Final Evaluation Findings

He‘eia National Estuarine Research Reserve

January 2017 to June 2023

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Office for Coastal Management
National Ocean Service
National Oceanic and Atmospheric Administration
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List of Hawaiian Language Words and Phrases

Adapted from the He‘eia National Estuarine Research Reserve Management Plan (2023)

ahupua‘a – Hawaiian conceptualization of community that typically extends from the mountains to the ocean, and includes zones for forest, various forms of Indigenous agro-ecology and aquaculture, as well as nearshore zones for fisheries management.

aloha – Love, affection, compassion, mercy, sympathy, kindness, sentiment, grace, charity; loved one; beloved; to venerate; to remember with affection.

‘āina – Land (lit., that which feeds).

kalo – Taro (*Colocasia esculenta*), a kind of aroid cultivated since ancient times for food, spreading widely from the tropics of the Old World. In Hawai‘i, taro has been the staple from earliest times to the present, and here its culture developed greatly, including more than 300 forms.

kama ‘āina – Native-born, one born in a place, host; native plant; acquainted, familiar, and child.

konohiki – Overseer, headman of an ahupua‘a land division under the chief; land or fishing rights under control of the konohiki.

kūpuna – Elders. Grandparent, ancestor, relative, or close friend of the grandparent’s generation, grandaunt, granduncle. Kūpuna—plural of kupuna.

laulima – Cooperation, joint action; group of people working together; community food patch; to work together, cooperate (lit., many hands).

loko i‘a – Indigenous aquaculture systems, colloquially referred to as a “fishpond.”

lo‘i – Wetland agroecology system.

mālama – To take care of, care for, preserve, custodian, caretaker.

moku – District, island, islet, section.

mo‘olelo – Story, tale, myth, history, tradition, literature, legend, journal, log, yarn, fable, essay, chronicle, record, article; minutes, as of a meeting. (From mo‘o ‘ōlelo, succession of talk; all stories were oral, not written.)

muliwai – Estuary. River mouth; pool near the mouth of a stream.

Executive Summary

The Coastal Zone Management Act requires the National Oceanic and Atmospheric Administration’s (NOAA’s) Office for Coastal Management to conduct periodic evaluations of the performance of national estuarine research reserves. This evaluation examined the operation and management of the He‘eia National Estuarine Research Reserve for the period from January 2017 through June 2023. The evaluation focused on three target areas: reserve administration, conveying reserve successes and challenges, and biocultural restoration. The evaluation was conducted in a manner that respected the reserve’s operating principle to honor the past by using the Indigenous resource management approaches, integrated with the contemporary principles of the National Estuarine Research Reserve System, to support sustainable co-management of the He‘eia estuary.

The findings in this evaluation document will be considered by the NOAA Office for Coastal Management in making future financial award decisions concerning the reserve. The evaluation came to these conclusions:

Accomplishment: The Hawai‘i Institute of Marine Biology and the University of Hawai‘i are recognized for supporting the transition of the newly designated He‘eia National Estuarine Research Reserve into an operational research reserve that has established required reserve programming that serves and benefits the community, reserve partners, and the national system of research reserves.

Accomplishment: The He‘eia National Estuarine Research Reserve is an ambassador for the Hawai‘i Institute of Marine Biology and the University of Hawai‘i and developing strong connections to the He‘eia community in an authentic and sustained way.

Accomplishment: The He‘eia National Estuarine Research Reserve continues to support and convene the Reserve Advisory Board to guide the reserve’s work. The Reserve Advisory Board is a strong guiding voice for the He‘eia National Estuarine Research Reserve and provides an important venue to foster communication among community partners and advance the vision of the partners and the reserve.

Accomplishment: The Hawai‘i Institute of Marine Biology and the University of Hawai‘i have demonstrated commitment to the successful implementation of the reserve through hiring a committed and high-performing staff to support reserve operations and programming. The Reserve Advisory Board is recognized for its contributions to the hiring process of the reserve staff, including the vetting of candidates to make sure they understand and have knowledge of Hawaiian cultural values and have knowledge of both Hawaiian and hypothesis-driven science.

Accomplishment: The He‘eia National Estuarine Research Reserve education program was instrumental in creating opportunities for educating students during the COVID-19 public health emergency, utilizing five outdoor education structures at Kāko‘o ‘Ōiwi to safely host preK-college student and teachers and provide access to a culturally and ecologically rich learning environment.

Accomplishment: The He‘eia National Estuarine Research Reserve, in collaboration with the Lake Superior National Estuarine Research Reserve in Wisconsin, developed a new web-based, user-driven template for reserve site profiles, which can be used to create new site profiles or to update existing site profiles.

Accomplishment: The He‘eia National Estuarine Research Reserve is a leader in promotion and inclusion of Indigenous and traditional knowledge in research and stewardship, co-development of projects and co-authorship of findings, and protecting data sovereignty in the National Estuarine Research Reserve System, the University of Hawai‘i System, and beyond.

Accomplishment: The He‘eia National Estuarine Research Reserve builds place-based local capacity for natural resource management by developing a pipeline of practitioners, leaders, and decision makers who have the knowledge of ahupua‘a based management, cultural awareness, and deep aloha for place.

Accomplishment: The He‘eia National Estuarine Research Reserve has coordinated the implementation of the Laulima Days (“Many Hands Day”) to support the revival of the cultural value of community-based support for projects that support the community and where those conducting research or otherwise working in the reserve demonstrate a commitment to supporting the local community.

Accomplishment: The He‘eia National Estuarine Research Reserve reconnects people back to place and facilitates learning and understanding by providing access to natural and cultural areas and promoting a place of Hawaiian learning.

Accomplishment: The He‘eia National Estuarine Research Reserve provides graduate student support and mentorship at a very high level. The reserve promotes co-development in the development of graduate research projects and supports graduate students from the community within its program.

Accomplishment: The He‘eia National Estuarine Research Reserve developed a robust process to ensure reciprocal community-research partnerships and act as a buffer against extractive research.

Accomplishment: The He‘eia National Estuarine Research Reserve, in collaboration with site partners, has completed major restoration activities including the removal of invasive species; restoration of streamflow; re-establishment of agroforestry, aquaculture, and mariculture practices; and promotion of traditional and Indigenous Knowledge and practices.

Accomplishment: The He‘eia National Estuarine Research Reserve has contributed to national and system-wide efforts of the National Estuarine Research Reserve System, many of which advance inclusion of traditional, tribal, and Indigenous Knowledge and advance equity and inclusion.

Accomplishment: The He‘eia National Estuarine Research Reserve has developed many partnerships beyond the immediate four community partners that allow for knowledge sharing and capacity building throughout Hawai‘i.

Recommendation: The NOAA Office for Coastal Management encourages the He‘eia National Estuarine Research Reserve to explore the relationships with the partner recipients of CZMA Section 315 funding to see if there are ways to improve reporting, collaboration, and communication of funded activities. This includes standardizing reporting of education and visitor performance measures.

Recommendation: The NOAA Office for Coastal Management encourages the Hawai‘i Institute of Marine Biology and the University of Hawai‘i to consider ways to support additional reserve staff positions as existing reserve programs grow and new reserve programs develop and to also consider ways to continue to support existing reserve staff.

Recommendation: The NOAA Office for Coastal Management encourages the He‘eia National Estuarine Research Reserve to develop a detailed plan for developing public visitation and interpretation activities which are not part of a scheduled reserve-led activity.

Recommendation: The NOAA Office for Coastal Management encourages the He‘eia National Estuarine Research Reserve to consider ways to support the growing education programming needs of neighboring communities while still meeting the needs of site partners and the He‘eia community.

Recommendation: The NOAA Office for Coastal Management encourages the He‘eia National Estuarine Research Reserve to consider ways in which the reserve’s research and monitoring program could connect with efforts outside its boundary to better link with other observing and monitoring efforts within the Kāne‘ohe Bay watershed and He‘eia ahupua‘a to amplify the impact of the reserve’s monitoring program.

Program Review Procedures

The Coastal Zone Management Act (CZMA) of 1972, as amended,[1] requires that state coastal zone management programs and national estuarine research reserves that are developed under the act and approved by the Secretary of the Department of Commerce be evaluated periodically. Section 315 of the CZMA and implementing regulations at 15 CFR, part 921, subpart E, require that a research reserve be periodically evaluated with regard to 1) its operation and management, including education and interpretive activities; 2) the research being conducted within the research reserve; and 3) adherence to the requirements of section 315(b)(2) of the Coastal Zone Management Act.

The NOAA Office for Coastal Management evaluated the He‘eia National Estuarine Research Reserve in fiscal year 2023. The evaluation team consisted of Michael Migliori, evaluation team lead, Jean Tanimoto, Pacific Regional director, Leah Keller, site liaison, and Bree Turner, senior coastal management specialist, all from the NOAA Office for Coastal Management; and William Reay, director of the Chesapeake Bay-Virginia National Estuarine Research Reserve at the Virginia Institute of Marine Science in Gloucester Point, Virginia. The support of the He‘eia Research Reserve staff was crucial in conducting the evaluation, and this support is most gratefully acknowledged.

NOAA sent a notification of the scheduled evaluation to Eleanor Sterling, director, Hawai‘i Institute of Marine Biology, on January 11, 2023, and published a notice of “Intent to Evaluate” in the *Federal Register* on May 15, 2023 (88 FR 30950).

The evaluation process included a review of relevant documents and a survey of stakeholders, which helped identify target areas for the evaluation. The evaluation focused on three target areas: reserve administration, conveying reserve successes and challenges, and biocultural restoration. The evaluation team held a series of meetings with reserve staff members and group discussions with partners about the target areas. In addition, a public meeting was held on June 6, 2023, at 6:00 p.m. at Kāko‘o ‘Ōiwi, 46-406 Kamehameha Hwy, Kāne‘ohe, Hawai‘i, to provide an opportunity for members of the public to express their opinions about the implementation of the reserve’s programs.

Partners and members of the public were given the opportunity to provide written comments via email through Friday, June 16, 2023. No written comments were received from the public or interested parties. The Office for Coastal Management then developed draft evaluation findings, which were provided to the reserve for review, and the reserve’s comments were considered in drafting the final evaluation findings.

[1] 16 U.S.C. §§ 1451 et seq.

Final evaluation findings for the national estuarine research reserves highlight each reserve's accomplishments in the target areas and include two types of findings that may require action by the program:

Necessary Actions address programmatic requirements of the implementing regulations of the Coastal Zone Management Act. These must be carried out by the dates specified. Failure to address necessary actions may result in a future finding of non-adherence and the invoking of interim sanctions, as specified in the Coastal Zone Management Act.

Recommendations are actions that the office believes would improve the program, but which are not mandatory. The state is expected to have considered the recommendations by the time of the next evaluation or by the dates specified.

Evaluation Findings

Reserve Administration

The He'eia National Estuarine Research Reserve (He'eia Research Reserve) was designated in January 2017. This evaluation covers the time from designation through the evaluation site visit in June 2023. The administrative and operational support from the Hawai'i Institute of Marine Biology and the University of Hawai'i were critical to the success of the reserve in the transition from designation to implementation. Similarly, the Reserve Advisory Board has served an important role in guiding program direction and in further advancing on-the-ground objectives in education, research, and cultural and habitat restoration of the He'eia ahupua'a.

Through this transition from designation to operation, the He'eia National Estuarine Research Reserve has functioned as a connector among the many institutions and organizations in the area. The He'eia Research Reserve has created new relationships and strengthened existing connections between the He'eia community and the Hawai'i Institute of Marine Biology. The reserve has also served a similar role in connecting partners in the Reserve Advisory Board with new resources and programming, building on the existing network already present in the ahupua'a. Through these actions, the reserve advances the community's vision of collaborative research to inform adaptive co-management within the context of system-scale Indigenous resource management.

In the last six years, there have been many significant achievements. The He'eia Research Reserve has completed many of the initial requirements of designated reserves and has made progress towards completion of other requirements. Yet some requirements have yet to be addressed. This section will look at how the reserve has been administered since designation, the progress made in meeting the required elements of designated national estuarine research reserves, and the successes and challenges of implementing the reserve framework.

The He'eia Research Reserve completed an update to its comprehensive management plan during the latter part of the evaluation period.[2] The reserve initiated the plan update one year earlier than required so that they could include a new facilities and construction plan. With submission of a complete draft of the plan update, the reserve was eligible to compete for funding under the National Estuarine Research Reserve System Land Acquisition and Construction grant program. As described elsewhere in this findings document, the reserve has been successful in competing for these funds and has completed some facility construction projects and has other facilities construction projects underway.

Examples of Key Efforts

Hawai'i Institute of Marine Biology and Reserve Advisory Board

[2] Management plan update was finalized and noticed in the *Federal Register* on August 23, 2023 (88 FR 57438).

The Hawai‘i Institute of Marine Biology was one of the organizations involved in the designation process of the He‘eia National Estuarine Research Reserve. With designation, the Hawai‘i Institute of Marine Biology assumed the role as the state entity responsible for implementing the state’s obligations under the National Estuarine Research Reserve System state-federal partnership program. The Hawai‘i Institute of Marine Biology has demonstrated that it is a partner committed to implementation of this new reserve. This has been demonstrated through financial support, staffing, facilities, and access to resources at the University of Hawai‘i, among other support. In establishing the He‘eia Research Reserve at the Hawai‘i Institute of Marine Biology, the research reserve has become a new ambassador for the institute. Additional description of the community relationship building is included in the biocultural restoration section.

The positioning of the He‘eia Research Reserve within the Hawai‘i Institute of Marine Biology has created benefits to both organizations. One way in which to advance objectives and activities of mutual interest and benefit is to identify those opportunities that could be supported through resources that are available to the Hawai‘i Institute of Marine Biology and partners through their relationship with the He‘eia Research Reserve. The He‘eia Research Reserve has been successful in securing additional funding from Office for Coastal Management programs (that is, those funds beyond the annual base operational) through the Bipartisan Infrastructure Law, the research reserve Land Acquisition and Construction Program, and the reserve system’s Science Collaborative Program. Other extramural funding awards during the evaluation period include NOAA Bay Watershed Education and Training (B-WET), U.S. Geological Survey research funding, National Science Foundation Innovations in Graduate Education, and a multimillion-dollar private donation to support biocultural restoration. Continued partnerships and coordination for resources available only to or benefiting research reserves can further program development to the mutual benefit of the He‘eia Research Reserve and the Hawai‘i Institute of Marine Biology.

The He‘eia Research Reserve has benefited from a long-standing Reserve Advisory Board, and this group was key in promoting the value of a reserve in He‘eia that respected and integrated local and Indigenous Knowledge and traditions into the structure of a national estuarine research reserve. The result is a reserve that operates with the values and traditions of the Native Hawaiian community and also advances the hypothesis-driven research of the National Estuarine Research Serve System as created under the Coastal Zone Management Act. Ultimately, this group’s efforts resulted in a reserve designation, and it remains active in providing advice, guidance, and community and political support to the He‘eia Research Reserve and the Hawai‘i Institute of Marine Biology in all programmatic areas. The research reserve, through its advisory board, is the only reserve with a structure that includes kūpuna with ancestral ties to the land and resources within the reserve they advise. Due to this group's vested interest, they are instrumental in continuing to advocate for the stewardship of He‘eia in a culturally appropriate manner.

A portion of the reserve’s annual operations award funding is provided to reserve partners as subawards to support various stewardship and education activities by the partners. The

activities funded through subawards advance the objectives of the reserve and the communities and organizations represented by the Reserve Advisory Committee. The partner organizations have made great advances in the restoration, education, and stewardship activities identified in the reserve's management plan with this financial support. As the reserve prepares to implement the newly revised management plan, additional coordination among the reserve partners through the Reserve Advisory Board can help direct operational funding to advance the activities identified in the plan and improve reporting to NOAA. In particular, as part of the NOAA Office for Coastal Management's review of annual operations awards performance reporting, specific needs were identified in how education performance measures are reported and the documentation of outcomes from the subawards. One way to address this could be through providing clear expectations of reporting requirements to subawardees when developing the operations awards and supporting those subawardees to meet those requirements.

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Staffing

The Hawai'i Institute of Marine Biology has supported the hiring of all positions eligible for funding under CZMA regulations[3] and required under the Office for Coastal Management cooperative agreement policy[4]: reserve manager, research and monitoring coordinator, and education and interpretive programs coordinator. Additional staff at the He'eia Research

[3] See 15 CFR § 921.32.

[4] Includes NOAA Office for Coastal Management annual funding guidance memorandum.

Reserve include a program coordinator to implement the Coastal Training Program and research technician to support the System-wide Monitoring Program. It is important to note that the Reserve Advisory Board was directly involved in the hiring process of the reserve staff and vetting them to make sure they understand and have knowledge of Hawaiian cultural values and have knowledge of both Hawaiian and hypothesis-driven science.

During meetings with partners, the evaluation team consistently received input that reserve staff were high-performing. They were described with numerous positive superlatives. Reserve staff were recognized as connectors between partners and as integrators of traditional and Indigenous science and hypothesis-driven research.

At the time of the site visit, the evaluation team was informed that approval had been provided to hire an Indigenous stewardship coordinator and an administrative support position. The Office for Coastal Management acknowledges that these are important positions that will support existing and emerging programmatic activities.

> **Accomplishment:** The Hawai‘i Institute of Marine Biology and the University of Hawai‘i have demonstrated commitment to the successful implementation of the reserve through hiring a committed and high-performing staff to support reserve operations and programming. The Reserve Advisory Board is recognized for its contributions to the hiring process of the reserve staff, including the vetting of candidates to make sure they understand and have knowledge of Hawaiian cultural values and have knowledge of both Hawaiian and hypothesis-driven science.
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Public Education and Interpretation

Given the layout of the reserve, public access to components, and current use of He‘eia State Park, public education and interpretation for visitors not part of a scheduled reserve program remain underdeveloped at the reserve. Public access to reserve headquarters at Moku o Lo‘e is limited. The capacity to transport and accommodate visitation for large numbers of people to the island and facilities to conduct programs is constrained. Public access to the loko i‘a at Paepae o He‘eia and the lo‘i kalo at Kāko‘o ‘Ōiwi is restricted. For example, access is available for certain scheduled activities, such as formal education programs or Laulima Days (weekly restoration of lo‘i, muliwai, forest, and loko i‘a at co-management partner sites). However, there are few opportunities for visitors to the Kāne‘ohe Bay area to learn about the reserve unless involved in a structured, scheduled program. In part because of its sweeping views of the reserve and the ahupua‘a uplands, He‘eia State Park has been envisioned as a possible location for public education facilities and interpretation within the reserve management plan. . At the time of the evaluation site visit, the He‘eia Research Reserve and site partners had struggled to

make progress towards its intention of establishing public education, visitor facilities, and interpretation programs at He‘eia State Park. It is worth noting that public access is available at He‘eia State Park, but there is no coordination on programming by the reserve at this site. In addition to considering public education and interpretation activities and facilities at He‘eia State Park, the He‘eia Research Reserve could consider other opportunities and partnerships in the area that would support these activities. The Office for Coastal Management would expect as the reserve moves into this next stage of reserve operations that progress will be made on developing accessible public education and interpretation which are not part of formal education programs offered by the reserve.

> **Recommendation:** The NOAA Office for Coastal Management encourages the He‘eia National Estuarine Research Reserve to develop a detailed plan for developing public visitation and interpretation activities which are not part of a scheduled reserve-led activity.

Facilities

The He‘eia Research Reserve has made significant progress in meeting initial facility needs. This includes a research laboratory for the reserve’s System-wide Monitoring Program and office space for reserve staff. The reserve has supported facility upgrades at the Hawai‘i Institute of Marine Biology campus on Moku o Lo‘e through the installation of a new seawater pump and in-progress updates to housing facilities on the island. Additional facilities projects include education pods at Kāko‘o ‘Ōiwi, which provided important outdoor learning spaces during the COVID-19 public health emergency.

The Hawai‘i Institute of Marine Biology has provided key facilities for the reserve, but the potential for growth at this site is constrained by space and access limitations of island geography. These constraints could impact near-term and future reserve needs given the potential for moderate program staff growth. Given these space limitations and the logistics to bring visitors to Hawai‘i Institute of Marine Biology, along with the close proximity of Paepae o He‘eia and Kāko‘o ‘Ōiwi, the reserve is encouraged to engage in dialogue and develop actionable options for joint use and access of facilities and natural resources with key partners.

> **Accomplishment:** The He‘eia National Estuarine Research Reserve education program was instrumental in creating opportunities for educating students during the COVID-19 public health emergency, utilizing five outdoor education structures at Kāko‘o ‘Ōiwi to safely host preK-college student and teachers and provide access to a culturally and ecologically rich learning environment.

Establishment of Reserve Research and Monitoring Program

There are several elements of the reserve research and monitoring program that are required under the CZMA and its implementing regulations,[5] the Office for Coastal Management

[5] See 15 CFR § 921.60(a)

program guidance, and terms and conditions of reserve operations funding provided through cooperative agreements with the Office for Coastal Management. The reserve research and monitoring program has established the required elements of the System-wide Monitoring Program (SWMP). The monitoring program was co-developed with the community partners in order to understand that impacts of biocultural restoration. In addition, monitoring sites were designed in a way to minimize impacts to cultural resources, including preserving viewsheds, continued access for education and recreation, and preservation of traditional agricultural and aquacultural practices.

It was noted that the He‘eia Research Reserve had some challenges installing its monitoring station where the He‘eia Stream enters the He‘eia fishpond at an inflow gate, identified as Wai 2. It is an important site for assessing freshwater that comes from the wetland and enters the fishpond. However, with a silty soft mud substrate and no suitable permanent structure available for deployment, the reserve created a concrete platform on which to secure the monitoring infrastructure. The design was approved by the SWMP Oversight Committee and a review of data submission to the Centralized Data Management Office from this monitoring site showed no unusual missing data or data quality issues. The reserve is in the process of leveling this site and considering additional infrastructure to provide increased stability. With the anticipated improvements, the reserve research and monitoring program should continue to monitor the station and work in concert with the SWMP Oversight Committee to ensure continued collection of high-quality monitoring data.

At the time of the site visit in June 2023, the reserve was on the verge of publishing the reserve’s site profile as required under National Estuarine Research Reserve System regulations. As part of a reserve system’s Science Collaborative project with the Lake Superior Research Reserve in Wisconsin, the He‘eia Research Reserve contributed to the development of a template for a new type of site profile, one that would also include a greater emphasis on the historical and ongoing human-nature interactions with reserve resources. Many site profiles previously developed by other reserves in the national system are largely static developed as a reference of conditions from the time of publication. Updating them has been an ongoing challenge. The site profile approach developed by the two newest reserves in the system, He‘eia and Lake Superior Research Reserves, creates a dynamic, web-based template for developing and updating reserve site profiles.

> **Accomplishment:** The He‘eia National Estuarine Research Reserve, in collaboration with the Lake Superior National Estuarine Research Reserve in Wisconsin, developed a new web-based, user-driven template for reserve site profiles, which can be used to create new site profiles or to update existing site profiles.

Biocultural Restoration

From the original visioning of a national estuarine research reserve at He‘eia, the He‘eia Research Reserve was designed to support long-standing community efforts to manage and restore natural and traditionally valued culturally based resources. The He‘eia Research Reserve is a vivid example of co-management of resources within Ko‘olaupoko, with Kāko‘o ‘Ōiwi, Paepae o He‘eia, and the Hawai‘i Institute of Marine Biology leading stewardship activities on their properties, or on properties where they are the designated management entity. The He‘eia Research Reserve and partners should be recognized for their collaborative effort and successes on implementing a co-development and co-management strategy of resource stewardship and restoration.

Examples of Key Efforts

Co-development and Co-management

To conduct research within the He‘eia National Estuarine Research Reserve, researchers must undergo place-specific research protocols rooted in the principles of Kūlana Noi‘i (respect, reciprocity, self-awareness and capacity, and communication). A multi-step process to first establish relationships, prioritize the needs of the community, and emphasize reciprocity must be followed. Researchers are required to attend regular Laulima Days where reserve staff, researchers, and students spend time in place with co-management partners working on restoration projects and discussing the nature and purpose of the work supported by the He‘eia Research Reserve. The reserve has developed specific protocols to steward Indigenous intellectual property and properly honor the contributions of Indigenous people and local community collaborations through data sharing agreements and authorship guidelines. For all grant and collaborative partnerships, “participation fees” are collected to compensate partners for their participation in the grant. This eliminates the extractive nature of conventional research, promotes reciprocity, and normalizes these processes within the academic institution. The reserve staff teach MBIO600, an immersive graduate course within the University of Hawai‘i-Manoa Marine Biology Graduate Program, to orient incoming marine biology students to the cultural context of Hawai‘i. This works to enhance dual fluency among students coming through the University of Hawai‘i-Manoa and to implement community-driven research in Hawai‘i.

The reserve’s Teachers on the Estuary (TOTE) program is highly respected and appreciated by the area school districts. As a result of the TOTE program, school activities, or internships, students in grades K-12 are exposed to experiential science and cultural values of aloha and mālama ‘āina (love and care for the land) while developing a relationship to natural places. Young volunteers and interns conducting fieldwork are shown different opportunities in the natural resource management field, such as monitoring, researching, management, or other expertise. The success of the reserve’s educational programs has attracted the interest of additional community members and those from neighboring areas. The existing staffing and structure of the reserve education program, however, cannot meet the needs of all those

individuals and organizations that would seek to participate in reserve programs. The NOAA-approved management plan and Reserve Advisory Board should be consulted as the reserve considers how to meet growing interest in their programming. In this way, the He‘eia Research Reserve will be able to meet partner needs, continue to meet NOAA program requirements, and prioritize additional activities and resources for potential expansion of the reserve education program.

Notwithstanding the successful and impactful K-12 and teacher education programs and a highly regarded reserve education coordinator, partners and community members identified a need for additional programming to meet growing interest and demand for reserve education programs. The He‘eia Research Reserve could consider ways in which they can meet this identified need while still meeting the existing commitments to partners and community. Strategies to consider may include additional staff, additional coordination among existing staff or partners, or developing new partnerships or educational and training products.

The He‘eia Research Reserve is able to compensate community partners for attending training and meetings. Teachers are provided stipends to be able to participate in the TOTE program and develop field trips and place-based learning for their students.

In so many ways, the He‘eia National Estuarine Research Reserve reconnects people back to place by providing access to natural and cultural areas and promoting a place of Hawaiian learning. By hosting public volunteering activities, bringing teachers and students in to visit the sites, and sharing cultural knowledge such as mo‘olelo, the He‘eia Research Reserve helps lineal descendants and kama ‘āina rebuild their relationship with these places. Additionally, this approach facilitates the inclusion of Native Hawaiian cultural values in the academic setting supported by the reserve. As one focus group participant shared, the reserve’s approach and programs “allows young Hawaiian scientists to feel authentically themselves in an academic setting.”

> **Accomplishment:** The He‘eia National Estuarine Research Reserve is a leader in promotion and inclusion of Indigenous and traditional knowledge in research and stewardship, co-development of projects and co-authorship of findings, and protecting data sovereignty in the National Estuarine Research Reserve System, the University of Hawai‘i System, and beyond.
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Resource Stewardship and Restoration

The He‘eia National Estuarine Research Reserve and reserve partners have revived the Indigenous agro-ecosystems of lo‘i and loko i‘a in the buffer areas of the reserve to productive cultural landscape that has revived Indigenous food systems, provided habitat for native species (including several endangered waterbird species), and expand ‘āina-based educational activities. Restoring the function of the muliwai is the focus of restoration efforts in He‘eia. Stewardship practitioners have Indigenous Knowledge pertaining to hydrology and the roles of various native plants and are able to restore function to return the land to a food-producing state. Through the careful management of streams and muliwai, removal of invasive species, creation of new waterbird and fish habitat, and diversification of plant species, ecological function is restored to the area. The lo‘i and loko i‘a serve as a sediment and nutrient retention buffer to prevent soil erosion into the bay while providing a safe and healthy nursery for juvenile fish and native bird habitat. Agro-ecology efforts in buffer areas also support plants that are important for cultural reasons and food production (kalo pa‘a, poi, kulolo, lūa‘u, ulu, banana, etc.) for the local community.

Accomplishment: The He‘eia National Estuarine Research Reserve, in collaboration with site partners, has completed major restoration activities including the removal of invasive species; restoration of streamflow; re-establishment of agroforestry, aquaculture, and mariculture practices; and promotion of traditional and Indigenous Knowledge and practices.

Conveying Reserve Successes and Challenges

In the few years since designation, the He‘eia National Estuarine Research Reserve has been able to transfer many of its programs and outcomes within various networks to broaden and enhance the impacts of the accomplishments. Simultaneously, the He’eia Research Reserve is contributing perspectives and approaches that challenge the status quo, current definitions, and policies of the current reserve system. Institutions and networks at times don't have context for the Indigenous and cultural approaches the He’eia Research Reserve uses.

The reserve is at the forefront of the National Estuarine Research Reserve System in placing high value on Indigenous Knowledge, and traditional ecological knowledge, and its subsequent integration with hypothesis-driven science to support reserve management and community identified needs. This effort extends across all reserve programmatic areas, and related expertise and experience are openly shared with the broader national reserve system. An example of this is revisions to the guidance for the merit review process of the Science Collaborative competitive grants program to provide clear instructions on how Indigenous Knowledge, and traditional ecological knowledge should be considered when reviewers are considering applications.

Key partners, the Reserve Advisory Board, and local community representatives unanimously stated that the reserve has made a huge difference in this space, with core efforts including respectful engagement of local community, development of trust, giving credit for knowledge and effort, and compensation for time and effort. This section will highlight several of the ways that the He‘eia Research Reserve has contributed to resource stewardship and management, education and training, and research and monitoring beyond the reserve community and He‘eia ahupua‘a. It also includes a discussion on challenges the reserve encounters as it works across boundaries and in a discipline-spanning environment of traditional and Hawaiian cultural knowledge and non-Indigenous approaches to carry out resource protection and management.

Examples of Key Efforts

Contributions to the National Estuarine Research Reserve System

The He‘eia National Estuarine Research Reserve has made a significant, positive impact to the national reserve system in the six years since designation. Perhaps the most impactful contribution has been the efforts related to traditional and Indigenous Knowledge. As described in the “Reserve Administration” section of this findings document, the He‘eia Research Reserve worked with another reserve to develop a new site profile template which includes the integration of social and ecological context into site profiles that reflects the evolving priorities of the reserves and provides opportunities to connect with broad audiences through place-based storytelling. The He‘eia Research Reserve also contributed to informing national guidance on tribal engagement and Indigenous Knowledge for comprehensive reserve management plan updates. Additionally, staff from the reserve worked with the National Estuarine Research Reserve System’s Science Collaborative to develop best practices for

considering Indigenous and tribal knowledge when reviewing research grant applications. These efforts are far-reaching and have the potential to shift attitudes and advance equity and justice.

> **Accomplishment:** The He‘eia National Estuarine Research Reserve has contributed to national and system-wide efforts of the National Estuarine Research Reserve System, many of which advance inclusion of traditional, tribal, and Indigenous Knowledge and advance equity and inclusion.

Reserve Programming Extended Beyond the He‘eia Ahupua‘a

The examples of reserve programming whose impacts extend beyond the He‘eia community and ahupua‘a are numerous. This section will present a subset of those programs, their accomplishments, and applications beyond the immediate area of the reserve.

The habitat restoration activities in the He‘eia wetlands at Kāko‘o ‘Ōiwi are of significant ecological and cultural significance. The He‘eia Research Reserve and site partners were able to demonstrate that the agroecological landscapes of restored kalo lo‘i, managed with traditional Hawaiian agricultural practices, have created habitat for some of Hawai‘i’s endemic waterbirds. During the site visit, the evaluation team observed the a‘eo (Hawaiian stilt, *Himantopus mexicanus knudseni*) and ‘alae ‘ula (Hawaiian moorhen, *Gallinula galeata sandvicensis*) in the lo‘i kalo and muliwai at Kāko‘o ‘Ōiwi. Both of these species of waterbird are listed as endangered under the Endangered Species Act. The reserve and site partners were able to demonstrate that their management approach was beneficial to these ecologically and culturally important species. In working with the U.S. Fish and Wildlife Service, the reserve developed approaches to avoid impacts to nesting activities. These approaches have statewide applications for meeting federal requirements for managing these endangered species while honoring traditional management practices of natural and cultural resources.

The reserve, through the work of Paepae o He‘eia, has taken its success and expertise in traditional Hawaiian loko i‘a restoration and management at the He‘eia loko i‘a to support other loko i‘a in the Hawaiian Islands. The reserve’s Coastal Training Program and research and monitoring program conducted a workshop on fishpond eDNA and provided follow-up technical assistance for a network of loko i‘a organizations.

The reserve Coastal Training Program has supported the implementation of the Hawai‘i Department of Land and Natural Resources Makai Watch Program in the He‘eia community. Makai Watch is a community-led effort to monitor for inappropriate uses of the natural and cultural resources in their areas. The approach reflects the traditional Hawaiian system where konohiki are in the best position to monitor and care for the resources in their community. With support from the He‘eia Research Reserve, the local Makai Watch Program has expanded to cover the entirety of Kāne‘ohe Bay, and the reserve opened up its model to others from other communities to learn about their Makai Watch locally and how it could have potential value in other communities on O‘ahu.

Accomplishment: The He'eia National Estuarine Research Reserve has developed many partnerships beyond the immediate four community partners that allow for knowledge sharing and capacity building throughout Hawai'i.

Contributions to the University of Hawai'i System

As described in the "Biocultural Restoration" section of this findings document, He'eia National Estuarine Research Reserve staff are centrally involved in the development and delivery of the required MBio600 graduate course for marine biology graduate students at the Hawai'i Institute of Marine Biology. The success of this program has been recognized by the leadership at various levels of the University of Hawai'i. The MBio600 course and the reserve's approach to community-based research development is foundational to a National Science Foundation Innovation in Graduate Education grant to the University of Hawai'i to institutionalize co-development of research with the communities that care for and utilize natural resources for early career marine science researchers.

The He'eia Research Reserve has worked closely with the Hawai'i Sea Grant Program on several initiatives. Both programs are part of the University of Hawai'i and this has allowed for leveraging resources and collaboration. For a portion of the evaluation period, the reserve and the Hawai'i Sea Grant Program shared a staff position. More recently, the Hawai'i Sea Grant Program released a research funding opportunity that incorporates He'eia Research Reserve priorities.

Through expertise gained in water quality and biological data collection and resource stewardship, along with understanding the value and protocols associated with Indigenous and traditional knowledge, and also serving as a trusted intermediary between key partners, the He'eia Research Reserve is potentially positioned to support a regional repository and data delivery role for the broader Kāne'ohe Bay region. The benefits of this initiative would not only serve individual efforts of the reserve's key partners, but could initiate "Ridge to Reef" ecosystem-level studies in support of basic science and resource management. Given that this effort is a significant investment and would require long-term commitment from several partners, it is recommended that if the reserve were to consider this, that they engage local and regional entities in a strategic planning process.

Recommendation: The NOAA Office for Coastal Management encourages the He'eia National Estuarine Research Reserve to consider ways in which the reserve's research and monitoring program could connect with efforts outside its boundary to better link with other observing and monitoring efforts within the Kāne'ohe Bay watershed and He'eia ahupua'a to amplify the impact of the reserve's monitoring program.

Challenges

The reserve Coastal Training Program has demonstrated success in convening workshops that weave Indigenous and local knowledge, including Indigenous science, with conventional science

to inform climate adaptation, habitat restoration, and water quality. However, the evaluation materials (i.e., survey) required by the national Coastal Training Program are not always the most relevant or in a culturally appropriate format for the kind of convenings or the "talk story" (conversation and sharing) style of some workshops led by the He'eia Coastal Training Program. This can create challenges for the program meeting grant-reporting requirements and could lead to misinterpretations of the impact of the programs. Subsequent to the evaluation site visit, the He'eia Coastal Training Program Coordinator, along with coordinators from other research reserves, provided input to the national program coordinator on approaches for evaluation and reporting requirements that could be more effective and place-based for each reserve. These changes are under consideration and will be further discussed by the national system at an upcoming meeting.

Reserve staff and their Indigenous Hawaiian partners are trusted and experienced experts in representing inclusion of Indigenous and traditional knowledge in scientific research and resource management. This findings document describes many of the efforts in which the reserve staff has provided this service to the University of Hawai'i, the Hawai'i Institute of Marine Biology, and the NOAA Office for Coastal Management and the National Estuarine Research Reserve System. There are also invisible ways in which reserve staff are expected to represent Indigenous and traditional knowledge ("cultural loading") even when that is not part of an explicit purpose or request of participation or work assignment. The NOAA Office for Coastal Management recognizes that regularly performing this role can lead to cultural loading that burdens reserve staff. This "extra" work that can include revisiting intergenerational trauma can have a toll on individuals that are working between the two worlds of Native Hawaiian and non-Indigenous cultures.

The University of Hawai'i and the Hawai'i Institute of Marine Biology have provided resources to He'eia Research Reserve staff to support and encourage their work in this area. The evaluation team notes that the reserve and partners have developed several products and tools that include information on best practices for how to work with Indigenous communities. Non-Indigenous partners and groups, including the Office for Coastal Management and the National Estuarine Research Reserve System, can work to learn about Indigenous experiences in such a way that reduces cultural loading on He'eia Research Reserve staff.

Evaluation Metrics

Beginning in 2012, reserves began tracking their success in addressing three evaluation metrics specific to their programs. The evaluation metrics include a five-year target and provide a quantitative reference for each program about how well it is meeting the goals and objectives it has identified as important to the program. In 2017, reserves began a new five-year period and set targets specific to their programs based on measures from existing National Estuarine Research Reserve System performance measures. The He'eia Research Reserve did not develop evaluation metrics in 2017 as it was a newly designated reserve without permanent staff or programming. The reserve has developed metrics for the current cycle which began in 2022. The evaluation period covered the first year of this 5-year cycle.

Evaluation Metrics: 2022-2027

Metric 1

Goal: Increase our understanding of the effects of anthropogenic drivers and natural events to improve informed decision-making affecting He'eia ahupua'a, and ultimately the coastal ecosystems of the entire moku.

Objective: Synthesize information for relevant outputs by weaving Indigenous Knowledge with research to better inform community decision-making toward creating a sustainable ecosystem.

Performance Measure: From 2023 to 2027, number of scholarly outputs (peer reviewed publications, graduate research thesis and dissertations, conference papers and posters, and technical reports) that will be produced from research in the He'eia National Estuarine Research Reserve that include co-authorship by "Indigenous and local knowledge (ILK)" holders along with professional scientists.

Target: From 2023 to 2027, 5 scholarly outputs (peer-reviewed publications, graduate research thesis and dissertations, conference papers and posters, and technical reports) will be produced from research in the He'eia National Estuarine Research Reserve that include co-authorship by "Indigenous and local knowledge" holders.

Calendar Year 2023 Data: 11 scholarly outputs produced from research in the He'eia National Estuarine Research Reserve that include co-authorship by "Indigenous and local knowledge" holders.

Discussion: The reserve has met the target for this metric in the first year of data collection. The reserve has established a research program that promotes the inclusion of Indigenous and local knowledge holders in the production of research products. This findings document provides descriptions of some of these methods, including co-development of graduate

research projects and coordination with the Hawai‘i Institute of Marine Biology in authorship protocols.

Metric 2:

Goal: Develop place-based education and training programs that inspire and educate the community about coastal ecosystems and Indigenous resource management practices that mālama (nurture) these systems sustainably, developing “dual fluency” within the community.

Objective: Increase student, educator, and community understanding of coastal ecosystems and Hawaiian resource management.

Performance Measure: From 2022 to 2027, number of P-12 students participating in education programs offered by He‘eia Research Reserve and its co-management partners.

Target: From 2022 to 2027, 25,000 P-12 students will participate in education programs offered by He‘eia Research Reserve and its co-management partners.

Fiscal Year 2022 Annual Data: 10,405 P-12 students participated in education programs offered by He‘eia Research Reserve and its co-management partners.

Discussion: After one year of education programs in this evaluation metric cycle, the reserve has met 40% of the five-year target. As described in this findings document, the reserve education program has had an extensive and broad reach within the He‘eia ahupua‘a and to neighboring communities.

Metric 3:

Goal: The He‘eia Research Reserve will engage in collaborative management to practice and promote stewardship that sustains cultural, biological, and natural resources.

Objective: Weave Indigenous and local knowledge (ILK), including Indigenous science, with conventional science to inform climate adaptation, habitat restoration, and water quality.

Performance Measure: From 2022 to 2027, number of Coastal Training Program workshops held.

Target: From 2022 to 2027, 30 Coastal Training Program workshops will be held.

Fiscal Year 2022 Annual Data: 8 Coastal Training Program workshops held.

Discussion: After one year of reporting, the reserve has met about a quarter of its target. Coastal Training Program workshops include “Equitable and Inclusive Authorship for Co-Produced Research in the He‘eia NERR,” “Leveraging Science to Support Indigenous Research,” and “Applying eDNA in Fishpond Management.”

Conclusion

For the reasons stated herein, I find that the Hawai‘i Institute of Marine Biology is adhering to the programmatic requirements of the Coastal Zone Management Act and its implementing regulations in the operation of the He‘eia National Estuarine Research Reserve.

These evaluation findings contain five recommendations. The recommendations must be considered before the next regularly scheduled program evaluation, but they are not mandatory at this time. Program recommendations that must be repeated in subsequent evaluations may be elevated to necessary actions.

This is a programmatic evaluation of the He‘eia National Estuarine Research Reserve that may have implications regarding the reserve’s financial assistance awards. However, it does not make any judgment about or replace any financial audits.

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Jeffrey L. Payne, PhD
Director
NOAA Office for Coastal Management

Date

Appendix A: Response to Written Comments

No written comments were received.