Final Evaluation Findings

San Francisco Bay
National Estuarine Research Reserve

July 2015 to August 2021

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Summary of Findings

The Coastal Zone Management Act requires the National Oceanic and Atmospheric Administration (NOAA) Office for Coastal Management to conduct periodic evaluations of the operation and management of each national estuarine reserve participating in the National Estuarine Research Reserve System. This evaluation examined the operation and management of the San Francisco Bay National Estuarine Research Reserve by the San Francisco State University, the designated lead agency, for the period from July 2015 to August 2021. The evaluation focused on the target areas of administration, regional impact and stewardship, and climate change and coastal resilience.

The findings in this evaluation document will be considered by the NOAA Office for Coastal Management in making future financial award decisions concerning the San Francisco Bay National Estuarine Research Reserve. The evaluation came to these conclusions:

Findings for Program Administration

Accomplishment: The San Francisco Bay Reserve identified its niche within the complex, multi-jurisdictional San Francisco Bay region, and partners now recognize the reserve as a go-to organization for science-based information, especially as it relates to impacts of climate change on Bay ecosystems, coastal restoration, resilience, and stewardship.

Accomplishment: The San Francisco Bay Reserve excelled at strengthening its core partnerships and building and maintaining other existing and new partnerships.

Accomplishment: The San Francisco Bay Reserve is incorporating diversity, equity, inclusion, and accessibility into its programming and operations. For example, the reserve assisted with the design and installation of a wheelchair-accessible trail, provided translation services in its community work, and developed a new job description and outreach plan to attract a diverse applicant pool for the education coordinator position.

Recommendation: The NOAA Office for Coastal Management encourages the San Francisco Bay Reserve to identify ways to strengthen cross-sector collaboration as it develops its next management plan and to seek other opportunities such as existing and proposed projects to strengthen cross-sector collaboration.

Recommendation: The NOAA Office for Coastal Management recommends that the San Francisco Bay Reserve update its memorandum of understanding with its land management partners, last signed in 2003, as part of the reserve's management plan update scheduled in 2023.

Recommendation: The NOAA Office for Coastal Management encourages the San Francisco Bay Reserve to review the fiscal health of the reserve and complete a business plan that identifies

programmatic and staffing areas for growth, and opportunities for revenue sources and additional grants management support.

Recommendation: The NOAA Office for Coastal Management encourages the San Francisco Bay Reserve, Estuary and Ocean Science Center, and San Francisco State University to provide staff support from the university for grants management to enable the reserve to leverage additional grants and financial support.

Recommendation: The NOAA Office for Coastal Management encourages San Francisco State University, Estuary and Ocean Science Center, and the San Francisco Bay Reserve to incorporate diversity, equity and inclusion into all future hiring processes.

Recommendation: The NOAA Office for Coastal Management encourages the San Francisco Bay Reserve, Estuary and Ocean Science Center, and San Francisco State University to develop a plan to address the stewardship gap while the coastal resilience specialist is the acting manager, and to build out this role going forward. The plan should include identifying and pursuing opportunities to hire a full- or part-time stewardship coordinator.

Necessary Action: San Francisco State University, Estuary and Ocean Science Center, and the San Francisco Bay Reserve must hire a full-time reserve manager to ensure continuity of operations and continued growth in programs and partnerships by April 30, 2023.

Findings for Regional Impact, Stewardship, and Climate Change and Coastal Resilience

Accomplishment: The San Francisco Bay Reserve worked with partners to found and develop the Wetland Regional Monitoring Program for the San Francisco Estuary. This collaboration of permitting agencies, restoration planners, land managers, regional planning organizations, environmental consults, and others established a long-term monitoring program that will guide the development of large-scale tidal wetland restoration projects planned for the region.

Accomplishment: The San Francisco Bay Reserve is conducting monitoring and research and extensive public outreach and education to inform the development of an adaptive strategy for San Pedro Road, an important evacuation route, that meets the multiple objectives of community access and marsh migration. This effort has informed statewide policy development and adaptation strategies for California State Parks.

Accomplishment: The San Francisco Bay Reserve's contributions to restoration efforts, invasive species management, rare species recovery, and climate resilience are informing coastal and natural resource planning and decision-making in the San Francisco Bay region.

This evaluation concludes that San Francisco State University is adhering to the programmatic requirements of the National Estuarine Research Reserve System in the operation and management of the San Francisco Bay National Estuarine Research Reserve.

Program Review Procedures

The Coastal Zone Management Act of 1972, as amended,[1] requires that state coastal zone management programs (coastal programs) and national estuarine research reserves (research reserves) that are developed under the act and approved by the secretary of the Department of Commerce be evaluated periodically.[2] Section 315 of the Coastal Zone Management Act, 16 U.S.C. 1461, and implementing regulations at 15 CFR 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 National Oceanic and Atmospheric Administration (NOAA) evaluated the San Francisco Bay National Estuarine Research Reserve in 2021. The evaluation team consisted of Carrie Hall, evaluation team lead; Melis Okter, coastal management specialist; Rebecca Smyth, West Coast regional director; Cadijah Walcott, Sea Grant Knauss marine policy fellow at the Federal Emergency Management Agency and Coastal States Organization, and Michael De Luca, senior associate director, Office of Research at Rutgers University. The support of reserve staff members was crucial in conducting the evaluation, and this support is most gratefully acknowledged.

NOAA sent a notification of the scheduled evaluation to the president of the San Francisco State University, published a notice of "Intent to Evaluate" in the *Federal Register* on June 28, 2021, and notified members of California's congressional delegation. The reserve advertised the public meeting in the *Marin Independent Journal* on June 28, 2021 and posted a notice of the public meeting and opportunity to comment on its website.

The evaluation process included a review of relevant documents and a survey of stakeholders who work with the reserve. The surveyed stakeholders were identified by reserve and Office for Coastal Management staff. This information was used to identify three target areas for the evaluation: program administration, regional impact and stewardship, and climate change and coastal resilience. A site visit was conducted and the evaluation team held meetings with staff members and group discussions with stakeholders and program staff members about the target areas. In addition, a virtual public meeting was offered on Wednesday, August 11, 2021, at noon, local time, to provide an opportunity for members of the public to express their opinions about the implementation of the program. Stakeholders and members of the public were also given the opportunity to provide written comments. No written comments were received. NOAA then developed draft evaluation findings, which were provided to the San Francisco State University for review, and the university's comments were considered in drafting the final evaluation findings.

[1] 16 U.S.C. 1451 et. seq.

[2] CZMA Section 312, 16 U.S.C. 1458.

Final evaluation findings for the national estuarine research reserves highlight the reserve's accomplishments in the target areas and include recommendations, which are of two types.

Necessary Actions address programmatic requirements of the Coastal Zone Management Act and its implementing regulations. 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 Sections 312(c) and 315(f), 16 U.S.C. 1458(c), 1461(f), and 15 CFR 921.40.

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 dates specified.

Evaluation Findings

Program Administration

The San Francisco Bay Reserve is university-based with the primary staff and facility located off-campus at the Estuary and Ocean Science Center. The two components of the reserve, China Camp State Park and Rush Ranch Open Space Preserve, are located a distance away from the reserve headquarters. China Camp is a state park with day-to-day management conducted by the Friends of China Camp under an agreement with California State Parks. Rush Ranch is owned and managed by Solano Land Trust and is one of a number of properties managed by the trust. As a result, establishment and maintenance of partnerships is vital to the success of the reserve and is an area where they have excelled during the evaluation period.

Benefits of co-location with the Estuary and Ocean Science Center include access to a deep talent pool with expertise in coastal and estuarine issues, financial support, additional visibility with university leadership, collaborative opportunities to pursue external grant funding, and access to marine operations facilities including boats and vehicles. The center has been a strong advocate and supporter of the reserve during the evaluation period.

Management Plan, Regional Niche, and Sector Integration

The reserve is successfully implementing its 2018-2023 Management Plan and its three goals

- *to increase and improve scientific knowledge of the San Francisco Estuary ecosystem;*
- *to expand understanding, practice, and application of estuarine and coastal science; and*
- *to increase, enhance, and help disseminate on an annual basis research by students and scientists working at reserve sites.*

The management plan also identifies the reserve's niche: "*The Reserve is unique in the San Francisco Estuary by combining place-based long-term scientific assessment and research with education and coastal training programs that draw upon and extend beyond the outputs from the two Reserve sites, with the capacity to integrate science across disciplines and audiences. Foundational to our success is the strength of our signatory partnerships and collaboration with a wide range of entities and programs in the Estuary and the NERRS national network.*"

National estuarine research reserves are required to update their management plans every five years. With the upcoming management plan update, the reserve should consider updating its memorandum of understanding with its land management partners, last signed in 2003.

Recommendation: The NOAA Office for Coastal Management recommends that the San Francisco Bay Reserve update its memorandum of understanding with its land management partners, last signed in 2003, as part of the reserve's management plan update scheduled in 2023.

The reserve's partners articulated this niche when talking to the evaluation team about the value of the reserve. Partners identified the reserve as the unique "go-to" organization that has

science, stewardship, education, and training capabilities. Partners noted that the reserve brings a different set of partners together than other regional collaboratives—federal, universities, government agencies, and nonprofits. They also cited the reserve's ability to facilitate work across jurisdictions and boundaries and to bring together different types of partners who don't normally work together. The reserve's leadership and contributions to initiatives, including the Wetland Regional Monitoring Program and China Camp Road project discussed in the findings, are examples of projects that build on the reserve's identified niche.

Accomplishment: The San Francisco Bay Reserve identified its niche within the complex, multi-jurisdictional San Francisco Bay region, and partners now recognize the reserve as a go-to organization for science-based information, especially as it relates to impacts of climate change on Bay ecosystems, coastal restoration, resilience, and stewardship.

The reserve's strengthened cross-sector collaboration over the evaluation period is recognized by its partners, who look to the reserve as an entity that can bring together unique capabilities. There are still opportunities for the reserve to improve cross-sector integration and capitalize on the reserve's full suite of capabilities to address key coastal management issues. The reserve is encouraged to identify ways to strengthen cross-sector collaboration in its next management plan. Prior to development of the plan, the reserve can capitalize on existing and new project opportunities to advance cross-sector collaboration.

Recommendation: The NOAA Office for Coastal Management encourages the San Francisco Bay Reserve to identify ways to strengthen cross-sector collaboration as it develops its next management plan and to seek other opportunities such as existing and proposed projects to strengthen cross-sector collaboration.

Understanding Fiscal Health and Building Reserve Capacity – A Business Plan

As discussed throughout the evaluation findings, the reserve has excellent staff and programming, and has spent the past six years building strong relationships with partners. Many of the fellows, interns, and students it has supported over the years are now professionals in the region. The reserve is well positioned to grow its programming and impact in the region. The reserve has also been very successful when it has applied for grant funding.

In order to maintain and expand its existing programming, a key issue is having reserve and university capacity to manage grants in a timely manner. The NOAA Office for Coastal Management encourages the reserve and San Francisco State University to examine the fiscal health of the reserve and strengthen the business side of its operations. A first step could be working with the Estuary and Ocean Science Center to develop a business plan. The business plan could inform and complement the upcoming development of the reserve's 2023-2028 management plan. The development of the business plan should include identifying opportunities for the reserve to grow its programming and the steps needed to obtain the funding and staff support.

A business plan could cover these areas:

Improving Grants Management Capacity

- In conjunction with the center, find opportunities to bring in additional grant staff support from San Francisco State University as discussed further in the subsection, "Grants Management," below.
- Ensure that staff have the technical capacity to meet NOAA reporting and financial management requirements.
- Build internal capacity, or identify and build outside opportunities, for receiving and managing smaller grants.

Funding

- Identify and explore additional funding sources such as the Cooperative Ecosystem Studies Network, NOAA Sea Grant, California State Coastal Conservancy, and others that can support people and programs.
- In conjunction with the center, explore setting up a foundation, or other mechanism, to accept donations.

Staffing

- Identify staffing priorities for expanding reserve capacity and programming.
- Explore opportunities to share positions with partners to save on salary costs.
- Identify opportunities to increase staff retention in the high-cost San Francisco area, such as the potential for pay raises, job reclassification, opportunities for staff development, and flexible work schedules.
- Explore with university partners additional opportunities to build the next generation of coastal managers and scientists.
- Identify opportunities for attracting and building a more diverse graduate student body in the Estuary and Ocean Science Center.

Building Internal Support

- Identify opportunities to raise awareness and support of the reserve throughout the San Francisco State University community, such as systematically developing outreach materials and meeting with university leadership to communicate the reserve's success and contribution to the university and its students, and to identify new partnership opportunities. This could build on the recent document the reserve developed—"How the Reserve Supports the Academic Community."

Recommendation: The NOAA Office for Coastal Management encourages the San Francisco Bay Reserve to review the fiscal health of the reserve and complete a business plan that identifies programmatic and staffing areas for growth, and opportunities for revenue sources and additional grants management support.

Grants Management

Although placement of the reserve within the Estuary and Ocean Science Center has provided benefits, it has also placed a burden on existing administrative capacity at the center, especially in the area of grants management. Reserve staff actively leverage the support provided by

NOAA and the university by competing successfully for external grants. The reserve and Estuary and Ocean Science Center would benefit from having a grants management specialist within their unit that is familiar with their programs and can ensure timely and accurate invoicing and management of salary allocations, cost share, expenditures, and subcontracts. The reserve has been very successful in obtaining grants, and this additional support would enable the reserve to be able to leverage additional grants and financial support to strengthen and expand programming. The reserve could also use additional support to work through the university procurement procedures. Other reserves, such as Jacques Cousteau Reserve at Rutgers University, have benefited greatly from having a shared business manager. In addition, the reserve has trouble meeting NOAA grant deadlines due to the time and effort required to process grants paperwork through the university system.

Recommendation: The NOAA Office for Coastal Management encourages the San Francisco Bay Reserve, Estuary and Ocean Science Center, and San Francisco State University to provide staff support from the university for grants management to enable the reserve to leverage additional grants and financial support.

Staff and Staffing

As of December 2020, the reserve was staffed by a reserve manager, research coordinator, education coordinator, half-time Coastal Training Program coordinator (a shared position with the Estuary and Ocean Science Center), part-time coastal resilience specialist, two research technicians, and an administrative coordinator. Reserve staff are valued by partners for their expertise and were described by them as excellent, dedicated, high caliber, knowledgeable, and highly skilled.

As the university and reserve move forward with filling open positions and any future new staff positions, they are encouraged to incorporate diversity, equity, inclusion, and accessibility into the hiring process, both in the job description and in outreach to advertise the position. The university and reserve can capitalize on their success with attracting a diverse applicant pool for the education coordinator position. In addition, the university and reserve might look to other universities for best practices and procedures to implement an equitable hiring process.

Recommendation: The NOAA Office for Coastal Management encourages San Francisco State University, Estuary and Ocean Science Center, and the San Francisco Bay Reserve to incorporate diversity, equity and inclusion into all future hiring processes.

Stewardship Coordinator Position

The reserve has not had a stewardship coordinator since 2017. Prior to 2017, the reserve had a shared stewardship coordinator position with Solano Land Trust. In 2015, the reserve created a part-time coastal resilience specialist position, and the coastal resilience specialist works on wetland restoration projects. The coastal resilience specialist took on the manager position as a part-time employee when the program manager retired a few weeks after the virtual evaluation site visit.

The reserve would benefit from developing a plan to address the stewardship gap while the coastal resilience specialist is the acting manager, and to build out this role going forward. The reserve, Estuary and Ocean Science Center, and university should consider opportunities to hire a full- or part-time stewardship coordinator. The reserve is encouraged to pursue grants that could provide funding to fill the stewardship role. The reserve could also work to create a stewardship team across its staff and key partners to fill gaps in the short term and maximize its impact longer term. The reserve is also encouraged to work with its core partners to look at opportunities for volunteers to assist with stewardship activities. As part of its plan, the reserve is encouraged to look at opportunities for the stewardship sector to provide workforce development opportunities, including for historically excluded communities.

Recommendation: The NOAA Office for Coastal Management encourages the San Francisco Bay Reserve, Estuary and Ocean Science Center, and San Francisco State University to develop a plan to address the stewardship gap while the coastal resilience specialist is the acting manager, and to build out this role going forward. The plan should include identifying and pursuing opportunities to hire a full- or part-time stewardship coordinator.

Reserve Manager Position

A few weeks after the evaluation site visit, the reserve manager retired. The university appointed the coastal resilience specialist as the interim program manager. The interim program manager will continue to serve in a part-time role. The university plans to hire a full-time manager in 2023. NOAA strongly encourages the hiring of a full-time manager in a timely manner. Many of the reserve partnerships, so key to the vitality and management model of the reserve, require ongoing work and communication to be successful. In addition, there are many future funding and partnership opportunities that will require manager action for success.

Given the role that the manager plays in leading the reserve, as well as with building and maintaining the relationships and work in the Bay, NOAA encourages the university and Estuary and Ocean Science Center to carefully consider the suggestions of key skills identified by the Management Advisory Board in addition to university requirements. The key skills identified for a reserve manager are relationship building, financial and management acumen, scientific credibility, and collaborative approach.

Necessary Action: San Francisco State University, Estuary and Ocean Science Center, and the San Francisco Bay Reserve must hire a full-time reserve manager to ensure continuity of operations and continued growth in programs and partnerships by April 30, 2023.

Diversity, Equity, Inclusion, and Accessibility

The reserve has been incorporating diversity, equity, inclusion, and accessibility into its work. Examples include incorporating translation services into grants that include community engagement activities and developing a new job description and outreach plan to attract a diverse applicant pool for the education coordinator position. The reserve is updating the

education program's market analysis and needs assessment and will be including communities the reserve has not worked with before. The education program is investigating what barriers and challenges groups might have in interacting with the reserve and opportunities to overcome those barriers. The reserve is also utilizing its upcoming National Estuarine Research Reserve System (NERRS) Science Collaborative Transfer Grant to learn more about the engagement process with frontline communities and community-based organizations. The reserve has helped design and develop public access opportunities that include bilingual signage and providing for wheelchair access. Reserve staff are also actively engaged in national and regional workgroups that are addressing diversity, equity, inclusion, and accessibility.

Accomplishment: The San Francisco Bay Reserve is incorporating diversity, equity, inclusion, and accessibility into its programming and operations. For example, the reserve assisted with the design and installation of a wheelchair-accessible trail, provided translation services in its community work, and developed a new job description and outreach plan to attract a diverse applicant pool for the education coordinator position.

In addition, to the many efforts already underway, the reserve could consider additional opportunities in this area. The Estuary and Ocean Science Center reports that the diverse undergraduate student population at San Francisco State University is not reflected in the graduate students at the center. The reserve is encouraged to consider and develop strategies to promote diversity, equity, and inclusion in the graduate student body. One opportunity may be through more undergraduate student engagement. Other opportunities include

- Incorporating diversity, equity, inclusion, and accessibility into the next management plan update;
- Advancing diversity, equity, inclusion, and accessibility initiatives through partnerships, for example the Louis Stokes Alliances for Minority Participation;
- Utilizing lessons learned and best practices from other organizations, for example the National Association of Marine Laboratories, NERRS-NERRA Diversity Equity Inclusion and Justice Workgroup, and the Undergraduate Field Experiences Research Network;
- Encouraging efforts to look at how the education and training sectors can reach broader audiences;
- Utilizing a diversity, equity, inclusion, and accessibility lens in the manager hiring process, as well as all future job openings; and
- Ensuring that funding is allocated to provide paid opportunities for students and volunteers, especially from historically excluded communities.

Next Generation

The reserve has helped mentor and facilitate the research of graduate, undergraduate, and high school interns at the reserve. The new NOAA Davidson Fellowship and Hollings Scholars Program for undergraduates provide federally funded internship opportunities. In addition, the reserve's research partnerships with U.S. Fish and Wildlife and others provide additional opportunities for students to engage in paid research opportunities. Three professionals now working in coastal management and research in the region stated that their work with the reserve as students had been an "important part of professional development" and reserve

staff “helped with permitting at China Camp State Park and helped situate my work in a bigger career” and “[I am] really privileged to work with the reserve.” They also cited the ability of the reserve to provide access to the public as well as important training for young scientists. They cited the ability of the reserve to connect to decades worth of research and a tremendous amount of geographic and institutional knowledge, and the ability to connect with partners through staff.

With additional resources, the reserve could play a critical role in additional workforce development in the region and provide support to additional university students. In addition, the reserve could target local communities in Solano County, West Oakland, and Palo Alto to bring in underrepresented students to work at the reserve.

Partnerships

The reserve excelled at strengthening its core partnerships with the Estuary and Ocean Science Center, Solano Land Trust, California State Parks, and Friends of China Camp. In addition, it strengthened other regional partnerships such as the San Francisco Bay National Estuary Program and the San Francisco Bay Conservation and Development Commission, where the reserve assisted the commission with bringing in interns who were able to analyze the effectiveness of the agency’s permit requirements. The reserve also built new partnerships, including a collaboration with the San Francisco State University College of Education to provide training opportunities for student teachers. The reserve has served as a catalyst in bringing together new partners. For example, the reserve connected Solano Land Trust staff and U.S. Geological Survey researchers who are now doing research at Rush Ranch. The reserve is also valued by partners for its connection with San Francisco State University. U.S. Geological Survey researchers and others noted that the ability to connect and have graduate students work on their projects was very valuable.

The reserve was also cited by partners as allowing them to amplify their work and ability to educate. For example, 27 teachers came out to Solano Land Trust to learn about watersheds and wetlands and will be teaching others. The education coordinator has partnered with the San Francisco State University Center for Science and Math Education since 2009. The reserve has worked with the center to support K-12 programming. The center developed an Integrating Engineering and Technology with Math and Science (iTEAMS) Math and Science Partnership with San Rafael City Schools (2014-2017) and partnered with the reserve and Estuary and Ocean Science Center. The teachers were able to spend time at the center and reserve and learn about the oyster die-off that was occurring in the Bay while working with reserve data. As highlighted throughout the findings, these strengthened and new partnerships have extended the impact of the reserve’s research, stewardship, education, and training programs.

Accomplishment: The San Francisco Bay Reserve excelled at strengthening its core partnerships and building and maintaining other existing and new partnerships.

Regional Impact and Stewardship and Climate Change and Coastal Resilience

The reserve's stewardship efforts encompass restoration, invasive species management, rare species recovery, and climate change resilience. The reserve engages a broad range of community interests in these efforts, including surrounding communities, tribal and indigenous groups, schools, and professional development, all within a strong science framework. Reserve partners the evaluation team met with highlighted that the reserve brought together a unique skill set in the region, enhancing their impact. The reserve is highly valued for its monitoring data; research; ability to bring together multiple stakeholders to address regional issues; and for providing a unique platform for education and communication of science.

The reserve supports local, regional, and national efforts in building coastal resilience through science, stewardship, training, and education. The reserve's ability to work not only across the estuary, but also across jurisdictions, has been important in bringing people together to address climate change and coastal resilience in the region. Reserve lands are a space that brings climate impacts, adaptation, and resilience to light for stakeholders and the public. A few examples of the reserve's success are highlighted below.

Benchmark Sites

The reserve's components, Rush Ranch and China Camp, are uniquely positioned as benchmark sites (millennial marshes) because of the nature and history of the marsh system. Both are some of the oldest and least disturbed marshes in the region. Evaluation participants consistently cited the value of these marshes as reference sites and the value of the reserve's historical monitoring data and research conducted at the sites. Partners also noted the value of the reserve working in both the upper and lower marsh, allowing for continuity in adaptation strategies.

Wetland Regional Monitoring Program

The reserve has had a lead role in founding and developing the Wetland Regional Monitoring Program for the San Francisco Estuary. The program manager serves on the technical advisory committee and the Coastal Training Program coordinator serves on the project steering committee. The program brings together permitting agencies, restoration planners, land managers, regional planning organizations, environmental consultants, and others to establish a long-term monitoring program to assess both tidal wetland response to sea-level rise and other factors in the context of large-scale tidal wetland restoration projects. China Camp State Park and Rush Ranch marshes have been selected as two of the first benchmark sites for the program. Partners relied on the reserve and its relationship with NOAA to better understand vertical control in a tectonically active estuary. The reserve had a lead role in establishing parameters for water quality and vegetation and has been supporting more detailed vegetation studies in the reserve and estuary to fill in data gaps. These data will provide a baseline for looking at changes to vegetation communities and how this influences species habitat and shoreline change.

Accomplishment: The San Francisco Bay Reserve worked with partners to found and develop the Wetland Regional Monitoring Program for the San Francisco Estuary. This collaboration of permitting agencies, restoration planners, land managers, regional planning organizations, environmental consults, and others established a long-term monitoring program that will guide the development of large-scale tidal wetland restoration projects planned for the region.

China Camp Road

San Pedro Road runs through China Camp State Park and is an important transportation and evacuation corridor for the local community. The county road is increasingly prone to periodic seasonal flooding and bisects tidal marsh, impacting marsh habitat within the state park. The previous evaluation findings included a recommendation encouraging the reserve to work with "*partners to develop and implement an adaptive strategy for San Pedro Road that meets the multiple objectives of community access and marsh migration, serving as a model for other such projects across the nation."*

To address this issue, the reserve enhanced its monitoring program and conducted research to better understand the problem and potential solutions. The reserve is working closely with the community and state parks to design and pursue a solution that will address the flooding and improve marsh habitat. The reserve received a competitive NERRS Science Collaborative Catalyst grant, to conduct long-term monitoring of water levels and sediment elevation adjacent to the two sections of North San Pedro Road that experience periodic seasonal flooding to better understand the baseline conditions. The reserve supported additional related research led by the U.S. Geological Survey to better understand the mechanisms of sediment delivery to and retention within the China Camp salt marsh. This collaboration included three graduate students and a high school intern and led to a NERRS Science Collaborative Science Transfer grant. This research has nurtured a new project led by the U.S. Geological Survey to expand the work to a broad range of marsh types around San Francisco Bay. A California State Parks' representative cited the reserve's research and monitoring, along with the work of other San Francisco State University researchers, at China Camp State Park as an example of how San Francisco State University is having an impact statewide. California State Parks is using research and monitoring conducted at China Camp State Park to inform policy development and adaptive management of state parks throughout the system.

In the Fall of 2017, the Coastal Training Program organized a symposium bringing together stakeholders and community members from the Gallinas Creek watershed. This initial symposium led to a series of workshops that engaged interested parties in identifying a suite of short-term issues related to sea-level rise, resource management, recreational use, and access. This effort helped identify top options for a feasibility study while also strengthening local partnerships and building goodwill among the community and stakeholders. The workshops also informed the development of lesson plans for local teachers. An evaluation participant from the regional water quality control board stated that "the NERR facilitated the most productive public process I've ever observed…truly bottom-up instead of top-down." This work was also funded through a competitive NERRS Science Collaborative Catalyst grant.

The reserve continues to be very successful in obtaining funding for projects, including support of the China Camp Road project. In 2021, the reserve received 3 of 15 National Estuarine Research Reserve Science Collaborative awards. Two of the awards will support the China Camp Road Project: “Respecting the Past, Planning for the Future: Assessing Cultural Resources and Watershed Connectivity Associated with a Proposed China Camp State Park Road Modification Project and Resilient Roads and Reserves” and “Opportunities for Improving Habitat and Access in California,” a partnership project across all three California reserves.

Accomplishment: The San Francisco Bay Reserve is conducting monitoring and research and extensive public outreach and education to inform the development of an adaptive strategy for San Pedro Road, an important evacuation route, that meets the multiple objectives of community access and marsh migration. This effort has informed statewide policy development and adaptation strategies for California State Parks.

Wetland Restoration

The San Francisco Bay Area is investing significant funding to protect its marshlands and plan for marsh migration as sea levels rise to build coastal resilience. The reserve is supporting this effort through the role it has identified as its niche: “combining place-based long-term scientific assessment and research with education and coastal training programs . . . to integrate science across disciplines and audiences.”

The reserve led a project in San Francisco Bay in which thin layers of clean sediment were added to small experimental plots in low and high elevation areas of the Manzanita salt marsh in Richardson Bay. For the past few years, the reserve has been monitoring change in surface elevation and vegetation cover in those experimental plots relative to nearby control and reference plots. The project will lead to a greater understanding of how local salt marshes respond to thin-layer placement of sediment on top of existing vegetation. As part of the project, the reserve led the extensive permitting process and at the request of the San Francisco Bay Conservation and Development Commission added 10 experimental plots that used dredged sediment from the Bay as a more representative sediment source for what other regional projects will use in the future. The data from this project are now informing management decisions in San Francisco Bay and will continue to do so as additional monitoring data become available. The project provided support for a NERR graduate research assistant who added a greenhouse experiment using the same dredged material and plants collected from Manzanita marsh.

The reserve also strengthened its partnership with the U.S. Fish and Wildlife Service, particularly on marsh restoration planning and research. The reserve’s work has informed Fish and Wildlife’s five-year reviews of the status of listed species and informed marsh restoration actions.

Lower Spring Branch Restoration

At Rush Ranch, the reserve partnered with Solano Land Trust and other partners to complete the Lower Spring Branch Creek restoration in 2019. Solano Land Trust staff in particular, highlighted the reserve's value in serving in a science advisory role. The project, paid for with state bond funds, expanded the tidal slough 1,200 feet upstream and extended tidal action to an additional 15 acres, allowing for future marsh migration with sea-level rise. The project replaced an earthen road and small culverts with a large "arch culvert" bridge that allows the tidal slough to flow freely upstream, maximizing fish use and facilitating listed species recovery. The reserve research assistant's expertise in accessibility informed the bridge and road design, resulting in improved public access. The arched bridge's slope accommodates wheelchairs and the ranch road that crosses alongside the tidal marsh was resurfaced with angular gravel to improve the surface for wheelchair access. Interpretive signage highlighting the restoration and its role in coastal resilience was installed. The Lower Spring Branch restoration is being used by Solano Land Trust and other partners as a showcase for local leaders and communities to talk about climate change impacts and how habitat restoration projects can build future resilience. The director of the Solano Land Trust cited the restoration project and reserve as an "unbelievable opportunity" to demonstrate how marsh restoration can build resilience. A graduate student at the Estuary and Ocean Science Center developed an ArcGIS StoryMap (*storymaps.arcgis.com/stories/afc210395d584ba4b67ddfd1964e6891*) for the project.

The reserve is conducting long-term continuous monitoring of surface water levels and groundwater levels along with periodic measurements of salinity and vegetation within the restoration site. The endangered plant soft bird's-beak was previously well established along the upper edges of the restoration site, and continued monitoring of that population as well as environmental drivers of change is a critical part of improving understanding of restoration efficacy at the reserve. As funding allows, the reserve plans to expand restoration monitoring to include vegetation and habitat mapping, conduct topographic monitoring to see how the constructed tidal slough evolves over time, conduct a pilot manipulation to assess potential treatments that could promote recruitment of the Suisun thistle in a restored habitat, and assist Solano Land Trust in meeting regulatory compliance requirements for restoration monitoring. The success of the project also opens the door for the reserve to support Solano Land Trust on future collaborations and grant proposals.

Rare and Endangered Species

The reserve has conducted a variety of monitoring and research projects to better understand the distribution and ecology of rare, threatened, and endangered species, including Ridgway's rail, salt marsh harvest mouse, black rail, and Suisun thistle, soft bird's-beak, and Chinook salmon at Rush Ranch. Point Blue Conservation Science, a local nonprofit, has continued annual monitoring of both Ridgway's rails at China Camp and other marsh birds at both reserve sites. Their data have enabled more efficient and effective management of researcher access to minimize impacts to listed species, at China Camp in particular. The reserve also led a multi-partner initiative that includes the U.S. Fish and Wildlife Service, to document current distribution of Suisun thistle at Rush Ranch and to investigate important ecological aspects of that rare plant and its relationships to other species and the abiotic environment. Additional

work by the reserve and partners focused on soft bird's-beak distributions at Rush Ranch. Researchers from the California Department of Fish and Wildlife and the University of California, Davis, examined the distribution and ecology of the salt marsh harvest mouse and Chinook salmon, and researchers from the department are currently studying salmon feeding and growth in the tidal sloughs at Rush Ranch and also in Gallinas Creek. This work is helping inform the development of a tidal marsh recovery plan being developed by the U.S Fish and Wildlife Service.

Carbon Flux

The reserve is working with partners to investigate vertical and lateral fluxes of carbon in the brackish marsh at Rush Ranch, and have created one of the region's best and longest-running observations of greenhouse gas fluxes through brackish tidal wetlands in a rare intact marsh. The monitoring data and research continue to inform state and regional conversations about the value of marshes in removing atmospheric carbon and mitigating climate change and building coastal resilience.

The reserve collaborated with researchers from the U.S. Geological Survey to install equipment and maintain an eddy covariance tower and lateral flux monitoring station to quantify carbon cycling through the brackish tidal marsh ecosystem. The reserve has collaborated with other reserves to synthesize coastal inundation and carbon accretion data. The reserve is part of a NASA-funded project that brought together sediment data from eight reserves, which were included in a high-profile article, "Accuracy and Precision of Tidal Wetland Soil Carbon Mapping in the Conterminous United States," in *Scientific Reports*. The reserve is also part of a new project that is attempting to use NERRS wetlands to calibrate remote sensing imagery and modeling algorithms that aim to estimate variation in greenhouse gas fluxes spatially and temporally around the country. The flux tower at Rush Ranch is also visible to the visiting public, providing an opportunity to engage public interest in the reserve's research, since most others in the Bay area are not easily accessible.

MarineGEO

In 2016, the reserve collaborated with Smithsonian Environmental Research Center scientists and the MarineGEO program to install a new water-quality monitoring station in Richardson Bay on the edge of a bird sanctuary with an upgraded second weather station. The reserve has operated the weather station for five years and is now planning to elevate the water-quality component of the station to a secondary System-wide Monitoring Program station. An outcome of this collaboration is that MarineGEO scientists are developing semi-automated approaches to the quality assurance and control (QA/QC) steps that the National Estuarine Research Reserve System has been using for years, with the goal of applying those approaches to all water-quality monitoring stations in MarineGEO's network. The national Centralized Data Management Office is working with MarineGEO to test and refine their new automated approaches in hopes that the entire estuarine reserve system can implement and benefit from a more automated approach. The reserve's monitoring activities have catalyzed changes that may benefit the entire reserve system.

Additional Project Successes

The reserve made valuable contributions to other coastal resilience efforts in the Bay, including

- The Delta Plan Ecosystem Amendment to address climate resilience. The reserve developed new maps of diked land elevations relative to tidal datums for Suisun Marsh (100,000 acres) and the Sacramento-San Joaquin Delta (750,000 acres). The maps form the cornerstone of the Ecosystem Amendment, which should be approved in 2022.
- The Delta Stewardship Council's Delta Adapts: Creating a Climate Resilient Future Initiative. The reserve's stewardship, research, and monitoring informed the development of the vulnerability assessment and adaptation plan.
- Hosting an adaptive management forum with the Delta Stewardship Council's Delta Science Program that brought together practitioners and scientists. Delta Science Program staff stated that the reserve staff involvement helped them hone their work across San Francisco Bay.
- Assisting Solano Land Trust in obtaining National Estuarine Research Reserve System Procurement Acquisition and Construction funding for a solar facility at Rush Ranch.
- Supporting a regional effort to designate the San Francisco Estuary as a Hope Spot, special places that are scientifically identified as critical to the health of the oceans. The reserve took the lead to advise on the geographic extent of the designation through presentation of GIS data identifying elements of the estuary's bathymetry, land use, and natural resources.
- Developing workshops with Blue Point Conservation Science focused on adaptation planning and implementation of living shorelines. The partners will be building on this effort going forward with funding support from a NERRS Science Transfer grant.
- Partnering with the San Francisco Bay Conservation and Development Commission for a sea-level rise training program for local agencies and governments

Accomplishment: The San Francisco Bay Reserve's contributions to restoration efforts, invasive species management, rare species recovery, and climate resilience are informing coastal and natural resource planning and decision-making in the San Francisco Bay region.

Opportunities

The reserve is a leader in restoration and moving forward on building the region's resilience and focusing on science for coastal decision makers. The reserve also plays a very valuable role in providing a public-facing space to bridge science to management and to be a showcase for the public and coastal decision makers to understand the importance of and opportunities for building coastal resilience. There are also potential new opportunities for the reserve going forward, and the reserve may wish to consider the following:

- Promoting and building on the research and monitoring at China Camp and Rush Ranch, because their millennial marshes serve as important reference sites to determine the success of marsh adaptation and restoration projects.
- Continuing to capitalize on its cross-sector work in the region to support stewardship and climate resilience and continue to promote China Camp and Rush Ranch as

reference sites for research, education, and training on wetlands restoration and science-based land management.

- Continuing to bring together diverse groups of partners and establish unique partnerships in the region between stakeholders who would not generally be in the same room.
- Exploring opportunities to fill a regional need for public education and dialogue about land stewardship, wetland restoration, and the intersection with climate change and how the reserve affects estuarine resources based on its goals and regional niche.
- Exploring opportunities, including with its core partners, to engage more with volunteers to both support reserve activities and educate volunteers.
- Exploring and pursuing additional opportunities to work with San Francisco State University on resilience issues, such as the new Climate Certificate, which could benefit from reserve climate expertise.
- Exploring and pursuing additional opportunities and audiences for outreach and education to ensure that the reserve's work can inform coastal management decisions in the San Francisco area and also across the state, where appropriate.
- Exploring and pursuing additional opportunities for public outreach, such as new exhibits that highlight the reserve's research and monitoring, and build understanding of climate change and climate resilience.
- Exploring if there is a role for the reserve in research, stewardship, education, and training related to other climate impacts such as drought, wildfire, and groundwater, and pursue identified priorities.

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.

Evaluation Metrics: 2012-2017

Metric 1

Goal: Scientific investigations in the reserve improve understanding and inform decisions affecting estuaries and coastal watersheds.

Objective: By 2017, improve understanding of the effects of climate change and other environmental stressors on estuarine and coastal ecology, ecosystem processes, and habitat function.

Strategy: The research coordinator will conduct and coordinate basic and applied scientific investigations in the reserve and will work to ensure that results of reserve research and monitoring – collectively known as "science products" – are made readily available. Research

products include publications, technical reports, manuals, and proceedings that are based on research results. Monitoring products include publications, technical reports, manuals, assessment reports, inventory products, and survey products. This strategy, to make science products readily available, will be accomplished by facilitating permits for site activities, providing access to monitoring data, providing feedback on experimental designs, encouraging coordination with other complementary studies, and assisting researchers with data collection and infrastructure deployment and maintenance. Resulting science products will be recorded in the NERRS research database.

Performance Measure: Between 2012-2017, number of science products based on research and monitoring in reserve sites by reserve staff and other researchers made readily available.

Target: Between 2012-2017, 25 science products based on research and monitoring in reserve sites by reserve staff and other researchers made readily available.

Results:
Year 1 = 11 science products
Year 2 = 8 science products
Year 3 = 4 science products
Year 4 = 4 science products
Year 5 = 5 science products

Total: = 32 science products

Discussion: The reserve exceeded its target, producing science products and making them readily available to educate and inform decision makers and the general public.

Metric 2

Goal: Increase knowledge and understanding of the Bay, other Northern California estuaries and coastal habitats, especially around the topics of climate change, water quality, and habitat restoration.

Objective: By 2017, science teachers who participate in reserve trainings will better understand estuarine science, including potential local effects of climate change, water quality and water-quality data, and how to incorporate restoration projects into science curriculum. They will also have access to lesson plans and other support to aid teaching about these topics in their classrooms.

Strategy: The reserve's Education Program offers professional development programs for science teachers with content (including curriculum support) primarily focused on climate change, water quality, and restoration science. Pre and post-workshop evaluations are conducted to measure improvement in understanding of estuarine science and how science teachers intend to use the workshop content.

Performance Measure: Between 2012-2017, number of contact hours of professional development provided for science teachers around the topics of climate change, water quality, and restoration science.

Target: Between 2012-2017, 1,400 contact hours of professional development provided for science teachers on the topics of climate change, water quality, and restoration science.

Results:
Year 1 = 661 contact hours
Year 2 = 391 contact hours
Year 3 = 496 contact hours
Year 4 = 26 contact hours
Year 5 = 2,420 contact hours

Total: 3,994 contact hours

Discussion: The reserve was able to more than double its target for the number of contact hours provided for science teachers.

Metric 3

Goal: Scientific investigations in the reserve improve understanding and inform decisions affecting estuaries and coastal watersheds.

Objective: By 2017, improve understanding of the effects of climate change and other environmental stressors on estuarine and coastal ecology, ecosystem processes, and habitat function.

Strategy: Improving understanding and informing decisions affecting estuaries and coastal watersheds relies on having long-term monitoring data that is high quality, consistently collected and publicly available. The reserve will implement the National Estuarine Research Reserve System's System-Wide Monitoring Program (SWMP) following standard procedures and protocols as outlined in "System-Wide Monitoring Program Plan" (September 2011). Data will be submitted to the Centralized Data Management Office by required deadlines with proper QA/QC. SWMP data will be incorporated into education and training programs and/or materials.

Performance Measure: Percent of SWMP datasets submitted annually to the Centralized Data Management Office that meet established standards for QA/QC.

Target: 85% of SWMP datasets submitted annually to the Centralized Data Management Office meet established standards for QA/QC.

Results:
Year 1 100%
Year 2 100%
Year 3 100%
Year 4 100%
Year 5 100%

Discussion: The reserve met and exceeded its target each of the five years. Reserve monitoring data is utilized by researchers and partners throughout the region.

Evaluation Metrics: 2018-2023

Metric 1

Goal: Improve the scientific understanding of estuaries and their watersheds through the development and application of reserve research, data, and tools; and scientific, management, and educational audiences will know about and effectively use reserve research, data, and products to understand the effects of environmental drivers on estuaries, ecosystem services, and human well-being.

Objective: By 2022, improve understanding of the effects of environmental drivers on estuarine and coastal ecology, ecosystem processes, and habitat function.

Strategy: The research coordinator will conduct and coordinate basic and applied scientific investigations in the reserve and will work to ensure that results of reserve research and monitoring – collectively known as "science products" – are made readily available. Research products include publications, technical reports, manuals, presented posters, and conference proceedings that are based on research results. Monitoring products include publications, technical reports, manuals, assessment reports, inventory products, and survey products. This strategy, to make science products readily available, will be accomplished by facilitating permits for site activities, providing access to monitoring data, providing feedback on experimental designs, encouraging coordination with other complementary studies, and assisting researchers with data collection and infrastructure deployment and maintenance. Resulting science products will be recorded in the NERRS research database under "publications" and promoted through online posting, social media, press releases, and various lectures and presentations.

For this performance measure, the NOAA research database tracks publication dates by calendar year (not by cooperative agreement cycle). It is also noted that the reserve's research sector is in the process of further defining what should be included in the research database.

Performance Measure: Between 2018-2022, number of science products based on research and monitoring in reserve sites by reserve staff and other researchers made readily available.

Target: Between 2018-2022, 30 science products based on research and monitoring in reserve sites by reserve staff and other researchers made readily available.

Results:
Year 1 = 0 science products
Year 2 = 0 science products
Year 3 = 2 science products
Year 4 = 0 science products
Four Year Total = 2 science products

Discussion: The reserve does not appear to be on track for meeting this target and is not regularly entering science products into the NERRS Research Database System.

Metric 2

Goal: Increase and improve educational knowledge and understanding of the San Francisco Estuary (SFE) ecosystem through research and monitoring data and information that helps expand the understanding, practice, and application of estuarine and coastal science locally, regionally, and nationally.

Objective: By 2022, science teachers who participate in reserve trainings will better understand estuarine science, including potential local effects of climate change, water quality and water-quality data, and habitat restoration, and be better prepared to incorporate those topics into their teaching. They will also have access to lesson plans and other support to aid teaching about these topics in their classrooms.

Strategy: The reserve's Education Program offers professional development programs for teachers with content (including curriculum support) primarily focused on estuarine science. Pre- and post-workshop evaluations are conducted to measure improvement in understanding of estuarine science and how science teachers intend to use the workshop content. This performance measure is "Contact hours with TOTE educators" + "Hours with educators" in the NERRS education database.

Performance Measure: Between 2017-2022, number of contact hours of professional development provided for Teachers on the Estuary (TOTE) educators and other science teachers on the topics of estuarine science, including climate change, water quality, and restoration

Target: Between 2017-2022, 1,800 contact hours of professional development provided for TOTE educators and other science teachers on the topics of estuarine science, including climate change, water quality, and restoration.

Results:
Year 1 = 854 contact hours
Year 2 = 1,539 contact hours
Year 3 = 36 contact hours
Year 4 = 240 contact hours
Four Year Total = 2,669 hours

Discussion: The reserve met its target in two years. The education program had fewer hours in the past two years due to COVID-19 and the loss of the long-term education coordinator.

Metric 3

Goal: Promote decision-maker expertise, public appreciation, and support for stewardship of the SFE by using reserve research, data, and products, as well as other regional resources, to help understand the effects of environmental change and societal impacts on estuaries, ecosystem services, and human well-being over time.

Objective: Subject to confirmation, by 2022, coastal decision makers will receive knowledge, information, and skills to improve coastal management and will increase their understanding of

the effects of climate change and other environmental stressors on estuarine and coastal ecology, ecosystem processes, and habitat function.

Strategy: The Reserve's Wetland Science and Coastal Training Program will work with Research and/or Stewardship Programs and other experts to develop targeted workshops promoting the understanding and use of scientific information, and the formulation of research activities to address management issues within the Bay. Wetland Science and Coastal Training Program workshops are tracked in the Coastal Training Program database.

Performance Measure: Between 2017-2022, number of Wetland Science and Coastal Training Program workshops.

Target: Between 2017-2022, 30 Wetland Science and Coastal Training Program workshops will be conducted.

Results: Year 1= 7 training programs
Year 2 = 5 training programs
Year 3 = 7 training programs
Year 4 = 5 training programs
Four Year Total = 24 training programs

Discussion: The reserve is on track to meet this measure. The reserve offers training workshops that improve the region's understanding and use of scientific information, including reserve research.

Conclusion

For the reasons stated herein, I find that the State of California's operation and management of the San Francisco Bay National Estuarine Research Reserve, including education, research, and interpretive activities, is adhering to the terms of the reserve's financial assistance awards and continues to adhere to the requirements of Section 315(b)(2) of the Coastal Zone Management Act and its implementing regulations.

These evaluation findings contain one necessary action that must be addressed by the date given and six recommendations that must be considered before the next regularly scheduled program evaluation, but the recommendations are not mandatory at this time. Recommendations that must be repeated in subsequent evaluations may be elevated to necessary actions.

This is a programmatic evaluation of the San Francisco Bay National Estuarine Research Reserve, which may have implications regarding the state's financial assistance awards. However, it does not make any judgment about or replace any financial audits.

April 22, 2022

Jeffrey L. Payne, Ph.D.
Director, NOAA Office for Coastal Management

Date

Appendix A: Response to Written Comments

No written comments were received.