuleana Network. The content of the responses was similar and differed only in the amount of time spent on the discussion or the number of times the Network was brought up. Discussion of the Kai Kuleana Network included how the Network creates a space that is ultimately another level of community for people, provides support to community goals and initiatives, supports connection to place, and supports an integration between traditional and contemporary management (Figure 5).

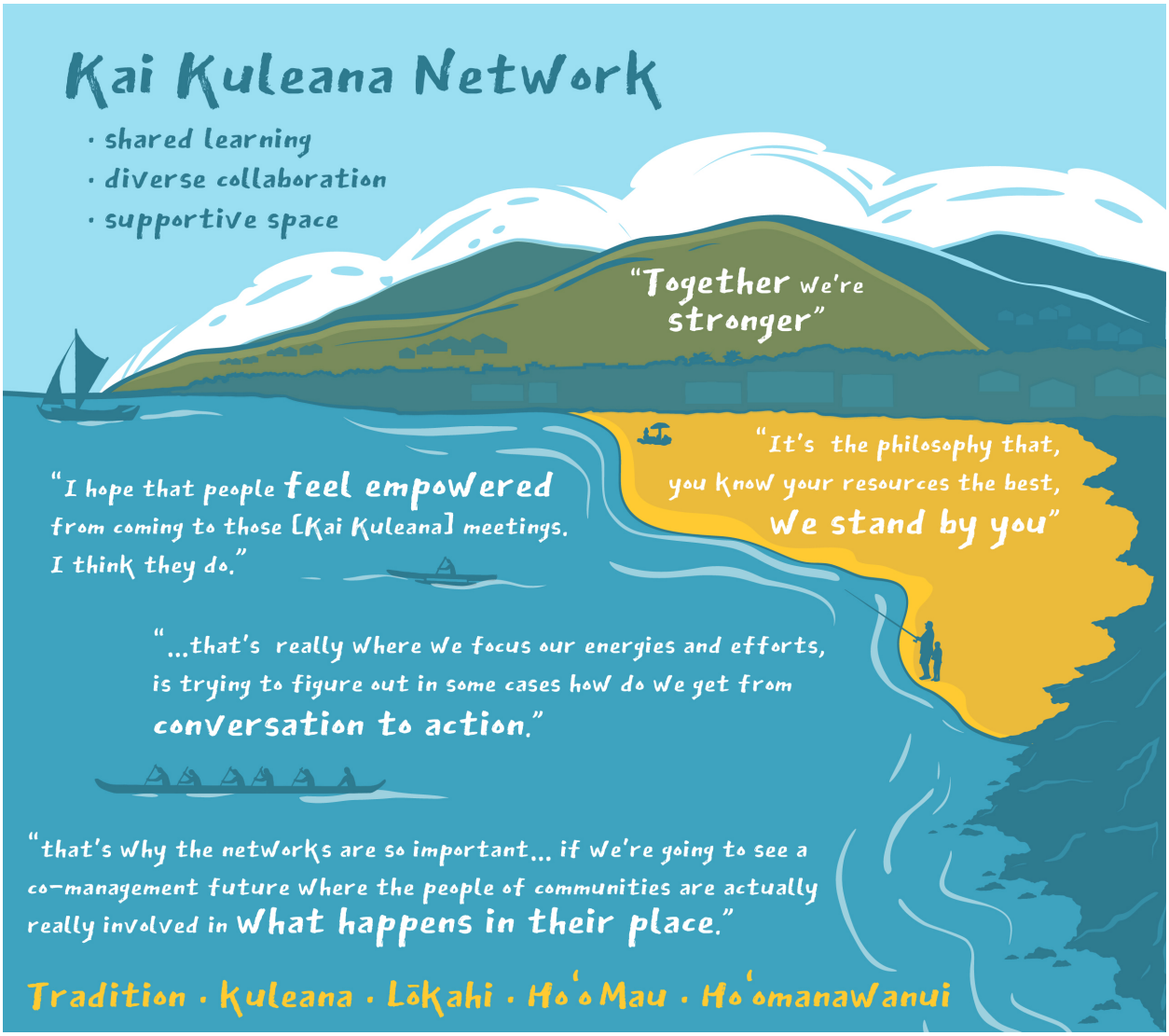

Figure 5. Representation of results from Kai Kuleana Network interviews.

According to interviewees, the Kai Kuleana Network provides another source of community to members; a place where people *"have people"* and *"allies."* Multiple interviewees spoke positively of being involved, for example one interviewee said, *"I'm also a member of, you know, Kai Kuleana. To me that's one of the best organizations that I've been involved with"* (3MA). Another interviewee expressed that before her own community directly benefited from involvement with the Network, it was still *"nice to hear and see everybody, I guess that's a part of maintaining relationships with people in our community"* (23FB). She also said that the Network has had a *"positive influence, and being able to learn about what other people are doing in their communities has been helpful"* (23FB).

These interviewees said that communities show up in support of one another because they understand that if they show up for one another, then they in turn receive support when they need it. They said that the Kai Kuleana Network is a place to share stories of strategies and struggles and provides an avenue *"to learn from others' mistakes or others' successes and apply it to their*

own community" (21FB). One interviewee expressed inspiration from seeing other communities have success achieving their goals and was eager to *"find a way to circle it here"* (2MA).

More than one interviewee credited the Kai Kuleana Network with having a part in conservation successes (e.g., Ka'ūpūlehu 10-year fishing closure). The Network creates opportunities for co-management and participation in the political realm of marine management by creating the place, encouraging empowerment, and providing a mechanism to inform contemporary management. Through the help of the Kai Kuleana Network, challenges with community management blocks can be overcome. As one interviewee said, *"the people there know how to manage their resources already, they just can't. […] There's too much outside pressures coming in over which we got no control"* (4MA).

These types of networks are believed to be essential to strengthening the connection between communities and their place, and that connection is essential to their motivation to care for the place. Without a way for communities to be a part of taking care of their place, "the connection [to place] can be further eroded. So it's a negative feedback loop that gets created if the ability for people to feel empowered and participate goes away" (19MB). This interviewee went on to say:

> *I think that's why the networks are so important and that's why it's important for us to help them be able to thrive and sustain themselves here and Maui Nui, the Kua, statewide and global networks. Those are really important for if we're going to see a co-management future where the people of communities are actually really involved in what happens in their place.*

One important distinction mentioned by some interviewees between the Kai Kuleana Network and other grass-roots community groups is their institutional support from government agency and non-profits which provides structure, funding, and facilitation. The Nature Conservancy's role in the Kai Kuleana Network was discussed as vital to its success. Examples of this value included the facilitator's role, organization of meetings, and funding for things like maps, posters, and other community needs.

Kai Kuleana Network was not the only conservation network identified during interviews (e.g., Hui Loko) as being a huge help and important to the success of conservation goals. When directly asked how the absence of their other network might affect the success of their conservation efforts, one interviewee said, *"I think I would just feel more alone, like we're at this alone"* (24FB).

One interviewee (10MA) brought up the presence of a fishing network (unprompted) and described it as being a part of his well-being, his daily life, and his traditions. The importance of the fishing network to not only his own but his community's well-being is evidenced by his descriptions of *"that intelligence"* which it provides through group-sharing of information about fishing conditions, the way the network allows for *"various roles in this community."* These roles included providing fishing opportunities to friends and family or sharing catch with older fisherman who are unable to fish anymore which, *"allow some of those people who can no longer fish, a connection. Can't, right? So they still have that connection."*

For more results regarding the Kai Kuleana Network, refer to Appendix D.

Reciprocity

Reciprocity is the concept that a person will respect and care for a place, and everything in that place, because they are a part of an integrated community which does not separate "human" and "environment" (Berkes et al. 2000; Vaughan 2018). As one interviewee explained, "*I still believe that if you take care of the land, take care of the ocean, it's going to take care of you, and that's my upbringing from my parents, my* kūpunas [sic] *before me"* (6MA). This concept can also be understood as a reciprocal connection between all things, human/non-human and living/non-living. As one interviewee explained, *"It's hard to separate anything from the ocean. Like place or animal, because it's all connected, so I can't put one over the other"* (30FB).

The concept of reciprocity was brought up during interviews repeatedly, with no specific prompting. Reciprocity was mentioned directly in 13 interviews, a total of 25 times. Reciprocity had co-occurrences with 10 other CES: Heritage, Tradition, Culture (8), Fulfilling Stewardship (6), Recreation (3), Sense of Place (3), Social Relations (3), and Spirituality (3), Sacred (2), Identity (2), Aesthetics (2), and Bequest (1). Almost always, interviewees brought up the concept of reciprocity in a manner that discussed CES. The following quotes are examples of this. One interviewee demonstrated how reciprocity is a part of her heritage and culture:

> *Our* tūtūs[26] [sic] *already understood that. They were well aware of what was there. And how they maximize the use of their resources in a* pono[27] *fashion. That's why [the resources are] still there because it's, you know, they made sure they knew what they was doing and they didn't… They left a light footprint on a place because they understood the reciprocity of that process, of that gathering, I think. Because had they not felt that way, it would have been exhausted, we wouldn't have* limu*, we wouldn't have fish. But, I truly believe that they believed in that reciprocity process of we give back, you give us. You feed us, we feed you, kind of reciprocity, and that's what I think is lost today, that we've gotta bring back. (23FB)*

In another example, an interviewee responded to a prompt about sense of place by bringing up multiple aspects of human well-being, CES, and reciprocity:

> *Sense of place for me is a feeling of belonging and responsibility. I feel at peace here, I feel at home here. I can't imagine being anywhere else. Maybe for visits, maybe for some extended periods, but I always am drawn back to this place, and I get goosebumps as I say it. And that it's also my responsibility to care for and respect this place. Respect every place I visit, but this, this is like taking care of home, and I feel very strong sense of responsibility to take care of it and to learn from it. (28FB)*

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[26] *Tūtū*: Grandma, grandpa.

[27] *Pono*: Goodness, uprightness, morality, correct or proper procedure, excellence, well-being, prosperity, welfare, benefit, equity, true condition or nature, duty; moral, righteous, just, in perfect order, accurate, correct, eased, relieved; should, ought, necessary.

In another example, an interviewee discussed how caring for his place was a part of his identity:

> *It's a constant state of taking care, keeping them secret, keeping them healthy and then returning the blessings that they give you of joy, of dinner, of connection. Because it all shapes me of who I am today.* (31MB)

Reciprocity was also discussed through stories of sharing food with family and friends, bringing food to elders, holding reverence for a place, *pono* practices, *kapu*[28] areas, the desire to become a steward to a place, and bringing young children to the ocean so that they may learn to respect and care for it.

Interviewees discussed ways that they care for the marine environment, their family and friends, and their greater communities. During the coding process, it became clear that interviewees frequently wove reciprocity together with certain related CES. This is important when considering if and how reciprocity could be included within place-based indicators.

The next two sections will explore how interviewees cultivate connections to place in relation to reciprocity, and how they discussed the way that the mindset of reciprocity may be disappearing from the general population.

Connection to place creates and enhances reciprocity

Interviewees discussed diverse ways that they connect with particular places or the coastal and marine environment, specifically how they create connections, maintain connections via memories, cultivate new or existing connections, and the ways that disconnections can manifest. Of the many ways connection was discussed, consensus arose as to the underlying importance for connection to place as the foundational motivation to care for that place, echoing the concept of reciprocity. One interviewee explained, *"We live on an island, it's a healthy thing to have a relationship with the shoreline"* (10MA).

Interviewees discussed how the CES Fulfilling Stewardship; Sense of Place; Heritage, Tradition, Culture; and Social Relations support a connection with place. The concept of reciprocity weaves together multiple CES and expresses itself through a connection to place. One interviewee exemplifies this by bundling together many emotions, values, and benefits:

> *You know, whenever you're in the water here, you can feel the connection. You can feel the* mana*. […] I feel my use of it is definitely a practice. Where it's maintaining connections, like [NAME] said. Family members are there. And, maintaining connections to both place and the beings in those places was important. And, being away from that is just like being away from home and family.* (31MB)

In many circumstances, interviewees discussed ways that they cultivate a connection with place that included some form of stewardship (either for a specific location or the island as a whole). A particularly important common theme that emerged from interviews was how reciprocity (and connections to place more broadly) relate to a person's sense of place and stewardship of place.

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[28] *Kapu*: Taboo, prohibition; special privilege; sacredness; prohibited, forbidden; sacred, holy; no trespassing, keep out.

As one interviewee said, *"We all have that story to tell, and we'll tell it in our own way with our own emphasis, but that connection will give us reason to care for something."* If a connection to place is part of the root of stewardship ("to care for something"), then it can be suggested that bolstering that connection can enhance the level of stewardship between a person and their place. As one interviewee explained, *"So, engaging with this place and space, whether it's in the ocean or the land, I think it's a* kuleana *in itself and reconnecting."* Learning how to enhance this reciprocal relationship may enhance stewardship in the region, ultimately creating a positive feedback loop. In contrast, if the reciprocal relationship is degraded, this could create a negative feedback loop. Some interviewees discussed their observations of ways that reciprocity is declining from the general population. They believe it is important to find ways to reverse this decline and revive the positive feedback loop.

In the quotes below, interviewees describe the ways that they cultivate a connection by caring for, stewarding, sharing, and otherwise enhancing *kuleana*.

- *Getting involved in Na Kilo 'Aina*[29] *is one of the biggest ways that I connect because I'm helping youth to connect.* (13FA)
- *So, we have annual meetings [in my community]. They're events. We're gonna be doing another [event], talk story event. Where people come and share stories. […] Stories they remember of the area. Dance. Music. Other things.* (13FA)
- *I do swim, I do freedive. I do paddle, not quite as much as [NAME]. Um, but like I said, the majority of my time in the ocean is spent enjoying it, yes, but maintaining and cultivating those connections.* (31MB)
- *And, it allows some of those people who can no longer fish, a connection. Can't [fish], right? So they still have that connection.* (10MA)
- *And then for me it's like really important that there's food for the future and that like the connection to the ocean is something that is strong. It's not just talked about in meetings, but people are getting in the water, they understand their resources and that like intimate connection is to me just as valuable as all the science and the fish counts and stuff like that.* (21FB)
- *I always tell [the kids], you know, you guys live in the best place in the world. People pay big dollars to come over here to enjoy what you have right in your backyard. You know, spend time connecting in these areas. Spend time in the areas. You know, try hand pole fishing or get a pair of goggles and go snorkeling, try catching one wave or just go hike on all the different trails that DLNR maintains over here. But I tell them, when you do go outdoors, there's responsibility. The biggest responsibility is safety.* (12MA)
- *So, if we're taking people on the trails, it's usually education. I would say, education is one thing but we're also hoping for a reconnection.* (18MB)
- *So, again, being able to reconnect with a place and understand its resources.* (23FB)

Related to stewardship and touched on by the above quotes, one interviewee highlighted the relationship between a connection to place and heritage, specifically:

[29] Na Kilo Aina is a West Hawai'i based youth program focused on stewardship and place-based learning.

> *I think that the connection with knowing that my ancestors reside in the area, you know, and not only the lineal and familial connection but also in a sense spiritual because you know they're overseeing you and the work that you're doing, and hopefully you satisfy them.* (23FB)

Many interviews discussed two primary ways to enhance a Sense of Place: eating locally sourced food and using traditional place names and/or *mo'olelo*[30]. Seven interviewees spoke about the importance of eating locally sourced food (i.e., caught or gathered on island) and how that supports a connection to place. One interviewee said, "*We have to 'ai of this place in order to understand its value to us. Without that, why take care of a place, yeah? If you cannot eat from it"* (23FB). Another interviewee said:

> *And so the diversity of flavors, and just restoring the* 'ono[31]*, restoring the taste that we have for the things of the sea. And the way that those things of the sea contribute not only nutritionally, but aesthetically and the flavor aspect to our lives. Our lives are just richer when we eat like that.* (10MA)

Eight interviewees said that sharing *mo'olelo* and/or using traditional place names builds respect and connection between people and place. "*The* mo'olelo *associated with [the place] and like how the place names really are clues into the resource management"* (21FB). According to interviewees, this is because *mo'olelo* and traditional place names tell you about the relationship that *kūpuna* had with the place, the resources, the habitat, and allows for deepening their own connection. During the member-checking process, one interviewee said, *"If Hawaiians had a name for it, it had a cultural purpose"* (15FA). Another interviewee explains:

> *I think that is just one example of maintaining the integrity of place, by using the traditional names that our* kūpuna *gifted this place because this is what the place meant to them. I think that's very important for us in the maintenance of our relationships with 'āina*[32] *and connection with* kūpuna. (23FB)

For connections that had been altered or erased due to environmental and social changes (e.g., land ownership changes), interviewees described that through their memories they can hold onto connections. Some of these interviewees even said that suited them more than trying to recreate or re-establish a replacement connection. Interviewees said that those connections can be accessed through *"mo'olelo"* and "emotional attachment." As one interviewee highlighted, the memories are also motivation for stewardship:

> *So, I think, like, coupled with the decline in resources and impact of the reef, you also have this decline in memories, decline in that connection. And, to me it's sad, but it also makes those places […] worth protecting.* (31MB)

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[30] *Mo'olelo*: Story, tale, myth, history, tradition, literature, legend, chronical, record.
[31] *'Ono*: Delicious, tasty, savory; to relish, crave; deliciousness, flavor, savor.
[32] *'Āina*: Land, earth; *Lit.* that which feeds

Declines in the reciprocity mindset

Interviewees spoke of the presence of reciprocity as a mindset, which can be exemplified through *pono* practices and *'aina momona*[33]. According to many interviewees, this mentality has disappeared from part of the general population. One interviewee described his observation of a changing mindset in regards to reciprocity:

> *Now it's like there is no taking care. There is no… it's pure harvest and it's pure recreation. So it's… These places have been passed down in their importance, like I said culturally and ecologically, yes. And, we are blessed enough to be able to continue our practice of not just having fun and viewing the area, but continuing the practice of caring for it to our degree. But there's only so much you can care for a place if every other person who uses it does not do the same.* (31MB)

Many interviewees shared the perspective that increased access to the ocean is leading to a mentality of overuse. These interviewees gave examples supporting the idea that there is a shift in identity happening; a movement from depending directly on resources to one of extraction and commercialization. One interviewee described the shift:

> *Fishermen who used to provide for their family are now construction workers. Or what not. But now you have a change in the way you use the ocean and a change in the way you interact with the fish and other beings in the ocean. So that's the way I see it as… of, practices get lost. Culture gets pushed back in this new era and today we can see those big changes because small changes over time add up until it reaches a point where you say… and you look back at old pictures or you look back at old memories and you're like, 'Wow, this is substantially different than it was.' Not just the resource. The coastline itself. The people themselves. The practice. The actual cultural identity of the people and their practice.* (31MB)

Some interviewees discussed a growing disconnect between younger generations and the environment as an intergenerational mindset shift. One interviewee expressed that in previous generations, people generally shared the expectation that they would care for marine resources collectively. This same interviewee then said that in the present day, *"we don't share the same sort of homogeneous vision on what marine [re]sources means to us"* (4MA).

Another example of this shift came from an interviewee describing how people no longer take only what they need in an effort to not overuse:

> *Yeah, because the fishing* ko'a[34]*, the whole purpose is to feed the fish so that they stay there and they get fat and when it's harvest time you go and pick them up. But it is in the, what do you call it? The line of the barge. And it's along this coastline. So we do have other people who know about [the* ko'a*] and who come and fish there without feeding [the fish]. So, it's kind of this practice of, how do we get fisherman to understand, even in*

[33] *'Āina momona:* Land that is rich, abundant, plentiful, sweet, and fat.
[34] *Ko'a:* fishing grounds, fishing shrine

> *the ocean, there are boundaries that if you're going to fish from here, you need to give back. It's not like a free-for-all.* (13FA)

Many interviewees discussed the way that the general population's values and perspectives seem to be shifting in what they value. The interview guide did not deeply investigate this; however, understandings of how this shift could be affecting connections between people and the ocean did emerge. One interviewee explains:

> *You take care of what you value. And, I think we're losing that connection, we're not valuing our ancestors like we did before. And we're not valuing the spiritual connection as much as we did before. […] So, we're beginning to value different things and I think that's maybe the challenge for us. It's that we don't see the values that perhaps the older generations saw. And so if we're gonna lose that value, we're gonna probably lose that connection.* (4MA)

Part of the reciprocity mindset is taking care of community. Interviewees described ways in which this reciprocity and sharing mindset has changed over time:

- *Now you get a lot more younger fishermans [sic] and no respect. I talk to some of the old fisherman and they say, "Man you don't wanna fish out there now, it's just no respect." But when we started, you know, all the old timers, we had great respect for one another. […] The "pass," is how you do everything. Everything by letting everybody get their pass. Now you make one pass, and you let this young guy make his pass, and you start yours, they turn around and cut you right off. Right in front of your face. Like, [they're saying], 'this is not your ocean, this is my ocean.'* (2MA)
- *We call it the 'give away,' right? You always give away 10 percent of your catch. That's still done by some of the old timers, but the newer guys not so much.* (15FA)
- *And I would just say that, people diving their home waters… There aren't that many people who would call that their home waters. We tend not to go… We [tended] to go where home is, unless we're invited by somebody else into their home. And that's not the norm so much anymore.* (10MA)

Many interviewees talked of specific behavior changes that they had observed or personally experienced related to this mentality shift. One interviewee said she knows that fewer people are subsistence fishing and more people prefer to buy fish from grocery stores which can increase convenience but decrease attachment with place. Another interviewee discussed a shift in his own fishing habits because going fishing now requires more work to avoid large crowds, making the activity undesirable to him. Multiple interviewees discussed the dwindling practice of sharing food or catch with friends and family (particularly those who could not go fishing themselves).

Discussion

In this section, we begin with a discussion on the importance of how interviewees bundled CES together rather than teasing them apart to explain different meanings. We then discuss how our analysis shaped a framework for monitoring ecosystems that better incorporates CES and human well-being. Our framework has three sections: ecological foundation of CES; community values, beliefs, and perspectives; and creating and conserving access to CES.

Cultural Ecosystem Services Bundling

A co-occurrence refers to when an interviewee discussed more than one CES or human well-being domain at the same time (i.e., in the same sentence or while answering a single question). These instances showed us which CES and human well-being domains are coupled together, a concept commonly known as "bundled" (Klain et al. 2014) and supported by Fish et al. (2016b), who posits that it is likely more beneficial to attempt to incorporate CES in management through the lens that CES support and reinforce one another rather than exist separately. Pascua et al. (2017) found that West Hawai‘i workshop participants deliberately spoke of CES and associated values together and were uncomfortable with the concept of separating them. This type of bundling emerged from our interview data, despite a lack of prompting for it specifically.

As an example of bundling, one interviewee provides examples of aesthetics CES and mental and emotional health when saying that, *"Looking at [the ocean] is what calms me down." (28FB)* However, by expanding on what else she said immediately before and after this sentence, it is clear that so many other services, benefits, and values are bundled. The entire quote reads,

> *For me, personally, I feel spiritually connected to the ocean because it is what brings me joy. Looking at it is what calms me down. There's a sense of purpose when I look at the ocean. There's a sense of connection when I look at the ocean. Things make sense when I'm in the water… (28FB)*

In the single activity of "looking at the ocean," she is experiencing numerous CES. She continues to say that her spiritual connection and these aesthetic benefits are the foundation for her volunteer and paid work in ocean conservation fields, which alludes to the related concept that CES can create and deepen a connection to place that inspires a desire to care for, or steward, a place (Chan et al. 2011; Daniel et al. 2012). This is another important understanding for management, which may be attempting to uncover motivations or bolster community engagement with and support of resource management.

The concept of bundling represents a way to increase the monitoring ability of indicators. During the member-checking process, one interviewee said that the bundling concept could be a way to view CES through a "macro" lens as compared to the "micro" lens that looking at each CES individually provides. This interviewee continued on saying that bundling could be a great way to capture the less frequently mentioned CES that may be otherwise left out of discussions. This relates to the idea that some indicators can be "cross-cutting" in the sense that they monitor multiple CES and human well-being domains. This is helpful for a number of reasons, including the facts that many CES do not currently have supporting data, collecting primary data is time-consuming and expensive, and collecting primary data for some indicators will be difficult due to the abstract or difficult to discuss nature of these CES.

Interview data provide a starting point to understand the concept of bundling multiple services, benefits, and values together in West Hawai‘i, and warrant further exploration. The concept of bundling raises more questions, such as: how does the larger population of West Hawai‘i bundle CES?; what ways does bundling highlight or obscure CES that may be difficult to discuss?; and does the length of time someone lives in Hawai‘i affect how they bundle their services, benefits, and values? Understanding these connections between CES and human well-being assists in identifying appropriate and widely informative indicators, ultimately leading to a greater ability to support and enhance community well-being.

Bundling Reciprocity with CES

The concept of reciprocity was discussed in half of the interviews. This was not unexpected as it was discussed during scoping for this research (Leong et al. 2019) and is present in regions with prevalent Indigenous culture (Gould et al. 2014; Pascua et al. 2017; Vaughan 2018). However, it is important to note that interview guides did not have specific questions to prompt the discussion of reciprocity. The concept emerged via bundling, during discussions of human well-being and CES.

The reciprocal relationship between people and place has been expressed in multiple studies regarding connections between CES and community well-being (Pascua et al. 2017; Poe et al. 2016; Shackeroff 2008). Arguably one of the greatest influences on identity across the Hawaiian Islands is the strong relationship and connection to the land and ocean that people hold. Native Hawaiian culture believes that in order to receive from your place, you must contribute and care for your place (Bryant 2011). It is clear that relationship with place, meaning either a geographic location or what that location may represent, significantly contributes to the well-being of communities in West Hawai‘i. Importantly, interviews show that these values permeate current perspectives and attitudes toward the environment.

Despite its deep cultural importance, the concept of reciprocity is largely absent from contemporary resource management and ecosystem assessment efforts. Our suggested place-based indicators attempt to integrate the reciprocity concept in two ways: first, by creating indicators that inherently bundle the reciprocity concept (e.g., most of the indicators for Fulfilling Stewardship would monitor ability and desire to care for a place);second, by suggesting that the CES most frequently bundled with reciprocity could be prioritized (e.g., Heritage, Tradition, Culture and Fulfilling Stewardship). This is an important inclusion due to the significance of the reciprocity concept, its connections to other CES, and interviewee descriptions of a decline of the reciprocity mindset in present day populations.

Monitoring Cultural Ecosystem Services with a diverse set of indicators

Ecological foundation of cultural ecosystem services

Monitoring CES has traditionally relied on indicators that focused on ecological aspects and social threats (e.g., pollution, urban sprawl), demographics, and economics. Understanding these foundational aspects is crucial, especially since interview data provided examples of how the ecological state can directly and indirectly impact CES and human well-being.

The ecological condition of a place creates the opportunity for a reciprocal relationship between human and non-human. Previous research has assumed that healthy biophysical and ecological conditions create opportunities for CES and therefore enhance human well-being. This research examined the assumption explicitly.

Interviewees were asked about their perspectives on changes to environmental conditions and how changes affect the way they connect with their place. The rich and diverse discussions exemplify how the ecological condition of West Hawai‘i does impact physical, mental, and emotional well-being. Interviewees gave examples of ways that they are affected by the marine ecological condition, such as how snorkeling and seeing a dead/unhealthy coral reef creates sadness. The concept of reef grief (Marshall et al. 2019) was also expressed by multiple interviewees who hold management roles. One interviewee explained how the existence of a healthy ocean was enough to enhance her well-being, even if she was not allowed to go in it, *"If I couldn't ever go in it, but the ocean were to survive, then I'd know it's ok. But if the ocean were to disappear, then, my life would be over"* (30FB). (It is important to note that this sentiment was not shared by all interviewees, and many said that they would *not* be okay if they could not go to the ocean. This is explored more in the following section.) These are examples of how monitoring the ecological condition can give insight into the human dimension.

Both prompted and unprompted, interviewees gave examples of how the ecological condition affects their well-being. However, other than the understanding that the ecological condition ultimately generates the possibility for experiencing marine-based CES, we do not know how critical elements such as personal values and levels of access differ amongst the community. Therefore, more diverse indicators are needed.

The goal of the West Hawai‘i IEA, which is generally shared by ecosystem assessments as a whole, does not currently focus on if or how people are engaging with CES, but rather focuses on ensuring that the ecological condition allows for the opportunity for engagement (i.e., high fish abundance and biomass translates to fisher satisfaction). Our research helped to confirm that this link exists and should continue to be monitored. However, while ecological indicators are important, they alone do not give an entire representation of how the environment is linked to human well-being. The depth and diversity in interviewee values, beliefs, and perspectives in relation to marine CES exemplifies the need to monitor another side of the story.

Collecting community values, beliefs, and perspectives

Human well-being consists of people's livelihood and possessions, but also how they feel about it. Measuring one side without the other will not result in a complete assessment. Understanding social values in relation to ecosystem services is crucial for management because these values illuminate how society feels, prioritizes, and makes decisions based on such meanings (Hicks et al. 2016; Lau et al. 2018).

As explained above, the commonly used human dimension indicators in ecosystem assessments monitor CES and human well-being via quantitative, secondary data. Unfortunately, these data cannot inform whether or not community members are satisfied with the CES supported and provided by the marine environment. If the selected indicators do not represent the diverse range of community values and perspectives, then community well-being is likely not included in the

assessment. This will almost certainly and unsurprisingly jeopardize community support (Dacks et al. 2019). To get a more robust understanding of this, we need primary data that measure people's values (e.g., what aspects of CES do they value?) and perspectives (e.g., do they see those aspects changing?).

Many suggested CES indicators will require primary data on how people in West Hawai‘i value CES. Primary data collection (e.g., surveys and interviews) can identify and monitor non-material indicators (e.g., values, beliefs, and perspectives) and support the material social indicators also included in the West Hawai‘i IEA (Biedenweg et al. 2016; Breslow et al. 2017; Breslow et al. 2016). Systematic and longitudinal primary data collection could capture perceptions of status, changes, and trends of the region in order to understand how environmental changes affect human well-being (Sterling et al. 2017a).

As an example of this, we can examine interviewee perspectives of marine species decline. Since most interviewees either worked or volunteered for a marine conservation effort, perspectives of marine species decline were anticipated. However, interviews revealed not only if species declines are observed, but also—perhaps more importantly—how declines are impacting the lives and well-being of communities. Even though ecological data may monitor a species decline, it cannot monitor this additional piece of crucial information.

Another current gap in understanding lies in how people who disagree or have no opinion about marine species decline perceive the availability of CES, impacts to well-being, and opinions on current marine management efforts. One interviewee involved in resource management stated directly that it would be helpful to have these types of perspectives collected and shared, since resource managers are generally unaware of this information which hinders their management abilities. According to this interviewee, this is a weak point in the management process.

Creating and conserving access to Cultural Ecosystem Services

Pivoting away from a linear perspective of ecosystem production of services that have an end point in human well-being, this research follows the understanding that Fish et al. (2016b) summarizes in regards to CES specifically, stating that CES arise from interactions and relationships between people and place, and are therefore "interpretive in character." This means that every person's understanding and experience of a CES will differ at least slightly, which was verified during our interviews, which significantly complicates management of CES. Rather than managing for individual CES, it may instead be a more appropriate goal for management to protect the existence and availability of the CES for all.

With this objective in mind, our research refers to "access" as an activity, experience, or other conduit/channel that allows a person to gain the benefits created by CES. Tracking "access" during coding revealed this emergent understanding; the codes developed intricate and dynamic definitions as interviews continued. The value, and even the existence, of any particular CES or CES bundle differed depending on the interviewee (which has been found in similar studies, see Klain et al. (2014)), but one constant was the necessity of access for a person to receive any CES (be it the service itself, or associated goods, benefits, and values).

This concept is relevant to the condition of the marine environment and human well-being. As an example, during the member-checking process one interviewee said that, *"I assert that people who have inhabited places for generations have a relationship with the ecosystem and removing or hindering access is an impairment [to the people and the environment]"* (8MA). This quote is exemplifying the fact that by removing access to an activity, experience, or place, the motivation to be an environmental steward is "impaired," thus affecting the well-being of both the people and the place.

As shown in the results, interviewees discussed recreation as a conduit to multiple layers of CES and human well-being. Additionally, interviewees described how a decline in opportunity for or quality of recreational activities would result in declines in multiple CES that contribute to human well-being (e.g., mental and emotional health, physical health, Social Relations) and the well-being of the environment (e.g., Fulfilling Stewardship). Recreation is a commonly used indicator in ecosystem assessments because it can typically be tracked or measured more easily than other CES. However, in those instances, recreation is usually taken to provide insight into the leisure activity itself or its economic inputs, rather than its potential to be a channel for any other CES. Understanding how recreation may or may not serve as a proxy for other CES is important for finding unique ways to understand non-material, difficult to measure CES. Co-occurrences and the bundling concept can illuminate the diverse meanings of recreation and how it relates to other values that are intrinsically present within recreation.

In the same way that recreation creates access to CES and enhances well-being, co-management and/or community participation in management may be another conduit for enhanced connection with place and well-being. Interviews highlighted that engaging in management of a place could be a successful way to support both the existence of and access to particular CES. This emphasizes the importance of supporting co-management strategies and creating opportunities for stewardship (e.g., stewardship networks, beach clean-ups, and citizen science). These types of actions can play an important role in ensuring community well-being and bolstering CES, such as sense of place, social relations, and identity.

Social networks appear to be one way to support co-management. Interviewees spoke of many examples of how their stewardship network or other social network supported their well-being, emphasizing that an "end goal" of the network is only one small part of the benefits provided. Interviewees gave examples of how these networks offer immense value along the journey of achieving a goal in ways of social support, creating relationships with additional community members, sharing success/failure stories, organizational structure and facilitation, and even creating specific and actionable conservation goals for a community.

The goal of the West Hawai‘i IEA, as well as many other ecosystem assessments, does not and should not focus on the "uptake" or "use" of CES, but rather ensuring that the opportunity exists by focusing on ecological spaces and cultural practices (Fish et al. 2016b). Understanding access in its many facets can help highlight priorities for resource management because providing and protecting access may be a large part of how management addresses barriers to CES (Figure 6). Creating management that provides and protects the access to the activities and experiences that create or support CES may be the most promising area for action right now.

Figure 6. Monitoring Cultural Ecosystem Services, Benefits, and Values through Meanings, Experiences, and Ecosystem Components

Next Steps

The importance of this work for contemporary resource management lies in an increased understanding of how CES contribute to human well-being, and how communities access, benefit from, and value CES. By integrating community values and perspectives into contemporary resource management, such as through the West Hawai‘i IEA, we can increase support and success of efforts to support human well-being.

This research also points to avenues for important further research. While the link between ecological condition and CES has been demonstrated by this research, the next critical step is collecting primary data on community values, beliefs, and perspectives regarding CES. This type of data can also assess the success of creating and conserving access to CES for communities. Primary data collection can include surveys and spatial analyses or representations.

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Appendix A Interview Guide For Community Leaders

Discuss interview objectives

1. Understand the meaning of human well-being within communities of West Hawai‘i in relation to the coastal and marine environment
2. Identify human well-being categories that are salient to West Hawai‘i communities
3. Understand how “cultural ecosystem services,” intangible values, and the meanings of “resources” are related to the well-being of West Hawai‘i communities
4. Understand if resource management can help to maintain or improve the well-being of West Hawai‘i communities

Interview objectives relate directly to the larger goals of the West Hawai‘i Integrated Ecosystem Assessment. These include: (1) contribute knowledge and refine science-based strategies for protecting and improving both ecosystem services and well-being for West Hawai‘i residents; (2) develop a set of human well-being indicators related to cultural ecosystem services; and (3) produce knowledge that can be used to support the integration of community values in resource management.

Possible questions

1. Introduction
    a. What is your name?
    b. How long have you lived in West Hawai‘i?
    c. What communit(y/ies) are you a part of?
    d. What is your age? (If not comfortable, age group is fine.)
    e. What do you do for a living? (If retired, what did you do?) Feel free to be general if you don’t want to get specific.
    f. What types of activities do you do along the coast or in the ocean? How often? (If activities are solo activities: What about activities with your friends or family?)
2. Status of ecosystem and connections to well-being
    a. Can you tell me what a healthy coastal and marine environment would look and feel like to you?
    b. What changes do you notice related to the coastal and marine environment?
        i. Do these changes seem to happen slowly or quickly?
        ii. How have you or your larger community responded to changes?
3. Identifying human well-being categories for cultural ecosystem services
    a. I’m going to ask you to tell me a bit about how you connect with the coastal and marine environment from multiple perspectives: your own, your families, and your communities.
        i. First, how do you connect with the coastal and marine environment? Connections can be an activity, experience, feeling, or anything else that helps you cultivate your relationship with the place.

ii. What about your family, are there different connections when we look at it from this perspective?
iii. And your greater community?
iv. Is there a larger scale, beyond community, that you want to mention?

b. Of these different ways you and your community createand maintains these connections that we've discussed, which is the most irreplaceable? What would you miss the most if it were to disappear?
c. Earlier we discussed changes to the coastal and marine environment. Do these changes affect your connection to this place or the activities you do here?
    i. Do you expect to see more changes in the future? What types of changes? Are any of these changes related to a changing climate?
d. Are there particular experiences with the coastal and marine environment that you hope your kids or other kids within your community will experience? What are they, and why are they important?
    i. Were these experiences important in past generations? Why are they so particularly important across generations?
e. Has an experience in the coastal or marine environment taught you something(s)?
    i. Sometimes we learn new things outside of traditional classroom settings, do you have an example of this?
f. Are there specific places on the coast are very important to you?
    i. Are these specific places important for educational, heritage, or spiritual reasons? Can you describe why they are important? Are there reasons that are not physical or tangible?
    ii. Are there places that remind you of important past events that are important to you, your family, or community? Can you share with me what the experience of those places and/or your attachment to them feels like? (Stories of the experience is an example answer.)
g. What about other connections?*

4. Science and management helping the community
    a. In your opinion, can marine/resource management help to maintain or improve you and your community's well-being? Can you give me some examples of how?
        i. Has being a part of the Kai Kuleana Network been beneficial to your community? If yes, how so?
    b. Are there ways that scientific research can improve you/your community's well-being?
5. Conclusion
    a. We've discussed many ways that your connection to this land and ocean affects your everyday life here. Are there any other connections that we haven't talked about that you want to mention?
    b. Do you have any questions for me before we end?

Appendix B Interview Guide For Resource Managers

Definition of "resource manager" for research purposes:

Resource manager can be defined as someone who holds a paid position with an organization, agency, etc. whose mission includes promoting the restoration and sustainability of natural areas and resources.

Possible questions

1. *Go over consent form and description of project/purpose of the interview*
    a. An update on the types of interviews completed so far; focus has been on identifying cultural connections between people/communities and the marine environment, in an attempt to bolster support for these elements in management strategies
2. *Introduction(s) and background of interviewee(s)*
    a. Name/age/years lived in West Hawai'i
    b. What communit(y/ies) are you a part of?
    c. What is your professional role in resource management? How long have you worked in this position? What brought you into this field of work?
3. *Status of ecosystem and connections to well-being*
    a. Can you tell me what a healthy coastal and marine environment would look and feel like to you?
    b. What changes do you notice related to the coastal and marine environment?
        i. Do these changes seem to happen slowly or quickly?
        ii. Do you expect to see more changes in the future? What types of changes? Are any of these changes related to a changing climate?
        iii. How have you or your agency responded to changes? How have your management strategies changed or evolved in response to environmental changes?
4. *Community perceptions, feelings, and response to perceived or real environmental changes*
    a. What communities do you talk or work with?
        i. How do you engage with these communities?
        ii. Does your organization see themselves as an extension of the community? (Too what extent/why? How?)
        iii. Are you happy with this level of engagement? Why? Do you find it effective for your goals?
        iv. What would you change if you could change anything?
    b. Do you think that the general population feels any sense of urgency toward protecting or restoring the marine environment? What makes you think that?

    c. Earlier we discussed changes to the coastal and marine environment. Do you see these changes affecting the way that communities interact and connect with the marine environment?
5. *Using spatial information in management strategies*
    a. How do you use maps in your work?
    b. What spatial information do you *wish* you had?
    c. Have you ever thought about using maps for anything related to social values or communities in some way?
6. *Science and management helping the community*
    a. In your opinion, how can marine resource management help maintain or improve you a community's well-being?
    b. Do you see co-management as a positive option/route for communities in Hawai‘i?
7. *Conclusion*
    a. What do you wish you had in order to benefit communities in West Hawai‘i?
    b. Do you have any questions for me before we end?

Appendix C Data Analysis Codebook

Code Name	Description
aina momona	the concept that the land and ocean are abundant and plentiful; providing more than what people need or want to take
analogies or metaphors	statements making analogies/metaphors
anchialine or fish ponds	any mention of anchialine ponds of fish ponds
aquaculture	any time someone mentions aquaculture happening or potentially happening off of West Hawai‘i
can't do anything	any comment the speaker makes indicating that there’s nothing they can do to address environmental or cultural change; can include comments about why other people can't or don't do anything
changes in behavior or mindset	when a person changes their behavior in direct response to a change in the environment (which was caused by human impact, naturally, or otherwise)
intergenerational	changes in behavior occurred across generations
over one person's lifetime	changes in behavior occurred within a lifetime
changes occurring elsewhere	participant mentions changes occurring in other places (on different islands or in a different state/country)
connection	any discussion of connection of system to itself or people to system here (using words like "connection" specifically
ancestral	ancestral/lineal connection
connection to land	when someone is talking about their connection specifically to land or mauka (can be related to connections to ocean, or stand alone)
connection to ocean	when someone is talking about their connection specifically to ocean
connection via memory	when someone is talking about their connection that they experience via memory
cultivating or stoking a connection	when someone is experiencing a bolster in connection
DISconnection	experience or observation of disconnection
facilitating a re-connection	experience or observation of something that creates a once existing connection

Code Name	Description
levels of connection	description of multiple levels of connection
other connections	connections that do not fit in other categories
Coral Bleaching Event of 2014-2015	comments relating to the massive coral bleaching event of 2014-2015
fishing license	any mention of opinions or observations of a potential fishing license
hard to explain	use this code any time somebody expresses a sentiment like "it's hard to explain" or "it's hard to put this in words"
health indicator	mentions of reefs as indicator of planet's overall health
human community	mentions of human community (as opposed to ecological)
community well-being versus individual human well-being	specific quotes that describe how community well-being is different than human well-being
definitions	descriptions of what community looks like, feels like, or can be define as
what communities do people belong to and why	direct answer to question
irreplaceable	when an interview describes something as "irreplaceable" or uses a synonym
lost value	when a place, connection, activity loses value
memorable quotes	memorable quotes
Q+A Healthy coast and ocean	direct response to interview question about healthy coastlines and oceans
reciprocity	two-way relationship; reciprocal relationship
reef or ocean characteristics	these codes denote when a speaker is talking about a particular aspect of the marine environment or reefs with regard to our questions of interest (e.g., change, management)
change valence (related to reef or ocean characteristics)	these codes can be matched with any other code to indicate change in that code in the indicated direction
decrease	participant indicates that things have decreased
increase	participant indicates that things have increased

Code Name	Description
no change	participant specifically indicates that things have not changed
no net change	some things have improved, others gotten worse, overall net zero change
unsure	participant specifically states that they are not sure whether or how things have changed
coral	participant mentions coral specifically (not coral reef)
coral cover	participant mentions coral cover specifically
coral health	participant mentions the health of the coral specifically
future coastal and marine changes	participant mentions changes that can/will happen in the future, according to their perspective or observations
hypothetical changes	participant mentions a change that may or may not happen
marine species number	participant mentions the number of marine species
marine species size	participant mentions the size of a marine species
marine species type	participant mentions the type of marine species
ocean generally	participant refers to the ocean generally, not specifically
reef generally	participant refers to the reefs in general, not a specific reef or component
shoreline generally	participant refers to the shoreline generally, and not a specific location or event
speed of change	the speed at which the change happens
fast	the changes are discussed as happening quickly
respect or loss of respect	when someone mentions respect for the land, ocean, elders, etc.
responsibility for change	what/who is responsible for changes in reef or ocean characteristics
speed of change	the speed at which the change happens
fast	the changes are discussed as happening quickly
slow	the changes are discussed as happening slowly
what responsible	what is discussed as being responsible for change

Code Name	Description
access issues	any mentions of access being responsible for changes
animal harassment	participant discusses humans harassing animals
dolphin harassment	harassment to specifically dolphins
fish harassment	harassment to specifically fish
manta ray harassment	harassment to specifically manta rays
turtle harassment	harassment to specifically turtles
aquarium fish trade	discussions of the formal aquarium fish trade
certain fishing practices	discussions of specific fish practices
climate	when changes are attributed to climate
coral bleaching	specific mentions of coral bleaching
drought	specific mentions of drought
large storm events	specific mentions of large storm events
ocean acidification	specific mentions of ocean acidification
sea level rise	specific mentions of sea level rise
warming water	specific mentions of warming water
commercial fishing	specific mentions of commercial fishing
creation of private property	discussions of how private property changed things
development	coastal and shoreline development
economics	economy, economics, in general

Code Name	Description
erosion	specific mentions of erosion
invasive species	specific mentions of invasive species
management or regulations	specific mentions of management or regulations
many factors	when a participant identified that multiple factors contributed to change
mechanical harm to the reef	when the reef is harmed physically by human contact or direct destruction (e.g., anchors)
media	media responsible for changes; social media, news outlets, etc
overfishing	overfishing mentioned specifically
pollution	various types of pollution responsible for changes
ag or other fertilizer runoff	Specifically, runoff related to ag
marine debris	trash and similar objects
plastics	micro plastics
stormwater runoff	runoff related to stormwater/storm drains
sunscreen	chemical sunscreen damage
waste water and sewage	discussions related to waste water, sewage, OSDS, etc
population increase	increased population in general
overcrowding	places becoming crowded or overcrowded
tsunami	direct mentions of tsunami events
volcano	direct mentions of volcanic activity
who responsible	who is discussed as being responsible for change
government or politicians	any level of government

Code Name	Description
houseless	the population of persons who do not have homes/dwellings
immigrants	when an interviewee uses the term "immigrants"
locals	people who have generational ties to Hawai‘i
Native Hawaiians	people who have Native Hawaiian ancestry
new residents	someone who has moved to Hawai‘i recently; usually defined by interviewee
ocean tourism companies	companies who conduct marine tour operations
people	general references to people, humans, or humanity being responsible
recreationalists	people participating in an activity for enjoyment or sport; not provisioning or livelihood alone
tourists	short term and non-permanent visitors
scientific research	direct mention of how scientific research affects HWB or CES
snowball	snowball contacts
social hierarchy	when someone mentions the levels of belonging or "right to be" in a place
being from a place versus moving there	when discussions that related to the differences that occur when being from (i.e., born) a place versus moving to the place at some time
social networks	official or unofficial group
fishing network	pertains to unofficial network of fisherman in West Hawai‘i
Kai Kuleana Network	pertains to official Kai Kuleana Network
spatial	anytime someone mentions a way that CES or HWB could be spatially monitored, even if they are not explicitly stating it
stewardship	mentions of stewardship at an organizational level; specific examples of stewardship
action others should take, as believed by speaker	stewardship related actions that the speaker believes others should take
actions others take	stewardship related actions that the speaker mentions that others do take

Code Name	Description
speaker taking action	stewardship related actions that the speaker is a part of
surface slicks	direct mentions of surface slicks
vog	direct mention of volcanic gases
well-being	broad code:" catch-all" for people who are not specific in how they are using well-being
change valence (related to human experiences or well-being)	change related to human well-being
decrease	examples of decreased well-being
increase	examples of increased well-being
net zero change	examples of no change overall in well-being (i.e. some good, some bad changes, evens out)
no change	examples of no changes in well-being
unsure	examples of uncertainty in changes to well-being
cultural ecosystem services	intangible or non-material ecosystem services; must be referring to reefs/ocean/coastal areas
aesthetics	satisfaction or meaning from visual characteristics or beauty of the reefs or coast; also includes soundscapes, feel of wind--satisfaction from sensory experiences; includes things like "i like seeing the reefs" even if don't mention beauty specifically
bequest	mention of importance of reefs for future generations; includes sharing experiences with children
ceremony	mention of importance of reefs for ceremonies (or greater coastal/marine area)
education and knowledge	learning or teaching opportunities or examples
ingenuity	reefs help speaker think about solutions to problems (specifically from a biomimicry sort of angle)
knowledge transmission	knowledge transmission from one person/entity to another (place-based, observational, formal, informal, etc.)

Code Name	Description
local and traditional knowledge	local knowledge about the coastal and marine environment; ability to recognize the presence of environmental signs or indicators (e.g. bioindicators)
everything or life	code responses that coral reefs are "everything" or that they are "life" to this node
existence	reefs matter simply because they exist, because they're part of the earth, or because they have a right to live; can include mentions of things reef does for us here that might also be supporting or regulating if the tone of the comment is that they are also valuable because they exist
diversity of reef	existence of diversity of coral reef
fulfilling stewardship	caring for reefs or coasts because it provides benefit/satisfaction—ability to care for resources and environment
successorship	When someone mentions the need for the next generation to understand the importance of stewardship, specifically in a way unconnected to employment
traditional or cultural stewardship	customary rights and responsibilities are locally known, practiced, and respected; specifically referring to caring for a culture or tradition, which can but may not always include acts of environmental stewardship
heritage, tradition, culture	connection to cultural stories, traditions, past events, multi-generational interactions/connections with natural resources; archaeological and historic sites; cultural resources; acceptable historical change; "kinship;"
different; not Native Hawaiian specifically	general reference, not necessarily related to Native Hawaiian, use this code if it is unclear what specific aspect of heritage or culture is being referred to
Native Hawaiian specifically	specifically discussing Native Hawaiian
identity	personal or communal identity if someone mentions feeling connected to the reefs because they grew up around them, or going to the beach, or something along those lines, code that to this node
identity of West Hawai‘i as a whole	discussions or mentions that represent West Hawai‘i as a whole

Code Name	Description
inspiration	Broadly circulating public discourse about collective responsibilities (e.g., caring for place or malama ‘aina); specifically for art or other forms of creative expression; local artistic or creative practices
novel experience	emergent code for reefs being valuable because they provide a novel experience; for mentions of "paradise," combine with recreation code; combine with recreation
recreation	playing, tourism, activities related to reefs; include non-extractive activities
sacred	mention of reefs as having sacred or religious significance
sense of place	mention that reefs or coastal environment contribute to one's sense of belonging or feeling at home there. sense of self, community, and/or home related to the coastal and marine environment
eating locally grown and caught food	importance of eating local
proper place names	importance of using proper/traditional place names
social relations	mention of strengthening ties in family or community; presence of strong social ties or networks; sense of community; trust in neighbors
family specifically	speaking specifically of family interactions
sharing	the practice of sharing goods, services, time with others in the community
spirituality	mention of metaphysical forces larger than oneself or beyond one's comprehension interacting with the coastal/ocean to perpetuate spiritual beliefs and practices (e.g., divine power)
religion	specifically mentions spirituality in relation to a religion
way of life or lifestyle	any mentions of way of life here, and also code to identity. include provisioning services (be specific if you can) IF they make reference to an economic or provisioning component related to "way of life"
disservice	mentions of reefs causing harm to people/communities’ well-being
governance and management	in relation to coastal and marine environment
access	physical or otherwise (emotional, memory)

Code Name	Description
decrease	decreased access
increase	increased access
adaptive management	contemporary or community/traditional entities mentioning adaptive management
another level of community	in vivo code: communities formed by governance structures or interest rather than geography
co-management	contemporary and community working together
common pool resource issue	in vivo code: discussion about common pool resources in a manner that suggests the resource is being impacted by common pool "rules" or specifically considered common pool
contemporary management	formal, "western" style natural resource management
control over lineal land	in vivo code: discussions about control over lineal land
effectiveness (or success) of management	perceptions of management, permits, and regulation; adequate funding and staff capacity for achieving management objectives; partners and collaboration
marine management areas	legally recognized
merging traditional w/contemporary management	discussion of ways the modern resource management is or potentially could be conducted in tangent with traditional management styles
political participation and equity	participation in marine management decision-making processes and leadership; stakeholder processes; exercising rights/interest in politics; management reflects local and traditional values
regulations	legally enacted marine laws
succession	when people mention the younger generations taking over management of resources in management positions
trust	trusting contemporary management entities is mentioned or implied (existing or lacking)
health	human health

Code Name	Description
mental and emotional health	mental/emotional health is mentioned or implied
perspective	participant mentions their own perspectives on mental/emotional health
nutritional health	specific mentions to nutritional health
physical health	physical health is mentioned or implied
negative emotions	mentions of how coast/marine create negative emotions
anger	interviewee mentioned exact word or synonym
annoying	interviewee mentioned exact word or synonym
disheartened	interviewee mentioned exact word or synonym
fear	interviewee mentioned exact word or synonym
frustration	interviewee mentioned exact word or synonym
sadness	interviewee mentioned exact word or synonym
stress	interviewee mentioned exact word or synonym
neutral well-being	claims that reefs don't affect well-being (can put negative well-being here as well as a placeholder)
positive emotions	mentions of how coast/marine create positive emotions
calm or stress relief	interviewee mentioned exact word or synonym
enjoyment	interviewee mentioned exact word or synonym
excitement	interviewee mentioned exact word or synonym
happiness	interviewee mentioned exact word or synonym
hope	interviewee mentioned exact word or synonym
joy	interviewee mentioned exact word or synonym
provisioning ecosystem services	must be referring to reefs/coastal areas
biochemicals	examples of provisioning ecosystem services as biochemicals

Code Name	Description
economic support	examples of how provisioning ecosystem services provide economic support
tourism money	specifically referring to money/economy related to tourism
food	examples of provisioning ecosystem services as food
crab	any species of crab but must be referring to eating crab
fish	any species of fish but must be referring to eating fish
kalo	taro; *Colocasia esculenta*; but must be referring to eating
limu	seaweed; but must be referring to eating
octopus	must be referring to eating
opihi	limpet; must be referring to eating
other seafood	eating seafood
resources equal icebox	in vivo code: resources discussed in a way that equates the marine environment with storage
salt	gathering/eating salt
turtles	eating turtles; a practice that is illegal but has historically been an issue
regulating ecosystem services	must be referring to reefs/coastal areas
storm protection	coastal/marine protection from storm events
water purification	water purification processes
water regulation	water regulation processes
safety and security	security and safety related to real or perceived environmental risks
supporting ecosystem services	must be referring to reefs/coastal areas
primary production	e.g., photosynthesis
structure of ecosystem	structure of coral reef, or shoreline ecosystem

Appendix D Kai Kuleana Network Analysis

Significant quotes from interviews with Kai Kuleana Network members

- You know, I think everybody has a piece in doing something really well. You know, all of these communities are successful because they're doing something really well. And another community might not be doing what these guys are doing as well as the other guys are, and so, to be able to bring together community, like under Kai Kuleana, is a good start to do that.
- KKN member: …that's really where we focus our energies and efforts, is trying to figure out in some cases how do we get from conversation to action.

  Becky: That's something that you guys are able to help with?

  KKN member: Well, we need to better, I think. But that's definitely a part of it. The Network is supported by NOAA. And so NOAA has some tangible needs and in the absence of any social science indicators, then we rely on the ecological ones, which is really a harder sell to show the benefits in that group.

- I hope that people feel empowered from coming to those meetings. I think they do. I've never seen – you know, after the meeting people often stick around and they'll talk story with each other and they'll kind of enhance their connections.
- And I think that's why the networks are so important and that's why it's important for us to help them be able to thrive and sustain themselves here and Maui Nui, the Kua, statewide and global networks. Those are really important for if we're going to see a co-management future where the people of communities are actually really involved in what happens in their place. And if those dissolve, then the theory is that people will get disengaged and they're run roughshod over by special interests and other groups that don't have the connection. And as we've talked about, then the connection can be further eroded. So it's a negative feedback loop that gets created if the ability for people to feel empowered and participate goes away.
- [In relation to NOAA/HFA support] What isn't happening and may not need to happen, but is something to always consider is to have kind of community-facing staff on this island or to have somebody who can spend enough time here to really get to know what's needed.

- That whole philosophy of forming a network is something that I really believe in. Because each community is strong and has amazing people within the community. And, each individual community is doing amazing things specific to their place. And then Hui Loko and Kai Kuleana is the philosophy of like, together we're stronger.
- A good example is the 'Try Wait' initiative for Ka'ūpūlehu. Kai Kuleana Network showed up. Brought their whole families, brought their whole communities to the public hearing. And, it's the philosophy that, you know your resources the best, we stand by you in pushing forward what you know to be best. Whether or not they agree with every

management plan or you know objective of 'Try Wait'—some didn't. They believed that Ka'ūpūlehu had the right to drive their own ship. You know, navigate their own path. So, they showed up in support.

- In addition, there's just all the sharing within the networks. Um, sharing of like, what they're going through, and challenges, success stories, creative solutions, funding, getting grants for the whole network that can be shared.
- The resources don't get chances to recover. That's why I think it's important, like, groups like Kai Kuleana to take responsibility and try to educate.
- I'm also a member of, you know, Kai Kuleana. To me that's one of the best organizations that I've been involved with. Kai Kuleana. You know, it's just different communities on the coastline from Kohala to South Point, or yeah, Miloli'i, Ho'okena, you know. […] Yeah, I mean, I just love those people and they're into protecting their *kuleana* around their communities.

Interviewer Feedback Based on Interview Data

1. What does KKN add to the grassroots smaller groups that already exist in the area? As a Network, what extra value is added?
    a. The larger network provides value by offering a venue for sharing information about success and challenges.
    b. Opportunity for shared learning.
    c. A place for people with similar values and goals to collaborate.
2. How does KKN advance co-management of conservation?
    a. By providing the space and opportunity to facilitate collaboration amongst communities who all share this goal of moving toward co-management. Kai Kuleana does not require the communities to want to achieve co-management in a particular way, so everyone feels welcome. This atmosphere creates a safe space to discuss options. It is clearly motivating and inspiring to community members.
3. What is the value added to the communities by KKN? (That some community members may not even realize is happening.)
    a. Empowerment of community members
    b. Knowledge building
    c. Opportunity for diverse engagement among different community members, agencies, and organizations. Brings multiple levels of management to the same meeting.

Raw Interview Data Related to Kai Kuleana Network

Interview 1

Reference 1

Interviewer: Do you, speaking of that community side and building that capacity, what are your thoughts on networks like Kai Kuleana?

KKN member: Awesome.

Interviewer: And their ability to organize and support [communities] and stuff?

KKN member: Yup. It's great. Very happy with The Nature Conservancy. You know, they invited us to participate in the Conservation Action Plan that they're doing for South Kohala. And so I was… went in there with the thought, what we were talking about today about people are part of the ecosystem. […] And, so I brought up the concept that people are connected to the environment and people, connections should be a target in addition to coral reefs…in addition to, you know…

Interviewer: That's exactly… I agree with you, yeah.

KKN member: So, in addition to all of that, that connection is threatened. And, so, it needs to be a target. It was a bit of a challenge […] but they did embrace it. So it's… kinship, community connections is a target now. And then when you look at what [NAME], them, are doing down at [PLACE NAME]. They were given that pond by [NAME], and so they embraced that. That concept of community connection, [everyone involved] really embrace this whole thing about connecting community. So that was very encouraging, and so I feel like: 'Wow!'

Reference 2

KKN member: So. An organization like Kai Kuleana is great because we were actually basically working with all of those communities already.

Reference 3

Interviewer: I think so. I mean, a lot of these are just general stuff and I think that we touched on all the main topics which is pretty much about, like I said, the connection to place and community capacity was a big thing that I wanted to talk about, which we did. And then that the power, or, whether or not power does exist in networks. Community networks.

KKN member: Absolutely. You know, I think everybody has a piece in doing something really well. You know, all of these communities are successful because they're doing something really well. And another community might not be doing what these guys are doing as well as the other guys are, and so, to be able to bring together community, like under Kai Kuleana, is a good start to do that.

Interview 2

Reference 1

Interviewer: Right. Okay. I think my only last question -- or last topic, I should say, because -- is specifically about Kai Kuleana. And I just want to talk about it directly and ask you what your overall impression of the Network has been and -- I mean, you're obviously more than just a part of it. I think you can take credit for a lot of the structure and that's a huge component of success. Can you just talk to me about how you see Kai Kuleana benefiting people and their communities?

KKN member: I can try.

Interviewer: Okay.

KKN member: The real goal there is just to create a safe space for them to determine all that.

That's the goal of the Network, is they've done their need's assessment. They've done their thinking about who needs to be a part of it. They come prepared to the meetings to share what they feel is important and we make sure that there's always space for them to do that.

They've set up the structure to do *pule* before the meetings, to do *pule* before meals. They've set up their decision-making structure. Basically, what we have done is help them schedule meetings and write down what they say and provide food. And so I think the network, itself -- for the successful aspects of what they do, it's all them, themselves. For the parts that might not be quite as refined, that's really where we focus our energies and efforts, is trying to figure out in some cases how do we get from conversation to action.

Interviewer: That's something that you guys are able to help with?

KKN member: Well, we need to better, I think. But that's definitely a part of it. The Network is supported by NOAA. And so NOAA has some tangible needs and in the absence of any social science indicators, then we rely on the ecological ones, which is really a harder sell to show the benefits in that group. And the other thing that I always prepare all of our groups for, and this has come in handy in [PLACE NAME], for instance, and [PLACE NAME], is the absence of TNC. So we're on an annual budget cycle. The priorities of the organization can change with new leadership. So that's why right now there's a little bit more focus on the structure of the Network, and I think we have a long way to go for them to be able to be independent, and that's just one of my worries, is that we'll run out of time before they get where they need to be to not need us at all.

But so far, through providence and the support of NOAA, we've continued to have time to work with our networks and groups, and even the [PLACE NAME] community. I don't know that the Nature Conservancy is going to always manage the [PLACE NAME]. So something we think about is building that succession in.

I hope that people feel empowered from coming to those meetings. I think they do. I've never seen -- you know, after the meeting people often stick around and they'll talk story with each

other and they'll kind of enhance their connections.

I think this exchange to Molokai was huge, and just in that kind of 24/7 experience -- 24/3 experience?

Interviewer: Yeah, does it feel like seven?

KKN member: Yeah, I think so. But building those bonds, and the reason that this is important from our perspective is just because when people want to make a change, as you've acknowledged there's a lot of people out there who don't know about it at all, who are going to oppose it no matter what. It's really hard for an individual or a small community to stand up to all of those groups. And I think that's why the networks are so important and that's why it's important for us to help them be able to thrive and sustain themselves here and Maui Nui, the Kua, statewide and global networks. Those are really important for if we're going to see a co-management future where the people of communities are actually really involved in what happens in their place. And if those dissolve, then the theory is that people will get disengaged and they're run roughshod over by special interests and other groups that don't have the connection. And as we've talked about, then the connection can be further eroded. So it's a negative feedback loop that gets created if the ability for people to feel empowered and participate goes away.

I think the Habitat Focus Area has been really good in that it's gotten a lot of NOAA attention on specific geographies, West Hawai‘i being one and a good recipient of that. And we've worked really, like, well with people in NOAA that I didn't know existed before because of that Habitat Focus Area. So resources related to sea level, to fish monitoring, to human dimensions, you know, have been brought here and are making tangible contributions to the work that we do.

What isn't happening and may not need to happen, but is something to always consider is to have kind of community-facing staff on this island or to have somebody who can spend enough time here to really get to know what's needed.

My perspective on what's needed is just the resources to continue to support communities. So the level of support that they're getting now is based on the amount of resources available. More resources means more support, means more faster growth. And organizational capacity, sustainable financing, archival documentation, a lot of these things are beyond the scope of what is happening now, but would be really useful. And then participatory planning at a more regional scale is something that NOAA could help a lot with. You know, I think about the MPA Center, I think about some of the groups that are within NOAA that are good at what the State's proposing, to roll out 30 x 30. And those groups would be really good to at least engage.

But the main thing with all of it is local knowledge. So if NOAA's comfortable, kind of having partners do that, to fill that role, then there are definitely partners who can and will do it.

But it might not hurt to have some institutional capacity within NOAA, that would mean somebody who has local knowledge over here, sort of, being a part of your team.

Interview 3

Reference 1

Interviewer: Okay. That makes sense. Has being within the Kai Kuleana Network helped your community achieve its management goals in any way?

KKN member: I would say yes, but maybe not directly. But certainly indirectly. First of all, just through networking with people who have that like mind. Remember I was talking to you about if everybody thinks the same, that they are supposed to be doing this, then there's no conflict. So the group that we're in, unfortunately, well not unfortunately, but we're all kind of like minded so it really helps to understand that we're not the only ones who have, you know, those challenges of wanting to manage the resources better. We're not the only ones seeing the decline. We're not the only ones willing to take action. And, in the… I think one of the benefits, and I'm looking at this really strategically, I think one of the benefits is the more people we get in Kai Kuleana, the more we can help inform some entity like the West Hawai‘i Fishery Council or DAR or DOCARE or whatever. And we're all kind of thinking together. And then when it comes to making those changes, if they're administrative, then we can work as a group, as a community. And, I think we can also change the thinking, I guess, of the people in our communities or the people who comes into our communities. Left to our druthers in [PLACE NAME], the people there know how to manage their resources already, they just can't.

Interviewer: They can or cannot?

KKN member: They can't because it's just, there's too much outside pressures coming in over which we got no control.

Interviewer: So there's support coming out of Kai Kuleana?

KKN member: Oh yeah.

Interviewer: You guys are able to support each other, learn from each other?

KKN member: Oh yeah. Learn from each other. Right.

Interview 4

Reference 1

KKN member: It was important. So what ended up being, is [NAME 1] got involved and [NAME 1] made a 15 minute film, and then entered it into the film festival. So, it won its little category at the Waimea and Ocean Film Festival in January, but that's also how we united with [NAMES 2 and 3]. Because they were there for the presentation of the Haʻena Point one. And, [NAME 2], of course, is a hysterical woman, as I am, and so when she sees the part where he cries in the movie she lost it. And then she made a vow that she wasn't gonna let his tradition die, and they have been hounding us since then. So, we went up and visted them. And then, um, [NAME] been pushing for us to join Fisheries Council and then Kai Kuleana Network invited us in.

Reference 2

KKN member 1: Because the thing we enjoyed about, with The Nature Conservancy and the Kai Kuleana Network is the first step is identify the culture and tradition, second step is find your *kupuna* that's actually living and practicing, third step is humility. Which is what he's all about. I mean he's humble, right? So, that's what we were approached to, and what we were appealed to, is that these people who are silently doing things in the back and that's Kai Kuleana Network– who knew they existed. I didn't know they existed. He's good friends with some of them. It's very quiet, very private. But they've done all this amazing stuff. And so, we feel really honored.

Reference 3

KKN member 1: So there, this is the beauty of being connected in that network now, because I'm like, we so need that down here.

Reference 4

Interviewer: So, I'm hearing a lot underneath what you're saying, being a part of this network can strengthen your own abilities—

KKN member 1: Absolutely. Yeah.

Interviewer: —to do what you feel you need to do down here.

KKN member 2: Yeah.

Reference 5

Interviewer: So we talked a lot about the next questions on my list which were mainly about things related to Kai Kuleana so I can kind of skip over some of that, but I wanted to ask you how, in your opinion, how marine management can help to maintain or even hopefully improve your well-being and your community's well-being and relationship to this place. So, if you have anything else to add to that?

KKN member 1 to KKN member 2: What do you like about that [Kai Kuleana] meeting with all those people? Or did you?

KKN member 2: It was a first time for me, and you know, what I see is working for them, and I think it can work down here. And you know, we need to go to more meetings so we can see more and more of what's really happened.

KKN member 1: Do you feel like their supportive of each other in some way?

KKN member 2: Yeah, they're really supportive and then, you know, first, I've been down that area, you know, Pine Trees road area, when it was controlled. And how dirty it was [before], I was so surprised, we drove through there and the way the place looks, and how it's been kept. It is just, it's unbelievable.

KKN member 1: You know what, that's old Hawaiian style. You know when I came here you guys weren't dirty.

KKN member 2: Yeah, it's old Hawaiian style but it wasn't that way before.

KKN member 1: No. How they've done it.

KKN member 2: How they done it now, you know, it's unbelievable. I was surprised.

KKN member 1: You know, it's integrated.

Interviewer: Of how cleaned up it is?

KKN member 2: Clean. How clean and how taken care it is.

KKN member 1: It's also, it lets the public in, that you have to deal with, like down here.

KKN member 2: They letting the public in, you know.

KKN member 1: But in a controlled manner, and providing facilities so you don't have the issues. They're providing security, they're providing the gardening and landscaping, they've paved it.

KKN member 2: The luas and everything.

KKN member 1: They keep the luas, you know. So the management of it is amazing.

Interviewer: That's something that you could see, envision, that could happen in this area?

KKN member 2: Envision that could happen in this area. Yeah.

Interviewer: Whatever that version is works for here?

KKN member 1: Yeah.

KKN member 2: It would be nice if you could bring that in this area.

KKN member 1: It's like Kiholo. What Hui Aloha Kiholo has done. It's like, oh my god, they did it.

Interviewer: Find a way…

KKN member 2: Find a way to circle it to here.

Reference 6

KKN member: …that's where I think like, when you see like Ha'ena Point. We saw their movie and how long it took them, but that they're their own advisory now. Like, they're here, like here with the state. But it's like, that's where the indigenous knowledge was recognized by the state. So that seems to me like where science can really help. On all levels. Like, whether it's a cultural assessment, because that's gonna speak the language of the people who own things. The State owns it. NOAA owns it. Or you know, the responsibility has come to the government. But, you know, you can still work. And that's like when you see these community based management projects, that's where it's starting to work. So on some level I think that that. What we've seen, is like when we're at the Kai Kuleana meeting, it's like everybody is freaking out about Chad leaving. If he leaves in 2 years. Because like, well, how do we keep Chad?

Interview 5

Reference 1

Interviewer: One thing that led me to talk to Kai Kuleana first is you guys exist and you have a definition of place and what that means to you as a group and community?

[Kai Kuleana Member nods]

Reference 2

Interviewer: Has being a part of Kai Kuleana been beneficial or brought some benefit to the community?

KKN member: Yes, and I did just bring that up at [my last community meeting], may I continue to speak for them. And they said yes. So that's part of our standard operating procedure, is to reaffirm this voice being acceptable to them. And it has been. Yes, and I think also what we bring to the other communities in terms of strategic examples. Examples of employing strategy to accomplish our desired results. And then for us, having, and the benefit back to us, to have allies and to have people that would participate with us in outreach and teaching. And providing testimony for one another. So just because of where we are timing wise, you know, more so we're providing testimony for other folks at this point than they for us. When we did [an initiative], I don't know if Kai Kuleana was born yet, but we did benefit from the E Alu Pu Network and so we... E Alu Pu is like a giant Kai Kuleana.

Interviewer: Okay.

KKN member: And that was a tremendously interesting experience because not everybody agreed with [the initiative], but nobody testified against it. Because with the Hui, as you get to know people, even if you don't agree with what they're doing, if you've come to have respect or even affection for them you're not so likely to testify against them. You might challenge them at your table, but you're not gonna go out and challenge them. So it was interesting, one of the E Alu Pu members, one member, an older male, who just didn't like it. But after he came to hearing... But he pledged that he wouldn't testify against it. But after he came to the hearing, and he saw the hearing, he was wearing our shirt. And when we organized our testimony with tremendous deliberation.

Interview 6

Reference 1

Interviewer: Have you felt like being a part of the Kai Kuleana Network has been a positive thing for your community?

KKN member: Yeah, actually. In the beginning I was kind of like, eh, because I was already investing and I still am, investing time with [GROUP NAME 1] so, you know, first thought was, oh man another group I gotta join. I got enough on my plate! I have so much on my plate and it's just overwhelming sometimes. When I was asked by [NAME] to, 'hey you like attend one meeting and represent [GROUP NAME 1]?' But I don't know if he understand what else background I had, and work I was already doing. That kind of grew into the, okay, now I'm kind of representing multiple communities. Not only [PLACE NAME 1] for my family, but also [PLACE NAME 2] and [PLACE NAME 3] because of [my work], and the management of this place that we kind of manage more for educational and access wise, but then also helping to take care of these sacred places and *wahi pana* here in [PLACE NAME 2], kind of naturally kind of formed. But I think it's a good thing, recently in the last maybe 2 years, I felt, okay, you know, maybe this is a good network to be part of. Just hearing, you know... And I always thought it was a good Network. But they're trying to convince [my work] that it's legitimate for me to leave during work hours to go for a two to three hour meeting. It was a little bit hard.

But, I think it is a good. And most recent, I want to just say in the last few years, it kind of became, maybe in the last three years since we did the work with the *ku'ula*, I think has been... Helped me to find the relevance. Because before I was like, I'm only here for the [GROUP NAME 1] and I don't know if people care for the [GROUP NAME 1] or whatever, but I didn't feel invested in [Kai Kuleana] because that was initially how I got invited in, was through [GROUP NAME 1]. […] But once I found my niche as to a function that I can have to contribute. Because for me, I like to have one function. I like to be able to contribute. I don't wanna be sitting there just to kill time. I no more time for kill like that. So it's like, okay I'm here for the [GROUP NAME 1], okay our meeting is only this long, I'm leaving right after. Because yeah, good to hear all the updates from the families and finding out how [GROUP NAME 1] can help, but... When I found my niche to present on what we were doing with our family place and with the *ku'ula* and what we doing […] working with the families, then I figured out, hey you know, I get one function. I have a function because I can update these communities that come from Kohala to South Kona as to what we're doing in [PLACE NAME 2] and [PLACE NAME 3], and what are we doing with [PLACE NAME 1]. So, once it got to that point, I think, then I found the value in Kai Kuleana. But in the beginning, just coming in for [GROUP NAME 1], I was like, Oh man I feel like I'm wasting my time. But it was nice to hear and see everybody, I guess that's a part of maintaining relationships with people in our community. So, I found that value in a sense but, again, I still kind of felt like, yuck, because […] I don't even know if they care. But when I found a way of being more functional in the space, I think that helped. That helped a lot.

Interviewer: Did you get support from Kai Kuleana and help when you were doing the work for the different community work that you've done? Like have you felt that they've been able to support you. I don't know a lot about the Network.

KKN member: Not yet. So, we've been around when we've helped other communities in the Network. I don't know how much it helped to share with them about [our initiatives]. I think, […] but I think just that dialog of interacting to share what we're doing and how we can help each other out, I think, has been good to be able to just interact with these people in the community. And finding new ways that we can serve, too, [from my work's side…] The dialog part, and knowing if there is a need, and if there is a need I can bring it back to my KS folks that do provide funding for the community. You know, the opportunity presented itself and then they're fortunate to get the money.

Reference 2

KKN member: Yeah. Sorry, we went off track, but Kai Kuleana hasn't helped me yet. Yet.

Interviewer: Like, directly?

KKN member: Yeah. But it has had a positive influence, and being able to learn about what other people are doing in their communities has been helpful for me to understand, too. And share this information with [my work]. And see how we can help to meet those needs, and also check off those boxes that are essential to our strategic plan and relevant.

Interview 7

Reference 1

KKN member: But um, with communities, the Hui Loko network and the Kai Kuleana Network are the two that I [participate in]... That whole philosophy of forming a network is something that I really believe in. Because each community is strong and has amazing people within the community. And, each individual community is doing amazing things specific to their place. And then Hui Loko and Kai Kuleana is the philosophy of like, together we're stronger.

Interviewer: Uh huh.

KKN member: A good example is the 'Try Wait' initiative for Ka'upulehu. Kai Kuleana Network showed up. Brought their whole families, brought their whole communities to the public hearing. And, it's the philosophy that, you know your resources the best, we stand by you in pushing forward what you know to be best. Whether or not they agree with every management plan or you know objective of 'Try Wait'--some didn't. They believed that Ka'upulehu had the right to drive their own ship. You know, navigate their own path. So, they showed up in support.

Interviewer: Mmm hmm.

KKN member: That was huge. And, I think was why 'Try Wait' was so successful. Um…

Interviewer: Because of that network support?

KKN member: Because of the network support.

Interviewer: Ok.

KKN member: So, when it's time to show up, you have a whole other community showing up in support of what you're trying to push forward.

Interviewer: Yeah.

KKN member: In addition, there's just all the sharing within the networks. Um, sharing of like, what they're going through, and challenges, success stories, creative solutions, funding, getting grants for the whole network that can be shared.

Reference 2

Interviewer: Are they stronger for being a part of that network rather than just a community themselves, even though they are strong by themselves.

KKN member: I would say yes.

Interviewer: Ok.

KKN member: I think that there's… each community is unique, right?

Interviewer: Uh huh.

KKN member: Each community has its own dynamics, its own challenges, its own management initiatives. Some of them are like further along on the progression of being organized than others.

Interviewer: Sure, yeah.

KKN member: But, I do feel that the ones that have joined the networks and have started those, like, learning exchanges. […]

Interviewer: Yeah.

KKN member: They're stronger because of the training that they get, their ability to learn from others' mistakes or others' successes and apply it to their own community. It's… yeah. They're supported, so they don't feel isolated and so the morale of the community feels like others have got their backs. They're they… they're not alone. Some of the challenges seem insurmountable but when you… you don't have any money, when you're not organized, you don't have a non-profit, but you have great intentions and you really care.

Interviewer: Yeah.

KKN member: And some of the times it feels like: Where do you even start?

Interviewer: Totally.

KKN member: So, here's this whole group of other communities that have been there.

Reference 3

KKN member: So, there was a lot of misinformation about 'Try Wait' by the opposition.

Interviewer: Yeah.

KKN member: There was also that public hearing where…

Interviewer: I watched that.

KKN member: It was impressive.

Interviewer: Yeah.

KKN member: So that was where Kai Kuleana showed up.

Interviewer: Ok.

KKN member: You know, they brought the whole family. They brought all of the neighbors from all of the communities. And came to that meeting. And that was kind of the climax of all of the preparation that had been going on in Kai Kuleana for it.

Reference 4

KKN member: And TNC being in a support role. And them getting more organized, is was where I was going with that. So, 'Try Wait' was like seeing the power of it, and I think that it was impressive for all the communities, too. And they're like: Ok, we supported Ka'upulehu, we now know that all these people will show up for us when we want to push forward a management initiative. And, that's great. And now Kai Kuleana is even talking about… I don't, I haven't been at the meetings the last few months. But, getting organized. Forming their own non-profit. Going for grant funding for Kai Kuleana.

Interview 8

Reference 1

KKN member: That's great because it's all because… you know, I mean, we're all from different ahupua'a's and we're sharing what goes on because we're concerned of what goes on in each… each everybody's ahupua'a, you know, mostly your own, but then you find out that certain of the ahupua'a's are having the same kind of situation that you have... And, uh, which is… doesn't only cover from the ocean, but it always goes from the ocean to the mountain, you know what I mean? So…

Reference 2

KKN member: Yeah, basically it was, you know, it was just… you know Kona has grown. Queen K has come in. Queen K has done a lot of good, but yet it has done a lot of bad too, huh? Because it really hurt our, you know, our fishing ground shorelines, you know, because accessibility came too easy. Whereas before you'd have to come from Mamalahoa Highway and you'd have to catch the trails that come down or come by boats, you know? So that gave the grounds time to rest, to recover, but now there are so many people, there are so many boats, you know. The resources don't get chances to recover. That's why I think it's important, like, groups like Kai Kuleana to take responsibility and try to educate.

Reference 3

Interviewer: Do you think, um, that the Kai Kuleana Network is a beneficial structure? Or that there's… the communities within that network have been able to… Or, is being a part of that network beneficial?

KKN member: Yeah, it's been a real positive.

Interviewer: Ok.

KKN member: It's a positive. Um, the reason why I say it's a positive is because… the way it's run now, with [NAME]. I mean, [NAME]... I kind of wish it wasn't with TNC. Not because TNC is doing anything wrong, but, like [NAME'S] time… his time is on the clock.

Interviewer: Right.

KKN member: And sooner or later he's going to leave us. And that's what I'm saying, I don't want him to leave us because he's been so influential in guiding us through… through, to the point where we are today, you know?

Interviewer: Mmm hmm.

KKN member: Like, I think you heard in the meeting today that you can see that they're searching for everybody to take over the meetings and stuff. I can't go up there and do that. I mean…

Interviewer: Yeah, it takes a lot of energy.

KKN member: Yeah. It's planning and… I don't know. But, I think it is positive and they speak to the right people, the bring the right people to get the right story.

Interviewer: Ok.

KKN member: I mean, we have numerous, numerous talk session with the DLNR Chairman or Deputy Chairman or stuff like that. So, you know, they create a lot of avenues to have communication.

Interviewer: To get the… whatever change, or whatever... is being…

KKN member: Whatever the situation is. You know, whatever, like say we talking about KLMC things, you know, and... But that's only a 10 year closure and I think [they're] on the third year or something like that…

Interviewer: Mmm hmm.

KKN member: And prior to all that we got the ears to have it closed. It was difficult.

Interviewer: Mmm hmm.

KKN member: And that's part of it. I wish we can do it all the way down the coastline, you know.

Interview 9

Reference 1

Interviewer: And then is there any other, I guess, level, beyond your community down here specifically that also has values or connections that you would want to mention. I'm thinking, greater West Hawai‘i in general or anything.

KKN member: Yeah. I'm also a member of, you know, Kai Kuleana. To me that's one of the best organizations that I've been involved with. Kai Kuleana. You know, it's just different communities on the coastline from Kohala to South Point, or yeah, Miloli‘i, Ho‘okena, you know.

Reference 2

Interviewer: No worries, that's okay. You said it's the best organization to be involved with?

KKN member: Yeah, I mean, I just love those people and they're into protecting their *kuleana* around their communities. Just a really good people. I suppose it's because they're all Hawaiians, they all have that in their *na‘au*, it's part of their culture. So, I enjoy those folks. But that's probably the most important connection.

Interviewer: Do you feel like the Kai Kuleana Network helps everyone achieve their goals for their community?

KKN member: Yes. Yeah.

Interviewer: That's wonderful.

KKN member: That's why, you know, we've been so effective on, like, by Kona Village, Ka‘upulehu. You know their fishing rules?

Interviewer: Mmhhmm, yes.

KKN member: That's a great thing.

Interviewer: Definitely.

KKN member: And they're, you know, that's spreading to other islands. Now it's Moloka‘i, Mo‘omomi. And Ha‘ena on Kauai. They've got rules..

Reference 3

Interviewer: That’s a good example. [long pause] Totally flipping the spectrum now, we talked a little bit about different management stuff that has gone on down here. Like the fishing conservation districts, and [PLACE NAME] being a part of Kai Kuleana and stuff like that. Do you feel like your voice, or your community’s voice, has a place in resource management decision making?

KKN member: Definitely.

Interviewer: You have felt like there have been examples where you inserted your voice and it has been heard?

KKN member: Yes.

[Talks about first example.]

Interviewer: Has Kai Kuleana been one of the venues that your community has been able to voice things?

KKN member: Yeah.

Interviewer: Have they been supportive?

KKN member: Yeah.

Interview 10

Not a Kai Kuleana Network member officially; does not attend meetings but is well known and involved

Reference 1

Interviewee 1: Because when we go to KMLAC or part of Kai Kuleana, to me the most powerful thing is Hawaiians coming together and communicating. Because, we bring our *kuleana* and our *mana'o* of *mano* or of certain places of these special places and every other person who comes to the table has their special places, their special practice.

Interviewee 2: Uh huh.

Interviewee 1: Their little stories and their history. And their part of the culture that makes it more complete when you come together. But not only does it enrich everyone else from hearing it… it gives us a better ability and a better tool and a better, stronger voice to enact the change. And, I think, um, you only have that ability when there has been enough of a change.