ENGAGING WITH CULTURAL ECOSYSTEM SERVICES IN THE NERRS TO SUPPORT THRIVING HUMAN AND NATURAL COMMUNITIES: A RESOURCE GUIDE

Rachel Dacks, Syverine Bentz, Jessica Brunacini, Casey Ching, Chris Feurt, Kristen Goodrich, Ingrid Harrald, Empress Holliday, Luciana Ranelli, Shimi Rii, Aimee Sato & Lauren Sutton

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Dacks et al. 2025. "Engaging with Cultural Ecosystem Services in the NERRS to Support Thriving Human and Natural Communities: A Resource Guide". A white paper prepared with support from a 2022 NERRS Science Collaborative Science Transfer Grant.

Cover: (*Top*)During the installation of the SWMP station Kaho'okele, He'eia Fishpond stewards worked with us to stake out sites, co-develop design, and help with installation. *Photo by: Keli'i Kotubetey.* (*Bottom*) Docents walking on a boardwalk over the Little River Salt Marsh at the Wells Reserve. *Photo by: Wells NERR.*

National Estuarine Research Reserve System Science Collaborative

Preamble

Cultural Ecosystem Services

This Resource Guide was produced as part of the NERRS Science Collaborative project **Reciprocal Relationships in Reserves: Establishing a Community of Practitioners for Identifying and Using Cultural Ecosystem Services Approaches**.1 This project sought to examine and share how Reserves are already engaging with Cultural Ecosystem Services (CES) (both formally or informally), to encourage a larger number of Reserves to intentionally incorporate the intangible benefits of coasts and estuaries into their work.

This project was motivated by another NERR Science Collaborative Project, **Cultural Ecosystem Services in Estuary Stewardship and Management**2, which partly focused on methods for identifying and assessing CES. However, in the process of piloting potential methods, we realized that these methods were useful for other purposes as well. For example, we learned that these methods could be used to build relationships that are needed to meaningfully engage with CES.

We commonly use the phrase "engage with CES" because it encompasses the many ways in which CES are part of the work done across the NERRS. For example, across the NERRS, Reserves "engage with CES" through:

- Hosting or participating in celebrations of places, species, seasons, etc.
- Facilitating access that allow people to experience CES
- Facilitating stewardship opportunities
- Hosting volunteer opportunities across all NERR sectors
- Providing environmental and place-based education
- Conserving resources and places for future generations

However, we realize that "engaging with CES" is not a common phrase and may be confusing and even the use of CES may seem overly jargony. Other concepts and frameworks that are similar to CES include nature's contributions to people, biocultural diversity, human dimensions, social-ecological systems, reciprocal relationships with nature, and relational values.

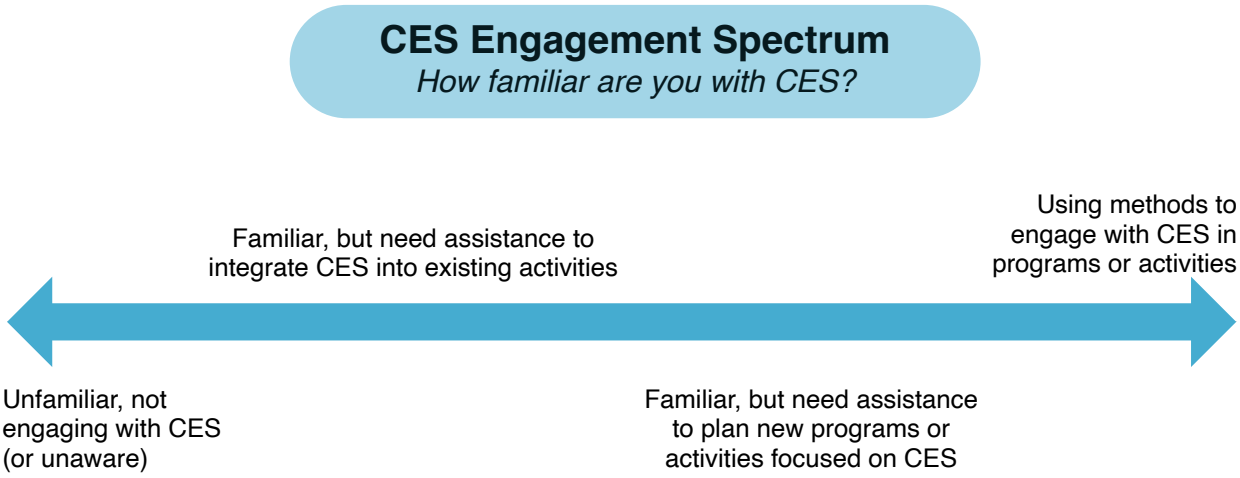
Why we created this resource guide

Over the last several years, there has been an increased focus on human dimensions across conservation, restoration, and resource management contexts, including within the NERRS. In parallel, there has also been confusion and sometimes a feeling of being overwhelmed by yet another thing that "we have to add to our plates." In response, we created this Resource Guide for a wide range of users. In the beginning of our project we conducted a number of consultations with users who were interested in CES to better understand the status of CES work in the NERRS. We found that there are users with different familiarities with CES, that could be conceptualized as falling on a spectrum from being completely unfamiliar with CES and wanting to know more, conceptually and why it's worth the time and effort on one end to people who are ready to design activities framed by CES. Somewhere in the middle of the spectrum are folks who are familiar with CES and interested in incorporating into existing activities or programs, but may need a bit of guidance in order to do so.

1 https://nerrssciencecollaborative.org/project/Dacks_Sterling22

2 https://nerrssciencecollaborative.org/project/pascua20

We hope this guide provides resources to 1) clarify what CES are and why they are worth engaging with; 2) highlight how programs and activities are already engaging with CES (whether or not they use this language), 3) make small adjustments to existing programs or activities in order to be more intentional about engaging with CES, and 4) provide examples of programs or activities that were motivated by a desire to engage with CES.



How to use this guide

This guide contains three types of resources: background resources, job aids, and case studies. These three types of resources were designed with three types of users in mind. The **background resources** may be useful if you are interested in better understanding what CES are and why it might be valuable for you to engage with CES in your work. The job aids provide examples of how different activities can be added to your existing programs in order to engage with CES. The **case studies** provide examples of programs that were intentionally designed to fully engage with CES.

This guide is not intended to be read from cover to cover; it can be browsed like a cookbook, or you can skip to a specific section if you know what kind of "recipe" you are looking for! It may be helpful to first assess where you might fall on the CES engagement spectrum, in order to identify which resources may be more useful for you.

Cultural Ecosystem Services

Don't know where to start? You're in the right place!

This section is designed to introduce you to resources to better understand what Cultural Ecosystem Services are, how they are experienced in the NERRS, and why they might be important to think more about.

Cultural ecosystem services and related concepts

Cultural ecosystem services (CES) are one of four categories within an ecosystem service framework (along with supporting, provisioning, and regulating services). CES are commonly described as the non-material benefits that humans receive from their interactions with the environment.

In this Guidance Document we will focus on CES, but it's important to acknowledge that there are several other terms, concepts, and frameworks that relate, and may even overlap with CES. So, it's possible that your work may involve CES, but you just call it something different!

For example, in recent years, there has been an effort across the NERRS to think more about **human dimensions** in the Reserves. The NERRS Human Dimensions Working Group defined human dimensions in the NERRS as:

> "How and why people value a place and its natural resources, what benefits people seek and derive from those places and resources, and how people affect and are affected by those places, resources, and their management[1]."

Another framework that overlaps with CES is **social-ecological systems** (SES). SES can be thought of conceptually as the systems in which social and ecological dimensions are inextricably linked, or in more structured ways through SES modeling, in which these links are specified, examined, and in some cases, quantified (Partelow 2018).

Biocultural diversity, a concept also based on inextricable links between people and their ecosystems, specifically considers the coevolution of biological and cultural diversity (Maffi 2007). Building from this core concept of biocultural diversity comes **biocultural restoration** (Chang et al. 2019), or the restoration of ecosystems that focus not only on restoring the ecological relationships in the system, but also the human-environment relationships.

While CES and other ecosystem services are usually considered benefits that flow in one direction from an ecosystem to people, more interdisciplinary and transdisciplinary influences have caused a paradigm shift in the sustainability sciences to think more relationally (West et al. 2020). As a result, other frameworks that describe human-environment relationships have been developed to also recognize the benefits that flow from people to their ecosystems (e.g., **Services to Ecosystems** (Comberti et al. 2015)), viewing human-nature connections as **reciprocal relationships,** with benefits flowing in both directions.

1 NERRS Human Dimensions Workgroup. 2022. The People of the Place: A Plan to Consistently Collect, Compile, and Integrate Human Dimensions Information and Activities into the Operations and Decision-making of the National Estuarine Research Reserve System.

Resources to learn more about CES

A previous NSC Catalyst Project focused on strengthening the conceptual foundation for CES in the NERRS developed many resources to learn more about CES.

What are CES?

Common Cultural Ecosystem Services (CES) Frameworks and Categories
Expanding and Deepening the Application of Cultural Ecosystem Services in Estuary Stewardship and Management

Eleanor J. Sterling, Pua'ala Pascua, Erin Betley, Nadav Gazit, Amanda Sigouin

There are a few key internationally recognized frameworks commonly cited in CES work. These include the Millenium Ecosystem Assessment (MEA or MA) and Common International Classification of Ecosystem Services (CICES). While researchers commonly cite and reference these CES categories, they should not be seen as exhaustive. Other more recent CES initiatives have expanded the possible values and categories to be considered (see our compilation of case studies for more information). Our scan of the CES literature helped us to compile a list of commonly used CES categories. While this list aims to provide a substantive picture of the types of CES that can be measured, it should not be seen as exhaustive. This list of categories draws from the research encountered in our literature search; see Sterling et al. in prep. for additional details.

List of commonly used CES categories with descriptions and examples

Activity: Recreation, Sport, Leisure, Ecotourism
Description: Includes a range of opportunities to be physically active or relax in a natural environment.
Example: *Enjoying spending time on the beach or kayaking on a river.*

Aesthetics
Description: 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.).
Example: *Enjoying beautiful mountain views.*

Bequest
Description: Importance of maintaining landscapes and seascapes for future generations.
Example: *Protecting vulnerable habitats and engaging in sustainable harvesting practices so that coastal wetland resources are available for future generations.*

Ceremony/Sacred
Description: Places, plants, animals, or other natural elements that are sacred and/or important for ceremonies.
Example: *Maintaining knowledge of species used for specific cultural ceremonies, including when and how to engage in sustainable harvesting of those species.*

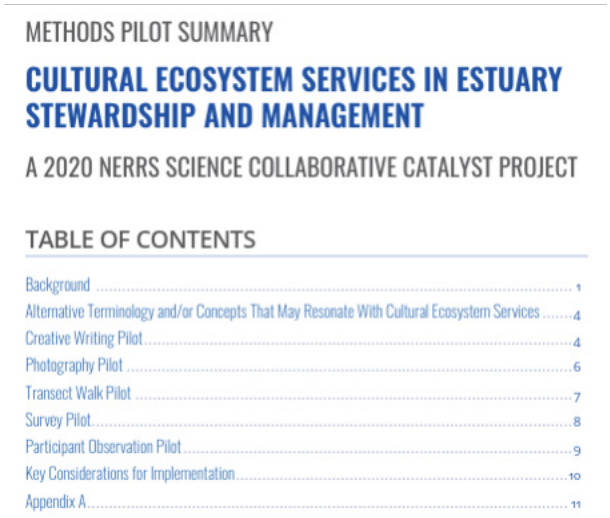
Cultural Heritage
Description: Multi-generational interactions/connections with landscapes and/or resources through cultural traditions, stories, and/or past events, etc.
Example: *Benefit from knowing that one's ancestors resided in a particular place or engaged in a particular occupation over time.*

Common Cultural Ecosystem Services (CES) Frameworks and Categories

This factsheet provides brief descriptions of some common CES categories.

To identify specific examples of CES in the Reserves, our team has developed a list of examples for each category. A description of this process and the list can be found in **Job Aids: Identifying CES in Reserves.**

How to identify or assess CES?



METHODS PILOT SUMMARY

CULTURAL ECOSYSTEM SERVICES IN ESTUARY STEWARDSHIP AND MANAGEMENT

A 2020 NERRS SCIENCE COLLABORATIVE CATALYST PROJECT

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Additional methods for identifying CES were piloted as part of this project. Read more about using these methods in: **Methods Pilot Summary: Cultural Ecosystem Services in Estuary Stewardship and Management.**

What CES are experienced in the NERRS?

Celebrations

This **webinar** explores different celebrations that occur across five NERRs. In celebrating our estuaries and the ecosystems and species they support, we experience CES.

Volunteer Activities

This **webinar** explores the roles of volunteers across five NERRs. Volunteers are often motivated to serve the NERRs because of the CES they experience in their interactions with NERRs.

Why is it important to identify and assess CES?

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?)[2]. Below is an overview of non-monetary assessment methods that may resonate with the unique context and diverse needs of Reserves across the NERRS. Included with each method is a reference that has utilized the assessment technique and describes the method in greater detail. This brief overview of methods complements a collection of case studies on the application and assessment of CES in different contexts.

Arts
- Performance[34]
- Creative writing[35]
- Participatory creative processes[36]
- Visual media[37]

Assessment of Existing Information
- Literature or multimedia[38,39]

Discussion
- Collective decision-making through discourse (deliberation)[40–43]
- Discussion only (i.e., to inform future decision making)[44]

Ethnographic
- Participant observation/Participatory action research[45,46]
- Unstructured interview[47]
- Storytelling-oriented exchange[42,46]

Mapping/modeling
- GIS/Remote sensing deskwork (not participatory)[48]
- Participatory mapping and modeling[49,50]
- Computational[51]
- Cultural models[52]
- Game/simulation[53]
- Visioning/Future scenarios[17,46]

Survey/sorting
- Q-methodology[54]
- Structured survey[53,55]
- Semi-structured or unstructured survey[56–58]

Other
- Social media[7,59]
- Transect/Landscape walk[59]

Recommendations when Advancing Application of Cultural Ecosystem Services

Broaden Perspectives on Relationality

In and of itself, the concept of ecosystem services (ES) can support the dominant paradigm of "nature as a service provider", which emphasises an instrumental relationship between humans and nature[60]. A number of efforts have aimed to counter this framing, like O'Connor and Kenter[61] who recognize multiple forms of relationships between humans and the environment: 1) how we live from the world (e.g., the environment as a resource), 2) how we live in the world (the environment as a place that sustains our values and experiences), 3) how we live with the world (nature or non-humans as beings who co-exist alongside humans), and 4) living as the world (exemplified by Indigenous worldviews regarding kinship, the Deep Ecology movement, etc.). Identifying which of these relationships to include in a CES analysis is important.

Clarify who benefits, access to benefits, and potential tradeoffs or unequal impacts across user groups

Communities are not homogeneous and within a community there are often multiple competing CES and related values across space and time[62–67]. Individuals assessing CES should be clear on who is represented in the assessments and who is not.

Chaudhary et al.[68] recommend analyzing trends and patterns of access to benefits — Are the 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 representation, academic disciplines and training, etc). Strategic and equitable partnerships with local stakeholders can be useful to identify CES that otherwise may not have been considered.

Expanding and Deepening the Application of Cultural Ecosystem Services in Estuary Stewardship and Management

This resource explains what CES are, why they are important in the NERRS context, and how they can be assessed.

CES in Evaluation of Training

Brief synopsis

Evaluation of training opportunities across the NERRS (e.g., Coastal Training Program activities and Teachers on the Estuary programs) has typically focused on sector-required, post event surveys where participants self-report on metrics of learning and intent to apply new knowledge.

Recently, the Coastal Training Program (CTP) decided to remove the requirement of using a standard template for evaluations, thereby opening up evaluation options to different formats and questions. This is an opportunity to measure additional outcomes for participants beyond knowledge and awareness, attitudes and perceptions, and skills development. CTP has come to realize that learning and engagement opportunities can serve additional purposes to meet NERR goals, and be just as fulfilling to local communities without aiming to achieve the previously specified outcomes.

How does this relate to CES?

Evaluation may utilize culturally relevant, participatory approaches that effectively and respectfully engage and solicit responses from community through approaches such as storytelling, oral histories, photo elicitation, and collaborative mapping.

CES can be identified or assessed in evaluation by including questions that address values and non-material benefits, such as **cultural identity, spiritual connection, recreation, reciprocal relationships,** and **sense of place**. By designing evaluations with CES in mind, Reserves can better understand the multidimensional **social values** that learning opportunities provide to people and communities.

Why is this worth doing?

To ensure NERRS are places where human and natural communities thrive, evaluation across the NERR System should ensure that estuarine management is focused on more than just ecological conditions, by incorporating the social and cultural connections that communities identify in these ecosystems. This approach fosters stronger community partnerships, promotes inclusivity, and enhances the relevance and effectiveness of management strategies.

Assessing CES through evaluation can result in a holistic understanding of how cultural values intersect with ecological priorities, improving policy and management outcomes based on the well-being of local communities. By recognizing and safeguarding cultural values, the NERR System contributes to the resilience of ecosystems, the communities that depend on them, and the perpetuation of place-based cultural practices.

Resources

- **CES Evaluation Postcard Example**
- **CES Evaluation Post Event Survey Example**

CES in Fellowships/Internships

Brief synopsis

The Reserve system has access to many opportunities for working with undergraduate and graduate students through scholarships, fellowships, and internships. For example, Reserves can host **Hollings Undergraduate Scholars**[1], **EPP/MSI Undergraduate Scholars**[2], and **Margaret A. Davidson Graduate Fellows**[3]. Any sector within the NERRS that is interested in conducting a CES-related project can apply to host undergraduate or graduate scholars with relevant skills through these programs. In the case of the Davidson Fellowship program, Reserves can include a CES-related management need in their recruiting materials to potentially recruit a fellow with interests in CES. Additionally, many colleges and universities provide their students with funded internship opportunities (e.g., Undergraduate Research Opportunities Program (UROP) and Research Experiences for Undergraduates (REU)) that Reserves can take advantage of to conduct CES projects with undergraduate or graduate scholars.

How does this relate to CES?

Reserve staff from any sector can partner with fellows and interns to carry out projects related to CES. Doing so increases the capacity of the NERRS to understand how Reserves foster CES in the system.

Recent examples of Reserve's working with students to explore CES topics include:

- **Tijuana River National Estuarine Research Reserve (TRNERR) 2024-2026 Davidson Fellow:** TRNERR's Coastal Training Program crafted a management need, that complemented established biophysical priorities, to understand challenges (including psychosocial) occurring within coupled human and natural systems. This management need requires the application of interdisciplinary science and practice of boundary spanning. This led to the recruitment of a City & Regional Planning PhD student interested in conducting CES-related research on access in the highly complex socio-ecological setting of the Tijuana River Watershed. The Fellow will investigate different frameworks that account for CES to find the best fit for the Reserve's tri-national context (US-Mexico-Kumeyaay). They will also build on existing knowledge of **culturally important places, practices, and processes** within the broader Tijuana Estuary landscape using place-informed methods. In the pursuit of more equitable access to land for **culturally meaningful practices** (especially in urban areas), the Fellow will also expand upon their place-based expertise in order to to apply their findings to other parks and protected areas, working toward a career in academia or civil service where these concepts and frameworks can be furthered.

1 https://www.noaa.gov/office-education/hollings-scholarship
2 https://www.noaa.gov/office-education/epp-msi/undergraduate-scholarship
3 https://coast.noaa.gov/nerrs/research/davidson-fellowship.html

- **Wells NERR (WNERR) 2025 Hollings Scholar:** WNERR's Education sector will work with a Hollings Scholar in Summer 2025 to explore how volunteers engage with and experience CES when they are working at the Reserve. The undergraduate student will conduct a survey with volunteers to investigate questions including: how does spending time at the Reserve impact volunteers' **physical and mental health / wellbeing**? How does volunteering affect people's sense of place and connection with the Reserve? Does participating in stewardship activities provide volunteers with a **feeling of satisfaction or fulfillment**?

Additionally, fellows and interns who are able to spend time physically engaging with the landscapes and ecosystems at their host Reserve may themselves experience the benefits of CES, which could positively impact their educational experience. This can be fostered by providing fellows and interns with an orientation or introduction to the Reserve's people, places, and habitats.

Why is this worth doing?

Engaging CES across the lifespan of internships and fellowships (e.g., from developing position descriptions to the fellowship activities themselves) can increase the capacity of Reserves to conduct human dimensions research while generating new knowledge on the role of CES within these environments. The work of interns and fellows can, and has, directly informed management practices, leading to more effective and sustainable conservation strategies. Additionally, host Reserves as well as fellows and interns benefit by gaining interdisciplinary skills. For example, fellows and interns who have more of a background in biophysical science can learn to apply social science tools, while reserve staff who have limited experience with human dimensions research can learn new approaches from fellows and interns who are trained in social science. This enriched educational experience not only broadens students' expertise but can also contribute to higher rates of recruitment, retention, and graduation, ultimately strengthening the future workforce in environmental research and conservation. In addition, as ambassadors for addressing NERR priorities and management needs, students play a crucial role in fostering relationships between academia and Reserve management.

Resources

- Wells NERR's 2020-2022 Davidson Fellow Jessica Brunacini's research project exploring people's connection to place: **https://tinyurl.com/JBWells**
- Lake Superior NERR's 2020-2022 Davidson Fellow Molly Wick's research investigated how and where people in the community experience benefits from waterways: **https://tinyurl.com/mwLSNERR**

CES in Research Protocol

Brief synopsis

Designing collaborative, community-engaged research and monitoring in the NERRS has largely focused on identifying "end user" needs. During project design, there are underutilized opportunities to ensure that projects align with cultural values and contribute to the reciprocal relationships between people and place. Explicit protocols to guide researchers in their activities can be helpful for prioritizing the co-production of knowledge with local communities. He'eia NERR has established place-based and organization-specific protocols with their co-management partners, and Kachemak Bay NERR is designing protocols with Alaska regional Tribal nonprofit partners to authentically partner with Indigenous people and local communities.

How does this relate to CES?

As part of the research protocol in He'eia, potential researchers must respond to questions regarding both the researcher's **relationship to place** and to community, and how they intend for the project to contribute to sustaining **cultural values** and reciprocal relationships with place within the community. Questions include :

- What is your relationship with [NERR Site]? Please describe your personal and professional connections to the place. If you don't yet have one, why do you want to work in [NERR site]?
- Have you provided service through community workdays or volunteer events in [NERR Site]? If yes, please describe.
- How can the proposed research contribute to [NERR Site] or their partners' missions, and how does your research benefit stewardship, restoration, and/or management of [NERR site]?
- [NERR Site] and their partners request that all research teams contribute to the community-based restoration efforts, through participation in volunteer work-days, educational efforts, technical assistance, or other means, as appropriate. We hope this type of engagement also leads to better research outcomes. Please describe how your research team plans to contribute to the community during the course of your proposed research.
- What will be the products and outputs of your research? Who will use them and how will they be used?

He'eia NERR, Paepae o He'eia, and The Nature Conservancy gather to check out boat damage on reefs in Kāne'ohe Bay as part of initiating research and understanding community needs, lead by Uncle Gabby Kawelo, a long time fisher and lineal descendant of Kahalu'u. Photo by Shimi Rii.

He'eia NERR Graduate Student Claire Atkins sharing preliminary data results with partners while (not after) she conducts her analyses to finish up her dissertation chapter, in order to incorporate CES and other human dimension perspectives into her research results. Photo by Shimi Rii.

Why is this worth doing?

This protocol is a step in moving away from extractive research, or research that prioritizes the perspectives and benefits to researchers, where researchers primarily take knowledge and data from communities without adequately involving them in the process. The process ensures that projects conducted in the NERRS truly benefit local communities.

This protocol trains researchers (including students) to think critically about the purpose and intent of their work, and provides a deeper **connection to the people and places they work**, leading to a more holistic research and educational experience and in turn, increased fulfillment. The protocol also provides communities with the agency to set their own terms on how they would like to conduct research at their sites, with whom, and on what topics: they may be able to request assistance with personnel, equipment, supplies, or general site maintenance costs to offset time and space taken for research; or, they can specify which study sites they may prefer to obscure exact sampling locations in publicly shared data.

Related resources

- **Research Expectations**

Laulima Workdays

Brief synopsis

In the Hawaiian language, *laulima* means "many hands" (working together). The He'eia National Estuarine Research Reserve (NERR), hosts weekly volunteer opportunities, Laulima Days, for our network (University students, faculty, staff, and partners), where we gather to lend our hands towards community-based restoration efforts with our partners in He'eia. The Laulima Days are organized by the Stewardship Coordinator, and rotate around weekly to community partners with biocultural restoration activities such as invasive species removal, outplanting, building or maintaining indigenous agro-ecology and aquaculture systems.

Volunteers partaking in biocultural restoration of a wetland as part of a Laulima Day in He'eia Reserve (left). Volunteers removing non-native, invasive mangroves as part of a Laulima Day at Moku o Lo'e, He'eia Reserve (right). Photos by He'eia NERR.

How does this relate to CES?

The profound effects of engaging with nature are widely acknowledged, with a growing recognition of the advantages of purposeful activities within natural settings, such as participation in environmental volunteerism. In 2024, the He'eia NERR developed a collaborative social-ecological research project with a graduate student to start to understand how we might measure the contributions of Laulima Days to the NERR System's vision of "thriving people" in the estuary and extended watershed community. We first conducted interviews with graduate students who participate in Laulima Days, and are currently conducting semi-structured surveys with an extended group of Laulima Day participants. Preliminary results indicate that Laulima Day participation contributes to a deepened **sense of place, social connections, sense of purpose,** and **inspiration**. Research findings will provide guidance for integrating

CES assessment into restoration monitoring, which is often focused on biophysical metrics, fulfilling a recognized need voiced by the Stewardship sector, other NERR sectors, and NERR partner organizations. The semi-structured survey that was co-developed with interviewees can be used to reveal the nonmaterial benefits of biocultural restoration projects in He'eia and beyond.

Why is this worth doing?

This place-based research responds to the needs and interests of our community partners. Through informal dialogue with participants, we became aware of some of the nonmaterial values associated with Laulima Days. Interviews and semi-structured surveys are allowing us to collect this information in a systematic way, over a larger population, so we will be able to robustly share the value of Laulima Days. The relationship building between people and place, as well as the strengthening of relationships among community members that takes place during Laulima Days is valuable for supporting "thriving people" and in turn, working towards the NERRS vision.

Resources

- **Laulima Day Survey**
- **Laulima Day Interview Questions**

Identifying CES in Reserves

Brief synopsis

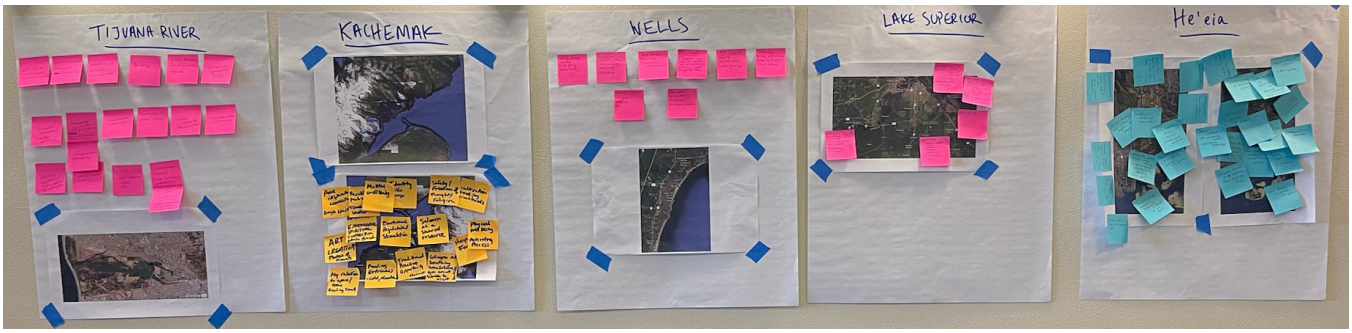
In the Summer of 2024, a group of 13 NERRS staff members from five Reserves (He'eia, Kachemak Bay, Tijuana River, Wells, and Lake Superior), representing all four NERRS sectors convened to deepen their understanding of CES in the NERRS. An initial activity that the participants took part in involved the identification of CES in their Reserves. The participants were given a printed aerial image of their respective Reserves to assist them in thinking about the specific places in their Reserves that people visit and what CES they may experience in relation to these places. They were also given a list of common CES categories with brief descriptions (see Resource below). Participants were instructed to list examples of the CES that people experience from their Reserves.

Group discussion on the cultural ecosystem services that are experienced in the Reserves. Photo by Casey Ching.

How does this relate to CES?

The representatives from each Reserve were able to list a large number of CES, with some examples being shared across each Reserve (e.g., **physical activity, social gatherings**) and other examples being unique to particular Reserves (e.g., **harvesting for cultural regalia**, specific **celebrations** or **ceremonie**s to mark seasons or migrations). Similarly, some categories resonated more than others at certain Reserves. In addition, participants noted that, while each CES category was distinct, there was overlap between certain categories (e.g., **cultural heritage, ceremony, spirituality**) and some experiences could fall into many categories. For example, fishing may be considered as recreation, but also as **cultural subsistence, cultural heritage, Indigenous knowledge,** and **identity**, among other categories. It is important to note that not all of the CES that were listed are experienced while physically being in the Reserves. For example, one does not need to be in place to be inspired by that place (i.e., they may be **inspired** by seeing a photo of the place or reading about the place). Similarly, one does not need to be in a Reserve in order for the Reserve to contribute to one's **identity**. A selection of examples that resulted from this exercise is shared as a Resource below.

Further, beyond user surveys that may occur in some Reserves, CES are not actively monitored or assessed across the NERRS. As such, the CES that were listed as part of this exercise are the CES that the participants know of because of personal experience or that they perceive others are experiencing in relation to the NERR. If this activity was conducted with other participants (e.g., community members or other NERR visitors), it is likely that a different list of CES would be generated.



Maps of Reserves with post-its notes of the cultural ecosystem services that people experience at various locations on the maps. Photo by Kristen Goodrich.

Why is this worth doing?

Participants noted that through engagement in the activity, they gained a deeper understanding of what CES are and their significance to their Reserve. They also noted the process of listing examples from their Reserve increased their capacity to be able to explain what CES are and how they contribute to the value of their Reserve. Participants thought that developing and sharing a longer list of CES examples with others across the NERRS may be more useful than just just sharing the CES descriptions alone, as has been done previously.

Further, this activity can be adapted in a participatory mapping exercise if the maps were printed in a size that is large enough for participants to mark certain locations for specific CES. A mapping exercise may be useful for identifying specific locations that may be of higher interest to monitor or devote other resources to.

Related resources

- **List of CES examples**
- **Common CES Frameworks and Categories**

CES in Catalyzing Collaborations

Brief synopsis

Integrating Indigenous Knowledge and NERR Science and Monitoring to Improve Estuarine Stewardship and Management, with Shared Benefits for Birds and Local Communities[1] is a collaborative project to connect several geographically separate Reserves in the Pacific region by focusing on shared migratory bird species to inform collaborative management.

As part of this project, and with support from the **NERRS Science Collaborative**[2] and **Pacific Birds Habitat Joint Venture**[3] (Pacific Birds), a three day gathering in He'eia was held to explore how western and Indigenous Knowledge systems can be paired for the conservation of migratory birds and the habitats they rely on for survival. Participants included Reserve staff, community partners, and local cultural practitioners from He'eia along with 41 participants who came from Alaska, Washington, and Oregon.

How does this relate to CES?

The workshop combined service learning projects, field trips, and discussions about biocultural restoration, Indigenous **stewardship**, data sovereignty, **education**, and outreach. Participants also had opportunities to share stories and cultural practices, which helped to build and/or strengthen **relationships** between Reserves and their Indigenous partners across the Pacific.

Why is this worth doing?

The workshop created space for participants to discuss the cascading benefits that communities and ecosystems experience when people are (re)connected with their lands and culture and the benefits of intergenerational participation in conservation. Staff from the Kachemak Bay, Padilla Bay, South Slough, and He'eia Reserves and their partners at Pacific Birds are building on this experience to develop an inventory of site-based **Indigenous and conventional knowledge sources** and management/stewardship practices for coastal wetland habitats and birds.

Resources

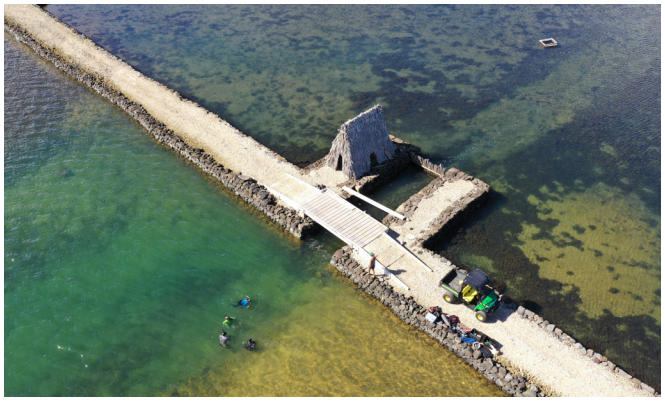
- NERRA Article: **https://tinyurl.com/NERRAbirds**
- **Pacific Birds Post Event Survey** (see also "CES in Evaluation and Training")

1 https://nerrssciencecollaborative.org/project/Iglecia23
2 https://nerrssciencecollaborative.org/
3 https://pacificbirds.org/

CES in SWMP and Other Monitoring

Brief synopsis

Research and monitoring activities, including the NERR System-Wide Monitoring Program (SWMP) and other question-driven research, present opportunities to connect with communities and ecosystems in Reserves. For example, through creating space to welcome input from communities in the planning of research and sharing of data, researchers can receive feedback on research design (e.g., SWMP site locations, infrastructure, and protocols). Reserve staff can also engage in reciprocal knowledge exchange with relevant communities on research-related topics that are applicable to human wellbeing. In our experience, knowledge exchange can be formal, such as through inviting a panel of diverse experts to speak about various perspectives of water, or can be informal, such as through having project partners engage in watercolor or craft activities to explore what water means to them. Researchers also have the opportunity to engage in appropriate protocol by being observant and respectful of sites during the collection of environmental or biological samples (e.g., in Hawai'i, an appropriate 'oli, or chant may be used for wai or freshwater sampling, or specific protocol may be used for sampling during specific seasons or moon phases). Finally, being mindful of data sovereignty considerations in Indigenous or place-based communities is important for ethically engaging with CES while conducting research.



Kumu Hula Frank Kawaikapuokalani Hewett and He'eia Elder Aunty Rocky Kaluhiwa share their perspectives on the importance of Water at a panel event hosted by a Science Collaborative Reesarch grant. (left). Photo by He'eia NERR. During the installation of the SWMP station Kaho'okele, He'eia Fishpond stewards worked with us to stake out sites, co-develop design, and help with installation (right). Photo by Keli'i Kotubetey.

How does this relate to CES?

Engaging with the people of a place encourages those involved in research to think beyond the routine scientific monitoring activities and may reactivate a **sense of purpose and sense of community**. Development of, follow-through, and protocols and place-based traditions during monitoring and research can allow for the building or strengthening of a **sense of place**.

Why is this worth doing?

The mission of the NERRS is to promote and practice coastal and estuarine stewardship; however, for the purpose of standardization, lots of activities in the research realm stick to conventional scientific methods without the inclusion of human dimensions, including the values people have for the environment and its organisms. Being intentional about why and how research sites, such as SWMP, are established and maintained provide opportunities for holistic engagement and investment in monitoring infrastructure. In turn, research efforts may be more sustainable if there is community involvement and buy-in, and the results are applicable to actions. Further, developing a sense of purpose, sense of community, and sense of place may increase morale and contribute to long term retention of staff, and being cognizant of any sort of sensitive data in the Reserve. Together, these practices can build connections to organisms and the environment, potentially leading to increased protection.

Stewardship Coordinator

Brief synopsis

In 2024, the He'eia NERR embarked on hiring a Stewardship Coordinator. As a NERR grounded in biocultural restoration, the job description was carefully crafted to reflect the unique stewardship needs of the He'eia NERR, including the needs of its community partners. Stewardship activities in He'eia are guided by Native Hawaiian knowledge systems and values, especially those related to mālama 'āina (taking care of the land) and 'āina momona (abundant resources). In addition, because the He'eia NERR staff is based at the University of Hawai'i, Hawai'i Institute of Marine Biology (HIMB), this position is also required to work with the researchers and students at this research station. The position was designed to ensure that stewardship, research, education, and training activities within HIMB and the He'eia NERR continue to be deeply connected to Native Hawaiian practices, values, and worldviews. As such, the position requires experience of Indigenous knowledge, practices, skills and the ability to weave knowledge systems. This is a shift from what has traditionally been the role of Stewardship Coordinators in the NERRS.

How does this relate to CES?

By focusing stewardship activities on mālama 'āina with the vision of 'āina momona, the role of the He'eia NERR Stewardship Coordinator is guided by the CES of **cultural heritage** and **Indigenous knowledge**. Many of He'eia NERR's partners are focused on restoration of Native Hawaiian food systems, so the Stewardship Coordinator collaborates with partners to revitalize and perpetuate **cultural subsistence**. Further, an important role of the Stewardship Coordinator is the organizing of opportunities for the students, staff, and faculty of HIMB to participate in stewardship activities, allowing them to experience the benefits of **fulfilling stewardship**. The Indigenous Stewardship Coordinator position represents an investment of the Hawai'i Institute of Marine Biology to prioritize CES in its research, service, and collaborations.

He'eia NERR's Stewardship Coordinator weaving in cultural practices such as "lei" (traditional adornment using natural and cultural resources) into the Reserve (left). He'eia NERR's Stewardship Coordinator working alongside local stewards, students, and conservation partners in biocultural stewardship activities. (right). Photos by He'eia NERR.

Why is this worth doing?

The Indigenous Stewardship Specialist position is a crucial investment in capacity building that ensures the inclusion of Indigenous knowledge and cultural stewardship in academic activities. The position builds capacity within HIMB, elevating Native Hawaiian practices and values as essential components of research, supporting place-based and community-driven projects, serving as an advocate for the He'eia community, as well as a resource for faculty, staff, and students to engage in place-based research and education. Without this role, cultural perspectives might be overlooked, leading to research being done in a way that is not supported by the community. By prioritizing community engagement, this position supports biocultural restoration, and fosters long-term sustainability by ensuring that stewardship is grounded in Native Hawaiian values and practices. By investing in this role, HIMB demonstrates a commitment to creating a holistic approach to research that honors both the Indigenous community and the environment.

Resources

- **Indigenous Stewardship Specialist Job Description**

Place-Based, Engaged Education

Brief synopsis

All incoming graduate students in the Marine Biology Program at the University of Hawai'i at Mānoa (UHM) are required to take an introductory course, MBIO 600: ***Kūlana Noi'i—Introduction to Place-Based Methodologies in Hawai'i.*** The course begins with a two-week, intensive orientation, in which students participate in service learning opportunities across the island, being exposed to local, community-led stewardship practices and cultural values that have sustained thriving ecosystems and people over centuries. In these two weeks, students also engage in learning through reading relevant texts, media, and manuscripts and participate in discussions with their peers on the importance of Indigenous perspectives in place-based research and cultivating relationships with people and place.

Graduate students participating in an introduction to place at the start of a service learning activity (left). Photo by Rachel Dacks. Graduate students learning from a practitioner about Loko I'a o He'eia, an 800 year old traditional Hawaiian fishpond (right). Photo by Melanie (Ku'i) Keliipuleole.

He'eia NERR staff are instrumental in this course's success, as they serve as instructors and liaise with NERR community partners to provide service learning opportunities. Further, throughout the two weeks, the He'eia NERR staff shares their experiences in the co-development of research and co-production of knowledge that they are a part of through the NERR's activities. Student learning continues throughout the semester, as students are guided in reflecting upon their own research paradigms and ethics.

In addition, Lake Superior Reserve, Padilla Bay Reserve, and other Reserves offered a graduate course on advanced data analysis of System-Wide Monitoring Program (SWMP) data to meet the needs of the Reserves. The graduate course was offered through the University of Wisconsin and graduate students met with other Reserves in the System, learned about management needs and questions relevant to the Reserve, and conducted data analyses using SWMP data to address those questions. In addition, the students engaged in an experiential learning opportunity at the Lake Superior Reserve to contextualize the SWMP data in place, and to learn about place-based applications of their work.

How does this relate to CES?

In both examples, meeting and working alongside community stewards or Reserve partners provides students with first-hand experience of the intangible ways that people's wellbeing is supported by their ecosystems. For example, many service learning experiences begin with an introduction to place, in which **cultural heritage** is shared and the hosts' sense of place becomes evident. In addition, participation in service learning allows students to experience CES themselves. For example, many students begin to cultivate a **sense of place** and **social connections** with others in their cohort during the experiential learning portions of these classes. Further, through readings and storytelling, students learn about colonial practices that intentionally disconnected Native Hawaiians from their places, resulting in the loss of CES and downstream wellbeing impacts.

Graduate students participating in biocultural restoration at Loko Iʻa o Heʻeia, an 800 year old traditional Hawaiian fishpond (left). Photo by Rachel Dacks.Graduate students learning from a practitioner about Loko Iʻa o Heʻeia, an 800 year old traditional Hawaiian fishpond. Graduate students learning about water rights issues in Hawaiʻi from Uncle Charlie Reppun (right). Photos by Melanie (Kuʻi) Keliipuleole.

Why is this worth doing?

The UHM course is designed to enhance the graduate school experience by introducing students to the historical and cultural context of Hawaiʻi, preparing them to be responsible researchers. Preparing the next generation of researchers to conduct themselves in ethical ways may enable improved relationships between researchers and communities, and may result in more actionable research that is in line with community values, interests, and needs. Student evaluations reflect that the objectives of the course are being met in a way that students find challenging, yet satisfying and valuable.

The SWMP course was designed to expose students to data analyses methods of high quality environmental data, while linking their efforts to place-based questions and applications of results direct to management. By forming partnerships and relationships with those who are seeking answers, students find purpose and meaning in their analyses, and can also gain perspectives from various viewpoints on how to interpret or analyze data. They can also learn about communication strategies to diverse audiences, including what types of data products are beneficial for management actions.

Resources

- Kūlana Noiʻi: **https://tinyurl.com/kulana-noii**

Tijuana River NERR | The Multi-Initiative (TM-I)

An aerial view of the Tijuana River mouth (left) and TRNERR education programs work to foster a sense of place and to encourage stewardship (right). Photos by Michael O. Snyder.

Brief synopsis

The Multi-Initiative (TM-I) aims to further investigate and elevate human dimensions of coastal habitats and coastal restoration work by better understanding cultural values and heritage. The TM-I is led largely by the Tijuana River National Estuarine Research Reserve (TRNERR) Coastal Training Program, however it also expands to other Reserve sectors by acting as a converging point for multiple efforts that increase collaborative capacity within the tri-national Tijuana River Watershed. The TM-I invites the people that engage with it to see the Reserve as a place for research and monitoring, training and engagement, education, and stewardship, and not only concerned with biophysical data and ecological protection. It emphasizes a more holistic view of the possibilities for expanding activities toward a more social-ecological framework.

How does this relate to CES?

To integrate the many Tribal and non-Tribal cross-border communities that depend on the Tijuana Estuary in its efforts, the TM-I engages with several CES such as **education, cultural heritage, stewardship, inspiration, livelihoods, sense of place, and social relations**. For example, a critical goal for the TM-I is to foster and nurture relationships with Tribal communities that are not solely based in formal consultation processes. This allows TRNERR staff to better understand Tribal communities' **sense of place, stewardship, ceremony, subsistence use**, and other intangible cultural values and promote this in restoration. Some activities which have been critical for relationship building are: participating in Tribal and non-Tribal led Tribal engagement training that focuses on how to facilitate outreach and communication with Tribes; an emphasis on listening and learning by being in community with Tribes and attending Tribal-led events and meetings; and providing resources and pathways to foster equitable Tribal engagement in Reserve programs such as providing the option for attending meetings virtually or offering honoraria or stipends to support participation.

Outcomes of relationship building through engagement with CES have resulted in several efforts centered on **cultural heritage**:

- A community-led assessment (in partnership with the California State Historic Preservation Office and the Scripps Institution of Oceanography) to measure the vulnerability of local cultural heritage to climate impacts;
- Public education programs and Reserve messaging that are more encompassing of climate impacts on cultural heritage within the Reserve;
- A refined focus on cultural heritage elements in the planning of a restoration project as part of the current phase of the TRNERR **habitat restoration program**[1].

Participants in a cultural literacy workshop identifying sites of value (left). Community art emphasizing cultural heritage as a CES with an overlay of sustainability as a CES (right). Photos by Empress Holliday

Why is this worth doing?

The development and implementation of TM-I demonstrates TRNERR's commitment to facilitate more pathways to learn about the values of the Reserve's multinational community in order to protect the things they value. In providing information, resources, and learning opportunities to Tribal and non-Tribal communities in the United States and Mexico, TM-I has

1) increased staff capacity to meaningfully and intentionally engage with Tribes through approaches that elevate Tribal voices and help meet Tribal needs;
2) deepened existing relationships with cross-border community partners through the process of assessing cultural heritage and climate threats; and
3) shared and applied new knowledge on cultural heritage that was gained through participation in National Geographic's Preserving Legacies project.

Resources

- Preserving Legacies Project: **https://www.heritageadapts.org/**

1 https://trnerr.org/what-we-do/stewardship/tetrp/

"This Place Saved My Life": The Power of Volunteering at the Wells Reserve

Brief synopsis

A long-term volunteer at the Wells Reserve has voiced this sentiment multiple times to staff members at the Wells Reserve. Volunteers across the system share similar expressions of gratitude about how their wellbeing and quality of life are improved because of their work. At Wells, approximately 250 volunteers donate more than 15,000 hours annually. Their dedication helps the Reserve to thrive. Volunteers greet and orient visitors, lead school groups and nature walks, patrol and maintain trails, staff the library, assist with research projects, help with events, collect phenology data, remove invasive plants, and serve on guidance committees. They paint, repair, mow and build. The result of this collective action is a well-maintained campus, safe and beautiful trails, informed visitors, and well-supported education, stewardship and research programs. Volunteers represent a good cross-section of the year-round and seasonal residents of the Reserve's surrounding communities. Currently, the youngest volunteer is 20, the oldest is 94. Most volunteers are between 60-75 years of age.

Volunteers are recruited in both formal and informal ways. An annual volunteer recruitment event is held on Zoom. Volunteer achievements and any needs are highlighted in the local media, a blog, and in a quarterly volunteer email newsletter. One of the most effective recruiting methods is by word of mouth from volunteers themselves. The Volunteer and Visitor Services Director onboards 25-30 new volunteers each year. Volunteers also build capacity by taking on more than one role. A docent volunteer might patrol the trails as a Ranger or gather phenology data. A facilities volunteer might have a regular shift in the Visitor Center. A Ranger might volunteer June-August collecting water samples for Maine Healthy Beaches. For the last two years, 100% of the volunteers who work in the Visitor Center also assisted with the Reserve and Laudholm Trust's largest annual fundraiser, the Laudholm Nature Crafts Festival.

Incoming volunteers are interviewed and placed according to their interests. Reserve staff train and supervise them. Volunteers receive training specific to their role and are encouraged to attend educational programs. A volunteer lunch or coffee is often added before or after a program to encourage attendance and foster social connections. Each year the Volunteer Director coordinates with the Research program to hold a volunteer "Open House" in the

Wells Reserve volunteers (left). Wells Reserve volunteers, Lee and Sylvia Pollack, monitoring larval fish (right). Photos by Wells Reserve

Coastal Ecology Center so that all volunteers can learn more about research projects. There are fewer volunteer opportunities in the winter, and so volunteers stay engaged and connected through book groups and walk-and-talks.

Support for volunteers begins at the top. The Reserve Director and the Laudholm Trust President are present at volunteer meetings to welcome volunteers and express appreciation. They write letters of recommendation for volunteer awards and never miss the annual Volunteer Appreciation celebration.

How does this relate to CES?

Through interviews with docents, writing of blog posts and newsletters, and informal interactions with volunteers, the Wells Reserve staff learn what volunteering means to the volunteers at the Reserve. A couple of examples of how volunteers talk about the benefits from their service are documented in the Reserve's blog posts:

> Bruce Bjork[1] puts a modest spin on his volunteer service. ***"It keeps me out of trouble,"*** he says. In the six years that Bruce has been a volunteer at the Reserve, he has filled as many as 8 volunteer roles. ***"I'm motivated,"*** he says, ***"Because I'm retired and have the time to give back."*** Bruce's volunteer service is wide ranging, combining professional skills and lifelong passions, fueled by a desire for **social connections** and new experiences.

Lee and Sylvia Pollack[2] bring their expertise identifying larval fish to the Research efforts of the Wells Reserve. Lee literally wrote the book that guides larval fish research nationally.

> *The research team thinks we are doing them a favor by helping out with the picking and keying. The truth is we are the beneficiaries! Not only do we **feel useful**, we get to keep contributing to the important work of the Wells Reserve. We'll get through this bizarre period with a project on track and our sanity intact!*

Inspired by the **Cultural Ecosystem Services in Estuary Stewardship and Management**[3] project and the CES categories that resulted from that project's literature review, a group from the Wells Reserve (CTP, Education, Visitor and Volunteer Services) convened and began to explore the CES that volunteers experience. The following categories were identified as most commonly experienced by volunteers as part of their service: Activity; Aesthetics; Bequest; Ceremony; Cultural Heritage; Education/Scientific Knowledge; Fulfilling Stewardship; Identity; Indigenous/Local Knowledge; Inspiration; Intrinsic Value; Physical/Mental Health/Well-being; Religion/Spirituality/Mindfulness; Sense of Place; Social Relations.

Why is this worth doing?

Existing mechanisms within the NERRS are effective at documenting ecosystem conditions, and trends over time. Volunteer hours and how Reserves benefit from those hours are also documented. Less well known are the ways volunteers benefit from their experiences - the reciprocal nature of volunteering. We have begun to identify the CES that volunteers experience. Holling Scholar research during the summer of 2025 will continue to contribute to the systematic documentation of the reciprocal benefits for people and reserves.

Resources

- The Wells Reserve Volunteer website page: **https://tinyurl.com/WELLSvolunteers**
- Volunteer profiles: **https://tinyurl.com/Vprofile1**; **https://tinyurl.com/Vprofile2**
- **Testimonial from a long-time docent**

1 https://www.wellsreserve.org/blog/doing-what-i-can-to-help
2 https://www.wellsreserve.org/blog/ordering-take-out-volunteers-shift-studies-from-the-lab-to-their-kitchen
3 https://nerrssciencecollaborative.org/project/pascua20