




# **EXPANDING AND DEEPENING THE APPLICATION OF CULTURAL ECOSYSTEM SERVICES IN ESTUARY STEWARDSHIP AND MANAGEMENT: RELEVANCE TO THE NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM**

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About the NERRS

The National Estuarine Research Reserve System (NERRS) is a network of 30 reserves located in 25 states and Puerto Rico. Each site includes programs focused on land stewardship, research and scientific monitoring, training programs for the public and local officials, and education.

About the NERRS Science Collaborative

The NERRS Science Collaborative is a NOAA-funded program that provides grants and other support for user-driven collaborative research, assessment, and transfer activities that address critical coastal management needs identified by the reserves.

<https://nerssciencecollaborative.org>

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Cover photos by S. Rii (top image) and J. Argueta (bottom image).

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INTRODUCTION

Humans derive many benefits from coastal and estuarine ecosystems, and ecosystem service assessments are frequently recognized as valuable tools to characterize those benefits. Furthermore, within and beyond the National Estuarine Research Reserve System (NERRS), there is increasing interest in better understanding human dimensions in resource management so that researchers and decision-makers can meaningfully apply approaches that may yield positive ecological, social, and other outcomes. In this light, the topic of cultural ecosystem services represents a timely and important opportunity to deepen estuary stewardship and management by highlighting the diverse and multifaceted ways humans interact with the environment.

We developed this white paper for the 2020 NERRS Science Collaborative Catalyst project "Cultural Ecosystem Services (CES) in Estuary Stewardship and Management" to strengthen the conceptual foundation for CES in the NERRS and to support the enabling conditions for research and management application across the national network. The information contained in this paper derives from literature reviews and expert elicitation regarding how researchers and managers in marine, coastal, and Great Lakes settings address human dimensions in resource management. We present a summary of concepts, methods, and other considerations that are relevant for staff, partners, and collaborators across the national network who are interested in learning about and applying CES (and related concepts such as nature's contribution to people and connectedness

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to nature) in stewardship and management. While we provide guidance and recommendations for identifying and assessing CES, it should be noted that meaningful engagement with CES first requires relationships of trust between NERR staff and their partners and collaborators; if these relationships do not exist, a focus on establishing these relationships should be a priority. Additional materials associated with this project, including case studies of how CES research has been applied in practice and a summary of preliminary methods piloted by the reserves in Hawai'i and Alaska, are available on the [project page](#).

## CONCEPTUAL FOUNDATIONS

CES are one of four main categories evaluated within an ecosystem service assessment (the others being supporting, provisioning, and regulating) and are often described as the non-material benefits that humans receive from their interactions with the environment (Millennium Ecosystem Assessment 2005). More nuanced definitions, like that used by Fish et al. (2016), provide greater specifics about the non-material benefits: “[CES] are contributions ecosystems make to human well-being in terms of the identities they help frame, the experiences they help enable and the capabilities they help equip.”

CES represent a complex set of linkages between nature, culture, human values, and governance (Hirons et al. 2016). CES is not the only term used to represent these linkages. There are a number of concepts that share strong synergies with the human dimensions, environmental interactions, and reciprocal relationships characterized by CES (such as nature's contribution to people and connectedness to nature; see Díaz et al. 2018; Mayer and Frantz 2004; Winthrop 2014; Loerzel et al. 2017).

Several complementary fields of social science (e.g., anthropology, sociology, area studies) evaluate similar questions about place attachment, knowledge, practice, and values but may not label them as CES.

Methods used in these fields are a useful source for expansion and/or deepening of CES-focused efforts and may support individuals interested in CES to leverage existing work that may already be underway.

We have found that CES categories are diverse, ranging from Recreation to Livelihoods to Sense of Identity and Sense of Place. A handful of internationally recognized frameworks have dominated CES work, including the Millennium Ecosystem Assessment (MEA or MA) and Common International Classification of Ecosystem Services (CICES). Inherent to these frameworks are values relating to how people conceive of humans and their relationship to one another and to non-human biodiversity (Chan et al. 2011). Given the critical importance of understanding intersecting values and resulting implications on sustainable development and biodiversity conservation, among other significant global priorities, in 2022 an intergovernmental panel released their systematic assessment of diverse values associated with nature, including a values typology and implementation guidelines for various valuation methods and assessments (Pascual et al. 2022). Similar to our project team's NERRS-focused efforts, the global assessment called for transformative change in conventional approaches to biodiversity conservation by underscoring the critical importance of including diverse values and benefits in policy and related decision-making.

CES is a meaningful tool to identify diverse values. A number of CES initiatives have expanded the possible values and categories to be considered (see the [compilation of case studies on our project page](#)). In Table 1 we provide a sampling of categories drawn from the MEA and from studies that have broadened the CES categories (Rodrigues et al. 2017; Gould et al. 2019; Chan et al. 2011; Pascua 2015; Ingram et al. 2020; Moore et al. 2022; Sterling et al. unpublished).

**Table 1. Commonly used CES categories with descriptions and examples**

Select CES categories are derived from several sources (Millennium Ecosystem Assessment 2005; Rodrigues et al. 2017; Gould et al. 2019; Chan et al. 2011; Pascua 2015; Ingram et al. 2020; Moore et al. 2022; as well as unpublished scans of the literature by the authors. While this list aims to provide a substantive picture of the categories of CES that can be measured, it should not be seen as exhaustive and continues to grow and evolve over time.

CES Category	Description	Example
Activity: Recreation, Sport, Leisure, Ecotourism	Includes a range of opportunities to be physically active or relax in a natural environment.	Enjoying spending time on the beach or kayaking on a river.
Aesthetics	Appreciation or meaning from visual characteristics or beauty of landscapes or seascapes; also includes appreciation from other sensory experiences (e.g., soundscapes, feel of wind, etc.).	Enjoying beautiful mountain views.
Bequest	Importance of maintaining landscapes and seascapes for future generations.	Protecting vulnerable habitats and engaging in sustainable harvesting practices so that coastal wetland resources are available for future generations.
Ceremony/Sacred	Places, plants, animals, or other natural features that are sacred and/or important for ceremonies.	Maintaining knowledge of species used for specific cultural ceremonies, including when and how to engage in sustainable harvesting of those species.
Cultural Heritage	Multi-generational interactions/connections with landscapes and/or resources through cultural traditions, stories, and/or past events, etc.	Sense of belonging from knowledge that one's ancestors engaged in a particular tradition over time.
Lifeways	Place-based practices (e.g., fishing, farming) that not only provide material goods but also perpetuate local knowledge, cultural norms, and cultural values surrounding those practices.	Nearshore fishing practices and their associated norms, values, behaviors (e.g., family care for coral reefs, gear restrictions to limit waste, elders fishing with children, and transmission of Indigenous and local knowledge).
Education/Scientific Knowledge	Ecosystems and their components and processes provide the basis for both formal and informal education and learning.	Conducting field-based research or outdoor education in a specific ecosystem. Both lead to contextualized knowledge and better foundational skills such as observation and systems-thinking ability.
Fulfilling Stewardship	The satisfaction or benefit in carrying out the responsibility and role of caring for and managing the environment and its resources.	Caring for the coastline provides benefits/satisfaction.
Identity	Sense of personal or community identity that is intimately tied to a particular place or practice.	An important part of who I am / how I identify myself to others is in regard to the place I grew up, the knowledge of my ancestors in that place, and how I was raised.
Indigenous/Local Knowledge	Lived experience of Indigenous and/or local communities over time and the associated transmission of knowledge, which shape interactions with the environment.	Knowledge of seasonal abundance or spawning seasons informs local harvesting periods.
Inspiration	Feeling stimulated and hopeful, often for creative outlets, by being in nature.	A song or painting that was created or heavily influenced by the creator's time spent in nature.
Intrinsic Value	The value nature has "for its own sake"; the idea that nature has its own spiritual, ecological, and physical value even if it does not benefit humans.	A particular forest is inherently valuable and significant in its relationship with other beings and entities regardless of the services or benefits it contributes to humans.

<b>CES Category</b>	<b>Description</b>	<b>Example</b>
Livelihood	Ecosystems play an important role in supporting and sustaining populations dependent upon them for survival.	Healthy wetland ecosystems can enable and support diverse ways of acquiring life necessities or otherwise making a living (e.g., subsistence fishing and farming, and/or occupations in fishing, farming, conservation, and outreach education).
Material/Subsistence/Use	The adequate provision (in quality and quantity) of locally and/or culturally meaningful resources for human needs and use.	Availability of culturally significant plants for harvest, made possible by having those resources in adequate quality (health) and quantity (abundance).
Option	Future unknown and speculative benefits or the importance that people give to the future availability of ES for personal benefit.	I have never spent time enjoying coral reefs (e.g., through snorkeling), but I may want to in the future.
Physical, Emotional, and Mental Health/Well-being	Spending time in nature for physical (e.g., cognitive functioning, physiological changes) and mental (e.g., stress reduction, feeling of peace) benefits.	Walking in a forest can reduce stress levels.
Religion, Spirituality, Mindfulness	Gaining deeper meaning from metaphysical forces larger than oneself or beyond one's comprehension; interacting with nature in a way that perpetuates spiritual beliefs and practices.	A particular place that is important for connecting with something greater than oneself or meditation.
Sense of Place	Sense of belonging to and connection with landscape/seascapes.	I feel I belong to this place, being associated with this place is integral to who I am as a person.
Social Relations	Ecosystems influence social interactions, cohesion, and relationships that are established in a particular place.	Coastal restoration activities can build communities of practice (e.g., among volunteers, managers, stewards, etc.) and the health of coastal subsistence resources can promote social cohesion when resources are shared across groups.

Efforts to identify and monitor CES are increasing as managers and decision-makers recognize the critical importance of understanding the relationships between people and their environment (Fish et al. 2016; Chan et al. 2018) as well as the role of culture in managing healthy human and non-human systems (Biedenweg et al. 2017). Understanding

these feedbacks between human and environmental well-being is integral to long-term and successful application of stewardship and management strategies (Liu and Opdam 2014; Plieninger et al. 2015; Winter, Lincoln, et al. 2020). Evidence shows the many benefits of including CES in ecosystem services assessments (see Table 2).

**Table 2. List of benefits of including CES in ecosystem services assessments**

Benefits of including CES in ecosystem services assessments may include	As described in
Broaden perspectives to provide a fuller understanding of an ecosystem and its functioning	Berkes 2012; Poe et al. 2014; Luk et al. 2019
Illuminate inequities	Breslow et al. 2017; Chan et al. 2019
Enhance community resilience and trust	Gregory and Trousdale 2009; Evans and Klinger 2008
Reduce conflict	Evans and Klinger 2008
Help prioritize areas for action	Poe et al. 2016; Angradi et al. 2018; Bremer, Mandel et al. 2018
Deepen stewardship and management efforts particularly through respecting factors like tenure rights and cultural models of social norms	Leong et al. 2020; Allan et al. 2015; Berkes 2012; Paolisso 2007
Meet U.S. federal mandates regarding equity, justice, and conservation of social, cultural, and heritage values	Poe et al. 2016

Many studies have revealed that CES are perceived as being just as valuable or more valuable than other ecosystem services such as provisioning and regulating (Combetti et al. 2015; Holt et al. 2011; Liu et al. 2019; Caro et al. 2020; see also Sears et al. 2018). Studies have shown that cultural and provisioning are the services most directly experienced and appreciated by people (Combetti et al. 2015). Thus, any ecosystem service assessment that does not meaningfully include CES can overlook significant aspects of the environment that are actually most important to people (Norgaard 2010; Kenter et al. 2015). For instance, for many people sense of place is an important ecosystem service that encompasses the multidimensional and dynamic process formed by relations between individuals, society, and their environments that contribute to a sense of belonging, feeling of home, and/or connection with a landscape or seascape (Acott and Urquhart 2018; Ingram et al. 2020). Yet sense of place is often overlooked in lieu of assessing more commonly measured ecosystem services.

Despite their importance, CES remain underrepresented in ecosystem service assessments due to significant theoretical and practical challenges, particularly in their evaluation (Milcu et al. 2013).

Ecosystem service valuations share a theoretical underpinning with ecological economics, which often assumes that individuals are rational and aim to maximize benefits to themselves. Furthermore, the field of economics often employs market logic to resolve environmental issues and may focus on the commodification of nature (Gómez-Baggethun et al. 2010). These economic assumptions may undermine circumstances in which communities prioritize shared benefits and experiences, or when non-monetary benefits guide decisions. CES are subjective and can be influenced by a number of intersecting factors, including nature, culture, human values, and governance (Hirons et al. 2016). In practice, these strong interrelationships can make it difficult to separate natural and cultural benefits (Kaltenborn et al. 2017). For instance, harvesting to feed one’s family can provide food, but interacting with the environment while harvesting may also contribute to broader well-being, such as maintenance of one’s identity and sense of place (Kaltenborn et al. 2017). Theoretical and practical challenges like these reveal a timely opportunity to expand and deepen the application of CES in stewardship and management.





Project team members identify CES together during a transect walk in Kachemak Bay. *Photo credit: J. Argueta.*

## **NERRS RESONANCE AND RELEVANCE**

Enhancing and advancing the application of CES has strong synergies with ongoing efforts within and beyond the NERRS network. CES explorations resonate with the NERRS 2017–2022 Strategic Plan, which includes a focus on interdisciplinary research, ecosystem services, and thriving communities and human well-being. Similarly, efforts to advance and enhance the representation of CES in estuary stewardship and management support the National Ocean Service’s focus on place-based conservation programs, which “value the experiences of local and indigenous [sic] populations and help provide services that combine their traditional knowledge with modern technologies and techniques” (National Ocean Service 2016). In 2020, a NERRS Human Dimensions Ad Hoc Steering Committee articulated a pressing need to strengthen and streamline representation of human dimensions across the system (NERRS Human Dimensions Strategic Concept Steering Committee 2020), which could be further supported by expanding CES efforts.

When meaningfully identified and monitored, CES can illuminate key locally centered values and priorities across Research, Education, Coastal Training, and Stewardship sectors (see callout boxes that follow). Thus, deepening understanding and action-oriented application of CES research can advance conservation outcomes that are central to the success of the NERRS, while also improving and supporting well-being outcomes for both human and ecological communities. As recognition of the resonance, relevance, and capacity to measure and monitor CES grows across the NERRS network, so, too, has the number of studies that aim to advance meaningful application of CES in specific reserves, including in He’eia, Hawai’i (Winter, Rii, et al. 2020); in Kachemak Bay, Alaska (Flaherty et al. 2019); and a joint exploration in Rookery Bay, Florida (Mason et al. 2020a) and North Carolina (Mason et al. 2020b). Restoration, management, and other programmatic priorities have been, and continue to be, shaped by expanding and deepening CES research (Washburn et al. 2018; for more, see our [supplementary compilation of case studies](#)).

## AN OVERVIEW OF ASSESSMENT METHODS AND CASE STUDIES

Selecting a method to assess CES is a reflection of many factors, some practical (e.g., time and resource constraints) and others value-laden (e.g., what is the context? who is valuing CES and for whose benefit?) (Hirons et al. 2016). CES are frequently assessed using monetary valuation methods—for example, surveying visitors' willingness to pay to estimate the dollar value of a coastal wetland system (Pendleton 2009; Barbier 2016). While monetary valuation methods may be an entry point to begin to identify benefits, solely relying on them has significant limitations (Gómez-Baggethun and Muradian 2015).

Economic assessment methods could adversely impact user groups already marginalized in resource management and can overwhelm and suppress positive attitudes toward ecosystem services (Hirons et al. 2016; Gómez-Baggethun and Muradian 2015). In Colombia, payment for ecosystem services (PES) initiatives resulted in large-scale private water users gaining access to resources at the expense of water supplies to local communities (Rodríguez-Francisco and Budds 2015). In PES schemes in Mexico, the longer people engaged in market systems that were developed to monetize ecosystem services, the less likely they were to support intrinsic, culturally based reasons for conservation (Rico García-Amado et al. 2013). In contrast, non-monetary and related CES assessment could be useful to enhance diversity, equity, and inclusion in partner engagement by creating meaningful opportunities for reflection and

exchange, as has been shown in Hawai'i (Bremer, Mandle, et al. 2018; Bremer, Falinski, et al. 2018). Relatedly, in a 2022 Reserve Exchange with staff from He'eia and Kachemak Bay, the group reflected on terms that may emphasize equitable, inclusive, and respectful partner engagement when considering CES work. In a discussion on the term stakeholder, the group noted ways the term can connote power differentials among user groups and can also surface historical trauma among marginalized communities. Alternative language should spell out the specific groups and individuals appropriate for the local context (e.g., advisors, interested parties, potential users, community members, consultants, collaborators, rights holders, knowledge holders, co-owners).

Examples of outcomes that show tangible benefits of including CES include expanding metrics to more completely include culturally informed values. For instance, exploration of the material and non-material values of blueback, or sockeye, salmon populations for the Quinault Indian Nation led to a broader suite of dimensions monitored, including social and cultural indicators, such as:

- the frequency of sharing or donating salmon within the community; and
- the extent to which one's Tribal identity depends on the abundance of salmon.

The CES methods also led to an increased understanding of how investment in different salmon restoration strategies may impact human well-being (Amberson et al. 2016).



Table 3 is an overview of non-monetary assessment methods that may resonate with the unique context and diverse needs of reserves across the NERRS. We have included with each method a reference(s) that describes the assessment technique in greater detail. This brief overview of methods complements a [collection of case studies](#) on the application and assessment of CES and complementary topics in different contexts.

<b>Table 3. Non-monetary assessment methods</b>	
<ul style="list-style-type: none"> <li>● <b>ARTS</b> <ul style="list-style-type: none"> <li>◦ Performance (Gould et al. 2014)</li> <li>◦ Creative writing (Fernández-Giménez 2015)</li> <li>◦ Participatory creative processes (Ranger et al. 2016)</li> <li>◦ Visual media (Edwards et al. 2016)</li> <li>◦ Photography (O'Brien et al. 2014)</li> </ul> </li> </ul>	
<ul style="list-style-type: none"> <li>● <b>ASSESSMENT OF EXISTING INFORMATION</b> <ul style="list-style-type: none"> <li>◦ Review of literature or multimedia (Dillard et al. 2013; Leong et al. 2019)</li> </ul> </li> </ul>	
<ul style="list-style-type: none"> <li>● <b>DISCUSSION</b> <ul style="list-style-type: none"> <li>◦ Collective decision-making through discourse (deliberation) (Great Lakes Wild Rice Initiative 2020; Loomis and Paterson 2014; Kenter et al. 2016; Nahuelhual et al. 2013)</li> <li>◦ Discussion only (i.e., to inform future decision-making) (Pascua et al. 2017)</li> </ul> </li> </ul>	
<ul style="list-style-type: none"> <li>● <b>ETHNOGRAPHIC</b> <ul style="list-style-type: none"> <li>◦ Participant observation/participatory action research (Comberti et al. 2015; Kaltenborn et al. 2017)</li> <li>◦ Unstructured interview (Pascua et al. 2017)</li> <li>◦ Storytelling-oriented exchange (Kenter et al. 2016; Kaltenborn et al. 2017)</li> </ul> </li> </ul>	
<ul style="list-style-type: none"> <li>● <b>MAPPING/MODELING</b> <ul style="list-style-type: none"> <li>◦ GIS/remote sensing deskwork (not participatory) (Angradi et al. 2016)</li> <li>◦ Participatory mapping and modeling (Smart et al. 2021; Shucksmith and Kelly 2014)</li> <li>◦ Computational (Mazzotta et al. 2019)</li> <li>◦ Cultural models (Feurt 2006)</li> <li>◦ Game/simulation (Moreau et al. 2019)</li> <li>◦ Visioning/future scenarios (Kaltenborn et al. 2017)</li> </ul> </li> </ul>	
<ul style="list-style-type: none"> <li>● <b>SURVEY/SORTING</b> <ul style="list-style-type: none"> <li>◦ Q methodology (Pike et al. 2015)</li> <li>◦ Structured survey (Loerzel et al. 2017; Yoskowitz et al. 2016)</li> <li>◦ Semi-structured or unstructured survey (Pleasant et al. 2014; Martin 2014; Cooper et al. 2014; Amberson et al. 2016)</li> </ul> </li> </ul>	
<ul style="list-style-type: none"> <li>● <b>OTHER</b> <ul style="list-style-type: none"> <li>◦ Social media (Allan et al. 2015)</li> <li>◦ Transect/landscape walk (Ryfield et al. 2019)</li> </ul> </li> </ul>	

In choosing a CES method, it is important to first determine the purpose for engaging with CES. While much of this report is focused on assessing CES, CES methods can also be used for other purposes, including building relationships with potential partners and finding common ground with other organizations. In engaging in CES methods, reserves may be able to broaden their reach by expanding their potential audiences and in the process can potentially increase the diversity of users they are engaging.

In planning for engaging with CES methods, it is also important to determine the type of analyses that may be needed for the data that are gathered. Depending on the purpose, varying levels of analysis may be required. For example, if the purpose of engaging with CES is for building relationships with potential partners, there may be no analysis required (e.g., participants may be guided to take photographs of their favorite places in a reserve and share them as part of a photo exhibit). However, if the purpose is to identify CES, different types of analysis may be required (e.g., participants may be instructed to explain their relationship with the photographed places, and qualitative analysis to distill themes within the narratives may be conducted to identify the relevant CES). Further and/or different analyses may be required to monitor CES (e.g., the photography method may need to be repeated, and themes and frequencies of mention may need to be compared over time). As is the case when considering any new method, whether within the natural or social sciences, the skills and time required for analysis are important to consider when planning for engaging with CES methods.

## **SELECTED METHODS AND THEIR SPECIFIC APPLICATION**

### **Q methodology used at South Slough, Oregon:**

The social component of this project sought to better understand the value of estuaries and what successful habitat restoration looks like to different user groups. Participants in focus groups first ranked statements based on how they resonated with them and then ranked photos of salt marshes in different restoration phases, based on their visual appearance. The social values were compared with management priorities and ecological data in order to identify mismatches—where management priorities may not align with what is most valued by people. Focus group discussion was also analyzed alongside the rankings in order to identify six “personas” or types of people with distinguishable characteristics and values. Understanding these personas can help in tailoring outreach messaging. See <https://nerrsciencecollaborative.org/project/Cornu12>.

**Transect Walk at Dublin Bay, Ireland:** This study focused on assessing the cultural ecosystem service of “sense of place.” Local experts in coastal and maritime heritage were invited to participate in informal transect walks with the research team, in which the participants were asked to identify and talk about natural and cultural features of the landscape and seascape. The informal conversations were not recorded but played an important role in building relationships between researchers and the local community and also providing important context for the development of a survey on place-based values. See Ryfield et al. (2019).

**Photography in England:** This study sought to understand the contributions of woodlands to human health and well-being. At six woodland sites, participants were instructed to take photographs of things that impacted their health and/or well-being during a one-hour walk or activity. Participants were



Reserve exchange participants joined He'eia Reserve community partner Kāko'o 'Ōiwi in service learning and practiced participant observation/participatory action research while removing an invasive plant species from the coastal wetland. *Photo credit: He'eia Reserve.*

also asked to note (a) what they photographed and (b) the impact to their health/well-being. The photos were then used to guide discussion in focus groups. The notes about the photos and the focus group discussion transcripts were coded and resulted in four high-level themes. See O'Brien et al. (2014).

**Visioning/Future Scenarios at Lofoten Islands, Norway:** The goal of this study was to understand the links between ecosystem services and human well-being in a coastal fishing community. In workshops, participants were directed to identify natural and social drivers of “the good life,” in order to develop 3–4 future scenarios. Participants also developed conceptual maps of these scenarios to explore their causes and impacts. The scenarios were used to guide discussion and were also the focus of follow-up interviews. The researchers used qualitative analysis to distill their findings into four distinct narratives that describe how ecosystem services contribute to “the good life.” See Kaltenborn et al. (2017).

## MULTIMETHOD PILOT IN THE NERRS

In April 2022, He'eia NERR and Kachemak Bay NERR gathered in He'eia to pilot five distinct CES assessment methods with staff from each reserve—Transect Walks, Structured Surveys, Participant Observation, Creative Writing, and Photography—and to evaluate each method's strengths, weaknesses, and applicability within each reserve. Each of the methods was found to be useful for different purposes and audiences within different sectors of the reserves. The group also evaluated the time, resource, and skills required for each method. Further details on their findings are in a Methods Pilot Summary report (Pascua et al. 2022). Using lessons learned from the methods pilot exploration, Kachemak Bay NERR demonstrated additional art-based methods and a method inspired by a transect walk with their reserve partners. This demonstration again highlighted the potential value of these methods for building and strengthening relationships; these types of relationships are necessary for moving forward to identify and monitor CES.



## RECOMMENDATIONS FOR ADVANCING THE APPLICATION OF CULTURAL ECOSYSTEM SERVICES

### BROADEN PERSPECTIVES ON RELATIONALITY

In and of itself, the concept of ecosystem services can be used in support of the dominant paradigm of “nature as a service provider,” which emphasizes an instrumental relationship between humans and nature (James 2015) and may be at odds with certain worldviews, including those of many Indigenous and local communities. A number of efforts have aimed to counter this framing. For instance, Comberti et al. (2015) explored the idea of human communities providing services to ecosystems. Furthermore, O’Connor and Kenter (2019) recognized multiple forms of relationships between humans and the environment, which was reiterated and expanded in a global assessment on the multidimensional values of nature (Pascual et al. 2022). Identifying which of these relationships to assess in a CES analysis is important:

See different concepts of relationships between humans and the environment below (adapted from O’Conner and Kenter 2019).

- 1) how we live from the world (the environment is a pool of extractable resources);
- 2) how we live in the world (the environment is a place that sustains our values and experiences);
- 3) how we live with the world (environment or non-humans are separate entities that coexist alongside humans); and
- 4) living as the world (humans and non-humans are not separate, exemplified by Indigenous worldviews regarding kinship, the Deep Ecology movement, etc.).



Ninilchik Traditional Council Executive Director, Ivan Encelewski, and Kachemak Reserve Manager, Coowe Walker, retrieve the traditional basket art installation during a cultural celebration on the banks of the Niqnalchintnu River. *Photo credit: Kachemak Bay Reserve*

### A Research Perspective

“As an ecologist, I spend a lot of time and energy exploring and researching how natural ecosystems are connected—in particular how landscapes are linked to stream productivity and how the productivity supports us, as people. I love the work itself, learning, and being outside, but I also hope that the work is relevant to people and that understanding how our ecosystems are linked will enable us to make better management decisions.

In 2021, the Kachemak Bay NERR participated in a cultural celebration with the Ninilchik Traditional Council (NTC) of the neighboring Tribal community. Everyone came together on the lower reaches of the Niqnalchintnu River, with the village on the far shore. The cultural celebration included the upstream deployment and river mouth recapture of a traditional basket artistic installation, designed by artist Argent Kvasnikoff. As soon as the basket started floating, some of us could not keep from running along the riverbank and into the water to share in the basket’s ride as it rode the current down to the mouth. For that time at least, I felt I was living as the world, sharing the fun with Ivan, the Executive Director of the NTC, who had the honor of guiding the basket when it became stranded on sandbars. For me, the cultural celebration showed something important that isn’t captured by the metrics measured in the ecological work that I do: the connection of people to place through joy and fun.”

—Coowe Walker, Reserve Manager, Kachemak Bay NERR

## BUILD RELATIONSHIPS OF TRUST

Meaningful collaborations arise from mutually built relationships between and across reserve staff and the partners, collaborators, and community members who care about the coastal and estuarine environment within and around reserves. This is especially true in the explorations of CES. Trust is a key element of all meaningful collaborations; however, in many instances the timeline for requesting collaborations is hastened without thoughtful approaches to establishing trust and relationship between all parties involved. Conversely, intentionally creating time and space for two-way learning—for instance, among researchers, educators, students, government and state agencies, resident, place-based and Indigenous communities—can yield significant long-term outcomes for any



Local students learn about the relationships between people and place that enable Indigenous aquaculture in Hawai'i. Photo credit: F. Reppun.

reserve collaboration. Just as the development of organizational collaborations requires a specific process, community engagement and relationship building also rely on their respective processes,

### A Research Perspective

“Here in He‘e‘ia, our stewardship organizations have asked us to help by being a ‘buffer’ for researchers requesting to conduct research in their space. Together with the stewardship organizations, we have helped to develop a stepwise research request protocol and standards that researchers follow to first establish relationships with the place and people, to meaningfully engage in co-development of research questions, and to co-produce knowledge. This set of standards, or *kūlana*, defines ways in which researchers should communicate about the work that is collaboratively developed with the people of the place, with a long-term focus in mind for the research to benefit their overall goals. While this is still a work in progress, we find that this protocol puts the power back into the organization’s hands, to be able to say yes or no to specific research, and request edits to their proposed work to better fit the organization’s needs and projected scope of ongoing work. This also addresses issues of equity by providing the organizations the power to manage data, for data protection and sovereignty.

We also work with our budding *haumāna*, or students, to uphold these concepts for building *pilina*, or connections, and trust with the community where they conduct their work. Within our He‘e‘ia NERR Graduate Assistantship program, students follow guidelines that emphasize ways to demonstrate reciprocity in the students’ work, through hands-on work such as volunteering, providing technical assistance, or creating other products (educational, outreach, etc.) requested by the community. The students also are required to schedule meetings for co-development to discuss intentions and goals and for co-validation of preliminary results to iteratively incorporate different knowledge systems into data analysis and interpretation. These are just some of the ways in which we try to incorporate this idea of building trust as a CES framework within our reserve.”

—*Shimi Rii, Research Coordinator, He‘e‘ia NERR*

including time spent at the place, humility, and willingness to learn. Examples of these opportunities can begin with events such as community and stewardship volunteer days, site exchanges among different parties, and social events aimed at equity and justice between different parties. It is during moments of fellowship that trust, and subsequently collaborative reciprocity, can be built to further CES frameworks among differing parties.

### **CLARIFY WHO BENEFITS AND HAS ACCESS TO BENEFITS AND POTENTIAL TRADE-OFFS OR UNEQUAL IMPACTS ACROSS USER GROUPS**

Communities are not homogeneous, and within a community there are often multiple types of CES and related values across space and time (Kenter et al. 2019; Fagerholm et al. 2012; Fagerholm et al. 2016; Cabana et al. 2020; López de la Lama et al. 2021). Zhou et al. (2020) found that CES are not distributed randomly across the landscape but rather clumped in their distribution depending on socio-demographic factors. People have different relationships within

an ecosystem, for instance across social diversity— income, gender, livelihood, etc.—and related power structures or across different land tenure systems (Hausner et al. 2015; Elwell et al. 2020; Garcia Rodrigues et al. 2022). For instance, Chan et al. (2019) highlighted the different perceived impacts from a marine protected area (MPA) in the Caribbean across groups: inshore fishers felt significantly greater negative impacts, particularly related to their livelihoods and identity, than off-shore fishers, who perceived neutral to positive impacts from the MPA (Chan et al. 2019).

Individuals assessing CES should be clear about who is represented in the assessments and who is not. Chaudhary et al. (2018) recommended analyzing trends and patterns of access to benefits—Are the identified CES primarily benefiting local residents? Are they primarily important for visitors to an area? Are there perhaps competing interests between these different user groups? Researchers conducting the assessments should also be mindful of factors that may impact their own unconscious bias (e.g., institutional

#### **A Training Perspective**

“Engaging with CES methods can serve those in the NERRS tasked with connecting research to people through decision-making in coastal communities. To start, they can broaden the reach of the reserves. Culturally relevant methods can lead to new collaborative relationships among people or groups who may not currently know about the NERR or perceive the NERR as an organization they want to work alongside. Understanding social norms and values serves the Kachemak Bay NERR in developing support for ethical, equitable research and screening potential research partnerships and student projects. Trusting relationships lead the way towards meaningful knowledge co-production, community understanding, and participation in decisions that affect overall well-being.

The Coastal Training Program at KBNERR designs programs that recognize Indigenous Peoples’ and local knowledge and targets diverse decision-makers. Revealing CES and relationships to place can be a stepping-stone to understanding what structures, strategies, or actions in current plans or policies may be not serving or may be in conflict with individual or collective priorities. By identifying and acknowledging local CES, we enhance our capacity to integrate non-economic benefits and values that people hold. With CES we move toward rectifying the inequities and barriers to inclusion in research and policy processes and relationships.”

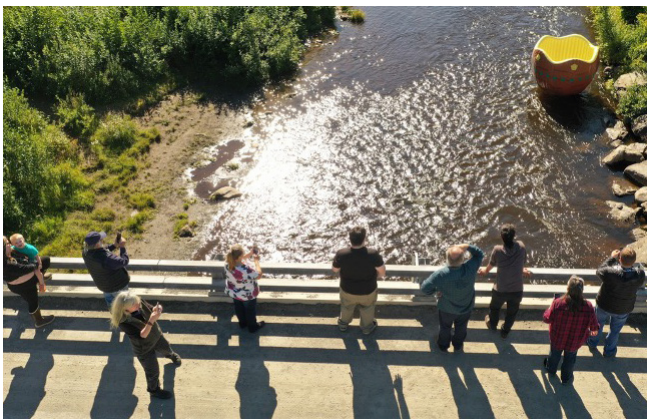
—*Syverine Bentz, Coastal Training Program, Kachemak Bay NERR*



## A Stewardship Perspective

“Working collaboratively with the community group ‘Homer Drawdown’ on Kenai Peninsula peatland conservation has brought forth diverse perspectives and creative solutions in our efforts to put peat on the map. Drawdown members’ backgrounds range from artists to educators, business owners to scientists, and much more in between. People bring their own unique experiences with peatlands to the group, which in turn creates a more holistic understanding of the benefits these ecosystems provide. Hearing stories of generations of berry picking, understanding how peatlands support salmon streams, learning to sketch the water-loving plant residents, and seeing the charismatic moose and cranes who frequent these places all help build shared values around our peatlands, which we hope ultimately results in proactive stewardship.”

—Jacob Argueta, Research and Stewardship Technician, Kachemak Bay NERR



Tribal partners and Reserve staff enjoy one another's company while gazing at the Niqnalchintnu River. Photo credit: J. Argueta.

representation, academic disciplines and training, etc.). Strategic and equitable partnerships with local communities can help identify CES that otherwise may not have been considered. Co-production of knowledge frameworks (i.e., Ellam Yua et al. 2022) are tools to address equitable inclusion in research practices.

## CONSIDER BOTH INDIVIDUAL AND COLLECTIVE BENEFITS

Often the unit of measurement of CES is presumed to be the individual, building on economic models in which collective outcomes can be explained as the result of many individual decisions (Winthrop 2014). This assumption contrasts with collective action in which actions taken by a group result in

sharing benefits and costs (Barnaud et al. 2018). While understanding priorities and behavior at the individual scale may reveal new insights, assessing CES solely at the individual scale can undermine group and social values related to the natural world and may bias towards the often dominant cultural norms that favor individual actions over communal ones (Kenter et al. 2015). Sometimes the more appropriate unit of analysis is at a collective or group level (Kenter et al. 2015; Satterfield et al. 2013). For example, a group setting should be used when the goal is to promote discussion and identify community-driven strategies (Leong et al. 2019). Group deliberative discussion can be a useful tool to support these goals. Arts-based and ethnographic methods including storytelling could also be effective to enable community building and to elicit and explore issues that would likely not have surfaced with other approaches. To fully understand CES in a given location, it is important to recognize the presence of both individual and shared cultural values and consider what is most relevant in order to reach sustainable long-term solutions. With complex networks of individuals and entities who benefit or relate to ecosystems, consider ways to work with people who may make individual choices and actions to conserve CES as well as decision-makers engaged in policies promoting stewardship (Walker et al. 2021).



Local community engagement is one important way the Kachemak Bay Reserve identifies the diverse values of peatlands. *Photo credit: J. Argueta.*

## USING MIXED METHODS APPROACHES CAN REVEAL A RANGE OF VALUES

Given the complex nature of CES categories and their interrelationships, use of multiple assessment methods can help provide a fuller picture of CES by eliciting a deeper understanding of the values in a given place than one method alone (Hirons et al. 2016). In particular, researchers found that providing some structure (for instance, predefined categories) can be useful in expanding participant reflections on what constitutes CES and that this approach can

be complementary to more open-ended interview methods that bring to light important connections between CES factors (Hirons et al. 2016; Pascua et al. 2017; Raheem et al. 2019). More specifically, some CES (e.g., awe, or inspiration) might be especially difficult to elicit with overly structured assessments that target specific benefits but provide little to no context about the environmental setting itself (Satterfield et al. 2013). Instead, narrative-based techniques may be better suited to identify these categories of CES by engaging participants in a conversational setting that encourages reflection on important values while ensuring prompts are not guiding the interviewee in a particular direction. Similarly, narrative-based techniques with appropriate prompts were used by Klain and Chan (2012) to elicit people's values related to the ocean; they found in-person interviews were useful for exploring intangible values and yielded richer results than paper- or web-based surveys. The study also found that while spatial mapping techniques could yield rich results for many values related to ecosystem services, some intangible values were difficult to identify (e.g., spiritual value, peace, sense of place).

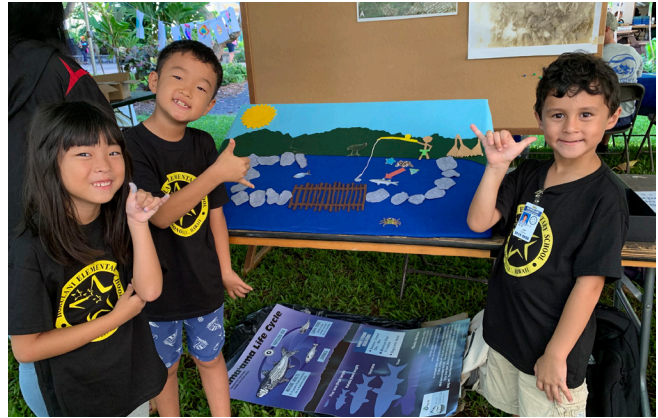
### An Education Perspective

“Educational programs for children and adults in the He‘eia NERR use multiple methods to help participants identify and, ultimately, enhance the cultural ecosystem services they receive and contribute to in the reserve. ‘Oli (chant) and mo‘olelo (stories) are used to remember and contextualize traditional names of mountains, wetlands, reefs, and islets, providing participants with a sense of continuity due to the presence of ancestors associated with the visible, named features. Engaging the senses of taste and touch through food and hands-on work are extremely effective in bringing out cultural and social value that people associate with that particular place or with another place with which they have a close relationship. We also use newer tools such as 3D printers, computer games like Minecraft, and georeferenced satellite images to create models of the whole watershed to conduct virtual transect walks and surface new perspectives on places that people call ‘home.’ Whenever we have extended contact time with an audience, we allow participants to conduct projects of their choosing with a creative output: art, tools, gardens, recipes, videos, presentations—this allows them to develop and display their personal relationship to the place.”

—Frederick Reppun, Education Coordinator, He‘eia NERR

## CONSIDER WHAT YOUR INDICATOR IS ACTUALLY MEASURING

The types of metrics or indicators used to measure CES can vary considerably (see Table 3), depending on the amount of time and other resources available. Some initiatives only measure performance indicators that are simple to gather and summarize, such as how many people attended a meeting. But there is a critical distinction between measuring the opportunity to support thriving human communities (for instance, measuring numbers of visitors to a protected area to demonstrate visitors' value of the site) and providing evidence of impact—the extent and depth of the change in benefit to well-being of an experience or an initiative. Practice- and meaning-based indicators would measure benefits or contributions to well-being—for example, measuring trends in people's



Local students use participatory creative media to describe their relationships to place in He'eia. Photo credit: S. Rii.

sense of place or assessing changes in values as a result of a particular experience. Measuring a suite of CES is an important first step; however, deepening the application of CES in resource management and stewardship may more closely align with assessing the impact of a CES on human well-being.

### An Indigenous Perspective

“Indigenous worldviews do not perceive the dividing lines between humanity and nature that are foundational to the neoclassical worldview that dominates conventional thinking. We know that the health of our environment is our health. As long as the land is sick, so, too, will be our people. As we endeavor to heal our lands and our waters, we heal ourselves, our families, and our communities in the process. To address substance abuse in our community, we plant trees. We need ways to measure how the dots are connecting, not just how many dots we have. Doing so will help us to show the true value of our work.

In our assessment of CES methods, there were some clear gaps between what we have experienced in working with Indigenous Peoples and local communities (IPLCs) and the aspects of well-being that are measured in the realm of scholarly literature. For example, the gravitational pull towards focusing on economics has influenced terminology in the categories, such as use of the word livelihoods rather than lifeways—the latter being a term that is increasingly used in the realm of Indigenous studies. While we did not come across a method for quantifying CES in terms of lifeways, that should not stop researchers from designing a new methodology to explore this within the context of CES, if that puts things in a framework that is more aligned with IPLC priorities in your area.”

—Kawika Winter, Director, He'eia NERR



## CONCLUSION

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Considering CES illuminates the linkages between people and their environment in coastal and marine ecosystems. Measuring, monitoring, evaluating, and otherwise applying or engaging with CES is, therefore, critical in successful natural resource and reserve management. Ignoring or failing to meaningfully incorporate CES into management plans and program implementation can undermine their efficacy and sustainability, thereby reinforcing structural hegemony within the NERRS.

How CES are measured and evaluated is important. Furthermore, the process of identifying the appropriate tools and methods to elicit and understand CES in a particular context can reveal key paths for partner and collaborator engagement and for achieving management objectives. And while CES can be difficult to measure and assess beyond monetary methods, we hope that this document can be a guide and resource for resource managers and decision-makers seeking to engage CES in a comprehensive and, hopefully, curious fashion.

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**National Estuarine  
Research Reserve System  
Science Collaborative**



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