



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
OFFICE OF OCEAN AND COASTAL RESOURCE MANAGEMENT
Silver Spring, Maryland 20910

February 3, 2011

John McCamman, Director
California Department of Fish and Game
1416 Ninth Street, 12th Floor
Sacramento, CA 95814

Dear Mr. McCamman:

Enclosed are the final evaluation findings for the Elkhorn Slough National Estuarine Research Reserve (NERR) for the period from April 2005 through July 2010.

The fundamental conclusion of this evaluation is that California is adhering to the programmatic requirements of the NERR system in its operation of the approved Elkhorn Slough NERR. The Reserve's many accomplishments included addressing stressors to species and habitats through a science-based approach to protection. This evaluation includes five recommendations, two of which are necessary actions and considered mandatory. The necessary actions are for DFG to fill the vacant reserve manager position prior to July 1, 2011, and to take action to obtain spending authority over Minhoto property lease income. These actions are critical to effective management and supplementary funding for the Reserve, as well as continued adherence to NERR program requirements and agreements with NOAA including a 2009 Memorandum of Understanding. The enclosed document details these accomplishments and recommendations.

We appreciate your cooperation and assistance and that of your staff during the accomplishment of this evaluation.

Sincerely,

Donna Wieting
Acting Director

Enclosure

cc: Dr. Jeffrey Single, California DFG
Terry Palmisano, California DFG
Mike Graybill, South Slough NERR, Oregon
Laurie McGilvray, Estuarine Reserves Division, OCRM



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FINAL EVALUATION FINDINGS
ELKHORN SLOUGH NATIONAL ESTUARINE RESEARCH RESERVE
APRIL 2005 THROUGH JULY 2010

FEBRUARY 2011



Photos courtesy of ESNERR and Michael Graybill



Office of Ocean and Coastal Resource Management
National Ocean Service
National Oceanic and Atmospheric Administration
United States Department of Commerce

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I. EXECUTIVE SUMMARY

The Coastal Zone Management Act (CZMA) of 1972, as amended, established the National Estuarine Research Reserve System (NERRS). Section (§) 312 and §315 of the CZMA require the National Oceanic and Atmospheric Administration (NOAA) to conduct periodic performance reviews or evaluations of all federally designated National Estuarine Research Reserves (NERRs); §312 and their implementing regulations describe the evaluation process requirements. The review described in this document examined the operation and management of the Elkhorn Slough National Estuarine Research Reserve (ESNERR or “the Reserve”) during the evaluation period of April 2005 through July 2010. The California Department of Fish and Game (CDFG or “the Department”) administers ESNERR.

This document describes the evaluation findings of the Director of NOAA’s Office of Ocean and Coastal Resource Management (OCRM) with respect to ESNERR during the evaluation period. These evaluation findings include discussions of major accomplishments as well as recommendations for program improvement. The conclusion of the findings is that the State of California successfully implemented its federally approved NERR during the evaluation period.

The evaluation team documented a number of accomplishments during this review period. ESNERR strategic planning led to a new management plan that integrates conservation goals across its sectors and emphasizes ecosystem-based management for the Reserve. CDFG memoranda of understanding with strategic partners NOAA, the California State Coastal Conservancy (“Coastal Conservancy”), and the Elkhorn Slough Foundation (“Foundation”) clarify and codify these collaborative, evolving partnerships. The Reserve’s productive staff performed a wide breadth and large quantity of noteworthy programmatic work. The Reserve’s monitoring and research activities aligned with its conservation goals and generated high quality data that provide a unique look at the continued evolution of the Elkhorn Slough ecosystem, inform land management decisions and education, and document the state of the Reserve. The Coastal Training Program built and nurtured collaborative learning networks that inform and connect decision makers. The Reserve’s science-based approach to protecting species and habitats addressed many of the stressors to these resources. ESNERR volunteers supported the Reserve’s work towards conservation goals across the research, education, and stewardship sectors and increased the number of ambassadors of Elkhorn Slough

All but two of the recommendations for the Reserve are Program Suggestions, and describe actions that OCRM believes CDFG should take to improve the program but that are not currently mandatory. Related to the Coastal Conservancy requesting CZMA § 315 operation and management funds for Reserve on behalf of CDFG, OCRM strongly urges CDFG to undertake efforts needed to empower CDFG to become the sole applicant for these financial assistance awards. OCRM encourages the Reserve to collaborate with the Elkhorn Slough Foundation, NOAA, and other appropriate partners to establish thoughtful criteria for ESNERR boundary expansion. OCRM strongly encourages the Reserve to update its education market analysis and

needs assessment, and inform the upcoming management plan, educational curricula, and training materials updates through an education strategic planning process. In addition, the findings include a necessary action for CDFG to fill the vacant reserve manager position prior to July 1, 2011 and a necessary action for the Reserve to take action to obtain spending authority over Minhoto property lease income.

II. PROGRAM REVIEW PROCEDURES

A. OVERVIEW

NOAA began its review of the Reserve in April 2010. The §312 evaluation process involved four distinct components:

- an initial document review and identification of specific issues of particular concern;
- a site visit to California, including interviews and a public meeting;
- development of draft evaluation findings; and
- preparation of the final evaluation findings, partly based on comments from the state regarding the content and timetables of recommendations specified in the draft document.

The recommendations made by this evaluation appear in boxes and bold type and may be of two types:

Necessary Actions address programmatic requirements of the CZMA's implementing regulations and of the Reserve designated by NOAA. These must be carried out by the date(s) specified;

Program Suggestions denote actions that OCRM believes would improve the program, but are not mandatory at this time. If no dates are indicated, OCRM expects the state will consider these Program Suggestions by the time of the next CZMA §312 evaluation.

Appendix A is OCRM's summary of accomplishments and recommendations. Note that OCRM called out a number of the most noteworthy accomplishments in section IV of the findings report. OCRM deferred other noteworthy accomplishments to Appendix A to explore a handful of activities in detail without increasing section IV beyond a useful length to the audience.

Failure to address Necessary Actions may result in future findings of non-adherence and the invoking of interim sanctions, as specified in CZMA §312(c). Program Suggestions reiterated in consecutive evaluations to address continuing problems may be elevated to Necessary Actions. NOAA will consider the findings in this evaluation document in making future financial award decisions relative to the Reserve.

B. DOCUMENT REVIEW AND PRIORITY ISSUES

The evaluation team reviewed a wide variety of documents prior to the site visit, including: (1) the 2006 §312 evaluation findings for the period June 2000 through March 2005; (2) the federally approved Environmental Impact Statement and program documents including the Reserve's 207-2011 management plan; (3) financial assistance awards and work products; (4) semi-annual performance reports; (5) official correspondence; (6) ESNERR's responses to the evaluation team's supplemental information requests; and (7) relevant publications on natural

resource management issues in California. Based on this review and on discussions within OCRM, the evaluation team identified the following priority issues:

- the Reserve’s general administration, including memoranda of understanding (MOUs), grants and fiscal management;
- facilities development and operations planning;
- research, monitoring, and education program implementation;
- Reserve staffing and needs;
- the manner in which the Reserve coordinates with other governmental and non-governmental organizations and programs in the state and region;
- major accomplishments during the review period; and
- the manner in which the Reserve addressed the recommendations contained in the §312 evaluation findings released in 2006.

Appendix B is CDFG’s assessment of how it responded to each of the recommendations in the 2006 evaluation findings, and where applicable OCRM comments on specific responses.

C. SITE VISIT TO CALIFORNIA

OCRM sent notification of the scheduled evaluation to CDFG, the Reserve, members of California’s congressional delegation, and regional newspapers. In addition, NOAA published its “Intent to Evaluate” in the Federal Register on July 20, 2010.

The site visit to California occurred August 2-5, 2010. The evaluation team consisted of Gregory Gervais, Evaluation Team Leader, OCRM National Policy and Evaluation Division; Alison Krepp, Program Specialist, OCRM Estuarine Reserves Division; L. Christine McCay, Evaluator, OCRM National Policy and Evaluation Division; and Michael Graybill, Reserve Manager, South Slough (Oregon) National Estuarine Research Reserve.

During the site visit, the evaluation team met with Reserve personnel; CDFG leadership and staff; representatives of ESNERR partners; and stakeholders from public education, government agencies, universities, and non-governmental organizations. Appendix C lists people and institutions contacted during this review.

NOAA held an advertised public meeting on August 3, 2010 at 6 pm at the Elkhorn Slough National Estuarine Research Reserve, Administration Building Conference Room, 1700 Elkhorn Road, Watsonville, California. The public meeting gave members of the public the opportunity to express their opinions about the overall operation and management of the Reserve. Appendix D lists individuals who registered at the meeting. NOAA solicited but received no written comments during this review.

Reserve staff members provided essential support in setting up meetings and arranging logistics for the evaluation site visit, in addition to providing the evaluation team with needed ESNERR information before, during, and after the site visit. The evaluation team greatly appreciated their assistance and active participation.

III. RESERVE PROGRAM DESCRIPTION

NOAA designated the Elkhorn Slough NERR in 1979. The Reserve's host agency and state partner is the California Department of Fish and Game. The following Reserve description is adapted from the executive summary of ESNERR's 2007-2011 management plan. The management plan is accessible from the Reserve's website, or upon request from ESNERR or OCRM:

<http://www.elkhornslough.org/esnerr/index.htm>

The Elkhorn Slough NERR is an ecologically diverse 583 hectare (1,439 acre) protected area located on the eastern shore of the Elkhorn Slough, near the Monterey Bay in Central California. Elkhorn Slough is a seven-mile arm of the Monterey Bay located half way between the cities of Santa Cruz and Monterey. This arm bends as it extends inland, and at the "elbow" lies the Reserve.

As the primary terminus of the Elkhorn Slough watershed, the Reserve is part of a biologically rich system containing a diverse landscape of estuarine habitats, freshwater ponds, and hills containing native upland vegetation. These areas are interspersed with roads, a railroad, working farms and residential housing.

Within the Reserve's boundaries there are lowland areas containing salt marsh, mudflats, and tidal lagoons, which flow into the slough's main channel. The Reserve's upland areas contain coastal prairie, maritime chaparral, oak woodland, pine and eucalyptus forest, and riparian/freshwater habitats.

Elkhorn Slough's tidal waters are part of the Monterey Bay National Marine Sanctuary, which is the largest of thirteen sanctuaries in the National Marine Sanctuary System. The entire Elkhorn Slough estuary has also been designated a Globally Important Bird Area by the American Birding Conservancy, and a Western Hemisphere Shorebird Reserve by the Manomet Bird Observatory.

The Elkhorn Slough NERR represents the California Biogeographic Region and Central California Subregion, and is protected for long-term research, water-quality monitoring, education and coastal stewardship. The Reserve also offers opportunities for public access and is home to an award-winning visitor's center. The property features several well-maintained hiking trails and has boardwalks, a wildlife viewing blind, and a fully-accessible scenic overlook.

CDFG owns the Reserve and operates it in partnership with NOAA and the local, non-profit Elkhorn Slough Foundation. CDFG's Central Region (Region 4), with its regional headquarters located in Fresno, administers the Reserve.

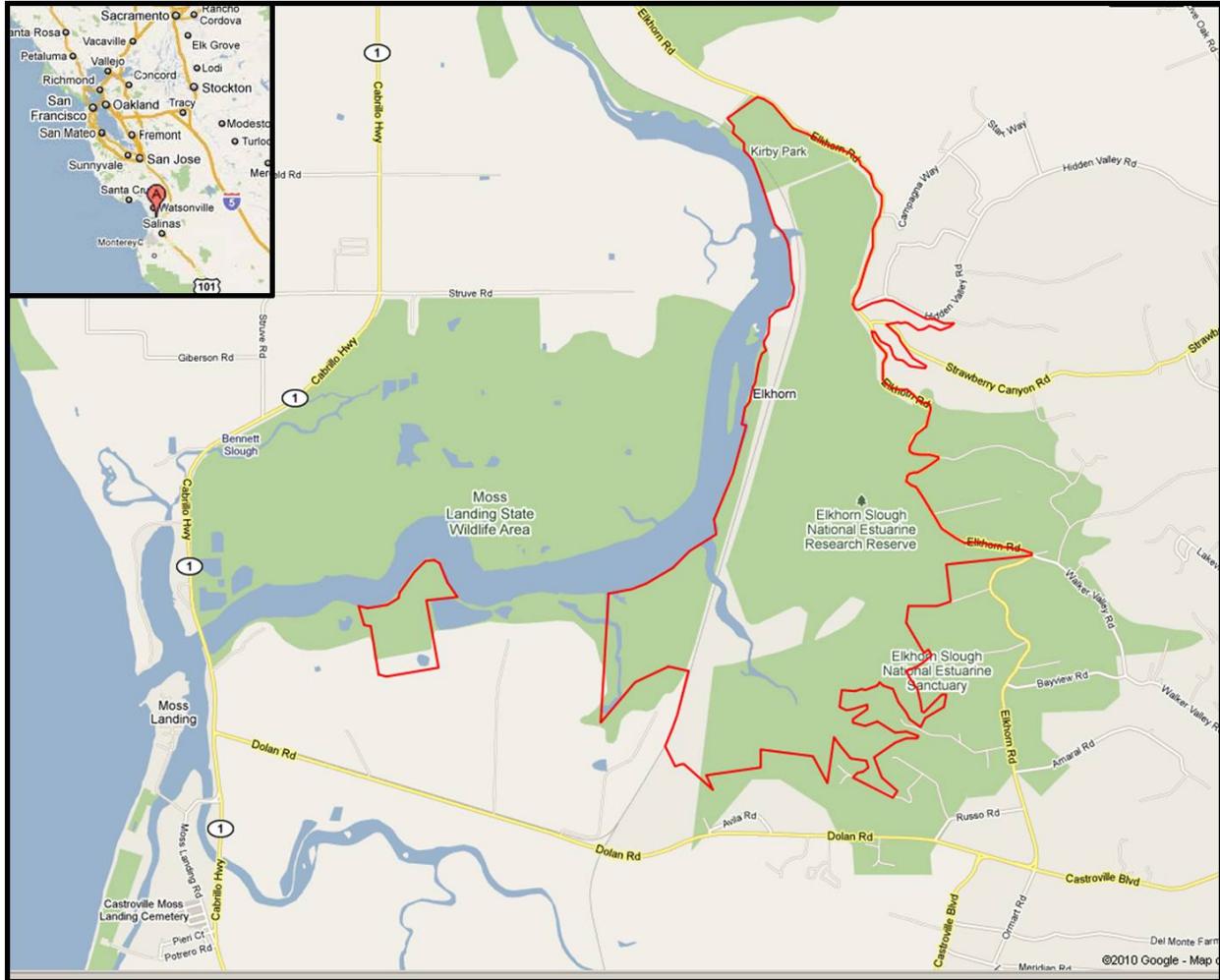


Figure 1 – Elkhorn Slough National Estuarine Research Reserve (Google Maps, 2010)

IV. REVIEW FINDINGS, ACCOMPLISHMENTS, AND RECOMMENDATIONS

A. OPERATIONS AND MANAGEMENT

Overall, NOAA finds that California's management of Reserve operations is satisfactory. A well-conceived strategic planning process led to ESNERR's conservation goals-based management plan, which guided Reserve activities through most of the evaluation period. The Reserve overcame state budget challenges and CDFG administrative hurdles, in part through partnership leveraging. These challenges remain and new ones, including a vacant reserve manager position, require ongoing diligence. Facilities development and property acquisition also highlight the evaluation period accomplishments. The Reserve made immediate programmatic use of these new assets but faces maintenance capacity limitations and reserve boundary expansion decisions.

1. ESNERR Strategic Planning and Execution

The Reserve completely revised its management plan in 2005 and 2006, following a necessary action from the previous evaluation period to update the plan. OCRM approved the final 2007-2011 management plan dated September 29, 2006. The plan includes updated program content, a new format and planning approach, and an emphasis on program integration in addressing the key conservation goals of the Reserve. ESNERR used a variety of strategic planning tools including program logic models and a modified version of The Nature Conservancy's "5-S" planning process to identify habitat indicators, their status, and stresses to Elkhorn Slough. The Reserve sought additional resources to aid its strategic planning, and received a significant grant from the California Wildlife Conservation Board, an independent board within state government. The Reserve used this grant to contract for a management plan coordinator through the University of California, Santa Cruz. The management plan coordinator, reserve manager and program coordinators developed all aspects of the plan. Reserve leadership and staff invested significant time to their strategic planning and management plan development.

The evaluation team reviewed the management plan and discussed both the strategic planning process and management plan implementation with the reserve manager and program coordinators. Reserve personnel indicated the management plan became a living, useful document in their daily activities and helped maintain a focus on performing the most important/critical work within the programs. Several Reserve personnel indicated the management plan empowered them to say "no" to performing work or pursuing grant opportunities for projects not aligned with the management plan. The management plan exemplifies and supports an ecosystem-based management approach implemented through program collaboration.

The evaluation team noted many examples of the staff employing a collaborative approach, which is necessary for successful implementation. Reserve manager and program coordinator involvement in strategic planning and management plan development fostered ownership of the process and a focus on by the Reserve leadership team. Several Reserve staff indicated their desire to use the management plan to guide annual action planning that informs and influences

annual operations, and frequent internal assessment of program and task outcomes compared with conservation goals described in the management plan.

ACCOMPLISHMENT: The Reserve effectively used strategic planning tools and expertise in the development of its revised management plan to create a guiding framework that aligns and integrates program activities around key conservation goals with demonstrable outcomes.

The current five-year management plan will guide Reserve activities through 2011, and the Reserve will soon need to begin work on a management plan update. This update will be a good opportunity for the Reserve to adjust its assessment of conservation goals, as well as provide the new reserve manager an opportunity to connect the new management plan with her/his vision for the Reserve.

2. Financial Support and Agreements

As noted in Section III of these findings, CDFG hosts the Reserve as part of its agency and is NOAA's primary partner for this NERR. CDFG provides seven staff positions for ESNERR and the entire required match for the Reserve's CZMA § 315 financial assistance awards from NOAA. Additionally, CDFG provides engineering, architectural, contracting, and legal services to the Reserve through its regional headquarters in Fresno and agency headquarters in Sacramento.

CDFG utilized its partnerships with the California State Coastal Conservancy and the Elkhorn Slough Foundation to address CDFG administrative hurdles that inhibited its ability to fund programs and staff at ESNERR. CDFG developed its 2009 MOU with the Coastal Conservancy and NOAA, and updated its MOU with the Foundation in 2006. These MOUs clearly articulate roles and responsibilities of the signing parties. The MOU among the Coastal Conservancy, NOAA, and CDFG describes and formalizes the financial relationships of these parties for the application and administration of CZMA § 315 financial assistance awards from NOAA, and enabled the evolution of the Reserve's fiscal management. The MOU between the Foundation and CDFG identifies their overlapping goals and mutual interests, and formalizes their relationship including CDFG's responsibilities in supervising Foundation employees assigned to staff the Reserve and the Foundation's use of Reserve facilities.

Due to constraints inherent to CDFG personnel rules and regulations, CDFG utilized the Foundation over the last 10 years to staff most Reserve positions, including several leadership positions within the Reserve including the research coordinator, Coastal Training Program (CTP) coordinator, and stewardship coordinator. CDFG contracting and subgranting authorities from the California legislature prohibit the Department from selecting a sole-source provider for Reserve positions, and the agency elected not to obtain these services through a competitive process.

At the beginning of the evaluation period, the Reserve received its CZMA § 315 financial assistance funds from NOAA through three separate requests: CDFG applied for funds to support administrative activities, the Coastal Conservancy applied for funds to support education

and training activities, and the Foundation applied for funds to support research and stewardship activities. In response to OCRM's concerns regarding the administrative burden and potential for miscommunications associated with three separate awards, the Reserve transitioned to a single application by the Coastal Conservancy on behalf of CDFG, with all CZMA § 315 funds subawarded to the Foundation under the Coastal Conservancy's sole source authorities. CDFG provided all of the required matching funds for the CZMA § 315 financial assistance award, consistent with the 2009 MOU. Prior to the 2009 MOU, match for the financial assistance awards included funds from non-federal sources like grants from private charitable foundations. The reserve manager oversees Foundation activities funded by the award to the Coastal Conservancy, as well as performance reporting and invoicing.

ACCOMPLISHMENT: CDFG's new MOU with the California State Coastal Conservancy and NOAA, and its updated MOU with the Elkhorn Slough Foundation, clarify and codify these current partnerships. Updated, relevant MOUs clarified these organizational relationships and provided mechanisms to overcome some of CDFG's administrative challenges as host agency in the near term.

The evaluation team noted some Reserve performance reports lacked sufficient information related to obtaining desired outcomes for the work funded under the financial assistance awards (e.g., research and monitoring). The Reserve indicated it continues to work on improvements to its reporting, and will continue working with OCRM to provide information on impact and outcomes.

Toward the end of the evaluation period, the Coastal Conservancy indicated it wants to end its role, over the next several years, as the applicant for federal financial assistance applications on CDFG's behalf for the Reserve because its role was not viewed as a long-term solution to the situation. Prior to the site visit, CDFG and the Coastal Conservancy discussed the Coastal Conservancy's authorities granted by the state legislature, and CDFG's alternatives. During the site visit, the Coastal Conservancy indicated it intends to fulfill its role in the MOU for several more years but that CDFG must make demonstrable progress toward a long-term mechanism to obtain CZMA § 315 financial assistance awards without the Coastal Conservancy as the applicant. CDFG indicated a solution may require state legislative action, and it anticipates a multi-year effort and a phased approach to enable the agency to assume all financial award applicant duties.

PROGRAM SUGGESTION: OCRM urges CDFG to commit to a multi-year effort to explore, identify, and facilitate the implementation of actions needed for CDFG to become the sole applicant for CZMA § 315 financial assistance awards.

CDFG indicated the state match requirement in the 2009 MOU limited its flexibility to supplement dwindling state resources with those from other non-federal sources and its ability to use CDFG funds as match for non-NOAA grants. The evaluation team understood CDFG's concern that declining state budgets and impacts, like state employee furlough days, directly reduce the amount and availability of state matching funds. OCRM encourages CDFG to continue working cooperatively with OCRM's Estuarine Reserves Division (ERD) to find a long-term alternative to the Coastal Conservancy serving as the applicant for CZMA § 315

financial assistance on CDFG's behalf, which carries the provision in the 2009 MOU for CDFG to provide all state match. In the meantime, CDFG should discuss with OCRM its state match opportunities that would satisfy the 2009 MOU and financial assistance award requirements.

CDFG receives lease income for farming on the Minhoto property, acquired during the evaluation period with funds that included CZMA § 315 construction and acquisition funds. In the 2009 MOU, CDFG agreed to retain revenues generated on or by the Reserve for use by the Reserve and/or for the purposes of fulfilling the Reserve's state matching requirements. However, CDFG indicated it lacks legislative authority to spend this lease income. CDFG regional management has rigorously but unsuccessfully pursued spending authority for these funds since acquiring the Minhoto property. CDFG senior management indicated a willingness and urgency to further pursue the required authority to spend the lease income. CDFG's lack of spending authority compromises the nature and terms of the 2009 MOU and limits the Reserve's ability to fund pressing needs at ESNERR and to seize new opportunities to advance the Reserve's strategic goals with these funds.

NECESSARY ACTION: CDFG must pursue spending authority for the Minhoto property's lease income and other program income to fulfill requirements in the 2009 MOU. CDFG must provide OCRM with a written update on its efforts and progress no later than July 31, 2011 and every six months thereafter until it is able to use this program income to support Reserve activities.

3. Reserve Operations and Staffing

During this evaluation period, the reserve manager led a staff of 25 who implemented the reserve's federally approved program consistent with its management plan. As highlighted throughout the findings report and detailed by ESNERR in Appendix E, Reserve staff performed a wide breadth and large quantity of noteworthy programmatic work this evaluation period. ESNERR had no turnover of its core positions (reserve manager, education coordinator, and research coordinator) or most other leadership positions during the evaluation period. Leadership stability bolstered Reserve planning and execution through continuity and institutional knowledge. Additionally, the evaluation team commended the reserve manager's leadership in nurturing a work environment where highly productive and innovative professionals chose to remain.

ACCOMPLISHMENT: The Reserve retained a highly productive staff that performed a wide breadth and large quantity of noteworthy programmatic work.

CDFG filled the previously vacant maintenance technician position during the evaluation period by using federal funds from the Sport Fish Restoration Act of 1950, as amended, for the position's salary and benefits. Reserve staff expressed great appreciation for the work performed by the maintenance technician, particularly the direct support provided to Reserve programs such as assistance in constructing research apparatuses (e.g., artificial oyster reefs). The ESNERR relies heavily upon volunteers to support maintenance activities but struggles with a maintenance backlog complicated by a paucity of materials and supplies. The evaluation team anticipates the Reserve's maintenance workload will grow and become more challenging due to recently

constructed facilities and acquired properties (see further discussion in the subsection entitled “Facilities”). CDFG may consider using lease income to fund a part-time maintenance assistant when it receives authority to spend those funds. Additionally, CDFG secured state funding for the Reserve’s administrative technician (i.e., administrative assistant) position and ceased using CZMA § 315 financial assistance for this critical position. CDFG’s actions regarding the filling of the maintenance position and state funding for the administrative assistant position occurred in response to a program suggestion from OCRM’s previous evaluation findings.

The 2009 MOU indicates CDFG will “provide staff, and endeavor to secure state funding for the (reserve) manager, education coordinator, and research coordinator...” Personnel rules and regulations require CDFG to fill positions from an exam-based list instead of through open competition. At the time of this evaluation, the Foundation employed 19 Reserve staff. As documented in the 2006 MOU, all Reserve staff, regardless of their employer, report to CDFG’s reserve manager.

OCRM remains concerned that the research coordinator position, a core position within any NERR, is not employed by CDFG and is funded exclusively using CZMA § 315 financial assistance funds. CDFG reported the position classifications available within the California civil service system are limited and most Reserve positions do not exactly match the available classifications. CDFG management indicated the classifications would be suitable for use on the Reserve, but CDFG has neither state funding nor a state position for a research coordinator. Both the funding and the creation of a position are outside CDFG authority and would have to be approved by the state legislature, which due to statewide budget crises in recent years has been reluctant to increase the number of state employees or allocate additional resources from the California General Fund. Presently none of the seven Reserve positions filled by CDFG employees are funded by CZMA § 315 financial assistance funds, and State of California funds for these positions represent over two-thirds of the state match for the federal assistance funds. OCRM appreciates CDFG’s financial commitment to the Reserve and understands the constraints associated with filling and funding the research coordinator function as a CDFG employee. OCRM encourages CDFG to pursue additional needed resources and approvals necessary to satisfy its responsibilities as agreed upon in the 2009 MOU.

The reserve manager left her position shortly after the evaluation site visit. CDFG assigned the reserve manager’s first line supervisor as acting reserve manager during the vacancy period. CDFG indicated this scenario was the best option during the vacancy period given present Reserve staffing and authority delegation requirements. The evaluation team understood that the acting reserve manager would not be physically present at the Reserve most days due to her management responsibilities throughout CDFG Region 4, and would continue maintaining a primary office in Monterey though she would be available to Reserve staff via telephone and would attempt to have a weekly presence at the Reserve.

The evaluation team and CDFG discussed CDFG’s strategy and constraints regarding their vacant reserve manager position, which may be vacant for three to twelve months. Several variables will drive vacancy duration, including the official date of separation for the outgoing reserve manager. The evaluation team anticipates Reserve staff will strive to remain productive during the reserve manager vacancy. However, CDFG indicated during the vacancy period that

the Reserve staff would not undertake any new initiatives and the acting reserve manager would be absent from the Reserve most days. The Reserve's willingness to identify and pursue new programs and initiatives makes ESNERR a national leader in estuarine research, education, and stewardship. The evaluation team identified strong, engaged reserve management as a key in empowering staff innovation, collaboration, and high performance. The acting reserve manager performs many other duties for CDFG and will not have sufficient time to perform most of the reserve manager duties described in the Reserve's management plan. OCRM is uncertain that the acting reserve manager can provide adequate oversight to sustain Reserve performance during a long vacancy period, given her numerous responsibilities for CDFG.

CDFG's reliance on the Foundation for nearly 75% of Reserve staffing and a minimal acting reserve manager presence at ESNERR necessitates a clearly communicated plan for addressing Reserve management and operations during this vacancy period and when a new manager is hired. The 2006 MOU between CDFG and the Foundation identifies the reserve manager as the Foundation's on-site contact at the Reserve as it relates to Foundation use of CDFG facilities for foundation business. The evaluation team understood that the outgoing reserve manager, incoming acting reserve manager, Foundation leadership, and Reserve program coordinators met several times prior to the site visit to discuss and prepare for both the reserve manager vacancy period and transition to a new reserve manager once CDFG fills the position. This group intends to continue monthly meetings during the vacancy period to facilitate coordination and communication.

The ERD program specialist noted during the site visit that CDFG had not provided a backup point of contact to ERD for time-critical communication and coordination with ERD when the reserve manager is not present at the Reserve. This situation existed throughout the evaluation period, and continues during the reserve manager vacancy period. CDFG lacks an on-site "backup" to the reserve manager, but needs one to address safety and emergency operations issues. Additionally, ERD needs a backup point of contact for the Reserve who can assist the ERD program specialist with time-critical communication and coordination. OCRM strongly urges CDFG to relay its vacancy and transition plans to the ERD program specialist, and provide a CDFG on-site Reserve chain of command that identifies a backup point of contact for the Reserve that addresses safety, emergency, and communication needs. The ERD specialist is available to provide support and input to ESNERR during the vacancy and transition period.

The potential one-year duration of the vacancy period deeply concerns OCRM, as it could constrain Reserve programmatic growth and innovation. Additionally, the lack of CDFG backfilling this position with a full-time person by the start of the next NOAA financial assistance award period that begins July 1, 2011 may make it difficult for CDFG to meet its award match requirement, since the reserve manager salary and fringe benefits represent roughly 30% of CDFG's total match. The evaluation team's meeting with CDFG senior management demonstrated the host agency's level of attention on these matters. OCRM expects CDFG to utilize available authorities and resources, and as necessary pursue additional ones, to fill the vacancy by the beginning of the financial assistance award period.

NECESSARY ACTION: CDFG must fill the vacant reserve manager position at ESNERR prior to the start of the NOAA financial assistance award period that begins July 1, 2011.

4. Partnerships

The Reserve and CDFG strengthened and expanded existing partnerships during the evaluation period. In particular, CDFG's partnerships with the Coastal Conservancy and the Foundation for operations and management of the Reserve were highly collaborative, productive, and enabled many Reserve accomplishments described throughout this report.

The California Legislature created the Coastal Conservancy as a unique state entity with flexible powers to serve as an intermediary among government, citizens, and the private sector in recognition of needed creative approaches to preserve California's coast and San Francisco Bay lands for future generations. The Coastal Conservancy's non-regulatory, problem-solving, collaborative approach allows it to use entrepreneurial techniques to purchase, protect, restore, and enhance coastal resources, and to provide access to the shore in partnership with local governments, other public agencies, nonprofit organizations, and private landowners. The Coastal Conservancy's mandate of coastal resource preservation aligns well with the Reserve's vision and mission. This partnership has matured since 2005. As referenced earlier in this report, the Coastal Conservancy now applies on behalf of CDFG for financial assistance from NOAA for CZMA § 315 funds that support operations and management of the Reserve. Additionally, the Coastal Conservancy actively participates on the Strategic Planning Team and Science Panel for the Tidal Wetland Project (discussed in greater detail in the subsection entitled "Tidal Wetland Project"), and provides a staff member who serves as project manager for the multi-agency Parsons Slough Restoration Team portion of the Tidal Wetland Project. Reserve personnel described the Coastal Conservancy's participation on the Tidal Wetland Project as "core" and "leading" as part of the strategic planning. The Coastal Conservancy also contributed funding towards the Parsons Slough Sill Project. The evaluation team noted the supportive relationship between the Coastal Conservancy and the Reserve, and the potential for more collaboration on projects in the future given the complementary nature of each entity's mission and goals.

The Elkhorn Slough Foundation provides most staff for Reserve operations through CZMA § 315 financial assistance funds subawarded to the Foundation by the Coastal Conservancy. Additionally, the Foundation is an on-site strategic partner whose key goals include "support programs and activities at the Elkhorn Slough Reserve that are complementary to (the Foundation's) mission." Critical outcomes of this partnership include coordinated property acquisition and land management within the Elkhorn Slough watershed, pursuit of funds beyond § 315 to assist with performance of Reserve program activities, Reserve visitor center operation, and volunteer recruitment and appreciation.

CDFG and the Foundation, in response to OCRM's necessary action from the previous evaluation, updated their MOU to reflect their evolving relationship. The evaluation team received input from numerous site visit participants that the functional closeness of the ESNERR and the Foundation makes it difficult to distinguish between the two entities for some activities. Participant views varied regarding positive and negative aspects of indistinguishable entities. One participant indicated the relationship fostered a collaborative culture on the Reserve

“campus,” while others expressed confusion regarding which organization they were supporting on specific activities.

The evaluation team agreed that the emphasis on outcomes articulated by the Reserve management plan and the Foundation’s strategic plan productively aligned the actions of these partners toward mutual strategic goals. However, the evaluation team struggled to determine whether the positive outcomes of the Foundation-CDFG partnership resulted from strong, collaborative individual professional relationships rather than from institutionalized attributes like overlapping missions and shared geographic responsibilities. CDFG leadership indicated a desire for the Foundation and CDFG to review, document, and disseminate within their respective organizations what is working well with the partnership and why, as a means to foster institutionalization of the collaborative, outcomes-focused culture of the Reserve and Foundation personnel.

Other noteworthy Reserve partnerships developed or maintained during the evaluation period included those with the Monterey Bay Aquarium; the Monterey Bay National Marine Sanctuary; the Monterey Bay Aquarium Research Institute (MBARI); Moss Landing Marine Laboratories (MLML); California State University, Monterey Bay (CSUMB); and the University of California, Santa Cruz. The Reserve has aligned its interests in research, education and conservation with partners like the Monterey Bay Aquarium and MLML, and has done a good job carving out and articulating its niches in the watershed to allow collaboration and cooperation with these partners. Evaluation findings elsewhere in this report provide additional details regarding these partnerships. Representatives from the Sanctuary, MLML, and the Aquarium serve on the Reserve Advisory Committee, while the reserve manager serves as a non-voting member of the Sanctuary Advisory Council. Advisory councils provide opportunities for stakeholder education, as well as input back to the Reserve and Sanctuary and enhance public participation in the activities of these two programs.

The Reserve hosted the 2008 NERRS/NERRA Annual Meeting, which included over 100 participants from the 27NERRs, their Friends groups and foundations, and NOAA staff. ESNERR staff indicated they collaborated with each other to have increased the meeting’s impact and meaning to participants. The evaluation team noted the high level of effort the Reserve expended to host this large meeting, and the corresponding commitment to the NERRS.

5. Facilities

National Estuarine Research Reserves plan, build, and maintain facilities to meet current and future needs relative to the operation of their programs. The Elkhorn Slough NERR actively performed noteworthy facilities-related work during the evaluation period. The Reserve successfully constructed its new Research and Education facility using CZMA § 315 construction and acquisition funds awarded before and during the evaluation period, along with CDFG match. This 3,500 square foot, four building complex around a central courtyard provides office and meeting space for the Reserve’s research and monitoring, geographic information system (GIS), stewardship, and CTP staff; science and education laboratory space; and a studio apartment for overnight research and education visitors. The Reserve also designed and constructed a native plant propagation greenhouse and its adjacent shade house using CZMA §

315 construction and acquisition award funds, along with CDFG match. The Reserve purchased an office trailer, which replaced a Reserve trailer with mold issues, to house Tidal Wetlands Project staff supporting the Parsons Slough Sill Restoration Project using American Recovery and Reinvestment Act (ARRA) funds.

ESNERR put these new assets to immediate uses that added capacity and richness to the Reserve's operations. The Research and Education facility allowed more undergraduate, graduate students, and Graduate Research Fellows (GRFs) to perform work simultaneously at the Reserve. The Reserve added monitoring capacity by having research and monitoring staff mentor undergraduate students who performed quality control on the Reserve's System-Wide Monitoring Program (SWMP) data. This freed Reserve staff time for data interpretation and dissemination, which informs stewardship adaptive management decisions. Prior to facility construction the Reserve lacked space for the multiple computer workstations needed to facilitate this activity. The greenhouse supported stewardship of Reserve lands as a facility used to grow large quantities of native plants for Reserve research projects and restoration activities. As discussed later in these findings, the evaluation team observed the greenhouse as a magnet of activity for the volunteer program that added to the breadth and depth of volunteering opportunities at the Reserve. The Parsons Slough Sill project trailer enabled co-location of the Tidal Wetlands Project staff and provided needed meeting space for collaboration.

ACCOMPLISHMENT: The Reserve completed construction and immediately used its new Research and Education facility and greenhouse. These facilities added capacity and richness to Reserve operations by facilitating college student and volunteer support of Reserve programs.

The Reserve's facilities meet its present needs for program area support. Education staff indicated their microscope laboratory has a sufficient number of workstations and support equipment to accommodate present demand from K-12 school groups, noting the busy spring season brought nearly 20 groups per week and reached facility and staff capacity limits during the three school days when the Reserve was open to the public (Wednesday through Friday). The administrative building, constructed prior to the evaluation period, includes office and meeting space for the Reserve. This building's conference room is the largest meeting space at the Reserve. Reserve staff indicated the capacity of this space limits the registration for some on-site activities including CTP workshops. The studio apartment provided a previously unavailable resource to facilitate external research that requires overnight lodging by scientists and students, though the studio has only one bed. To the evaluation team, the Reserve's facilities appeared well utilized and largely at capacity. The evaluation team noted the modular nature of the newer facilities and the Reserve's flexibility to expand its facilities footprint efficiently given available flat land in the administrative building complex and design of current buildings.

While the Reserve completed needed facilities expansion during the evaluation period, it struggled and continues to struggle with limitations in its capacity to perform maintenance of facilities and lands. The Reserve employed an extremely productive maintenance technician widely regarded as vital to ESNERR maintenance and assistance to research and stewardship activities. The Reserve also made excellent use of key long-term volunteers and other volunteers who further supported maintenance activities. The Reserve staff indicated state budget

limitations hindered its ability to eliminate its backlog of maintenance activities due to inadequate staffing levels, as well as lack of an annual maintenance budget for materials and equipment. While the 2009 MOU calls for CDFG to ensure adequate funding for facility operations and maintenance, the Reserve has no budgetary line item for maintenance other than salary costs for the maintenance technician. CDFG indicated it budgets \$500,000 annually for the whole agency's deferred maintenance. The Reserve can request funding from CDFG's deferred maintenance budget for emergency repairs. This competitive process does not ensure adequate facility maintenance funding and limits the Reserve's ability to perform preventive maintenance. NOAA and CDFG invested nearly \$3 million for the greenhouse and research and education facility. The Reserve's lack of an annual maintenance budget tied to a facility maintenance plan jeopardizes the large capital investments made by NOAA and CDFG at the Reserve.

The Reserve's management plan identifies the need for a facilities master plan and the intention of ESNERR to complete it by the end of 2011. The Reserve may choose to re-evaluate its current and future facilities needs in its upcoming management plan update, and prioritize future development that supports programmatic growth in the context of maintenance resource limitations. CDFG may consider program income, such as Minhoto property lease revenue, as a potential source of funding to address facilities development and maintenance when it receives authority to spend those funds.

6. Site Boundary

The Reserve's site boundary includes 1,400 acres along the eastern edge of the slough. ESNERR indicated it intends to add seven parcels acquired during this evaluation period to the site boundary. CDFG acquired four of these parcels, a total 280 acres, using CZMA § 315 construction and acquisition funds and CDFG match. CDFG acquired three other parcels (32 acres) with other funds, including NOAA Coastal and Estuarine Land Conservation Program funds. CDFG has no formal process for determining which properties in the Elkhorn Slough watershed, presently outside the Reserve boundary, should be included through a boundary expansion. Parties such as CDFG and the Foundation can purchase and/or manage properties outside the Reserve boundary, and can choose to do so in a manner consistent with ESNERR land management and conservation goals; not all conservation property acquisition within the Elkhorn Slough watershed necessitates inclusion within the Reserve boundary. OCRM strongly encourages CDFG to consult current ERD/NERRS guidance regarding boundary expansion criteria, and engage NOAA, the Foundation, and other appropriate partners in a collaborative planning process to develop decision criteria for boundary expansion decisions.

PROGRAM SUGGESTION: OCRM strongly encourages CDFG to develop boundary expansion decision criteria through a collaborative planning process with NOAA, the Elkhorn Slough Foundation, and other appropriate partners.

B. RESEARCH AND MONITORING

The ESNERR research program's highest priority is the consistent collection of long-term monitoring data for key coastal ecosystem health indicators in the Elkhorn Slough watershed. Its

monitoring portfolio for the evaluation period demonstrated the Reserve's commitment to watershed monitoring. Reserve research focused on short-term, applied research projects designed to understand threats to coastal ecosystems and test strategies to diminish impacts of the threats. These projects aligned with the ecosystem conservation goals identified in the management plan, which Reserve staff developed based on their relative evaluation of the risks to the ecosystem. Reserve research staff indicated it used the management plan's conservation goals to focus on the most urgent research needs, which in turn directed its pursuit of non-CZMA research grants and empowered staff to say "no" to lower priority research activities.

1. Monitoring

The Reserve has fully implemented the NERR system-wide monitoring program for measuring water quality, nutrients, and meteorological data at four SWMP stations. Monitoring staff improved data quality and usability in several ways. Moss Landing Marine Laboratories and the Reserve revised their laboratory protocols and evaluated analytical precision through quality control sample analysis at other regional laboratories. Reserve monitoring staff doubled their diel sampling frequency to improve temporal resolution of nutrient dynamics. Monitoring staff, with significant support from Reserve interns, developed its own SQL relational database for its water, meteorological, and nutrient data. This database allows monitoring staff and interns to perform updated quality assurance assessments. The quality assurance activities enabled the identification of data anomalies and temporal spikes in parameters, the correction of anomalous data, and detection of statistically relevant trends.

End use of these historical data included the Reserve's correlation study of turbidity data to total suspended solids concentrations, and relation of that correlation to current velocity to understand the transport and distribution of sediment within, into, and out of the estuary. The Reserve will be able to use the correlation study to estimate past sediment transport as well as detect sediment transport changes resulting from restoration projects, including the Parsons Slough Sill Project discussed in more detail later in this report. OCRM commends the Reserve for its collection, management, evaluation, and use of monitoring data for detecting trends and informing restoration project monitoring. The Reserve and the Foundation also used these historical SWMP data to inform land acquisitions and land management. The Foundation indicated water quality data correlated strongly to localized reductions in nutrient and sediment loading from former hillside farms after employing acquisition and restoration strategies.

ESNERR monitoring also included monthly water quality sampling at 24 additional non-SWMP stations, benthic habitat surveys at 20 stations, and extensive bird monitoring. Reserve volunteers, trained and mentored by Reserve staff, performed much of this monitoring. Key findings from monitoring data interpretation included Elkhorn Slough's overall increase in nutrient concentrations over the last two decades, the continued but lessening rate of bank erosion rates in the estuary, the shift in the heron colony location in response to tree loss, and potential impact of climate change on the breeding success of cavity nesting birds. The evaluation team appreciated the key role played by monitoring volunteers because the Reserve staff alone would not have the capacity to collect this volume of monitoring data. ESNERR disseminated these data in many forms, including raw data archives, summary graphs, and in the Reserve's "State of the Estuary" report on its website.

ACCOMPLISHMENT: The Reserve's high-quality monitoring data verified land acquisition and restoration strategies for former hillside farms reduce nutrient and sediment loading in the Elkhorn Slough watershed.

2. Research Activities

The Reserve researched several native species found in dwindling numbers in the Elkhorn Slough watershed. ESNERR initiated native Olympia oyster restoration experiments in 2009 to evaluate oyster colony restoration through artificial reef techniques never tested on the west coast of the U.S. Experimental results will inform future Olympia oyster restorations. The Reserve received one-time CDFG funding to hire an amphibian ecologist who monitored freshwater habitats throughout the watershed for native amphibian species, including the threatened California red-legged frog, endangered Santa Cruz long-toed salamander, and endangered California tiger salamander. ESNERR used these amphibian survey data to inform land management, including pond water level control.

Invasive species research also progressed during the evaluation period. The Reserve, supported by one of its NERRS Graduate Research Fellows, performed ecotone restoration experiments to evaluate reestablishment of native high marsh vegetation and eradication of invasive upland weeds using salt addition and weed removal. This project continued through the end of the evaluation period. Its results will help the Reserve to identify land management approaches to restore degraded ecotone habitat found behind hydrologic control structures located throughout the Reserve. The Reserve also studied the factors that predict green crab invasion success, a concern in California. The study results will inform management of this invasive species beyond Elkhorn Slough. Additionally, the San Francisco NERR used the crab sampling protocol developed by ESNERR to assess its estuarine crab communities.

While ESNERR researchers used the Reserve as its platform, many projects generated data and findings applicable to other scientists and coastal management decision makers outside the Elkhorn Slough watershed. ESNERR used multiple venues to identify research and information needs of coastal decision makers, as well as to disseminate its research findings. The Reserve website, recently updated, provides a convenient portal for those interested in summaries of research results. The Reserve routinely fielded and filled database and GIS layer and project requests, and maintained and distributed its collection of archived maps, photographs, and remote sensing data. Research staff frequently supported CTP workshop development and delivery, and prepared articles for reserve newsletters. Reserve staff published their research in peer-reviewed journals, including several papers co-authored by the research coordinator and stewardship coordinator. Research staff also authored a scientific book chapter and four technical reports during the evaluation period. Reserve researchers presented their findings at regional and national scientific and coastal resource manager events, including two Elkhorn Slough Conservation Research Symposia hosted by the Reserve and attended by about 100 regional scientists and managers.

ACCOMPLISHMENT: The Reserve used its management plan to focus its research on high-priority topics. Research projects during the evaluation period provided critical data and findings related to native and invasive species management needs identified by the Reserve and its coastal decision maker audience.

3. Mentoring and External Researchers

Reserve scientists include staff members as well as college students. The students frequently serve the Reserve by formal relationships via undergraduate internships through local colleges like CSUMB, and graduate student fellowships like the NERRS Graduate Research Fellow program. The evaluation team found these students well integrated into the research program and actively mentored by Reserve staff. The evaluation team noted a clear commitment by research staff to nurture young scientists during their educational journey, and simultaneously leverage these students to add needed capacity to the research program. Additionally, the Reserve staff presently includes two former GRFs. Other formal mentoring activities included the research coordinator's service as faculty adviser for three University of California, Santa Cruz graduate students and as a committee member for four other doctoral candidates. These roles allowed the research coordinator to encourage use of the Reserve as a research platform, and at times to direct students to the Reserve's priority research topics to fill data gaps and serve the Reserve. Other Reserve research scientists served on Master's degree candidate committees and worked with undergraduate interns on developing and using data management and analytical techniques to normalize and evaluate data quality in the historic set of SWMP data. OCRM commends the Reserve's commitment to mentoring and encouraging the next generation of estuarine and coastal scientists.

The Reserve's proximity to leading research institutions in the Monterey Bay and San Francisco Bay areas and Reserve staff efforts to engage, inform, and learn from other scientists and decision makers in the region facilitated Reserve use by external researchers during the evaluation period. Reserve staff ensured coordination among external and in-house research, monitoring, land management, education, and public access activities to provide access to protected field sites for research and monitoring by outside scientists. During the evaluation period, the Reserve issued approximately fifteen new research permits per year to external scientists, and typically renewed five old permits per year. CDFG management reviewed the Reserve's research permitting process, and indicated it would work with the Reserve to ensure the current process and revisions comply with CDFG permitting requirements.

4. Geographic Information Systems

The Reserve continued leveraging geospatial data to understand the evolution of the Elkhorn Slough system, and inform research and land management. ESNERR collaborated with several institutions to implement a high-precision and comprehensive elevation monitoring network, critical to detecting very small changes in water levels, sedimentation, and habitats. This network supported Reserve-specific needs, and in the future can serve NERRS-wide initiatives related to climate change impacts and adaptation strategies. The Reserve continues to acquire and maintain an extensive collection of contemporary and historic aerial photography, imagery, maps, and data sets. CDFG supports this effort with updated aerial photography as part of its statewide land

management. ESNERR's ongoing investments in geographical ecology and geospatial data as an analytical and communication tool served Reserve research, stewardship/land management, and education activities.

C. TIDAL WETLAND PROJECT

The Reserve initiated the Tidal Wetland Project during the previous evaluation period to address the dieback of salt marsh and the erosion of soft subtidal sediments, two primary threats to the Elkhorn Slough ecosystem. ESNERR expanded the TWP into a collaborative effort to develop and implement conservation and restoration strategies for estuarine habitats in Elkhorn Slough impacted by dieback and erosion. Seven TWP staff, other ESNERR staff, and over 100 other coastal resource managers, scientific experts, regulators, political subdivision representatives, conservation organizations, and community leaders are supporting the collaborative effort. The Reserve's management plan describes how the TWP will help ESNERR achieve its conservation goal to protect and restore estuarine habitats in the watershed.

TWP secured over \$6 million in grants during the evaluation period, funding project planning, focused research, outreach, restoration planning, engineering design, permitting, and construction. Integral to TWP's progress was a Strategic Planning Team of coastal decision makers and a science panel of experts in ecology, marine chemistry, hydrology, social science, and other disciplines. Both groups conducted their activities using an ecosystem based management philosophy, and Reserve staff demonstrated the TWP's strong links to research and stewardship/land management.

The evaluation team noted numerous outcomes and accomplishments from the TWP activities, including the Elkhorn Slough Tidal Wetland Strategic Plan, two published reports, and award of a competitive ARRA grant from the NOAA National Marine Fisheries Service Restoration Center for design and construction of the Parsons Slough Sill restoration project. The ARRA competition for Restoration Center awarded funds to only 50 projects out of over 800 applicants. The TWP team used standardized project management approaches to improve overall efficiency and effectiveness, particularly in executing the Parsons Slough Sill project. Construction for Parsons Slough will occur after the evaluation period. Overall, the Reserve estimates its ARRA project will create or save 132 jobs. The complex Parsons Slough Sill project, as well as other Reserve restoration projects, required coastal zone permits issued by local authorities as well as review of federal consistency determinations by the California Coastal Commission for federally permitted or funded projects in the coastal zone. Regional planning staff for the California Coastal Commission reported that the Reserve was an excellent permit applicant in many ways because ESNERR staff submitted complete permit applications in a timely manner and provided information responsive to permitting requirements. OCRM commends the Reserve and its partners for their meaningful progress on the Tidal Wetland Project and seizing the opportunity to fund a large restoration project with one-time ARRA funds. The Reserve should continue to explore opportunities to evaluate other conservation and restoration strategies for tidal wetlands, and maintain or increase its capacity to pursue such opportunities through appropriate staffing and strong partnerships.

D. EDUCATION AND OUTREACH

The Reserve's education philosophy focuses on discovery in education and building opportunities to share the excitement of discovery, with emphasis on a rigorous exploration of science (i.e., depth of study over breadth of topics) to develop a culture of conservation. The education program uses K-12 teacher professional development as its primary means to engage students. ESNERR public education relies heavily on its visitor center to promote community education and outreach. The Reserve operates the visitor center five days per week (Wednesday through Sunday) with a visitor center coordinator and two part-time naturalists. The center houses an award-winning interpretive display and a souvenir shop, whose proceeds benefit the Reserve. The Foundation provides the visitor center coordinator at its own expense to support Reserve education and outreach. CDFG provides the naturalists using Sports Fish Restoration Act funds. Additionally, volunteer docents lead Reserve tours for drop-in visitors as well as scheduled groups.

1. K-12 Student Education and Teacher Professional Development

The Reserve continued its teacher trainings during the evaluation period, educating over 200 teachers. Prior to leading any class field trips to the Reserve, the teacher must complete the ESNERR training as both an orientation to ESNERR and a means to obtain critical information needed for the teacher to act as the students' primary tour guide. Additionally, the Reserve equipped teachers with information and tools needed to integrate environmental science and conservation into their classroom curriculum. Teachers may choose to pay for continuing education units, because CSUMB has certified the teacher training as meeting state standards.

Student field trips to the Reserve include interpretive hikes along its network of trails, as well as instruction and discovery facilitated by ESNERR's education staff in their new microscopy laboratory in the Research and Education facility. The Reserve integrates the new laboratory and accompanying microscope resources into its education curriculum, effectively reaching students of science and non-science teachers. The Reserve and local educators reported school budget cuts during the evaluation period included limited funds for field trip transportation. OCRM encourages the Reserve and its partners to continue exploring creative solutions to transportation cost shortfalls, such as expanded use of virtual field trips and grant applications and transportation partnerships within the community.

The Reserve noted its collaborations with educational partners to train an additional 500 teachers during the evaluation period. Partners cited included the NOAA Monterey Bay National Marine Sanctuary's Multicultural Education on Resource Issues Threatening the Oceans (MERITO) program, MLML's Lab and Field Explorations in Marine Sciences, and the Science and Math Academy for Rural Teachers. ESNERR partnered with youth programs and local colleges to leverage the Reserve as an instructional platform for these partners, particularly for experiential learning. The evaluation team noted the numerous environmental education opportunities in the Monterey Bay area pose both a challenge and an opportunity to the Reserve as it defines, brands, and markets its educational offerings in a crowded marketplace. The evaluation team's discussion with educators identified the need for a clearinghouse of Monterey Bay area enrichment opportunities available to teachers, which does not presently exist. The Reserve may choose to take a leadership role in clearinghouse development, in part to identify additional

teacher and student enrichment opportunities that are complementary to, or a deeper study of, knowledge and skills acquired through the Reserve's research program, stewardship activities, and Coastal Training Program. Additionally, the educators identified the Reserve's proximity to the large Latino community in the Watsonville area as a great educational resource to a typically underserved constituency. OCRM encourages the Reserve to strengthen these partnerships and look for opportunities to clarify its role and niche for traditional and non-traditional teaching organizations.

The Reserve's approach to teacher training and use of those teachers as guides for their own class field trips provides great opportunities to enrich and engage student learning in the classroom as well at ESNERR. The evaluation team found the existing education curriculum somewhat disconnected from the conservation goals focus in the management plan, and somewhat dated in comparison to the newest Reserve research, environmental monitoring (particularly SWMP data), CTP workshop content, and land management approaches developed and used by the Reserve during the evaluation period. Additionally, during the evaluation period the Reserve participated and collaborated less actively than in past evaluation periods on NERRS-wide educational initiatives such as Estuaries 101 curriculum development.

The 2007-2011 ESNERR management plan indicated the education program will complete a market analysis and needs assessment and convene an advisory committee to guide the development of an education strategic plan. Specific actions will include clarification of the specific niche the ESNERR education programs can fill in the local/regional environmental education community; reviewing existing and potential new programs; prioritizing audiences and messages; and defining appropriate delivery modes. A significant aspect of market analysis and needs assessment would likely be addressing the educational and outreach needs of the large Spanish-speaking community in the Monterey Bay area. The Reserve had not initiated these activities at the time of the evaluation.

The evaluation team agrees with the Reserve's intention to update its education market analysis and needs assessment, and to convene its Education Advisory Committee to assist with educational strategic planning. NOAA provided over \$160,000 in FY 2010 for individual NERRs to initiate or update their education market analysis and needs assessment. The Reserve did not meet all eligibility requirements to receive supplemental CZMA §315 funds in FY2010 to perform the education market analysis and needs assessment. While the updated management plan satisfies one requirement, the Reserve did not satisfy the requirement to have an active Education Advisory Committee. The Reserve indicated the Monterey Bay Aquarium expressed interest in collaborating with ESNERR on its education market analysis.

OCRM strongly encourages the Reserve to perform its planned education market analysis and needs assessment, and undertake meaningful strategic planning, to guide updates to its education program including curricula and teacher training materials. OCRM urges the Reserve to reconstitute its Education Advisory Committee, which would support its education planning efforts as well as position ESNERR to take advantage of future supplemental CZMA §315 funding opportunities. Information from, and integration with, recent Reserve research, environmental monitoring data, CTP decision maker workshops, Reserve land management approaches, and NERRS-wide educational collaborations would provide excellent content for

these updates. ESNERR undergraduate and graduate students from the research program may also infuse research and monitoring data into education at the Reserve, as well as mentor the K-12 students. The Reserve intends to revise its management plan by the end of 2011. Timely efforts in education planning would inform the management plan update.

PROGRAM SUGGESTION: OCRM strongly encourages the Reserve to reconstitute its Education Advisory Committee, update its education market analysis and needs assessment, and conduct education strategic planning as a means to inform the upcoming management plan revision and guide revisions to educational curricula and teacher training materials.

2. Outreach and Community Education

The visitor center and the Reserve's trails and waterways attract visitors and facilitate educational opportunities. Over 200,000 people visited the Reserve during the evaluation period, including 9,000 who participated in over 1,100 docent-led tours. The Reserve also hosted and participated in many special events at ESNERR and in the community, including its Mother's Day event, seminars for Reserve volunteers and Foundation members, interactive display placement during weekend events at the Monterey Bay Aquarium, and the local Earth Day/*Día de los Niños* celebrations. OCRM commends the Reserve and Foundation's full-time operation of the visitor center in the face of state budget difficulties. Other Reserve program-specific outreach included the education program's participation in the MERITO and the Watsonville Wetlands Watch programs, whose focus is the Latino community.

The Reserve's website provides a well-conceived portal for public access to information about ESNERR and the Foundation, including information on educational and volunteer opportunities. The recent website update eliminated a previous architecture that included a common ESNERR/Foundation portal that linked to separate entry points to individual home pages for each entity. The Foundation and Reserve communicated this as an example of its culture of collaboration and focus on the slough instead of individual organizational boundaries. The evaluation team found numerous website references to the Foundation, ESNERR, and the partnership between CDFG and NOAA. The Reserve should continue its awareness of the balance between focus on the slough and need to differentiate roles and activities of the various partner organizations, for clarity and accountability for respective responsibilities as well as useful branding and attribution for the individual organizations' needs.

ESNERR's management plan describes outreach and public education needs relative to its conservation goals. As with other program areas, the management plan interweaves outreach needs through its stewardship, education and research programs. The Reserve identifies a staffing need for a community outreach coordinator in its management plan. The education staff committed to work with other Reserve programs and the Foundation to acquire funding for a community outreach coordinator, but have been unsuccessful as of the end of the evaluation period. The management plan also identifies the need for an integrated communication and outreach plan for the Reserve, indicating plan development would depend on the addition of the community outreach coordinator. The Reserve's outreach and community education activities, beyond those directly tied to the visitor center and tour groups, lacked an organizing principle

during the evaluation period. The management plan identifies numerous tasks for this position that did not occur during the evaluation period because this position remains unfunded. In the absence of a community outreach coordinator, OCRM encourages the Reserve to prioritize and complete critical outreach tasks, including an integrated communication and outreach plan, with its current staff.

E. COASTAL TRAINING PROGRAM

ESNERR's Coastal Training Program serves the educational needs of coastal management decision makers in the Central California biogeographic subregion. It provides access to science-based information, tools, and techniques; facilitates decision maker and stakeholder collaboration and networking; and increases CTP user understanding of the consequences of human activity within the coastal landscape. The CTP accomplishes these educational functions through workshop development and delivery, Coastal Learning Network development, and publication development.

The CTP prepared and/or delivered an average of 10 workshops per year, and directly served about 2,000 decision makers during the evaluation period. Workshop offerings varied from basic to advanced content and topics, providing breadth and depth to a diverse group of users. The Reserve indicated market analyses, needs assessments, workshop surveys, its CTP steering committee, and the Reserve management plan informed its workshop development and revisions during the evaluation period. ESNERR collaborated with the San Francisco Bay NERR on a new needs assessment of land managers. The Reserve repeated basic training workshops on a regular basis based on its market analysis finding that environmental professionals in their service area remain in their positions on average for less than five years. ESNERR utilized its CTP assistant to collect and analyze workshop audience data that informed such programming decisions. OCRM recognizes the Reserve's investment in its CTP assistant position and the value of CTP support staff in refining training offerings to meet the unique needs of the audience. CTP workshops also provided forums that support and encourage direct communications among planners, elected officials, consultants, scientists, landowners, and concerned citizens. A workshop participant indicated she could tell which planning commission members have attended CTP workshops based on their knowledgeable statements and questions during hearings, which exemplifies the CTP's effective targeted issues-based workshops for coastal decision makers.

The Reserve invested staff time in establishing two collaborative learning networks to address land management for grasslands and maritime chaparral habitats. The Central Coast Rangeland Coalition focuses on establishing science-based approaches to monitoring and adjusting livestock management to create cleaner water, maintain biological diversity, and support ecosystem resilience. The Central Coast Fire Learning Network focuses on preserving and restoring maritime chaparral while protecting public safety and property. The Reserve's active participation with its partners in these collaborative learning networks extends naturally from the CTP's core workshops but required intentional development of organized collaboration rooted in informal networking at workshops by landowners, resource management professionals, decision makers, and concerned citizens. The CTP coordinator referred to a diverse user base as the Reserve's "decision maker-shed." The partners developed and supported the networks, which in

turn bolstered the partnerships and fostered informed decision making. OCRM commends the Reserve's CTP for its role in building and nurturing collaborative learning networks that inform and connect its "decision maker-shed" to enable science-based communication and land use decisions that affect critical conservation issues within the Reserve and throughout its service area.

ACCOMPLISHMENT: The Reserve's Coastal Training Program worked to build and nurture collaborative learning networks that inform and connect its "decision maker-shed." The CTP's activities enable science-based communication and land use decisions that affect critical conservation issues within the Reserve and throughout its service area.

The Reserve translated and disseminated key research findings for coastal decision makers through CTP publications. Given the diversity of scientific backgrounds and information breath/depth needs of the decision maker audience, the CTP provided a variety of publication formats including fact sheets, peer reviewed papers, white papers and other unpublished literature, and CTP workshop materials. The CTP effectively used its website to distribute the information, with its most recent statistics indicating nearly 6,000 unique visitors per month. The CTP's ability to translate research data into usable and varied publications for its users may serve the Reserve's other opportunities for communicating estuarine and coastal science research to its larger audience of public education and outreach, neighbors, volunteers, and other stakeholders. The Reserve's K-12 education program may have an immediate need for research translation as it performs and implements its strategic planning to inform curriculum and teacher training materials.

F. STEWARDSHIP

The Reserve's stewardship activities protect and restore the varied natural resources at ESNERR. Anthropogenic activities heavily modified, and in many cases degraded, habitats in the Elkhorn Slough watershed since the late 19th century. Resource protection at ESNERR during the evaluation period involved mitigating the impacts of invasive species through detection and response, quantifying habitats and species at the Reserve through inventorying, and preserving ecological function through existing engineering controls and management. Restoration of degraded habitats attempted to recover portions of the lost aspects of local biodiversity and natural processes. Reserve stewardship included acquisition of new properties, which increased the portfolio of lands requiring protection and restoration.

1. Resource Protection

ESNERR's focus on achieving conservation goals required accurate and updated species and habitat inventorying and mapping. Stewardship staff, in collaboration with the Reserve's geographical ecologist, routinely updated databases with spatially relevant data regarding existing habitat, invasive species, and sensitive species. Stewardship staff and Reserve volunteers collected data through their regular field monitoring of Reserve lands. The geographical ecologist used updated aerial imagery to identify habitat changes, and with field observation results he geospatially interpreted species and habitat conditions.

The stewardship staff responded to invasive species using their updated species and habitat inventories and maps. ESNERR indicated its early detection and rapid response approach led to eradication of jubata grass, English ivy, and silver wattle from Reserve lands. This approach also led to removal of Cape ivy from four out of six known patches, and continued diligence led to substantial progress on control of known fennel, veldt grass, broom, and hoary cress patches on and immediately adjacent to Reserve lands. Reserve stewardship and research staff collaborated on the removal of several large infestations of eucalyptus trees, and studied the suitability of eucalyptus as migratory bird habitat. Stewardship and education staff collaborated on a Sudden Oak Death pathogen control project focused on preventing spread of the pathogen by controlling the transportation of mud onto the Reserve on shoes, vehicles and equipment, and by not importing cut wood material. The Reserve has had no known cases of oak tree impacts from this disease as of the site visit.

Based on research staff studies of amphibians on the Reserve, the stewardship staff managed water flow and level at a series of man-made ponds to protect salamanders, frogs, and turtles found on state and federal threatened and endangered species lists. As part of pond management, stewardship staff worked with research staff to implement sediment removal and with the Foundation to improve drainage on ESF's recently purchased property, to increase habitat quality in the Reserve's largest freshwater ponds.

ACCOMPLISHMENT: The stewardship staff applied research staff study data to manage a series of man-made ponds to increase habitat quality for several threatened and endangered amphibian species. Collaboration with the Elkhorn Slough Foundation led to improved drainage from an upland property that further improved amphibian habitat quality.

As discussed earlier, ESNERR acquired additional properties during the evaluation period that now fall within its responsibilities for resource management. One acquired property includes what had been the last unprotected tidal wetland within the slough and a working farm that generates lease income for the Reserve. The lessee reported a good working relationship with the Reserve, indicating his lease pre-dated ESNERR's acquisition and the lease transition from the previous landowner to CDFG went well. Stewardship staff identified 34 acres of cultivable land on the slope above the wetland to serve as a buffer to wetland impacts from the agricultural activities on the property. The Reserve received advice from the local Resource Conservation District about an appropriate annual cover crop, and worked with the farmer to gain his cooperation and willingness to plant the specified cover crop. The Reserve will purchase cover crop seeds from a local vendor in 2010, but plans to use its native species greenhouse to grow the annual cover seeds itself for subsequent years.

The main conservation landowners within the Elkhorn Slough watershed are CDFG, the Foundation, and The Nature Conservancy, though the Foundation assists The Nature Conservancy with land management. As discussed earlier, the Reserve needs to develop and implement decision criteria for determining whether the ESNERR boundary should change to include particular parcels currently outside its NOAA-approved boundary. The evaluation team found the Reserve's and Foundation's respective stewardship staffs communicate regularly on an informal basis to share best practices and determine opportunities to coordinate or support each

other's land management activities on parcels that affect the health of Elkhorn Slough. Land management level of effort may be a criterion for determining a parcel's inclusion in the ESNERR site boundary. However, the informal collaboration between the Reserve and the Foundation on stewardship issues may not provide a useful framework for supporting boundary decisions. ESNERR and the Foundation acquired numerous parcels during the evaluation period, and both entities appeared to the evaluation team to be near or beyond their respective capacities for conducting land management. The evaluation team identified a need for the Reserve and the Foundation to enhance coordination between their respective stewardship personnel so they can share and use best practices, prioritize and disseminate land management research, and identify opportunities to support each other including the coordination of their overlapping volunteer bases. OCRM identifies the need for a Reserve-Foundation plan, consistent with NERRS boundary expansion criteria, to determine the land management needs and responsibilities at all newly acquired parcels. The Reserve may choose to capture this plan in its 2012-2016 management plan and/or as part of the boundary expansion criteria development process described earlier in this document.

2. Restoration

ESNERR employed historical ecology to understand how natural and anthropogenic inputs led to the current conditions at the Reserve. This approach informed restoration project planning and research staff analysis of the changes to the slough's tidal prism over the last 120 years. Stewardship staff shared their findings as well as their approach with regional scientists, other NERRS stewardship staff, and with reserve volunteers.

Stewardship staff also collaborated with research and maintenance staff on many restoration science projects designed to inform Reserve land management. Reserve staff and GRFs mowed test plots over a five year period to quantify effectiveness in increasing the abundance of native grasses relative to invasive species. The Reserve found the mowing could significantly increase native grass abundance. Additional Reserve grasslands research generated science on the biology of ESNERR native grasses and the potential for restoration. Reserve undergraduate and graduate students disseminated the research data through several technical reports and a Master's thesis.

Other land management research involved control of poison hemlock and periwinkle with low intensity flames and restoration of ecotone native grasses through direct seeding of cleaned native grass seeds. Reserve stewardship staff operates the new greenhouse with support from dozens of volunteers. Greenhouse activities produced over 10,000 native plants for Elkhorn Slough watershed restoration projects in approximately two years of operation, heavily leveraging Reserve volunteers to perform seed cleaning, sorting, sowing, and re-planting. Long-time ESNERR volunteers supported the greenhouse program by identifying native seed sources on Reserve property. The Reserve and the Foundation collaborated on development of a native grass farm. The farm, located on Foundation property, will provide seeds to support grass restoration activities for both entities and may serve as a model for stewardship coordination and collaboration. The stewardship staff participated in a regional plant nursery network to learn and share best practices.

G. VOLUNTEER PROGRAM

The Reserve's long-standing volunteer program strengthened and enhanced all program areas during the evaluation period. Despite a vacant volunteer coordinator position for part of the evaluation period, the Reserve graduated over 30 participants from its docent training class. This nine week, 18-session program, provided long-term volunteers with basic and in depth knowledge and skills needed to become docents and tour guides, and to pursue special interests.

Reserve volunteers contributed 5,000 to 7,000 official hours of service to the Reserve each year. While a typical year saw over 100 volunteers at the Reserve, about 80 of these contributed 50 hours or more. ESNERR volunteer hours represented an important source of CDFG cost match for § 315 financial assistance awards. The Reserve estimated value of volunteer time at over \$100,000 per year, though CDFG only used \$15,000 to \$20,000 per year toward its match requirement.

The evaluation team enjoyed speaking with numerous volunteers who shared their experiences and insights about the Reserve. The team met some volunteers during a greenhouse activity. The group spanned new volunteers and twenty year-plus veterans of ESNERR, and included a great diversity of age groups and backgrounds. The Reserve excelled at volunteer recruitment and retention during the evaluation period. Long-time volunteers served as a source of institutional knowledge for ESNERR staff. Volunteers indicated the Reserve represented an excellent volunteering opportunity for themselves, citing many attractions including flexible volunteer scheduling, a diverse set of volunteer experiences to match one's interests, and direct access to Reserve program staff. One volunteer reported that other similar volunteer opportunities in the area have very rigid schedule requirements and afford a limited variety of experiences or opportunities for personal growth.

Volunteers expressed a sense of community and a high level of appreciation from the Reserve staff. Volunteers who completed the long-term volunteer training identify themselves by training class (e.g., Class of 2006), which seemed to add to the sense of camaraderie. Several volunteers indicated that Reserve staff members served as mentors, providing guidance and encouragement but also a level of empowerment and trust in getting work done. Some volunteers indicated the Reserve was their only significant volunteering activity, while others indicated Reserve staff helped them find other organizations to assist in addition to ESNERR. Volunteer program staff noted their recent effort in networking with other local organizations to share volunteer opportunities. The Reserve provided green vests to identify and acknowledge volunteers. Monthly volunteer newsletters, authored by staff and volunteers, kept Reserve volunteers informed on the latest happenings at ESNERR. The evaluation team noted numerous examples of Reserve accomplishments made possible through the tireless and enthusiastic efforts of volunteers, including greenhouse seed collection, separation, and potting; water quality monitoring beyond the four SWMP stations; benthic habitat surveys; bird surveys; public tour leadership, artificial oyster reef construction; native species control; and trail maintenance. The quantity and quality of volunteers enabled the Reserve to accomplish much more than the staff could do alone, sometimes accomplishing things that would otherwise be impossible to complete. OCRM commends ESNERR for its successful recruitment, training, retention, and leveraging of volunteers to further Reserve goals and increase the number of formal and informal ambassadors of Elkhorn Slough.

ACCOMPLISHMENT: ESNERR successfully recruited, trained, retained, and leveraged volunteers to further Reserve goals throughout the education, research, and stewardship sectors and increased the number of formal and informal ambassadors of Elkhorn Slough.

ESNERR volunteer recruitment occurred through the ElkhornSlough.org website, as well as through partnerships with other governmental and private organizations, print and radio media, Reserve tours and visitation, and Reserve staff and volunteer networking in the community. The Foundation used the same website and similar approaches in its volunteer recruitment. The evaluation team observed collaboration by the Reserve and the Foundation and a focus on mutual benefit through volunteer recruitment efforts, although similar to other areas noted elsewhere in these findings the lines of distinction blurred between ESNERR and the Foundation. For example, the web page for short-term volunteer opportunities listed the Reserve's volunteer coordinator as the primary point of contact for those interested in becoming a volunteer at Elkhorn Slough watershed, not exclusively the NERR. However, earlier on the same webpage the announcement for arranging a special project (e.g., a Boy Scout or Girl Scout troop volunteer project) listed the Foundation as the primary point of contact. The Reserve's management plan indicates that "(t)he purpose of the volunteer program is to recruit, train, and support volunteers so they can effectively assist Reserve and Foundation staff in carrying out their conservation goals." The evaluation team sometimes struggled with the collaborative approach to volunteers and other programmatic aspects of ESNERR taken by the Reserve and the Foundation. Prospective volunteers would benefit from the Reserve's continued efforts to clarify its volunteer opportunities as potentially complementary to, but organizationally distinct, from the Foundation.

V. CONCLUSION

For the reasons stated herein, I find that the State of California is adhering to the programmatic requirements of the Coastal Zone Management Act and the regulations of the National Estuarine Research Reserve System in the operation of the Elkhorn Slough National Estuarine Research Reserve.

ESNERR made notable progress in the following areas: strategic planning, collaborative partnerships, staff recruiting and retention, facility development and use, research and monitoring activities, collaborative learning networks, resource protection, and volunteerism.

These evaluation findings also contain five (5) recommendations. The recommendations are in the form of two (2) Necessary Actions and three (3) Program Suggestions. The state must address Necessary Actions by the dates indicated. The Program Suggestions should be addressed before the next regularly scheduled program evaluation, but they are not mandatory at this time. Program Suggestions that must be repeated in subsequent evaluations may be elevated to Necessary Actions. Summary tables of program accomplishments and recommendations are provided in section VI.

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



Donna Wieting
Acting Director, Office of Ocean and Coastal
Resource Management

February 3, 2011
Date

VI. APPENDICES

Appendix A. OCRM Summary of Accomplishments and Recommendations

The evaluation team documented a number of ESNERR’s accomplishments during the review period. These include:

Issue Area	Accomplishment
ESNERR Strategic Planning and Execution	The Reserve effectively used strategic planning tools and expertise in the development of its revised management plan to create a guiding framework that aligns and integrates program activities around key conservation goals with demonstrable outcomes.
Financial Support and Agreements	CDFG’s new MOU with the California State Coastal Conservancy and NOAA, and its updated MOU with the Elkhorn Slough Foundation, clarify and codify these current partnerships. Updated, relevant MOUs clarified these organizational relationships and provided mechanisms to overcome some of CDFG’s administrative challenges as host agency in the near term.
Reserve Operations and Staffing □	The Reserve retained a highly productive staff that performed a wide breadth and large quantity of noteworthy programmatic work.
Facilities	The Reserve completed construction and immediately used its new Research and Education facility and greenhouse. These facilities added capacity and richness to Reserve operations by facilitating college student and volunteer support of Reserve programs.
Monitoring	The Reserve’s high-quality monitoring data verified land acquisition and restoration strategies for former hillside farms reduce nutrient and sediment loading in the Elkhorn Slough watershed.
Research Activities	The Reserve used its management plan to focus its research on high-priority topics. Research projects during the evaluation period provided critical data and findings related to native and invasive species management needs identified by the Reserve and its coastal decision maker audience.

Coastal Training Program	The Reserve's Coastal Training Program worked to build and nurture collaborative learning networks that inform and connect its "decision maker-shed." The CTP's activities enable science-based communication and land use decisions that affect critical conservation issues within the Reserve and throughout its service area.
Resource Protection	The stewardship staff applied research staff study data to manage a series of man-made ponds to increase habitat quality for several threatened and endangered amphibian species.
Volunteer Program	ESNERR successfully recruited, trained, retained, and leveraged volunteers to further Reserve goals throughout the education, research, and stewardship sectors and increased the number of formal and informal ambassadors of Elkhorn Slough.

In addition to the accomplishments listed above, the evaluation team identified several areas where the program could be strengthened. Recommendations are in the form of Program Suggestions. Areas for improvement include:

Issue Area	Recommendation
Financial Support and Agreements	NECESSARY ACTION: CDFG must pursue spending authority for the Minhoto property's lease income and other program income to fulfill requirements in the 2009 MOU. CDFG must provide OCRM with a written update on its efforts and progress no later than July 31, 2011 and every six months thereafter until it is able to use this program income to support Reserve activities.
Reserve Operations and Staffing	NECESSARY ACTION: CDFG must fill the vacant reserve manager position at ESNERR prior to the start of the NOAA financial assistance award period that begins July 1, 2011.
Financial Support and Agreements	PROGRAM SUGGESTION: OCRM urges CDFG to commit to a multi-year effort to explore, identify, and facilitate the implementation of actions needed for CDFG to become the sole applicant for CZMA § 315 financial assistance awards.
Site Boundary	PROGRAM SUGGESTION: OCRM strongly encourages CDFG to develop boundary expansion decision criteria through a collaborative planning process with NOAA, the Elkhorn Slough Foundation, and other appropriate partners.
K-12 Student Education and Teacher Professional Development	PROGRAM SUGGESTION: OCRM strongly encourages the Reserve to reconstitute its Education Advisory Committee, update its education market analysis and needs assessment, and conduct education strategic planning as a means to inform the upcoming management plan revision and guide revisions to educational curricula and teacher training materials.

Appendix B. CDFG's Response to June 2000 – March 2005 Evaluation Findings

Necessary Action: ESNERR must update their Memorandum of Understanding with the Elkhorn Slough Foundation to reflect the current conditions of the partnership and to address future needs.

Response: The Memorandum of Understanding between the California Department of Fish and Game and the Elkhorn Slough Foundation was updated in 2006.

Necessary Action: The management plan update is subject to a necessary action for the fourth consecutive evaluation. The Reserve must complete, finalize, and submit the revised management plan to NOAA according to the following schedule:

- a) draft: May 31, 2006
- b) final: September 30, 2006.

If the final deadline is not met, NOAA will immediately initiate a problem-specific evaluation pursuant to 16 U.S.C. §§ 1458 and 1461 and 15 C.F.R. Part 123.133(b)(9), to address the Reserve's failure to complete the management plan revision. Upon completion of this focused evaluation, the State of California's operation and management of ESNERR may be found to be deficient and the State of California may be found to be not adhering to the requirements of NERRS' regulations as adopted by the Secretary of Commerce under the CZMA or the terms of its cooperative agreement. If it is so found, the State of California will be subject to sanctions pursuant to 16 U.S.C. §§ 1458(c) and 1461(f), 15 C.F.R. Part 921.33(c), and 15 C.F.R. Parts 923.131-923.135.

Response: The ESNERR 2007-2011 management plan was completed and approved in 2006.

Program Suggestion: The CDFG should work to fill the vacant habitat specialist/maintenance position. NOAA also continues to encourage CDFG to work to secure state funding for the administrative assistant's position.

Response: The Reserve's maintenance position was filled and state funding for the Administration Assistant (referred to in this document as the Office Manager) was secured in 2007.

Program Suggestion: ESNERR should consider developing an MOU with the California Coastal Conservancy and the Elkhorn Slough Foundation to formalize their joint agreement regarding management of NOAA Coastal Training Program funds.

Response: A Memorandum of Agreement (MOA) between NOAA, CDFG, and the State Coastal Conservancy was completed in 2009.

OCRM Comment: The referenced MOU addresses all NOAA funds awarded for the operation and management of ESNERR, not just the CTP funds. Additionally, the referenced MOU does not include ESF as a signatory however, the MOU described ESF's role as a receiver of the ESNERR O&M funds through the Coastal Conservancy. A 2006 MOU between CDFG and ESF describes their relationship.

Program Suggestion: ESNERR should redefine the purpose, and examine the composition, of the Reserve Advisory Committee to reflect current and future needs of the Reserve.

Response: As part of the management plan update, the role of the Reserve Advisory Committee was better defined.

Program Suggestion: ESNERR should create a grants management team for improved coordination and oversight across the three grant partners, the Elkhorn Slough Foundation, the Department of Fish and Game, and the California Coastal Conservancy. ESNERR and Reserve partners should also strive to be more comprehensive when reporting on programs and projects in their semi-annual performance reports.

Response: An ESNERR grants management team involving CDFG, ESF, and the Conservancy was formed in 2007.

OCRM Comment: These entities formed a grants management team. The evaluation team found the performance reports for financial assistance awards during the evaluation period frequently lacked details regarding outcomes.

Appendix C. Persons and Institutions Contacted

California Department of Fish and Game

Sandra Morey, Deputy Director for Ecosystem Conservation

Jeffrey Single, Manager, Region 4 – Central Region

Terry Palmisano, Lands and Wildlife Program Manager, Region 4 – Central Region

California State Coastal Conservancy

Trish Chapman, Central Coast Regional Manager

Elkhorn Slough National Estuarine Research Reserve

CDFG Employees:

Amanda Ankenbrandt, Volunteer Coordinator

Michelle Bakker, Management Services Technician

Peggy Casper, Visitor Center Naturalist

Steve Legnard, Fish and Wildlife Technician/Maintenance

Kenton Parker, Education Coordinator

Becky Suarez, Reserve Manager

Varyl White, Visitor Center Naturalist

Elkhorn Slough Foundation Employees:

Bree Candiloro, Stewardship Specialist

Nathan Chaney, Tidal Wetland Project – Assistant Project Manager

Nina D’Amore, Tidal Wetland Project – Adaptive Management Lead

Susie Fork, Research Biologist

Monique Fountain, Tidal Wetland Project – Project Manager

John Haskins, Water Quality Specialist

Grey Hayes, Coastal Training Program Coordinator

Brent Hughes, Estuarine Ecologist

Quinn Labadie, Tidal Wetland Project – Communications Assistant

Bryan Largay, Tidal Wetland Project Director

Guilherme Lessa, Estuarine Scientist

Grant Lyon, Coastal Training Program Assistant

Erin McCarthy, Tidal Wetland Project – Specialist

George Merilatt, Education Specialist

Kerstin Wasson, Research Coordinator

Tricia Wilson, Visitor Center Coordinator

Andrea Woolfolk, Stewardship Coordinator

Elkhorn Slough NERR Volunteers

Deirdre Baxter

Ron Eby

Kathryn Hannay

Jaime Karaszewski

Miriam Low

Marilyn McLoughlin

Shirley Murphy
Bob Newgard
Bill Ozuna
Ellie Satow
Jack Kopecky
Kira Kratzer
Jeana De La Torre
Alex Darocy
Adam Garcia

ESNERR Reserve Advisory Committee

Carolyn Anderson
Captain Yohn Gideon, Slough Safari
Benita Low
Marilyn McLaughlin, ESNERR Volunteer Representative
Katie Morange, California Coastal Commission
Simone Mortan, Monterey Bay Aquarium
Terry Palmisano, California Department of Fish and Game
Mark Silberstein, Elkhorn Slough Foundation

Elkhorn Slough Foundation

Kevin Contreras, Land Acquisition Specialist
Steve Dennis, Board Member
Terry Eckhardt, Board Member
Gabi Estill, Grants Manager
Kate Raymundo, Administrative Director
Kim Hayes, Stewardship Director
Mark Silberstein, Executive Director
Lorili Toth, Director of Development and Communications
Jim Van Houten, Foundation Advisor
Jessica Perri

Other State Agencies

Katie Morange, Regional Planner, California Coastal Commission

Federal Agencies

Andrew DeVogelaere, Ph.D., Research Coordinator and Director of Sanctuary Integrated
Monitoring Network, NOAA Monterey Bay National Marine Sanctuary

Local Government Representatives

Lou Calcagno, Monterey County Supervisor, Second District

Other Organizations and Representatives

Justin Brown, President/Chief Operations Officer, Golden State Bulb Growers
Captain Yohn Gideon and Naturalist Chelsea, Slough Safari

Mari Kloeppe, Elkhorn Slough neighbor and President of FANS – Friends, Artists and
Neighbors of Elkhorn Slough
Melody Randel, Teacher, Pajaro Watershed Institute, MERITO
Kim Swan Sosky, Monterey Bay Aquarium Youth Programs

Appendix D. Persons Attending the Public Meetings

OCRM hosted a public meeting on August 3, 2010 at 6:00 pm at the Administrative Building Conference Room, Elkhorn Slough National Estuarine Research Reserve, 1700 Elkhorn Road, Watsonville, California.

The following attended the meeting:

Carolyn Anderson, Reserve Advisory Committee
Ron Eby, ESNERR volunteer
Jim Harvey, Moss Landing Marine Laboratory
Rich Kirby
Donna Jones, Santa Cruz Sentinel
Benita Low, Reserve Advisory Committee (Education)
Marilyn McLoughlin, Teacher/Reserve Docent
Simone Mortan, Monterey Bay Aquarium/Informal Education Program

Appendix E. ESNERR's Own Summary of Accomplishments for the Evaluation Period

(continued on next page)

ELKHORN SLOUGH NATIONAL ESTUARINE RESEARCH RESERVE



ACCOMPLISHMENTS APRIL 2005 – JUNE 2010

The Elkhorn Slough National Estuarine Research Reserve (ESNERR) is fortunate to be a healthy and thriving organization with an impressive cadre of talented and dedicated staff. While not immune from the impacts of the nation's economic downturn, ESNERR has remained a productive center for habitat stewardship, scientific research, and education. This is largely a result of ESNERR's diversified funding and partnerships, as well as the creativity and hard work of each and every employee.

For the convenience of this document, we are reporting on accomplishments by program (Stewardship, Research and Monitoring, Education, etc.). However, the reality is that much of what we do is the result of collaborations and program integration – a veritable spider web of connections that make ESNERR function.

OPERATIONS AND MANAGEMENT

The day-to-day administration of ESNERR is the responsibility of the Reserve Manager and the Office Manager (also known as the Office Assistant). This team works to provide ESNERR staff with the resources and support they need to accomplish their tasks. Support activities include procuring funding, tracking budgets, purchasing supplies, managing contracts, creating site procedures, enforcing State policies, and coordinating facilities use, among many others. The Maintenance/Habitat Assistant is responsible for the ongoing maintenance of the Reserve's habitat and infrastructure, handling all manner of challenges from a leaking pipe to a failing levee to the construction of a research platform.

PARTNERS

ESNERR is a product of productive, collaborative partnerships. The four primary agency partners are the National Oceanic and Atmospheric Administration (NOAA), the California Department of Fish and Game (CDFG), the Elkhorn Slough Foundation (ESF), and the California State Coastal Conservancy (CSCC). While the benefits are clear and significant, maintaining solid and effective working relationships among these partners requires a significant

investment of time and resources. In addition, ESNERR works with a wide variety of other agencies and organizations, depending on the goal, project, or grant.

ESNERR is located within Region 4, or the Central Region of CDFG. It is supervised by an Environmental Program Manager based out of Monterey and Fresno. A large CDFG support network exists at the Region Headquarters in Fresno, as well as at the State Headquarters in Sacramento. ESNERR has been the beneficiary of high-level professional assistance from the State for engineering, contracting, architectural, and legal services, to name a few.

The role of the Elkhorn Slough Foundation as ESNERR's non-profit partner is integral to its success, and the long-standing positive relationship is a major accomplishment for the Reserve. Among the key goals in ESF's Strategic Initiative (provided as a separate document) is the goal to "Support programs and activities at the Elkhorn Slough Reserve that are complimentary to our mission." This includes hiring and administering staff, assisting with grant procurement and management, advocating federal budgets, supporting the Visitor Center, operating the bookstore, collaborating on large events such as the Research and Education Center grand opening and annual volunteer appreciation dinner, creating and managing the shared ESNERR-ESF website, raising funds for Reserve support, and much more. It is no exaggeration to state that ESNERR would not have the programs that it does without the ongoing dedicated support it receives from the ESF and the leadership provided by the ESF Executive Director.

A new three-way Memorandum of Agreement (MOA) was signed in April, 2009, between the California State Coastal Conservancy, the California Department of Fish and Game, and the National Oceanic and Atmospheric Administration. This MOA allows the CSCC to apply for and receive ESNERR's NOAA 315 funds on behalf of the CDFG. This partnership between Fish and Game and the Coastal Conservancy has been critical to the success of the NERR work at Elkhorn Slough.

The Elkhorn Slough Foundation and the California Department of Fish and Game updated their Memorandum of Understanding (MOU) in August of 2006. This MOU continues a long and close partnership in support of ESNERR.

MANAGEMENT PLAN

The Reserve's Management Plan was updated during 2005/2006. The final 2007-2011 Management Plan was approved in September 2006. The plan is a complete revision from the prior plan with updated content, as well as a new format and planning approach. Of note is the emphasis on program integration in addressing the key conservation goals of the Reserve.

A variety of planning tools were utilized including logic models and a modified version of The Nature Conservancy's "5-S" planning process was used to identify habitat indicators, their status, and stresses to the Elkhorn Slough. A significant grant from the California Wildlife Conservation Board funded the process, which included a Management Plan Coordinator who was contracted through the University of California, Santa Cruz. The Reserve Manager and Program Coordinators were heavily involved in developing all aspects of the plan and it was a high priority work task, requiring the postponement of other tasks, for well over a year.

FINANCES

The NOAA 315 funds that are awarded to ESNERR are applied for by the CSCC on behalf of the CDFG. The CSCC generously performs this task without charging an administrative overhead. ESNERR staff, under the guidance of the Reserve Manager and with support from the ESF Grants Manager, prepares the annual award application. After being approved by NOAA's Estuarine Reserves Division staff, the CSCC submits the award to Grants.gov. Once the grant is awarded, it is contracted to the Elkhorn Slough Foundation. The ESF administers the funds and pays staff salaries, while the ESNERR Reserve Manager oversees staff workload, performance, and program content.

The program coordinators, administrative staff, and Reserve Manager endeavor to obtain and manage a wide variety of state and federal funds that support ESNERR. The budgets for the NERR operations awards are developed with input from the coordinators who manage their program budgets. The Reserve staff works closely with the ESF Grants Manager, as well as fiscal administrators with the CDFG and CSCC.

Excel spreadsheets that summarize the funding sources for ESNERR will be provided to the evaluation team. They include the following:

- Summary of NOAA/NERR 315 Operations Grants FY 04 – 09
- Summary of CDFG Operations Budget FY 05 - 09
- Summary of ESNERR Grants Other Than NERRS 315 FY 04 – 09
- Summary of Grants Submitted in 2009-2010 (as of July 2010)

PERSONNEL

ESNERR currently employs twenty six staff, of which seven are CDFG employees. The CDFG employees are the Reserve Manager, Education Coordinator, Volunteer Coordinator, Office Manager, Maintenance/Habitat Assistant, and two Visitor Center Naturalists. The other nineteen employees are ESNERR staff who are employed by ESF. Their per view is specific to the NERR and, therefore, they are distinguished from the thirteen ESF staff who work more directly on behalf of the Foundation.

A duty statement for each employee will be provided to the evaluation team. This includes both ESNERR and ESF staff. "ESNERR staff" are people who work under the oversight of the Reserve Manager, with the ESNERR Management Plan as their guiding document. ESNERR staff may be CDFG employees or they may be ESF employees (in the case where ESF administers grant funds to pay ESNERR staff) . "ESF staff" are people who work under the oversight of the ESF Executive Director, with the ESF Strategic Initiative as their guiding document. The work by ESF and ESNERR staff is related and complimentary. Monthly staff meetings include both entities where the lines of employment are far less important than the function and goals of the work performed.

The ESNERR employees' performance and workloads are supervised by the Coordinators who are then supervised by the Reserve Manager. The ESF Administrative Director oversees all

personnel matters regarding payroll and benefits for all those who are employed by ESF, while CDFG personnel staff oversee these matters for those employed by the State.

ESF staff who provide administrative support to ESNERR include the Grants Manager, Executive Director, Administrative Director, Director of Development and Communications, Bookkeeper, Administrative Assistant, and Webmaster. ESF stewardship staff focus primarily on ESF lands, but also support the Reserve when needed.

All ESNERR staff salaries support only ESNERR work and none of their workload includes non-ESNERR functions or responsibilities.

Due to the integrated nature of ESNERR programs, some staff work in more than one program. For the sake of the table below, staff are listed within the program under which they are primarily working.

FY 2009 ESNERR STAFF and FUNDING

PROGRAM	NAME	TITLE	SALARY FUND SOURCE
Mgmt & Admin	Becky Suarez	Reserve Manager	100% CDFG – State funds
	Michelle Bakker	Office Manager	100% CDFG – State funds
Maintenance	Steve Legnard	Maintenance/Habitat Assistant	100% CDFG – Federal funds (SFRA)
Stewardship	Andrea Woolfolk	Stewardship Coordinator	100% NOAA 315 Grant
	Bree Candiloro	Stewardship Specialist	100% NOAA 315 Grant
Tidal Wetland Prog	Bryan Largay	TWP Director	NOAA – ARRA, other grants
	Monique Fountain	TWP Project Manager	100% NOAA - ARRA
	Erin McCarthy	TWP Specialist	100% NOAA - ARRA
	Nina D’Amore	TWP Adaptive Mgmt.	50% CDFG – Fed funds (Section 6) 50% NOAA-ARRA
	Nathan Chaney	TWP Asst. Project Manager	100% NOAA - ARRA
	Quinn Labadie	TWP Communications Assistant	100% NOAA - ARRA
	Guilherme Lessa	Estuarine Scientist	100% NOAA - ARRA
Research and	Kerstin Wasson	Research Coordinator	100% NOAA 315

Monitoring			Grant
	John Haskins	Water Quality Scientist	86% NOAA 315 Grant, 14% ARRA
	Susie Fork	Research Biologist	50% NOAA 315 Grant, 50% private ESF donation
	Brent Hughes	Estuarine Ecologist	75% NOAA 315, 25% RWQCB/ Mo.Comm. Fndn
	Elisabeth Watson	Project Scientist	100% CICEET
GIS	Eric Van Dyke	Geographical Ecologist	100% NOAA 315 Grant
Education, Interpretation, Outreach	Kenton Parker	Education Coordinator	100% CDFG – Federal funds (SFRA)
	Amanda Ankenbrandt	Volunteer/Events Coordinator	100% CDFG – State funds
	George Merilatt	Education Assistant	100% NOAA 315 Grant
	Tricia Wilson	Visitor Center Coord.	100% ESF
	Varyl White	V.C. Naturalist	100% CDFG – Federal funds (SFRA)
	Peggy Casper	V.C. Naturalist	100% CDFG – Federal funds (SFRA)
Coastal Training Prog	Gray Hayes	CTP Coordinator	100% NOAA 315 Funds
	Grant Lyon/Peggy Casper (transition)	CTP Assistant	100% NOAA 315 Funds

FACILITIES

The Reserve's new, 3500 sq.ft. Research and Education Center, which opened in 2007, was in the planning and construction phases during this reporting period. Funding for this construction project was from NOAA (PAC) and CDFG. The project to construct the Research and Education Center was overseen by the Reserve Manager. Planning and grant writing began in 1999 and the building was completed in July 2007. This facility provides office space for the Reserve's Research and Monitoring, GIS, Stewardship, and Coastal Training Programs. It also includes a teaching laboratory for students of all ages to engage in plankton and botany studies. A small but comfortable studio provides overnight accommodations for visiting researchers and CTP workshop presenters. A conference room provides meeting and project work space for staff.

In August 2007, a Grand Opening Celebration was held for the Research and Education Center. Attending this celebration were 250 members of the community, advisory committees, staff, volunteers and an impressive list of dignitaries including, Leon Panetta, Director of the Panetta Institute, Congressman Sam Farr, California's 17th District, John H. Dunnigan, Assistant Administrator, National Ocean Service, NOAA, Rito Guerra, Field Representative, State Senator Abel Maldonado, 15th District, Louis Calcagno, R, Supervisor, Monterey County, District 2, Ryan Broddrick, Director, CDFG, Bernadette Fees, Deputy Director, Office of Communications, Education and Outreach, CDFG, Greg Hurner, Senior Advisor to Director Broddrick, CDFG, William Loudermilk, Regional Manager, Central Region, CDFG, Richard Nutter, President, Elkhorn Slough Foundation Board of Directors, Paul Michel, Superintendent, Monterey Bay National Marine Sanctuary, and Jaime Kooser, Manager, San Francisco Bay National Estuarine Research Reserve.

A native plant propagation greenhouse and adjacent shade house was constructed with NOAA (PAC) and CDFG funds. Planning began in 2005 and the structure was completed in 2007. ESNERR Stewardship staff worked closely with CDFG engineers to design, obtain permits, and oversee this project.

In 2009, an new office trailer was purchased using Federal American Recovery and Reinvestment Act (ARRA) funds. This trailer was needed to house the seven Tidal Wetlands Program (TWP) staff working on the ARRA-funded Parsons Slough Project, as well as other TWP projects. The new trailer was also needed because an older office trailer that had previously housed the Education Coordinator was removed due to issues concerning mold. ESF administrative staff were especially instrumental in the procurement of this important office space.

The ESNERR Maintenance/Habitat Assistant has done an outstanding job, almost single-handedly, of keeping the Reserve's physical infrastructure in good repair. This ongoing maintenance allows a wide variety of ESNERR programs to be implemented. It also provides staff a comfortable work environment, and the public an opportunity to walk the trails and enjoy the Reserve. Safety and security issues are regularly attended to by both administrative and maintenance staff. The Reserve is in compliance with all State and County agency requirements for public drinking water, hazardous materials storage, fire safety, and emergency response.

NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM CONTRIBUTION

ESNERR served as host to the 2008 National Estuarine Research Reserve Annual Meeting. The meeting was held November 1 - 7 at the Asilomar Conference Grounds in Pacific Grove, California. About 200 people attended the meeting, which included a full day of field presentations at the Reserve. Congressman Sam Farr and CDFG Director, John McCamman, were two of the distinguished keynote speakers for the conference.

STATUS OF FINDINGS FROM 2005 312 EVALUATION

All Necessary Actions and Program Suggestions from the Reserve's 2005 NOAA 312 Evaluation have been met and are described below.

- The Reserve's maintenance position was filled and state funding for the Administration

Assistant (referred to in this document as the Office Manager) was secured in 2007.

- The Memorandum of Understanding between the California Department of Fish and Game and the Elkhorn Slough Foundation was updated in 2006.
- A Memorandum of Agreement (MOA) between NOAA, CDFG, and the State Coastal Conservancy was completed in 2009.
- The ESNERR 2007-2011 Management Plan was completed and approved in 2006.
- As part of the Management Plan update, the role of the Reserve Advisory Committee was better defined.
- An ESNERR grants management team involving CDFG, ESF, and the Conservancy was formed in 2007.

STEWARDSHIP

The Stewardship Program staff develops and implements strategies to protect, enhance, and restore the natural resources of ESNERR. Positions primarily responsible for supporting these functions include the Stewardship Coordinator (SC) and the Stewardship Ecologist. The Maintenance/Habitat Assistant also contributes significant hours to support Reserve stewardship. The Stewardship staff carries out habitat management and restoration projects in a variety of Reserve habitats, including estuarine and freshwater wetlands, coastal prairie, coastal scrub, maritime chaparral, and oak woodlands.

HISTORICAL ECOLOGY

Historical ecology is the recovery and synthesis of primary historical data sources, done in order to help us understand past and current conditions, and how present-day conditions have developed. At ESNERR, historical ecology helps guide science-based restoration and management decisions, by allowing us to understand the restoration potential of various sites, and using history as a restoration reference.

- Since 2005, the Stewardship Coordinator has acquired/compiled over 700 primary historical data sources, including local surveys, journal entries, maps, and newspaper articles.
- These and other sources already in ESNERR's holding have been summarized by the SC into a number of presentations, including :
 - A presentation on finding and using historical United States Coast Survey topographical sheets, given at the NERRS Stewardship Coordinator meeting in Homer, Alaska.
 - A presentation on the historical distribution of freshwater habitats in the Elkhorn Slough watershed presented at the regional Threatened Amphibian Summit, hosted by ESNERR research program.
 - A presentation on ESNERR's historical ecology project given at a regional workshop hosted by the Central Coast Wetland Working Group.
 - A presentation on historical changes to Elkhorn Slough's sediment inputs from the Salinas River – given at the California Estuarine Research Society's annual meeting.

- Annual presentations on local history to incoming ESNERR docent classes, as well as quarterly docent newsletter articles on local history
- Analyses using these data are routinely used by Stewardship staff to set habitat restoration objectives on ESNERR; and these data are currently being used by Research staff to analyze changes to the estuary's tidal prism over the last 200 years.

HABITAT AND SPECIES INVENTORY

A basic component of the stewardship program is to inventory and map the species and habitats currently on the Reserve. Working with the Reserve's GIS Coordinator, the stewardship program updates existing habitat, invasive species, and sensitive species maps as necessary.

- Since 2005 the stewardship program has updated plant species inventories regularly, and plant surveys have been completed on all new ESNERR acquisitions and incorporated into the existing plant database.
- Maps of high priority invasive plants maps were created prior to 2005 but are updated as needed, and maps of high priority weeds have been completed for new ESNERR acquisitions.
- Using habitat maps created by the ESNERR GIS Coordinator, the Stewardship staff has updated ESNERR maps to reflect newly acquired parcels.
- Stewardship staff updated sensitive species databases as part of the most recent ESNERR Management Plan update.

PROTECTION OF INTACT, NATIVE HABITATS AND SENSITIVE SPECIES

The conservation of relatively pristine habitat is a high priority for the Stewardship program, as is the protection of sensitive species. In general, the protection of native species and assemblages relies on the removal of stresses that degrade or impair conservation targets, and includes the use of strategies such as prevention, early detection, and rapid response.

- The Stewardship program employs an early detection/rapid response strategy for non-native plants that are known to be invasive in California, but that are not yet widespread on the Reserve. Since 2005, stewardship staff has eliminated all known ESNERR patches of jubata grass, English ivy, and silver wattle as part of this program.
- Working with the Education program, the Stewardship program continues to employ a prevention program for the Sudden Oak Death pathogen, which has devastated oak woodlands throughout coastal California. We require that shoes and equipment entering the Reserve be cleaned of mud, and we do not import cut wood material – both known to be capable of transporting the disease.
- The Stewardship program worked with Resource Conservation District to install an erosion control project that involved the installation of 700 foot long down drain to divert agricultural run-off and stop severe gully through Reserve oak woodlands and native grasslands.
- Working closely with the Research program and volunteers, the Stewardship program manages a series of man-made ponds and guzzlers for the benefit of wildlife in general, and for the protection of the endangered Santa Cruz Long-toed Salamander, the

threatened California Red-legged Frog, and a California Species of Special Concern, the Western Pond Turtle.

- Since 2005, Stewardship and Research staff has collaborated on infrastructure improvements and sediment removal to increase habitat quality in the Reserve's largest freshwater ponds.
- Stewardship staff has recently collaborated with ESF stewardship employees to improve drainage uphill of this pond, on a property recently acquired by ESF. The objective of that acquisition was to decrease agricultural runoff into this pond, a major stressor for these sensitive species.
- With the acquisition of a working farm in 2009, the Stewardship staff, on the advice of the local Resource Conservation District, worked to have approximately 34 acres of crops removed from the slope directly above tidal wetlands, in order to create a buffer zone.
 - Staff worked with the farmer to have this zone planted with an annual cover crop, also recommended by the Resource Conservation District.
 - Stewardship staff is collaborating with ESF stewards and volunteers to produce enough seed to restore portions of this buffer to native grasses in the future.

RESTORATION OF DEGRADED CONSERVATION TARGETS

ESNERR is the site of many degraded habitats, and a large portion of the Reserve's habitats are in need of restoration in order to recover at least some of the lost aspects of local biodiversity and natural processes. As much as possible, Reserve restoration projects are designed as *restoration science* projects, incorporating experimentation into the design, allowing us to focus on important questions about how to make a given project achieve its goals. Major components of ESNERR's restoration program include exotic species control (in addition the early detection/rapid response strategy mentioned above); replanting with native species, almost all of which are propagated on site in the Reserve's greenhouse; and local community involvement in many projects.

Restoration science

- Beginning in 2005, Stewardship staff, with the help of Maintenance staff, implemented a coastal prairie restoration experiment. Over the course of five years, we mowed three 25 m X 25 m plots once a year in late winter to test hypothesis that keeping sward height low would increase the cover of native grasses/forbs relative to non-native plants. Each mowed plot was paired with a nearby, unmowed control plot. Results indicated that annual mowing of selected ESNERR grasslands can significantly increase the abundance of native bunchgrasses, relative to unmowed controls. Results were presented at the California Invasive Plant Council's 2009 Annual Symposium.
- Stewardship staff worked with the Research Coordinator and local university students studying ESNERR grasslands. Three undergraduates submitted papers on the biology of native ESNERR grasses and the restoration potential of degraded Reserve grasslands. Papers were posted as technical reports on ESNERR website. Another student completed her Masters thesis on her ESNERR grassland research.
- Stewardship staff collaborated with regional weed scientists on an experiment to control poison hemlock and periwinkle with low intensity flames. Final results were presented

by the study's principal investigator at the California Invasive Plant Council's 2007 Annual Symposium.

- Stewardship staff collaborated with the CTP Coordinator, Department of Fish and Game staff, local ranchers, and a Reserve volunteer to develop and implement plans to test the effectiveness of cattle grazing on grassland management and restoration on the Reserve. Stewardship staff oversaw the construction of cattle fences and water lines needed for the experiment, and collects data at the grazed and an ungrazed control sites annually.
- In 2009, Stewardship staff implemented a restoration experiment, testing the most effective way to restore native grass in the transition zone above ESNERR's salt marsh using different methods of seed addition. Preliminary results suggest that direct seeding of cleaned native grass seeds is more effective than using locally collected native grass hay as a mulch and seed source.

Exotic species control

- The Stewardship program gives highest priority to controlling invasive plants rated as "High" impact by the California Invasive Plant Council (iceplant, jubata grass, Cape ivy, veldt grass, fennel, French broom, English ivy) and three "Moderate" rated weeds known to have high impacts in local habitats (hoary cress, eucalyptus, and periwinkle).
- In addition to the progress mentioned under the early detection program, since 2005 the Stewardship staff has:
 - Worked with community groups and college students to remove ice plant from salt marsh ecotone habitats on Reserve land,
 - Has nearly eliminated Cape ivy from four of the six known patches on ESNERR land. Work is underway to eradicate this species on ESNERR in the next few years
 - Worked to control all known fennel, veldt grass, broom, and hoary cress patches on and directly adjacent to the Reserve
 - Worked with a local utility company to remove a quarter acre infestation of eucalyptus trees; and worked with California Department of Forestry and Fire to remove ~200 small eucalyptus from habitat above Reserve's largest freshwater pond
 - Begun the permit process to proceed with much larger-scale eucalyptus removal in the future.

Native species propagation and outplanting

- With State and NOAA construction funds, and in collaboration with Department of Fish and Game staff, Stewardship staff oversaw the design, permitting, and construction of a new native plant greenhouse in 2008
- Since completion of the greenhouse and construction of associated shadehouse, Stewardship staff and volunteers have produced over 10,000 native plants for use in ESNERR and ESF restoration projects
- Of these plants, over half these plants have been or soon will be planted in restoration projects in oak woodlands, freshwater, maritime chaparral, and scrub habitats.
- Approximately 3000 have been or soon will be planted as part of an ESNERR/ESF "native grass farm" needed to produce enough seed to restore grassland on the 34 acre vegetated buffer on the recently acquired farm adjacent to tidal wetlands.

Local community involvement

- Every Monday, the Stewardship Specialist leads a volunteer stewardship crew in ESNERR restoration projects
- At least once a month, the Stewardship Specialist leads a volunteer greenhouse day, open to ESNERR volunteers and the public, to help with native plant propagation
- In 2010, the Stewardship Specialist organized a regional native plant nursery manager event to share best management practices and exchange propagation information
- In cooperation with the Volunteer Coordinator, Education Coordinator, ESF and the Monterey Bay National Marine Sanctuary, Stewardship staff routinely involves volunteers and local school groups in Reserve stewardship projects. Over the last five years the following groups have assisted with ESNERR weed control, native plant propagation, and outplanting of native plants:
 - Monterey Bay Aquarium's Young Women in Science (~ 100 girls have planted hundreds of native plants in a coastal scrub restoration project.)
 - Multicultural Education for Resource Issues Threatening Oceans (MERITOS, a local youth group who helped weed, plants native shrubs, and propagate native plants)
 - Duke Energy staff (weeded oak restoration project)
 - Camp SEALab (weeded Hummingbird Island)
 - Duke Energy (oak restoration)
 - REI (trail maintenance and habitat restoration)
 - University of California, Santa Cruz undergraduate interns (we average two interns a year, who work on habitat mapping, weed abatement, and habitat restoration)

HABITAT MANAGEMENT

Constraints sometime preclude the true restoration of lost natural processes, habitats, and species. In these cases, Reserve stewards maintain man-made structures or management regimes instrumental in the upkeep of habitat. Stewardship staff also oversees and/or assists with debris removal and erosion control where necessary.

- As mentioned under the section on "Protection of Sensitive Species" Stewardship staff manages man-made ponds and guzzlers freshwater habitats to protect populations of threatened amphibians and reptiles. Stewardship staff also enhances native habitats around freshwater ponds, by removing non-native invasive eucalyptus, periwinkle, cape ivy, and Australian tea tree from pond edges, and creating a brush piles as refuge for amphibians.
- Immediately after the acquisition of two new ESNERR parcels (Springer and Jazwin) Stewardship staff worked with the California Conservation Corps to remove 90 cubic yards of debris from these properties.
- Stewardship staff worked closely with Elkhorn Slough Foundation staff to implement erosion control on the newly acquired Springer parcel
- Stewardship staff has also coordinated and/or assisted with ongoing Coastal Cleanup days, sponsored by the California Coastal Commission. In most years, over fifty local

volunteers participate, cleaning up over 7 miles of roadside and shoreline along Elkhorn Slough

- Beyond ESNERR’s boundary, Stewardship staff works with the Monterey County Weed Management Area to control highly invasive weeds along local county roads, and has served on the WMA, helping to update its strategic weed plan, and to organize the annual Monterey County War on Weeds Symposium
- Stewardship staff has overseen a contractor to trap feral cats on the Reserve.
- Stewardship staff coordinates with Maintenance staff to manage and maintain tide gates and levees in order to control water levels in Reserve’s North Marsh and to optimize foraging habitat for shore birds.

LAND ACQUISITION

Land acquisition for ESNERR is guided by the approved 2002 CDFG Elkhorn Slough Conceptual Area Protection Plan (CAPP), developed by the Reserve Manager with input from ESF. The CAPP focuses on critical lands and habitat either adjacent to or nearby ESNERR. The CAPP is designed to compliment ESF’s acquisition work which focuses on watershed lands having the greatest impacts, positive or negative, on Elkhorn Slough.

The last five years have been extremely productive in terms of important new lands acquired, with seven properties now in state ownership. These purchases were primarily supported through a combination of State and Federal funds, with some private funds assisting with transaction costs.

Seven properties were acquired totaling 312 acres. Many of ESNERR’s targeted properties are not large in acreage, but they are significant in terms of protected wetlands, buffers, or access to Reserve lands. Transactions totaled \$9,221,570, with almost 21% of these dollars coming from NOAA PAC funds.

In addition to generous Federal and State funding, our ability to purchase lands is in large part due to strong collaboration between the Wildlife Conservation Board (WCB) - the State’s land acquisition agency, CDFG, and ESF. The ESF Executive Director and the ESF Lands Acquisition Specialist were enormously instrumental in assisting the state with many elements of the transactions. The Nature Conservancy also played a key role in the early stages of the land acquisition process.

The table below summarizes the land acquisitions completed during this reporting period.

ESNERR Acquisitions				
Property Owner	Property Name	Area - acres	Escrow Closing Date	Appraised value/Purchase price
DFG	Wells	22	9/13/2007	\$700,000

DFG	Howell	4	12/28/2007	\$65,000
DFG	Jazwin	6	3/20/2008	\$630,000
DFG	Springer	19	3/27/2008	\$1,500,000
DFG	Garcia	42	4/10/2008	\$1,070,000
DFG	Tabor-Beck	11	11/24/2008	\$465,000
DFG	Minhoto	209	1/22/2009	\$4,725,000
		312		\$9,155,000

EXTERNALLY FUNDED PROJECTS

- The Stewardship program was awarded a \$35,000 Department of Fish and Game grant to plan and install additional water quality improvement measures at Cattail Swale, the Reserve's largest freshwater pond. Stewardship staff worked with the Department of Fish and Game to sample sediments at Cattail Swale for a suite of contaminants, in preparation of dredging portions of Cattail Swale. The dredging project has led to increased water retention times in the pond, increasing habitat suitability for sensitive amphibians. Stewards also oversaw installation of slide gate at levee culvert at Cattail Swale, to maintain and improve pond infrastructure.
- The Stewardship program was also awarded a \$14,000 Department of Fish and Game weed abatement grant control Cape ivy the Reserve. Stewardship staff coordinated with California Department of Forestry and Fire crews to remove small eucalyptus trees and provide access to large Cape ivy patches, resulting in over \$6,900 in-kind match toward the project. Stewardship staff then hired a contractor to spray all Cape ivy within the project boundaries, resulting in over 90% control of Cape ivy at that site.
- The Stewardship program recently received \$8000 in funds and dedicated volunteer time as part of a Earthwatch/HSBC program to support ESNERR habitat restoration
- Since 2005, the Stewardship program has received three grants from the Monterey Bay Aquarium (for a total of \$8500) to support native plant propagation, and restoration projects in ESNERR oak woodlands and freshwater habitats.

CONTRIBUTIONS TO NERR INITIATIVES AND ACTIVITIES

During this period, the Stewardship Coordinator attended winter sector and fall NERR/NERRA meetings, and led various sessions at these meetings (e.g., historical ecology presentations, field trip). The SC contributed to various committees (sentinel sites, community-based education, restoration science, SC agendas), and co-organized (with the Research Coordinator) a session on

NERR response to sea level rise at the NERR/NERRA meeting hosted by Elkhorn Slough NERR. The Stewardship staff semi-annually reported on their accomplishments with performance reports and performance measures, and updated contributed content for the SC pages on the NERRS website.

TIDAL WETLAND PROJECT

The Elkhorn Slough Tidal Wetland Project is a collaborative effort to develop and implement strategies to conserve and restore estuarine habitats in the Elkhorn Slough watershed. This collaboration, initiated in 2004, involves over 100 coastal resource managers, scientific experts, representatives from key regulatory and jurisdictional entities, leaders of conservation organizations, and community members. This Ecosystem Based Management Approach focuses on the whole ecosystem of Elkhorn Slough, including people and their needs, and strives to both balance multiple objectives and adapt management to new information. Fifty percent, or 1,000 acres, of Elkhorn Slough’s salt marshes have been lost over the past 150 years due to human actions. Marsh loss and estuarine habitat erosion in Elkhorn Slough is currently ongoing with channel bank erosion rates from 1 to 2 feet per year and interior marsh dieback rates of at least 3 acres per year. These rapid changes not only affect the estuary’s animals and plants, but also impact public access sites and railroad and road infrastructure. In addition, Elkhorn Slough’s estuarine habitats suffer from subsidence, degraded water quality conditions, and invasion of non-native species.

The Elkhorn Slough Tidal Wetland Project employs a staff of seven professionals with training in science, environmental management and law. It has derived direct support in the form of over ten thousand hours of effort during the past five years from ESNERR staff including the Reserve Manager, Research Coordinator, Stewardship Coordinator, Geographical Ecologist, Water Quality Scientist, Estuarine Ecologist, Office Manager, and Maintenance/Habitat Assistant.

GRANTS AND FUNDING

Numerous grant awards have been secured to implement the Tidal Wetland Project. This funding has been secured to support the following key elements of this program: planning, research, outreach, engineering design, regulatory compliance and construction. The table below provides an overview of the funding invested in this effort.

Source	Date	Amount	Focus
Coastal Impact Assistance Program	2003	\$300,000	Initiation of planning process
Wetland Program Development Grant, US EPA	2006	\$208,000	Site restoration planning and design
Ecosystem Based Management Regional Initiatives, David and Lucille Packard Foundation	2006, 2008, 2009	\$1,569,000	Planning process, research, outreach
Organizational Effectiveness Program, David and Lucille	2008	\$35,000	Planning process

Packard Foundation			
American Recovery and Reinvestment Act, NOAA	2009, 2010	\$4,503,614	Construction, engineering, regulatory compliance, planning process, outreach

PLANNING EFFORTS AND PRODUCTS

The Elkhorn Slough Tidal Wetland Project has been guided by a Strategic Planning Team of coastal decision makers and a science panel of experts in the fields of ecology, water chemistry, marine policy, socioeconomics, hydrology, geomorphology, wildlife biology and other disciplines. Over thirty meetings of those two groups, typically lasting for one day each, have been held since 2005. In addition, dozens of smaller meetings have been hosted involving working groups focused on specific topics. Each meeting has focused on a specific outcome as the process moved through stages of understanding the problems facing the resource, defining a vision statement, setting goals and objectives, identifying strategies, and evaluating those strategies in terms of effectiveness, risks, tradeoffs and feasibility. These efforts yielded two substantial published reports, the Elkhorn Slough Tidal Wetland Strategic Plan, 2007, and the Parsons Slough Complex Restoration Plan, 2010. The Elkhorn Slough Tidal Wetland Project director has presented on this work at regional and national meetings of coastal managers.

PARSONS SILL PROJECT

In addition, a major recommended action emerging from this process was the Parsons Slough Sill, a construction project intended to restore the hydrology and geomorphology of the estuary while minimizing impacts to water quality, wildlife and infrastructure. This project was one of 50 selected for funding by the NOAA Restoration Center from over 800 applications as an approach to create jobs while restoring the environment during the economic crisis of 2008-2009. The project is anticipated to substantially improve hydrologic conditions in the estuary while creating 132 jobs.

RESEARCH PROJECTS AND PRODUCTS

The focus of the Elkhorn Slough Tidal Wetland Project is the dieback of salt marsh and the erosion of soft subtidal sediments. Many of the strategies to address these issues could affect water quality, populations of fish and wildlife and local socioeconomics. In order for decision makers to be fully informed of the tradeoffs, detailed investigations into these topics were sponsored by grants funded through this initiative and conducted by the ESNERR Research Coordinator and principal investigators at the Monterey Bay Aquarium Research Institute. This collaboration has produced nine reports and numerous presentations at conferences. Additionally, the Tidal Wetland Project has collaborated with researchers working with separate funding to ensure their data is applied to the planning process. This approach has incorporated research from institutions including Moss Landing Marine Labs, California State University at Monterey Bay, Stanford University, University of California at Davis.

RESEARCH AND MONITORING

The ESNERR research program includes coordination and implementation of the System-Wide Monitoring Program (SWMP), as well as other complementary monitoring, and applied research in and around Elkhorn Slough. Positions directly supporting these functions include the Research Coordinator, Research Biologist, Water Quality Scientist, Estuarine Scientist, Estuarine Ecologist, Geographical Ecologist, and Project Scientist.

SYSTEM WIDE MONITORING

The Reserve has fully implemented the NERR Systemwide-Monitoring Program (SWMP) for water quality, nutrients, and weather. Standard water quality data are collected in situ every 15 minutes at four permanent stations, and weather data are collected at one station every 15 minutes. Nutrient and chlorophyll concentrations are assessed at the water monitoring stations monthly. Data are rigorously processed for quality assurance and control, and submitted to the NERR Centralized Data Management Office. Recent highlights of SWMP at Elkhorn Slough include:

- **Vital equipment upgrades and purchases.** In the past years we continued to upgrade our older sondes to the V2 and to regularly purchase new sondes, ensuring continuity of high caliber data. We also have upgraded all our probes to the optical DO probes and are seeing a significant increase in dissolved oxygen data that is not compromised by fouling.
- **Refinement of nutrient analysis capacity.** During this period, we continued nutrient sampling and improved efficiency of laboratory protocols at neighboring Moss Landing Marine Laboratories. These protocols have been tested with regional cross-lab tests that show strong correlations. We chose to collect and analyze twice as many nutrient samples for the diel sampling as required (24 instead of 12) in order to improve temporal resolution of nutrient dynamics. During this time we have also improved on our QA procedures.
- **Development of in-house database.** Using the program SQL, we have developed a database system for our water, weather and nutrient data which greatly improved our ability to process data and conduct queries of subsets of the data using the program MATLAB, essential for analyses of trends.
- **Telemetry initiation, modification, and continuation.** Over this period, we implemented telemetry capabilities at one of our water quality stations and the weather station. Equipment and protocols were modified system-wide at various points and extensive trouble-shooting was required, but we have maintained and improved this capacity over the years. Currently data is being telemetered without interruption.

- **Improved time series.** Historical data have been processed using 2010 quality assurance techniques to obtain a better quality data set. Anomalous data and spikes are easier to spot with almost 15 years of data as a baseline. These spikes and anomalies were corrected which greatly improved data variability and ability to detect trends.
- **Calculating sediment budgets from SWMP data.** A rigorous study is currently being undertaken to increase the value of our SWMP dataset. The YSI sondes measure turbidity in units of NTU; we are comparing these readings to field collected, laboratory analyzed water samples filtered for total suspended sediments, and are relating these values to current velocity measurements using acoustic backscatter. This will enable us to use historic turbidity data to estimate sediment transport trends over the past decades, and to detect changes that may result from restoration projects.

OTHER LONG-TERM MONITORING

Consistently collecting high caliber long-term monitoring data on key indicators of coastal ecosystem health is the highest priority of the Reserve research program because no other individual or organization is poised to play this role in the Elkhorn Slough watershed. The Reserve is committed to implementing a number of other long-term monitoring programs that complement SWMP. Most of these programs depend on the dedication of highly trained Reserve volunteers. Rigorous data are collected consistently and disseminated to users as raw data archives as well as displayed in regularly updated graphs and reports. One route of dissemination is via the research webpage (<http://www.elkhornslough.org/research.htm>), where links can be found describing all the Reserve's long-term monitoring programs. Included on this website is a "State of the Estuary" report, summarizing the results of all ESNERR long-term monitoring programs. Examples of lessons learned from long-term monitoring are provided below.

- **Monthly water quality monitoring at 24 stations:** this program has enabled us to detect improvements at restoration sites relative to control sites, but has revealed overall increases in nutrient concentrations over the past two decades
- **Benthic habitat surveys at 20 stations:** this program has detected spread of invasive invertebrate species, and has revealed that restored sites on the Reserve have more invasive fouling cover than do adjacent natural sites. This program has also detected dramatic bank erosion rates in the estuary, which appear to be gradually decreasing in the past years.
- **Mudflat invertebrate transects at 4 sites:** this program has revealed that large clam and worm populations in the lower estuary remain abundant despite proximity of dozens of sea otters.
- **Crab trapping:** this program documented the initial invasion and increase of European green crabs, but the invasion appears to be stalling due to lack of recruitment.
- **Shorebird surveys at 5 sites in the estuary:** this program has revealed that willets have increased in abundance since the 1970s, while sandpipers have declined.

- **Heronry monitoring:** this program has recently documented the shift of the colony location from the main portion of the Reserve to the Seal Bend portion, apparently in response to tree loss.
- **Cavity nesting bird monitoring of 150 nestboxes:** this program has revealed that cavity nesters on the Reserve may be very sensitive to climate change, because breeding success seems to be strongly affected by temperatures during the nesting period.

SHORT-TERM APPLIED CONSERVATION RESEARCH

The Reserve's scientists complement the monitoring they coordinate with short-term, applied research projects aimed at better understanding threats to coastal ecosystems and strategies for diminishing them. The focus of such applied research projects stems directly from the Reserve's priorities for conservation and restoration in the watershed. Major short-term applied research projects completed in this period and funded mainly by NOAA are highlighted below. (Additional short-term applied research projects funded mainly from external sources are reviewed separately in the final research subsection.)

- **Marsh-upland ecotone restoration science.** The goal of this research was to improve management strategies for native high marsh diversity on the Reserve, particularly in areas where salinity has been artificially decreased due to tidal restriction with water control structures. We have tested salt addition and manual weed removal as strategies for restoring native marsh diversity to areas where human disturbances have led to invasions of upland weeds.
- **Characterization of ecological impacts of water control structures.** The goal of this research was to determine whether and how water control structures affect the ecological communities of Elkhorn Slough. A third of the estuary is behind water control structures, and further tidal restriction has been proposed to mitigate effects of the artificially wide and deep mouth to the Monterey Bay created and maintained to sustain Moss Landing Harbor. We detected significant negative impacts of artificial tidal restriction on the biodiversity of plants, invertebrates, shorebirds and fish.
- **Native oyster restoration science.** The goal of this research was to identify the factors limiting native oysters in the estuary, and to develop and test restoration strategies for them, because the population is so small that it is in danger of local extinction. This project is described at: http://www.elkhornslough.org/research/conserv_oysters.htm, where a slideshow illustrating the project can also be downloaded.
- **Investigation of community impacts of non-native vegetation.** The goal of this research was to determine whether invasive vegetation types that are abundant on the Reserve (eucalyptus groves, stands of poison hemlock and Harding grass) serve as valuable habitat for animal communities. Arthropod and avian surveys suggest that while animal use of different species does vary somewhat for individual species, overall the abundant non-native vegetation types are as heavily used as native vegetation types.

FACILITATING AND ENCOURAGING RESEARCH AT ELKHORN SLOUGH

Faculty, students, and employees from a wide variety of research institutions and agencies utilize the Reserve for their research. The Reserve scientists invest a significant amount of time in encouraging and supporting research by others at Elkhorn Slough. Historically, some of the most useful knowledge that has informed conservation has come from such investigations, especially by regional graduate students conducting thesis work. Mechanisms for facilitating and encouraging research by others are highlighted below.

- Students are directed to priority research topics (available on the Reserve's webpage at <http://www.elkhornslough.org/research.htm>). This list of priority questions is regularly updated, and over the years students have addressed many of the questions, highlighting the utility of this list. Research staff meet with students to help them choose topics and to provide logistic and conceptual support for their projects.
- Research Program staff provide extensive mentoring and support for students and other researchers conducting scientific studies in the estuary. During this period, the Research Coordinator has served as primary faculty advisor at the University of California, Santa Cruz for two graduate students who have completed their doctorates (A. D'Amore, R. Preisler) and for one current doctoral student (C. Fresquez). During this period, she has served as a committee member for four other graduate students conducting their dissertation research at Elkhorn Slough; the staff Research Biologist and Geographical Ecologist have also served on the committee of various Masters students in the region.
- The Reserve provides access to protected field sites for research and monitoring by outside scientists. The Research Coordinator oversees the Reserve Research Permit process, issuing approximately fifteen new permits a year to scientists, and renewing or closing permits from earlier years as needed. For instance currently in 2010, there are 20 permitted outside researchers conducting science projects on the Reserve.

CONTRIBUTIONS TO NERR INITIATIVES AND ACTIVITIES

During this period, the Research Coordinator attended all winter sector and fall NERR/NERRA meetings, and led various sessions at these meetings (e.g., ecosystem-based management, nekton monitoring). The RC contributed heavily to various committees (sentinel sites, CICEET-NERR, RC process), and co-organized (with the Stewardship Coordinator) a session on NERR response to sea level rise at the NERR/NERRA meeting hosted by Elkhorn Slough NERR. The Water Quality Scientist attended every SWMP Technician workshop, and served on the agenda planning committee for some of the workshops. The Research staff semi-annually reported on their accomplishments with performance reports and performance measures, and updated the research database on the NERR intranet.

GRADUATE RESEARCH FELLOWS

The Research Program has worked closely with the NERR Graduate Research Fellows during this period. GRFs are actively engaged in Reserve activities, and are given duties and responsibilities to support the Reserve, including updating the Reference Library and Endnote Bibliography, presenting and helping to facilitate the Elkhorn Slough Conservation Research Symposium, preparing technical reports on applications of their research to local management issues, and assisting Reserve staff in the field. Reserve staff support the GRFs with extensive mentoring, providing conceptual and logistical support for their graduate research. Examples of fruitful collaboration between GRFs and the Research Program during the past five years are highlighted below.

- Current GRF Carla Fresquez is collaborating with the Research and Stewardship Coordinators to test management strategies for the fragile, rich high marsh-upland ecotone. She has piloted salt addition techniques that appear to be controlling thistle invasions in the Yampah Island portion of the Reserve.
- Current GRF Joanna Nelson has been actively engaged with the Tidal Wetland Project, and completed a reported reviewing the literature on the role West Coast salt marshes may play in improving water quality upon request by Reserve staff.
- Recent GRF Rikke Preisler coordinated the Reserve's crab monitoring, Caspian tern monitoring, and breeding marsh bird monitoring programs for three years, including oversight of volunteer monitors, database management, and analysis and dissemination of the data. She also provided field support for oyster restoration science at the Reserve, and holds a temporary grant-funded position at the Reserve currently to continue this role.
- Recent GRFs Katie Griffith and Sherry Palacios completed robust reviews of factors that affect the distribution and abundance of pickleweed and eelgrass, respectively, under supervision of the Research Coordinator. These reviews have been instrumental in informing management decisions for the estuary and are available from the Elkhorn Slough Technical Report website (http://www.elkhornslough.org/research/bibliography_tr.htm)
- Under the coordination of the Research Coordinator, five current and former Reserve GRFs (Connors, Griffith, Heiman, Preisler, Woolfolk) collaborated on a synthesis of their diverse datasets which shed light on the negative impacts of artificial tidal restriction, in a publication in *Estuaries and Coasts* which has received national attention.

INFORMING MANAGEMENT AND POLICY

Reserve scientists work to enhance the scientific basis of decision-making about coastal ecosystems. Reserve research and stewardship staff collaborate closely on adaptive management of coastal habitats on the Reserve itself. For instance, Reserve research on threatened amphibian dynamics has informed freshwater pond management strategies on site. Reserve staff have helped organize and contributed presentations to Coastal Training Program workshops, informing regional decision-makers about the ecological impacts of invasions and about threatened amphibian and maritime chaparral restoration strategies. Research staff also regularly contribute knowledge about coastal ecosystems to other regional decision-makers regarding

coastal policy and management (e.g. Monterey Bay National Marine Sanctuary, Regional Water Quality Control Board, Monterey County Board of Supervisors, California Coastal Commission, Aquatic Nuisance Species Task Force).

Research staff have played a critical role in the Tidal Wetland Program, helping to inform this initiative by providing presentations and written summaries to inform decision-making about the future of estuarine habitats in the watershed. The Research Coordinator served as editor for a series of eight reports (available at http://www.elkhornslough.org/research/bibliography_tr.htm) summarizing data and literature on the factors that affect the estuarine distribution and abundance of key species in Pacific coast estuaries in general and at Elkhorn Slough in particular. These reports also contain robust predictions of how the species would respond to large-scale management alternatives under consideration, reached by consensus of 5-8 expert reviewers per report. These reports and the biological predictions form a cornerstone of the Tidal Wetland Program's initiative to evaluate the large-scale management alternatives at the mouth of Elkhorn Slough. Research staff have also played an instrumental role in the design and adaptive management of the Parsons Sill project, serving on various working groups and providing and synthesizing water quality, habitat, and biological data to support this restoration project.

ARCHIVING AND SHARING KNOWLEDGE ABOUT ELKHORN SLOUGH

The research program archives and disseminates data collected in Reserve-run, long-term monitoring programs, as well as the accompanying metadata. In addition, datasets contributed by other researchers are regularly acquired and archived. The Reserve has an extensive, ever expanding collection of maps, photographs, and remote sensing data that are carefully archived. The Reserve maintains webpages that describe Reserve research and monitoring projects. There is also a reference library containing all publications (including unpublished reports and theses) on research in the Elkhorn watershed, and these are entered and annually updated in an Endnote bibliography. The availability of the above resources is made widely known to regional researchers and the public, through presentations and on the Reserve webpage. Hundreds of requests for data, images, and references were received and filled during this period by research staff.

EDUCATION AND OUTREACH ABOUT SLOUGH CONSERVATION RESEARCH

The Research Program invests very heavily in dissemination of conservation research results. In addition to using scientific results to inform local Reserve management, the Reserve researchers are committed to reaching a broader audience of scientists and coastal managers so that the lessons learned at Elkhorn Slough can inform estuarine management elsewhere. Examples of education and outreach accomplishments are highlighted below:

- During this period, Reserve research staff authored 15 papers in peer-reviewed scientific journals, as well as a book chapter and four technical reports. These publications represent a major accomplishment of the Research program, since peer-reviewed journal articles are the most widely respected source for scientific information. The publications are detailed below.

- The Research Program created a simple, user-friendly State of the Estuary report available from the Research webpages (<http://www.elkhornslough.org/research.htm>), to inform the public and decision-makers about the key temporal trends detected by the Reserve's monitoring programs.
- Research staff regularly contribute to newsletters for the public, including a monthly column for the ESNERR docent newsletter, regular contributions to the Elkhorn Slough Foundation newsletter and the Monterey Bay National Marine Sanctuary annual report.
- Research staff present their findings to a variety of scientific and management audiences, including regularly presenting at the Coast and Estuary Research Federation meetings, the California Estuarine Research Society meetings, and the Western Society of Naturalists.
- The Research Program organized and hosted the Elkhorn Slough Conservation Research Symposium in January 2007 and January 2010. These all-day events highlighted research by Reserve staff, Graduate Research Fellows, and other regional researchers, and were attended by about 100 regional scientists and managers. Abstracts and powerpoints from both symposia are available from the Research webpages (<http://www.elkhornslough.org/research.htm>).

EXTERNALLY FUNDED PROJECTS

The ESNERR Research Program applies for external sources of funding each year, and has a strong record of receiving external grant funding to augment NOAA funds. These grants are used for short-term, applied studies that result in rapid completion of concrete products to inform local or regional management, and thus complement the long-term monitoring and research projects of the Reserve. Examples of externally funded projects are highlighted below.

- The Research Program received two grants with funds made available by the Central Coast Regional Water Quality Control Board . These were entitled “Expansion and enhancement of a 15-year north Monterey County water quality monitoring program” (\$170,200 from 2005-8) and “Investigating indicators of eutrophication in estuarine habitats of the Elkhorn Slough watershed” (\$49,680 from 2008-9). Each of these projects resulted in a powerful analysis of the Reserves water quality data disseminated in a high caliber publication. These grants have integrated NERR-SWMP data with the Reserve's monthly volunteer monitoring and have highlighted the extent, consequences, and predictors of eutrophication in the estuary.
- In partnership with the University of California, Santa Cruz and Graduate Research Fellow Rikke Preisler, the Research Program was funded by the National Sea Grant Aquatic Invasive Species program with a grant entitled “Biogeographic investigation of variation in abundance, habitat use and behavior of the European green crab” (\$16,754 from 2006-8). These funds enabled us to examine factors that predict green crab invasion success and to inform prioritization of management effort for this species.

- The Research Program received a Bring Back the Natives grant in 2007 from the National Fish and Wildlife Foundation. ESF partnered with ESNERR, ALBA (Agricultural & Land-based Training Association) and the Nature Conservancy to conserve native amphibian species. The 120K was focused on restoring freshwater habitat and adjacent upland habitat and the funding period stretched from 2008-2010.
- In 2007, the Research Program received \$75,000 in U.S. Fish and Wildlife Service Section 6 funds from the Department of Fish and Game. Funds were spent from January 2009-through June 2010. These funds were used to hire an amphibian ecologist to conduct monitoring of freshwater habitats throughout the Elkhorn Slough watershed. Freshwater wetlands were surveyed for native amphibian species, specifically California red-legged frogs, Pacific chorus frogs, Santa Cruz long-toed salamander and California tiger salamander.
- The Research Program received a grant from the Cooperative Institute for Coastal and Estuarine Technology, to fund a project entitled “A novel approach combining rapid paleoecological assessments with geospatial modeling and visualization to help coastal managers design salt marsh conservation strategies in the face of environmental change” (\$280,615 from 2009-2011). We are examining past, present, and future marsh sustainability at Elkhorn Slough in order to develop sound conservation and restoration strategies.

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GEOGRAPHIC INFORMATION SYSTEMS

The ESNERR geospatial program combines computer and technical expertise with conservation ecology to help understand, protect, and restore central California's natural habitats. The program's tools include geographic information systems (GIS), remote sensing software, precise field survey methods, and an extensive and growing archive of contemporary and historic aerial photography, maps, and related spatial data. The geospatial program contributes to efforts in all reserve sectors. Key activities include watershed and wetland land cover classification, habitat change analysis, long-term monitoring of selected habitats and species, analysis of estuarine processes, and modeling projected effects of global change. Several staff at ESNERR are skilled in using GIS technology, however a significant portion of this work is completed by the Geographical Ecologist.

LONG-TERM MONITORING

At the core of the ESNERR geospatial program is a comprehensive, long-term habitat monitoring program. Land cover across the Elkhorn watershed has been classified and mapped since 2000 using a combination of automated image analysis, manual aerial photo interpretation, and targeted ground verification. Advanced technologies, including multispectral and hyperspectral satellite imagery and airborne LiDAR and IfSAR topographic data, are investigated and incorporated into our evolving habitat monitoring methodology. Results are characterized according to the NERRS system-wide classification standard, and trends between intervals are determined based on standardized change detection methods.

At the scale of the estuary's tidal wetlands, semi-automated analysis is periodically performed to calculate the overall acreage of each habitat type (e.g. subtidal channel, mudflat, salt marsh) and to quantify changes in the width of the slough's main channel and major tidal creeks. We have documented a gradual, long-term conversion from salt marsh to unvegetated habitats, publishing the study in *Estuaries and Coasts* and presenting it at the CERF conference and other forums. This work has been a motivation for the ongoing Elkhorn Slough Tidal Wetland Planning Process. Results are summarized on the ESNERR research program's online *State of the Estuary* scorecard.

Establishing precise relationships between water levels and the elevations of upland, intertidal, and subtidal habitats is essential to understanding the processes driving tidal wetland habitat

change. The ESNERR geospatial program has partnered with various agencies and academic institutions to implement a comprehensive elevation monitoring network at Elkhorn Slough, including:

- Construction of a continuously operating GPS reference station at ESNERR, and inclusion of the station in the national CORS network (in partnership with UNAVCO and NOAA NGS).
- Incorporation of the ESNERR CORS into the region-wide Central Coast Height Modernization surveys and network adjustment (in partnership with the California Spatial Reference Center).
- Geodetic leveling to establish precise elevations at existing and newly installed benchmarks throughout the Elkhorn Slough (in partnership with NOAA NGS and NOAA CO-OPS).
- Installation of high-accuracy water level monitoring stations at four locations in the slough's major channels (in partnership with NOAA CO-OPS).
- Installation of eight surface elevation tables, with associated feldspar marker horizons, at four tidal wetland sites (in partnership with USGS).
- Precise topographic surveys in the vicinity of the four wetland sites (in partnership with NOAA NGS and Moss Landing Marine Laboratories).
- Recovery of Elkhorn Slough wetland elevations from historic surveys, and estimation of long-term regional subsidence rates from analysis of historic datasets (in partnership with NOAA NGS and the CSUMB Watershed Geology Laboratory).
- Acquisition and analysis of slough-wide topographic LiDAR and IfSAR data (in partnership with NOAA Remote Sensing and the NPS Remote Sensing Center).
- Acquisition and analysis of slough bathymetry (in partnership with the CSUMB Seafloor Mapping Laboratory).

Data acquired through this unique, integrated network is providing new insights into the complex relationship between estuarine sediments and the survival of estuarine vegetation in our geologically active region. Results have been presented at a variety of forums, including invited sessions at the NOAA NGS / Louisiana Spatial Reference Center Height Modernization Workshop, the NOAA CO-OPS Hydrographic Services Review Panel, the biennial CERF conference, and the NERRS annual meeting. Lessons learned from this work are providing important input to the emerging vision of the NERRS as a network of global change sentinel sites and, specifically, in the development of an elevation monitoring component for NERRS land use and habitat change plans.

FOCUSED RESEARCH

In addition to long-term habitat monitoring, the ESNERR geospatial program undertakes a variety of targeted research projects to support estuarine conservation and restoration.

Advanced remote sensing data, including multispectral and hyperspectral imagery and LiDAR and IfSAR elevation data, offers the potential for improved image classification quality and efficiency. With these high spatial and spectral resolution data types, new software tools and techniques (and frequently custom programming) are required. In collaboration with the NOAA Coastal Services Center and the Naval Postgraduate School's Remote Sensing Center, we have developed new image processing algorithms and integrated them into our automated habitat classification methodology. We have refined these techniques with multiple datasets from

Elkhorn Slough, as well as from Suisun Bay (Rush Ranch products supplied to SFBNERR / Solano Land Trust) and South San Francisco Bay.

The ESNERR research team, funded by a CICEET grant, is developing tools and techniques to assist coastal managers with the development of conservation strategies to mitigate wetland habitat loss resulting from global change. The geospatial program is responsible for a portion of this project, modeling and visualizing predicted effects under various climate change scenarios and time scales. This effort builds on several ongoing geospatial research activities, including land cover classification, elevation and water level mapping, and sediment and inundation modeling.

Understanding long-term patterns of change in the watershed's wetland and upland habitats is an essential prerequisite to developing effective conservation and restoration strategies. Recent trends are established through repeat habitat classification and change detection. Historical ecology strengthens this perspective by incorporating older maps, photographs, and similar historical evidence into the analysis. The ESNERR geospatial program focuses on several key habitats and associated sensitive species, including tidal wetlands (pickleweed and eelgrass), freshwater wetlands (threatened amphibians), maritime chaparral uplands (manzanitas and other rare species), and non-native habitats (eucalyptus). The geospatial program is an active participant in associated NERR Coastal Training Program workshops and the Coastal Training Network, bringing current science into the conservation planning process.

DATA ARCHIVE, DISSEMINATION, AND TECHNICAL SUPPORT

The ESNERR geospatial program maintains a large and rapidly expanding collection of contemporary and historic aerial photographs, images, maps, and datasets, both internally generated and acquired from external sources. Balancing the need to provide a safe archive for these often irreplaceable materials, while at the same time providing timely access for use by ESNERR staff and affiliated researchers and academics, is a fundamental responsibility of the geospatial program. Although substantial portions of the collection are in hardcopy form, access to these original materials is typically restricted to ESNERR research staff; digital copies are made available to others. Digitizing, processing, archiving, and distributing digital data is a substantial and continuing task. The entire digital collection is currently being migrated to a secure, network-attached redundant storage server.

ESNERR geospatial science is disseminated through a variety of channels. We are active presenters at CERF and other professional conferences, Elkhorn Slough research symposia, the NERRS annual meeting, and numerous local presentations. We mentor and collaborate with faculty and students at local universities, encouraging them to include Elkhorn sites and use ESNERR resources in their studies. We are active participants in the Elkhorn Slough Tidal Wetland Project (TWP and Science Panel), the NERRS Habitat Mapping and Change Workgroup (Technical Committee), the Rush Ranch Science and Technical Advisory Team (Solano Land Trust / SFBNERR), and variety of other committees and working groups.

The ESNERR geospatial program produces maps and geospatial data for ESNERR researchers, and offers technical support (GIS, GPS, survey equipment, etc.) to ESNERR researchers and affiliated scientists and academics.

EDUCATION, INTERPRETATION, AND OUTREACH

Our team of dedicated and creative staff and volunteers continue to improve the accessibility of the resources of the Elkhorn Slough National Estuarine Research Reserve to educators, students, and the general public. Paid positions working directly on Education, Interpretation, and Outreach are the Education Coordinator, Education Assistant, Volunteer (and Events) Coordinator, Visitor Center Coordinator, and two Visitor Center Naturalists.

Our 1700-acre outdoor classroom offers 5 miles of hiking trails through a variety of habitats including oak woodlands, grasslands, riparian corridors, fresh water ponds, salt marsh and mudflats. With over 90% of California's wetlands lost, the Elkhorn Slough Reserve offers a rare and important opportunity to witness the creatures that live in and around this seasonal estuary that empties into the waters of the Monterey Bay National Marine Sanctuary, and to teach the value of preserving wetlands and protecting watersheds. This program addresses ESNERR Conservation Goal #8 as described in the 2007-2011 Management Plan: "Educate the community about watersheds and inspire them to consider environmental conservation when making decisions affecting Elkhorn Slough and its watershed." This section looks at those aspects of our program that work in the "time frame that includes teacher professional development, curriculum development and field experiences for K-12 students."

TEACHER PROFESSIONAL DEVELOPMENT

Teachers are required to complete a 2-day training course before they can bring their students to the Elkhorn Slough Reserve. Teachers learn about the natural history, flora, fauna, and research of Elkhorn Slough through these rigorous, standards based environmental education workshops that are officially certified by California State University Monterey Bay (CSUMB). Teachers receive Continuing Education Units for their training and are provided with the information and tools needed to integrate environmental science and conservation into their classroom curriculums and to prepare their students for informative and enjoyable field experiences at the Reserve.

- **ESNERR Teacher Trainings:** We have trained over **200 teachers** over the past 5 years. In 2007 and 2008 in addition to our own materials we offered Project WILD and Project WILD Aquatic curriculum through collaboration with the California statewide coordinator for Project WILD. We look forward to making these workshops part of the national Teachers on the Estuary (TOTE) program and adding in Estuaries 101 curricular activities
- **Partnerships:** We also collaborated with the following organizations on teacher trainings that reached an additional **500 professional educators:** the Monterey Bay National Marine Sanctuary's MERITO program, (Multicultural Education on Resource Issues Threatening the Oceans); Moss Landing Marine Laboratory's "Lab and Field

Explorations in Marine Sciences”; California Institute for Biodiversity 8 day workshop spread over three weekends in September and October, 2006 entitled: “Coast Alive! Monterey; Land-Sea Interface”; 2008 Science and Math Academy for Rural Teachers (SMART), a program with the San Benito County Schools; and the Monterey Bay Aquarium Wetland Institute.

K-12 FIELD PROGRAMS

For the field experience at the Elkhorn Slough Reserve the students engage in a variety of hands-on, inquiry-based activities that are based on projects that the Reserve research and stewardship teams are engaged in. This includes water quality monitoring, plankton sampling, shorebird surveys, nesting Heron and Egret observations, and restoration of upland habitats.

- Over **30,000 students** from **1200 classrooms** have benefited from these field experiences during this time period.
- In support of our field programs a new education and research facility was completed in 2007 providing the infrastructure for new programs and collaborations. The teaching laboratory includes 24 microscope stations and digital video technology that enhances the opportunity for students to explore the minute yet significant aspects of both the aquatic and terrestrial habitats of the slough. We continue to improve presentations and upgrade digital microscopy equipment to facilitate explorations of plankton samples and terrestrial plants.
- We have worked closely with the Earth Systems Science and Policy and WeTEC (Wireless Education and Technology Center) programs at CSUMB to develop our capacity to do virtual field trips over the web and to broadcast live images from remote web cameras. Through this technology we can help teachers integrate the Elkhorn Slough environmental curriculum in their classrooms throughout the school year, so that the students can follow the seasonal changes and ongoing research/monitoring efforts at the Reserve before and after their actual field trip to the site.
- Through the MERITO program we have helped the Monterey Bay National Marine Sanctuary develop a standards based bilingual regional watershed curriculum that is now available for afterschool teachers/programs in Watsonville and Salinas: “Del Cielo al Mar; From the Sky to the Sea”. In this program students witness research and monitoring projects at the Elkhorn Slough Reserve such as the tag and release of leopard and smoothhound sharks where they learn the importance of basic research for fisheries management; monitor for marine invasive species; help our restoration team with seed collection, propagation and planting of native plants. They also visit other neighboring wetland systems, local beach and dune restoration sites, municipal waste water treatment plants, local water supply facilities, and a municipal recycling center. They learn about the responsibilities of taking care of the watershed to protect both terrestrial and marine wildlife, and the role of science in maintaining the health of our estuaries and oceans.
- We continue to work closely with the Pajaro Middle School Watershed Academy, an afterschool program reaching predominantly Latino youth. This was the original program that inspired the efforts to create the bilingual watershed curriculum for afterschool programs that is now included in the MERITO program.
- In 2007 a consultant was hired to complete a market analysis/survey of organizations in our area that provide environmental education opportunities and resources for K-12

teachers. This resulted in the “Environmental Education Resources Directory” that was published and distributed to providers and posted on the Reserve website. This will need to be updated and followed by a needs assessment as we proceed to participate in KEEP.

ADDITIONAL YOUTH PROGRAMS AND COLLABORATIONS

We are part of a growing network of opportunities where young people can gain experience in the environmental sciences and meet people with careers in this discipline, starting in elementary school and continuing into college. We look forward to the day when we will be able to hire graduates of these programs.

- Camp SEA Lab Monterey Bay summer youth programs, (Science Education and Adventure), a program offering field experiences for youth to inspire conservation of marine resources. This has recently expanded to offer year round activities.
- Ventana Wildlife Society’s summer day camp program.
- The RISE program (Recruitment In Science Education) sponsored by CSUMB to encourage minority youth to seek careers in science and pursue college educations.
- COSMOS, a high school science program sponsored by the University of California at Santa Cruz.
- Upward Bound, a science education program for inner city youth sponsored by Monterey Peninsula College.
- The Monterey Bay Aquarium’s Young Women In Science and Teen Conservation programs.
- Watsonville Public Works Department “Creeks to Sea” program.

COLLEGES AND UNIVERSITIES

- We have worked closely with **167 instructors** from local colleges and universities, giving special tours and presentations to **3500 college students** as part of courses on marine sciences, coastal ecology, wetland habitats, environmental education, interpretive exhibit design, and resource management. Many of these students become involved in research, monitoring, restoration and education projects at the Reserve to fulfill their academic requirements.

VISITOR CENTER, TRAILS, AND PUBLIC EDUCATION

In addition to supporting the many programs mentioned above, the visitor center is open to the public Wednesday – Sunday, 9:00am to 5:00pm. It offers a highly visible presence in the community for the NERRS and our partners, the California Department of Fish and Game, NOAA and the Elkhorn Slough Foundation.

- The award winning interpretive exhibits in the visitor center continue to engage visitors with unique perspectives on the more difficult to see and often rather peculiar creatures of the Slough, from an underwater view of a diving Pelican to a close-up of a polychaete larva in the plankton. (First place in Interior Exhibit Category of the National Association for Interpretation 1998 Media Award Competitions.)

- A new interactive computer exhibit on water quality monitoring offers a glimpse into the world of research and provides in depth information on the science behind the Monterey Bay Aquarium Research Institute's LOBO (Land/Ocean Biogeochemical Observatories) program and the NERRS System Wide Monitoring Program. A draft version has been tested, and will be updated and revised.
- In addition to welcoming drop-in visitors we offer docent led tours at 10:00am and 1:00pm on Saturdays and Sundays. Staff and volunteers also lead special tours upon request for seniors, scout groups, environmental organizations, etc. We provided **1160 tours** of the Reserve to **9,000 people** who participated in regularly-scheduled weekend hikes or who arranged specially-scheduled guided tours led by staff and/or docents. We had a total Reserve visitation of over **200,000 people** during this time period.
- The Visitor Center is the hub of activity for several special public events held each year at the Reserve.

SPECIAL EVENTS ON-SITE

- We reached a large and diverse audience through our annual Mother's Day event, (over 300 attendees) providing opportunities to participate in watershed habitat restoration; learn about the habitats and species of Elkhorn Slough and the importance of the Slough as nursery ground for many species of fish; and explore the microscopic world of plankton, the basis of life in our estuaries and oceans.
- ESNERR Stewardship and Education staff used our new teaching laboratory to present several seminars on plankton and plant ecology for ESNERR staff and volunteers and Elkhorn Slough Foundation members. These seminars offered the adult participants the opportunity to feel the same excitement our K-12 students experience as they use the microscopes and digital video technology to explore the world of plankton and the fine structure of plants.
- Hosted 200 attendees of the 2008 annual national meeting of the National Estuarine Research Reserve system. The education team worked with other Reserve staff on miscellaneous logistical support for this week long meeting, including one day of tours and workshops featuring the Reserve programs.
- In collaboration with the Monterey Bay Aquarium we hosted 60 participants of the National Marine Educators Association annual meeting that was held in May, 2009 in Monterey to an informative field day at the Reserve, highlighting our visitor center exhibits, teaching lab, field activities and partnerships.

SPECIAL EVENTS OFF-SITE

- **Coastal Cleanup events** – ESNERR partners with the Elkhorn Slough Foundation (ESF), Monterey County, and the Coastal Commission to conduct two community debris cleanups within the Reserve and along the boundaries. There is a long tradition in our local neighborhood of joining together for these mass efforts. On average 60 neighbors join ESNERR and ESF staff each event and donate at least 4 hours. From 2005 – 2010 over 2400 hours were donated and thousands of tons of trash have been picked up and thus prevented from entering into the slough.

- Participated in the annual Monterey Bay Bird Festival sponsored by Watsonville City, Watsonville Wetlands Watch and the Ventana Wildlife Society, hosting special guided tours on the Reserve. The Festival typically had over 500 participants who visited the Reserve and other venues over a three day period.
- Participated in weekend events at the Monterey Bay Aquarium where we were able to have an interactive display and inform visitors about our site and educational opportunities. One event entitled “Feathered Friends” features organizations in the Monterey Bay area that offer a variety of environmental education programs and field experiences for the public. Typically there were approximately **5,000 visitors** over the two days of this event. Another event is advertised as “Community Day”, a free day for local county residents and again, an opportunity to highlight our programs. Of the over **8,000 attendees** for this event more than 50% were Hispanic. Due to our involvement in these events we have an open invitation to join other Aquarium topic focused days such as Shark Days and Otter Days. Elkhorn Slough supports populations of both sharks and rays, and otters. Being present in a large venue such as the MBA enables us to invite a larger audience to visit ESNERR; and for us to share knowledge about estuarine systems and the value of wetlands. Our goal for the future is to continue this relationship and participate as often as we can.
- In partnership with the Elkhorn Slough Foundation, ESNERR has had a presence at several REI/Marina Store hosted conservation events. Two of note are: the 2009 National Park/National Geographic movie showing and the 2010 NOAA snap shot day. We now have an active partnership with REI that has resulted in additional support of our programs.
- In the local community Earth Day activities have been combined with “Día de los Niños”, an important holiday celebrated in the Latino community. Annually over **3,000 people** enjoy the festive activities and informational booths set up at Ramsay Park in Watsonville by a mix of local youth organizations and conservation groups including the Elkhorn Slough Reserve, the MBNMS, Save Our Shores, and Watsonville Wetlands Watch.
- Participated in the 2009 California State Parks Earth Day festival with approximately 2,000 participants.

EXTERNALLY FUNDED PROJECTS

- The virtual field trip project was funded by grants received by Henrik Kibak, a professor with Earth Systems Science and Policy, and Arlene Krebs, director of WeTEC (Wireless Education and Technology Center), programs at California State University Monterey Bay.
- The remote web camera project was funded through a Charles A. and Anne Morrow Lindbergh Foundation grant received by Steve Moore a professor with Earth Systems Science and Policy and director of the Ecosystem Electronics Laboratory at California State University Monterey Bay.
- The week long teacher workshops “Lab and Field Explorations in Marine Sciences” were funded through a B-WET (Bay Watershed Education and Training) grant received by Simona Bartl, a professor at Moss Landing Marine Laboratory.

- The MERITO program has been supported by B-WET grants received by the Monterey Bay National Marine Sanctuary.
- The interactive computer modules on water quality monitoring designed for the visitor center, teaching laboratory, and the web, were funded by a sub-award to the Elkhorn Slough Foundation from a NSF grant received by Ken Johnson, researcher at the Monterey Bay Aquarium Research Institute.

CONTRIBUTIONS TO NERR INITIATIVES AND ACTIVITIES

During this period, the Education Coordinator or the Education Assistant attended the winter sector and fall NERR/NERRA meetings, and presented at selected sessions at these meetings. The EC played a significant role in the early development of KEEP and has served on the KEEP and Estuary Live subcommittees. The EC has produced semi-annual performance reports on the accomplishments of the education team including performance measures, and updated content for the Education Sector pages on the NERRS website.

CONTRIBUTIONS TO STATE INITIATIVES AND ACTIVITIES

The Elkhorn Slough Reserve Education Coordinator is a member of the DFG Aquatic Education team and serves on the committee that develops and updates the 5-year plan for this statewide program. The EC oversees the federal Sport Fish Restoration Act grant funds received by ESNERR, and is responsible for annual grant reports. This grant funds the education coordinator position, the only maintenance position for the Reserve, two seasonal aids, and provides a small operations budget. The EC was a member of the committee that drafted the Natural Resource Education Messages presented to upper management in DFG in 2007; and presented on our successful bilingual outreach program, (MERITO), at both the annual meetings of the National Association of Recreational Resource Planners (May 1-3, 2005) and the California Roundtable on Recreation, Parks, and Tourism (May 25-26, 2005).

COASTAL TRAINING PROGRAM

The ESNERR Coastal Training Program (CTP) builds on the experience and research of the NERRS' community. Positions directly responsible for implementing this program are the CTP Coordinator and the CTP Assistant. The CTP strives to improve decision-making related to coastal resource management at local and regional levels by:

- *providing the best available science-based information, tools, and techniques to those individuals and groups that are making important decisions regarding resources within coastal watersheds, estuaries, and nearshore waters;*
- increasing networking and collaboration across sectors and disciplines related to coastal management issues in local and bio-geographic areas; and
- increasing understanding of the environmental, social and economic consequences of human activity within the coastal landscape.

WORKSHOPS AND TRAININGS

From 2005-2010, the Elkhorn Slough Coastal Training Program (ESCTP) held many successful events key to achieving the ESNERR mission. During this reporting period, ESCTP events totaled 49 workshops and field training sessions: approximately one event was held every 37 days. Events were designed to reflect audience needs as formally assessed using audience need assessments; subject areas were narrowed to conform with the priorities identified by the Reserve Management Plan and further refined through logic models. Training programs were evaluated using guidelines developed and implemented nationally for all CTP's. Participants reported a high degree of satisfaction with the events, the vast majority of events filled to capacity within a short period after advertising, and the ground changes that help achieve the ESNERR mission.

As proscribed by the ESNERR Management Plan and audience needs assessments, Elkhorn Slough Coastal Training Program events mostly fall into either ecosystem or species-specific educational foci. Prioritized conservation targets for the ESNERR Management Plan receive the bulk of the training program attention, including: estuarine, maritime chaparral, coastal prairie, and freshwater and riparian systems. Sensitive species occurring within each of these ecosystems receive regulatory attention and conservation funding, generating high level of audience interest and ongoing educational need. And so, the ESCTP has designed and implemented sensitive species workshops focusing on freshwater species (California tiger salamander, Santa Cruz long toed salamander, California red-legged frog, and western pond turtle) as well as coastal prairie species (Santa Cruz tarplant, Ohlone tiger beetle).

Because of an ongoing issue with job retention where those in environmental fields typically remain in their jobs less than 5 years, the ESCTP has repeated basic training in each area regularly. But, the ESCTP also has built on basic training by featuring more advanced training for the audience members remaining longer term in the region. In such a way, the ESCTP has sought to build a more knowledgeable and skilled community which is necessary for the long term work in protecting and recovering ecosystems and species.

The following table is a list of ESCTP events for this reporting period.

Coastal Training Program Educational Events 2005-2010

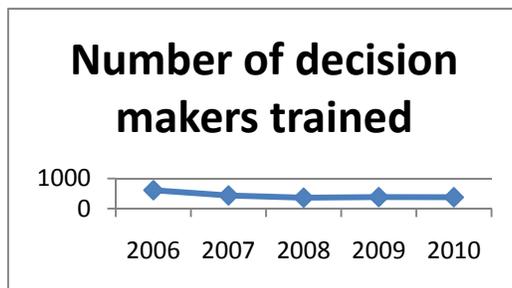
2005		
Title	Participants	Hours
Maritime Chaparral Management at Ft. Ord	24	8
Mitigation-Related Management of California's Maritime Chaparral	66	8
Yadon's Piperia Recovery Workshop	34	8
Fort Ord Maritime Chaparral Field Trip	16	4
Coyote Ridge Serpentine Field Trip	26	5
Control of Blue Gum Eucalyptus in Coastal California	78	8

Introduction to Ecology and Regulation of Tidal Wetlands in Central California and the San Francisco Bay	68	9.5
Defining the Science of Monitoring Grasslands for Management Goals: Scientific Advisory Panel	16	4
Defining the Science of Monitoring Grasslands for Management Goals	50	8.5
Riparian Restoration on California's Coast	93	9.5
Riparian Restoration on California's Coast: Repeat Workshop	90	9.5
2006		
Title		
	Participants	Hours
Adaptive Restoration of the West Coast's Tidal Wetlands Pre-Workshop Field Trip	75	1
Adaptive Restoration of the West Coast's Tidal Wetlands	183	8.5
Coyote Ridge Serpentine Field Trip	21	5
Managing Visitor Use for Snowy Plover Recovery on the Monterey Bay	16	4
Tidal Wetland Restoration Field Trip: Muzzi Marsh with Phyllis Faber	29	5
Sierra Azul Wildlife Connectivity	22	8
Identifying Conservation and Research Priorities for Coastal Prairie in Sonoma and Marin Counties	57	8.5
Ohlone Tiger Beetle Recovery Workshop	13	4
Martin Luther King Shoreline Tidal Wetland Restoration Field Trip	26	5
2007		
Title		
	Participants	Hours
Sierra Azul Wildlife Connectivity Decision Makers Workshop	46	6
California Red-Legged Frog Workshop	34	18
Repeat California Red-Legged Frog Workshop	33	18
California Tiger Salamander Workshop	34	13
Coyote Ridge Serpentine: Nitrogen effects on air, water, and butterfly habitat quality	16	5
Monitoring grasslands for native perennial grasses	24	5
Monitoring grasslands for native perennial grasses (repeat)	23	5
Defining and Delineating Maritime Chaparral on California's Central Coast	43	16
Wildlife Migration Data Requirements for Transportation	37	4

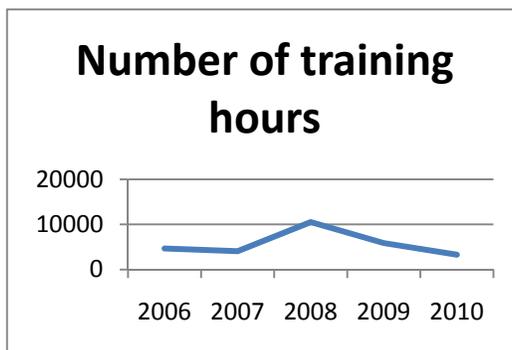
Corridor Impacts Analysis and Mitigation		
Monitoring grasslands for native perennial grasses	18	6
Orienting Monterey County Planners to the North County	12	3
Corridor Designer Workshop with Paul Beier	36	8.5
2008		
Title	Participants	Hours
Climate Camp	165	40.5
Jurisdictional Delineation of Waters of the U.S., Including Wetlands On the California Coast: Legal and Ecological Protocols For Diverse and Changing Landscapes	50	44
California Red-Legged Frog Workshop	34	18
2008 California Tiger Salamander Workshop	34	14.5
2008 Santa Cruz Sunflower Manager's Field Day	14	6
Western Pond Turtle	39	8
How and Why to Manage and Monitor for Residual Dry Matter	36	8
Jurisdictional Delineation of Waters of the U.S., Including Wetlands On the California Coast: Legal and Ecological Protocols For Diverse and Changing Landscapes	49	46.5
2009		
Title	Participants	Hours
CalFire's Vegetation Management Program - A Field Based Training	27	9
California Red-Legged Frog Workshop 2009	37	18
California Tiger Salamander Workshop 2009	34	14.5
Santa Cruz Long-Toed Salamander Workshop	31	14.5
Western Pond Turtle Workshop 2009	37	8
Ecology and Conservation of California's Coastal Prairie	94	9
Rangeland Stewardship - Grassland Conservation: Central Coast Rangeland Coalition Fall 2009 Meeting	50	9
Project Design and Evaluation	29	16
2010		
Title	Participants	Hours
Ohlone Tiger Beetle Recovery Workshop 2010	21	4
California Tiger Salamander Workshop 2010	32	18
California Red-Legged Frog Workshop 2010	12	14.5

Central Coast Rangeland Coalition Spring 2010 Meeting	80	6
Santa Cruz Long-Toed Salamander Workshop 2010	16	14.5
Western Pond Turtle Workshop 2010	26	8
California Tiger Salamander Workshop: Upland Habitat Focus	24	16

As evidenced by the following graph, the ESCTP has educated approximately 400 decision makers a year. Note that the first year represents 2005-2006 statistics, as will be the case in the following graphs, as well.

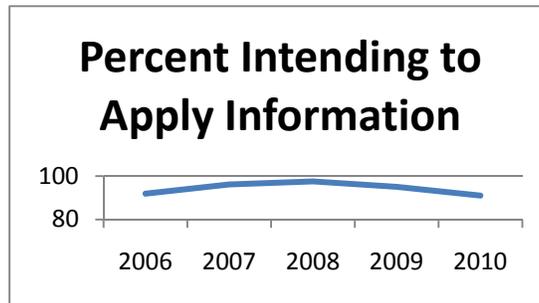


Yearly training hours offered by the ESCTP has varied, with a particularly large year in 2008 coinciding with larger, multiple day workshops.

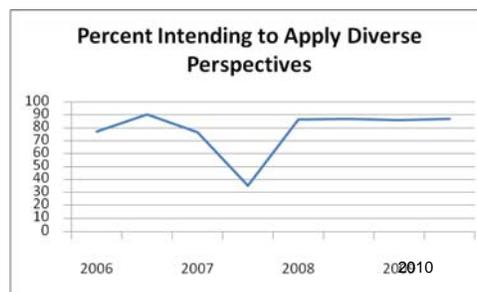


Two core performance measures are tracked by all CTP Coordinators: 1) intent of participants to apply the information they learn at the workshop and 2) intent to apply diverse perspectives that participants hear at the workshops.

The ESCTP maintains a very high percentage (>90%) of participants that report an intent to apply the information that they learn at educational events.



There has been more variability in participant responses with regard to their intent to apply diverse perspectives that participants hear at the workshops.



OTHER DECISION MAKER CONTACTS

In addition to workshops and field training events, the ESCTP works to train decision makers through publications and collaborative learning networks. Publications offer decision makers easy access to relevant information. Collaborative learning networks focus on long term community building across multiple disciplines focusing on the most complex environmental problems facing the Elkhorn watershed.

Between 2005-2010, the ESCTP published 4 print and 25 web endangered species fact sheets and posted an extensive array of web publications from peer reviewed papers, to white papers, gray literature, and workshop materials to its website. The ESCTP website is a very popular source of information, often appearing in the top 5 Google search engine choices in subjects prioritized by training subjects offered through the Reserve. While the traffic on the website has been increasing, most recent statistics indicate average daily use was 2,098 hits, with 5,844 average unique visitors per month. Website visitors most frequently downloaded peer-reviewed publications, maps of sensitive plant communities produced by our Reserve research staff, distribution maps of rare amphibians (workshop materials) and regulatory guide books from federal and state agencies, often also distributed at CTP events.

During the reporting period, the ESCTP has also been active in establishing and assisting with 2 collaborative learning networks: for grasslands, the Central Coast Rangeland Coalition and for maritime chaparral, the Central Coast Fire Learning Network. In each case, the ESCTP has assisted many partners (discussed below) in iterative learning exercises focused on subjects of

interest amongst diverse stakeholders. For grasslands, the Central Coast Rangeland Coalition has been focusing on establishing a science-based approach to monitoring and adjusting livestock management to create cleaner water, while maintaining biological diversity and ecosystem resilience. For maritime chaparral, the Central Coast Fire Learning Network has been focusing on protecting and restoring maritime chaparral, a fire-dependent ecosystem, while protecting human lives and property. Each group has met frequently and the ESCTP has helped the groups to be informed by science and leading practitioners.

NEEDS ASSESSMENTS AND PLANNING

The ESCTP credits successful educational programs with careful program design involving audience needs assessments, advice from ESCTP Steering Committee, and integration with the ESNERR Management Plan. These planning elements are carefully considered when formulating the ESCTP Strategic Plan, which was updated in 2005 and is due to be updated again in late 2010. In 2005, the ESCTP completed an audience needs assessment of its ecological consultant audience, which is key to assessing environmental impacts and implementing restoration and recovery efforts for sensitive species and ecosystems in the Elkhorn watershed. In 2010, the ESCTP in partnership with the San Francisco Bay NERR completed another needs assessment of lands managers. The analyses from these and one prior needs assessment (coastal planners and regulators) have been important to the success of ESCTP educational programs, and advice from the ESCTP Steering Committee has also been important. The ESCTP has recently added a building developer and a biological consultant to the Steering Committee, while maintaining membership by high-level regulatory and planning professionals as well as environmental education program coordinators from partner agencies. Whether surveying audience needs or asking for advice from the ESCTP Steering Committee, CTP staff has consistently used ESNERR conservation priorities, as reflected in the Reserve's Management Plan, as the anchor and filter with which to choose priorities.

PARTERSHIPS AND COLLABORATIONS

The ESCTP partners and collaborates with a variety of local, state, and regional entities. The bulk of partnership efforts have been through the two collaborative learning networks previously mentioned. The Central Coast Rangeland Coalition includes: the Regional Water Quality Control Board, the California Department of Fish and Game nonprofit conservation groups such as The Nature Conservancy and other local land trusts, ranchers, scientists, University faculty, and private landowners. The Central Coast Fire Learning Network likewise includes diverse partners including homeowners associations, CalFire, US Fish and Wildlife Service, The Nature Conservancy, county governments, and individual landowners.

A special area of emphasis for collaboration has been the ESCTP work with the Coastal Training Program at the San Francisco Bay National Estuarine Research Reserve. During the reporting period, the SFBNERR has hired a CTP Coordinator and embarked on a Reserve Management Planning effort. In both cases, the ESCTP Coordinator has assisted with that Reserve's efforts from serving on the interview committee for the SFBNERR CTP Coordinator to advising and facilitating some SFBNERR Management Plan partner meetings.

EXTERNALLY FUNDED PROJECTS

During the reporting period, the ESCTP has begun work on grants totaling \$116,000 to be awarded over 3 years. Work on these grants focuses on two ESNERR Management Plan priority areas: tidal and freshwater wetlands. Outcomes of these grants include improved water quality to the Elkhorn Slough through work in the Carneros Creek and improved adaptation to sea level rise in the low lying areas around the Slough.

To assist with improving water quality in the Elkhorn Slough, the ESCTP initiated a grant application to the US Environmental Protection Agency's West Coast Estuaries Program in partnership with the Agricultural Land Based Training Association (ALBA). In total, this grant is nearly 1 million dollars and funds extensive restoration work in one of the major remaining freshwater channels feeding the Slough.

To assist with climate adaptation, the ESCTP is working collaboratively with researchers at the Reserve to explore a variety of scenarios facing diverse stakeholders in the Slough region as sea level rises. Farmers, public works officials, and conservation groups are exploring how sea level rise will affect their interests and how they might collaboratively seek solutions to minimize economic impacts while maximizing ecological outcomes.

CONTRIBUTIONS TO NERR INITIATIVES AND ACTIVITIES

The ESCTP Coordinator has been extensively involved with system-wide NERRS operations during the reporting period. The Coordinator has served on the CTP oversight committee and the NERRS Strategic Committee, most annual meeting and sector planning committees, and CTP workgroups including Performance Measures Workgroup, the External Funding Workgroup (Chair), the CTP Mentor Workgroup, the CTP-SWMP Integration Workgroup (Co-Chair), and the CTP Governance Committee (Chair). These commitments have been substantial and have involved, in addition to sector and national meetings, one additional work-travel occasion per year, monthly or greater conference calls, and substantial meeting organization and presentation. In addition, the ESCTP coordinator was one of the ESNERR core staff organizing the NERRS annual meeting in 2008 in Monterey.

VOLUNTEER PROGRAM

ESNERR has the privilege to work with a variety of skilled volunteers who generously donate their time to further the Reserve's mission and goals. They are enthusiastic community members eager to share their passion for Elkhorn Slough with others. Led by a full-time Volunteer Coordinator, the ESNERR Volunteer Program provides a backbone of support for ESNERR.

VOLUNTEER SERVICE TO ESNERR PROGRAMS

All Reserve program areas are supported by volunteers. The Volunteer Coordinator regularly interacts with both staff and volunteers to help match needs and interests. Volunteers support the

Reserve in a variety of ways such as assisting with research and monitoring projects, leading public tours, teaching students in the education lab, propagating native plants in the greenhouse, controlling invasive species, greeting the public in the visitor center, and maintaining trails.

Over 100 volunteers, of whom 80 contribute 50 hours or more each year, actively engage in all the Reserve program areas. Between 5000 and 7000 hours are donated each year. With an estimated rate of \$22.00 per hour, ESNERR volunteer time is valued at between \$110,000 and \$154,000 each year.

VOLUNTER MANAGEMENT: RECRUITMENT, TRAINING, AND RECOGNITION

Volunteer recruitment is conducted through the website, www.elkhornslough.org, partnerships with other agencies such as California State Parks, corporate partners such as REI and McGraw Hill, local networking, Reserve visitation and tours, and print and radio media.

The ESNERR Volunteer Training class is a 9-week program covering watershed natural and cultural history, interpretation skills, partnerships, and various volunteer logistics with a thoughtful series of lectures and field experiences. In addition to this class, the Volunteer Coordinator and Reserve staff provide ongoing training for specific projects through one-on-one interactions and a variety of continuing education enrichments. For example, in 2009 there were 19 volunteer enrichments on conservation topics and Reserve programs. An additional 45 community-partnered enrichments on relevant local subjects were offered as well.

For a period of time during this reporting cycle, the Volunteer Coordinator position was either vacant or in transition and as a result, training of new volunteers was postponed. Nonetheless, during this period 31 new people attended and graduated from the formal Volunteer Training Class. An additional 30 people joined the ESNERR team as temporary or seasonal volunteers.

Volunteers are recognized informally throughout the year and formally in an annual celebration ceremony. The annual volunteer appreciation event averages 200 volunteers and their families, and includes dinner, special awards for hours contributed, a thank you gift, skits and songs.

Staff and volunteers contribute to a monthly volunteer newsletter, *The Slough News*. The newsletter has recurring sections such as “Science in Action”, “Did you Know?”, “Recent sightings”, and “Upcoming Activities”. The newsletter is now in electronic format.

PARTNERSHIPS AND COLLABORATIONS

The Elkhorn Slough Foundation is a key partner for the ESNERR volunteer program. Additionally, the Volunteer Coordinator was a founding member of administrative volunteer management group Monterey Area Volunteer Resource Administrators Consortium (MAVRAC). This group has been instrumental in skill building for volunteer administrators and in providing educational opportunities for volunteers.

The Elkhorn Slough Reserve Advisory Committee (RAC) membership includes a volunteer representative.

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