2019 Program Evaluation: SMBNEP Work Plan Narrative Report

March 2019

Prepared by the Santa Monica Bay National Estuary Program for submittal to the US Environmental Protection Agency

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Frequently Used Acronyms

Army Corps	Army Corps of Engineers
ASBS	Areas of Special Biological Significance
BEP	Boater Education Program
BRP	Santa Monica Bay Restoration Plan
BWER	Ballona Wetlands Ecological Reserve
CalTrans	California Department of Transportation
CCMP	Comprehensive Conservation and Management Plan (formerly BRP)
CCVA	Climate Change Vulnerability Assessment
CDBW	California Department of Boating and Waterways
CDFW	California Department of Fish and Wildlife
CDPH	California Department of Public Health
CDWR	California Department of Water Resources
CMP	Santa Monica Bay Comprehensive Monitoring Program
CNRA	California Natural Resources Agency
CoSMoS	Coastal Storm Modelling System
CRAM	California Rapid Assessment Method
CRI	Loyola Marymount University's Coastal Research Institute
CVA	Clean Vessel Act
DDT	Dichlorodiphenyltrichloroethane
EWMP	Enhanced Watershed Management Plans
FMP	Fishery Management Plan
FOLD	Friends of the LAX Dunes
GB	Santa Monica Bay Restoration Commission Governing Board
GHG	Greenhouse Gases
GPRA	Government Performance and Results Act
HABs	Harmful Algal Blooms
HHW	Household Hazardous Waste
JWPCP	Joint Water Pollution Control Plant (Carson)
LACDBH	Los Angeles County Department of Beaches and Harbors
LACDPH	Los Angeles County Department of Public Health
LACDPW	Los Angeles County Department of Public Works
LACFCD	Los Angeles County Flood Control District
LACSD	Sanitation Districts of Los Angeles County
LADWP	Los Angeles Department of Water and Power
LARC	Los Angeles Regional Collaborative for Climate Action
LARWQCB	Los Angeles Regional Water Quality Control Board
LASAN	City of Los Angeles Sanitation
LCP	Local Coastal Plan
LVMWD	Las Virgenes Municipal Water District
MDRA	Marina Del Rey Anglers
MPA	Marine Protected Area
MRCA	Mountains Recreation and Conservation Authority

MWD	Metropolitan Water District of Southern California
NEP	National Estuary Program
NMFS	National Oceanic and Atmospheric Administration's National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	National Parks Service
NRC	Natural Resource Council
NZMS	New Zealand Mudsnails
OA	Ocean Acidification
OPC	Ocean Protection Council
OREHP	Ocean Resource Enhancement Hatchery Program
OWDS	On-site Wastewater Disposal Systems
PCB	Polychlorinated biphenyls
POTW	Public Owned Treatment Works
Prop.	Proposition Grant
PVPLC	Palos Verdes Peninsula Land Conservancy
RCDSMM	Resource Conservation District of the Santa Monica Mountains
SCC	California State Coastal Conservancy
SCCOOS	Southern California Ocean Observing Systems
SCCWRP	Southern California Coastal Water Research Project
SCMI	Southern California Marine Institute
SFEP	San Francisco Estuary Partnership
SLC	State Lands Commission
SLR	Sea Level Rise
SMBNEP	Santa Monica Bay National Estuary Program
SMBRA	Santa Monica Bay Restoration Authority
SMBRC	Santa Monica Bay Restoration Commission
SMMC	Santa Monica Mountains Conservancy
State Parks	California Department of Parks and Recreation
SWRCB	State Water Resources Control Board
TAC	Santa Monica Bay Restoration Commission Technical Advisory Committee
TBF	The Bay Foundation (also known as the Santa Monica Bay Restoration Foundation)
TMDL	Total Maximum Daily Load
UCD	University of California, Davis
UCLA	University of California, Los Angeles
UCSB	University of California, Santa Barbara
USC	University of Southern California
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WAC	Santa Monica Bay Restoration Commission Watershed Advisory Council
WBMWD	West Basin Municipal Water District
WMP	Watershed Management Plans

Introduction

Section 320 of the federal Clean Water Act (CWA) establishes the National Estuary Program (NEP), which is administered by the United States Environmental Protection Agency (USEPA). USEPA identified the Santa Monica Bay as a national estuary, with the concurrence of the State that identified actions and priorities to restore the Santa Monica Bay. The Santa Monica Bay National Estuary Program (SMBNEP) is a locally driven program supported by a private-public partnership. This partnership was implemented by three entities during this review period: Santa Monica Bay Restoration Commission (SMBRC), Santa Monica Bay Restoration Authority (SMBRA), and The Bay Foundation (TBF). The three entities work together to implement the Comprehensive Conservation and Management Plan (CCMP) for SMBNEP along with their many partners. The original CCMP, or Bay Restoration Plan (BRP), of 1995 was updated in 2008 and again in 2013. SMBNEP is currently undergoing a major CCMP revision, completing a revised Action Plan in October 2018. This Program Evaluation is primarily based on an evaluation of the implementation of the 2013 BRP but may also contain references to the 2018 CCMP Action Plan.

SMBNEP would like to thank all their partners who have made significant progress over the last five years in implementing the 2013 BRP and developing the 2018 CCMP Action Plan. SMBNEP attempted to capture the highlights of these efforts summarized in the Program Evaluation (PE) documents, including this report and the PE Performance Measures Worksheet document. Additional details can be found in the more than 1,500 individual supporting Attachments (key deliverables), which are a synthesis of the final products during this PE review period (1 July 2013 – 30 June 2018). Without the support of our many partners, collaborators, and members of the public, these efforts would not be possible. Special thanks are due to SMBNEP's Management Conference, including SMBRC's Governing Board, Executive Committee, Watershed Advisory Council, Technical Advisory Committee, and interested members of the public and community stakeholders. Thank you for making this progress possible.

Structure of Program Evaluation (PE) Review Materials

There are three primary documents drafted specifically for this PE review, including this report and two other documents. Within the "2019 SMBNEP Performance Measure Worksheets" document, SMBNEP assessed its performance during the review period against the standardized measures outlined in the EPA template. Both this report, "2019 SMBNEP Work Plan Narrative Report", and the Performance Measures Worksheet are supported by a suite of additional documentation and key deliverables (i.e., "Attachments"). Supporting documentation includes over 1,500 key deliverable Attachments organized into 42 subfolders at the individual program or project level (e.g., Boater Education Program). Examples of Attachments include final reports, outreach materials, videos, selected presentations, scientific journal articles and other files. The database document containing the list of deliverables, with clickable cross-referenced hyperlinks, is called "2019 SMBNEP Attachments (Deliverables 2013-2018)". Lastly, this report and the Performance Measure Worksheets also contain clickable cross-referenced hyperlinks to key Attachments, which open in an online dropbox folder and require internet access to display correctly. They are also available for download primarily as pdfs.

This report includes three subsequent introductory subsections (i.e., NEPORT summary information, CWA support information, and responses to 2014 PE challenges), followed by the bulk of the Work Plan

Narrative Report, which contains a detailed evaluation at the goal-level (N = 14) of the implementation of the 2013 BRP within this reporting period. The evaluation is an application of the EPA PE logic model.

NEPORT Summary Information

NEPORT contains two primary categories of reporting and evaluation, "habitat" and "leveraging". Each are summarized individually below for the PE review period.

Habitat

During this review period, SMBNEP implemented numerous land acquisition and habitat restoration projects. Habitat restorations included subtidal rocky reefs (kelp forests), wetlands, dunes, beaches, riparian corridors, fish barrier removals, and non-native invasive weed maintenance. Table 1 summarizes the 5-year acreage totals by activity type. During this period, ***SMBNEP acquired 1,722 acres into the public domain for the purposes of restoration or protection and restored an additional 149 acres.*** Of the restored areas, approximately 13 acres were fish barrier removals, and 69 acres were invasive non-native removal, with additional smaller categories. Evaluated a separate way, restoration activities in the form of rehabilitation encompassed 77.5 acres, with 50.3 acres classified as re-establishment.

Table 1. Summary of 5-year total acreages by activity type.

Activity Type	Acres
Enhancement	14.62
Establishment	3.00
Maintenance	3.75
Protection	1721.79
Reestablishment	50.30
Rehabilitation	77.50
TOTAL	**1870.96**

Leveraging

EPA CWA funds require a minimum 1:1 non-federal match. SMBNEP vastly exceeded that minimum during all five PE review years. Including the federal grants competitively awarded to TBF, but excluding EPA 320 funds, ***SMBNEP leveraged funding ranged from a 15:1 ratio up to a 58:1 ratio, or an average ratio of 29:1 across all five review years*** (Table 2). More than $14,970,000 of non-federal match was summarized in the 2014 Annual Report (including SMBRC recommended State bond funds), or almost 25 times the federal 320 fund allocation. Similarly, in the 2016 Annual Report, as another example, the funding summary shows non-federal leverage over $15,356,000 (including SMBRC recommended State bond funds), which is over 25 times the federal 320 fund allocation.

SMBNEP's total funding for the 5-year period, not including EPA 320 funds, was $86,667,880 (Figure 1). Annual total funding including EPA 320 funds ranged from $9,888,002 to $35,392,368.

Table 2. Summary categories of annual funding for the 5-year review period.

Category	2018	2017	2016	2015	2014	5-YEAR
EPA 320 Funding	625,000	600,000	685,000	543,200	512,000	2,965,200
Foundation Funding	1,909,825	1,817,939	1,715,833	2,031,058	2,381,452	9,856,107
SMBNEP Other Leverage (NEPORT)	853,311	33,133,726	5,655,961	8,464,174	12,868,335	60,975,507
SMBRA Funding	229,766	129,481	266,388	362,380	402,129	1,390,144
State Bond Funding	6,895,100	311,222	9,000,000	50,000	1,155,000	17,411,322
Total Funding Including 320	**9,888,002**	**35,392,368**	**16,638,182**	**10,907,612**	**16,806,916**	**89,633,080**
Total Funding Excluding 320	**9,263,002**	**34,792,368**	**15,953,182**	**10,364,412**	**16,294,916**	**86,667,880**
Leverage %	1482%	5799%	2329%	1908%	3183%	2923%
Ratio, Leverage to EPA 320 Funding:	15:1	58:1	23:1	19:1	32:1	**29:1**

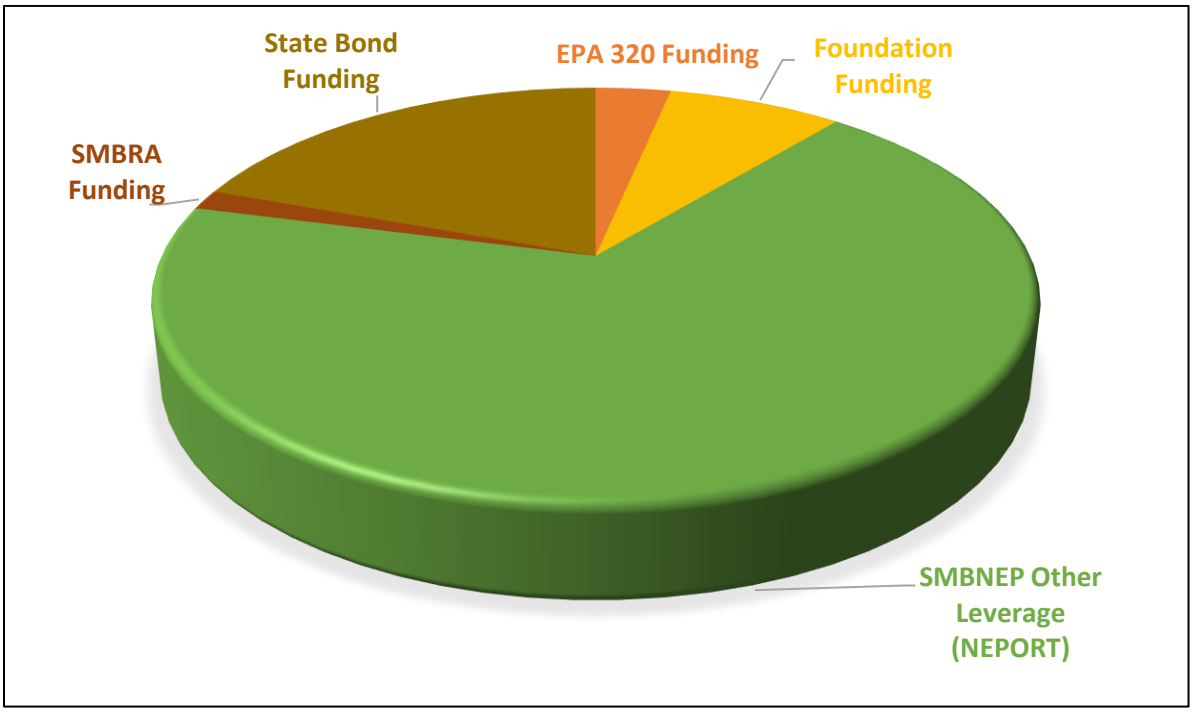


Figure 1. Summary pie chart displaying categories of funding summed across the 5-year period.

TBF obtains matching funding through non-federal grants and contracts as well as private or corporate donations (e.g., Coastal Connections). SMBNEP produces a summary of non-federal match in Annual Reports and annual NEPORT reports submitted to USEPA (Attachments 33a-l). Additionally, TBF documents all funding activities in detailed internal quarterly financial status reports. Tracking of State match is provided by the State Water Resources Control Board with support by SMBRC staff.

Of the EPA 320 funding received during this 5-year period, $2,102,591 was used on program staff delivering on program goals and objectives; $287,190 was used on special projects, including supplemental funding for projects and programs that included a Climate Change Vulnerability Assessment, Ocean Acidification project, ReThink Disposable program, and support for the Coastal Research Institute to fill data gaps identified in the Comprehensive Monitoring Program (CMP) and to inform adaptive management strategies in the Comprehensive Conservation and Management Plan (CCMP). Funding from EPA 320 also supplemented existing and new projects costs such as the SAMO Dunes Pilot project, Abalone Research lab, Malibu Lagoon Project, and others.

CWA Support Information

SMBNEP's BRP helps to further the goals of the Clean Water Act (CWA) Section 320. During this reporting period, the CWA Section 320 grant was administered by USEPA and provided to TBF to support the implementation of the BRP. Actions taken during this reporting period by SMBNEP and its partners serve USEPA's Goal 1: Core Mission – deliver real results to provide Americans with clean air, land, and water. EPA's FY 2014-2018 Strategic Plan charted a course for the agency and was organized around five key goals, including: addressing climate change and improving air quality; protecting America's waters; cleaning up our communities and advancing sustainable development; ensuring the safety of chemicals and preventing pollution; and enforcing environmental laws. This report documents activities that contributed to the FY14-18 EPA Strategic Plan goals as well as the Office of Water (OW) National Water Program Guidance (FY16 and FY17). Specifically, SMBNEP contributed to the element of the guidance that states: "EPA will continue to build the capacity within the National Estuary Program to adapt to changes from climate change on the coasts, and will provide additional assistance to individual NEPs to support their work to develop adaptation plans for their study areas or technical assistance to support implementation of those plans."

Responses to 2014 PE Challenges

During the 2014 Program Evaluation, EPA and the PE review team identified many positive attributes of SMBNEP, including excelling in goals related to the following: Program Planning and Implementation, Protection and Restoration of Habitat and Living Resources, Research and Monitoring, and Outreach and Public Involvement. Additionally, several challenges were identified that may serve to hinder expedited progress towards the implementation of SMBNEP's CCMP. EPA made several recommendations, and SMBNEP strove over subsequent years to further progress in overcoming these challenges. Those efforts are documented below and summarized into the two program areas. Some additional pressures or external factors caused challenges during this PE review period, and they are discussed with solutions summarized within each goal section.

Financial Management

Given the comprehensive nature of the goals of the CCMP, significant amounts of funding are needed to achieve each action. Broadening the scope of funding through securing and leveraging additional resources was identified as a challenge to overcome in the 2014 Program Evaluation. The EPA recommended continuing to explore new funding mechanisms and opportunities.

SMBNEP was successful in diversifying funding for projects within the study area and for the operation of the program itself during this PE review period. The need to obtain significant funding to work on comprehensive CCMP goals was actively pursued; total funding during this period, including EPA 320 funds, competitively awarded grants, State bond programs, in-kind support, and additional leverage funding, was almost 90 million dollars (Attachments 33b and 33i-n). To meet Bay Restoration Plan (BRP or CCMP) goals, SMBNEP mobilized over 17.4 million dollars from State bonds, and TBF was granted over 11 million dollars in addition to EPA 320 funds from various sources (Attachment 33b and 33i-n).

Additionally, new funding sources were pursued and obtained from partnerships that included: City of Los Angeles, Lighthawk, Resource Conservation District of the Santa Monica Mountains, Los Angeles Department of Water and Power, Metropolitan Water District, So Cal Gas, State Parks, National Oceanic and Atmospheric Administration, and more. Other efforts included an annual fundraising event titled "Coastal Connections" led by TBF's Board of Directors to celebrate our achievements, presence in the community, and meaningful partnerships. Additional TBF efforts in recent years included fundraisers supported by local organizations such as the Smog City Brewery in Torrance, CA, and Greenbar Distillery in downtown Los Angeles (Attachment 36g). See additional details in the "Performance Measures Worksheet" document as part of the PE package.

Outreach and Public Involvement

During the previous PE review period, public inquiry from several individual stakeholders raised concerns about various aspects of SMBNEP activities, including the eligibility of TBF to receive funding from EPA 320 CWA funds, among other issues. The EPA reviewed the concerns from the individual members of the public and continued to support TBF and the existing structure of SMBNEP as well as its roles in restoration projects such as the Ballona Wetlands Restoration Project, which involves contention among stakeholder groups. EPA recommended continuing to clarify roles and responsibilities overall and for specific projects, continuing efforts to engage stakeholders, continuing to engage the Watershed Advisory Council (WAC), and continuing to encourage public involvement in the CCMP.

Considerable efforts have been made over the past five years to better engage with the public, the WAC, and clarify the roles and responsibilities of the entities involved in SMBNEP. One defining event was the resignation of the SMBRC Executive Director in 2016. This position was occupied by the same individual who was also the director of TBF. This change was an effort to clarify roles and responsibilities overall. Under separate direction, SMBRC and TBF are better able to define their respective actions, efforts, and results. Continued effort by SMBNEP to conduct meaningful outreach to the Management Conference and the public was facilitated by the many public meetings held each year by all of the four bodies that comprise SMBNEP's Management Conference, namely, the SMBRC's Governing Board, Executive Committee, Technical Advisory Committee, and Watershed Advisory Council. The agendas for these meetings, staff reports, meeting minutes, and related documents can be freely downloaded from SMBRC's website and are sent to open, public electronic listservs. TBF, in response to interests in increased accessibility and transparency, now publishes the minutes from its Board of Director's meetings and IRS Form 990's (Attachments 3a-e). An additional effort is the annual public meeting of the TBF Board of Directors. This meeting is noticed and conducted similarly to public meetings by the State of California and allows for the public to provide comments and observe the proceedings of TBF's Board of Directors.

Additionally, SMBNEP is currently conducting a public revision of its CCMP (2018-19) with a focus on evaluating elements identified in the EPA's Program Evaluation and Funding Guidance documents. Further clarification of roles and responsibilities, including the structure and governance of SMBNEP should be resolved in documents produced in the coming months, targeted for mid to late 2019. The intent of this portion of the revision process, which includes a number of public meetings and workshops, is to create a structure and governance that supports the advancement and implementation of the CCMP while encouraging public input and involvement.

Figure 2. Photographs illustrating urbanization around SMBNEP's study area (credit: TBF).

Application of the EPA Logic Model

SMBNEP Priorities

SMBNEP's priorities, based on the 2013 BRP, included improving water quality, conserving and rehabilitating natural resources, and protecting the Bay's benefits and values to people. These three priorities are integrated and supported throughout the 14 goals. Recently the Management Conference recognized and identified a new priority area for SMBNEP: understanding and adapting to climate change impacts. This PE review period saw a substantial advancement of all four priority areas, which are summarized as part of each goal evaluation.

NEP Core Elements

As part of the goal evaluation, SMBNEP assessed which NEP core elements each of the key goals from the 2013 BRP supported. SMBNEP identified nine EPA categories of elements (listed below). Each of the 14 goals support multiple elements, and all include multiple forms of reporting. Additionally, all goals supported healthy communities, albeit some indirectly. The core elements are summarized in Table 3, and detailed evaluations and discussions for each goal follow in the form an EPA logic model from the program evaluation guidance. The logic model was applied for the reporting period July 2013 – June 2018 and results are presented from the same time frame.

1) ***Habitat*** – Did the goal provide benefits to habitat condition?
2) ***Water Quality*** – Did the goal improve water quality?
3) ***Living Resources*** – Did the goal provide benefits to native species or groups?
4) ***Healthy Communities*** – Did the goal support benefits to people or ecosystem services?
5) ***Trainings*** – Were trainings conducted to support professionals, teachers, students, or others?
6) ***Direct Assistance*** – Did the goal provide meaningful support to municipalities and others in the form of policy development or increased understanding?
7) ***Outreach and Public Involvement*** – Did the goal encourage public engagement?
8) ***Research Assessment and Monitoring*** – Did the goal support the CMP or conduct targeted research or assessment?
9) ***Reporting*** – Did the goal include reporting in the form of NEPORT, semi-annual reports, annual reports, project reports, or others?

In addition to Table 3, detailed goal evaluation sections contain additional information specific to each of the EPA categories of elements, particularly in the key accomplishment notes for each goal.

Table 3. NEP core element table for nine identified elements supported by 14 BRP goals (2013).

2013 BRP Goal	Habitat	Water Quality	Living Resources	Healthy Communities	Trainings	Direct Assistance	Outreach and Public Involvement	Research Assessment and Monitoring	Reporting
Goal #1: Improve water quality through enhancement of regulatory framework and collaborative implementation									
Goal #2: Improve water quality through pollution prevention and source control									
Goal #3: Address potential impacts of contaminants of emerging concern									
Goal #4: Create and support policies and programs to protect natural resources									
Goal #5: Acquire land for preservation of habitat and ecological services									
Goal #6: Manage invasive species									
Goal #7: Restore wetlands, streams and riparian zones									
Goal #8: Restore coastal bluffs, dunes, and sandy beaches									
Goal #9: Restore intertidal and subtidal habitats									
Goal #10: Protect and restore ocean and deep water habitats									
Goal #11: Protect public health									
Goal #12: Maintain/increase natural flood protection through ecologically functioning floodplains and wetlands									
Goal #13: Increase public access to beaches and open space									
Goal #14: Conserve water and increase local water supply									

Goal Evaluation Structure

The structure of the goal evaluation was based on an application of the EPA Program Evaluation logic model. Each of the following categories are discussed as part of each goal. The key goals evaluated as part of this Program Evaluation included all 14 from the 2013 Bay Restoration Plan (BRP).

- **Goal Summary**: This section briefly introduces the history and context of the goal, why it is a priority of SMBNEP, and relevant background information. At the end of each summary is a brief 1-2 sentence update of key actions undertaken during the PE reporting period.
- **Key Activities or Objectives**: For each goal, the objectives from the 2013 BRP are listed.
- **Partnerships**: Collaborating partner(s) is a list of key entities, in addition to the lead(s), who are directly engaged in accomplishing the goal. Partners represent organizations that might implement, champion, permit, or provide scientific or technical expertise in support of the goal. This list describes central partners but may not include all possible partners associated with a collaborative action and should not be interpreted as an exhaustive list of supporting entities for a particular action. There are often many additional supporters of a particular action. Common acronyms for partner entities are found in the acronym list at the start of this report.
- **Outputs**: Outputs can be thought of as specific activities or efforts that are produced or provided over a specific period of time. Outputs are often tangible products, activities, partnership development actions, or other achieved milestones within the 5-year PE review period. They are quantified when possible.
- **Key Deliverables**: This section lists key deliverables in the form of final products (e.g., final reports, final outreach products) produced during the PE review period. Numbering within these lists cross-walks to a database of final deliverables as part of the PE submittal package.
- **Short-Term Outcomes**: The term "outcome" means the result, effect, or consequence that will occur from carrying out an environmental program or activity that is related to an environmental or programmatic goal or objective. Outcomes may be environmental, behavioral, health-related or programmatic in nature. As the EPA annually quantifies acreage of habitat restored or protected by each National Estuary Program, this projected metric is estimated and used as the environmental result when possible. Environmental results are also informed by data collected within the study area. These are specific to the 5-year PE review period.
- **Long-term Outcomes**: Long-term outcomes (or environmental results) are focused on the significant outcomes that serve as long-term quantitative (when possible) target(s) or goal(s) for the action. These outcomes are projected future targets (on a 5-20 year timeframe) for each goal and are not meant to be assessed as accomplishments during this PE period.
- **Pressures**: These are examples of direct or indirect stressors that impact the environment and the potential to achieve a CCMP goal. SMBNEP conducted a Climate Change Vulnerability Assessment (CCVA) in 2016 that informed a detailed evaluation of the climate change stressors associated with each goal. Summaries of that evaluation at the goal level are included in each of these sections. Additional stressors are also identified, if present.

- **Programmatic Challenges**: This section includes a breakdown of external factors or challenges associated with each goal, specific to actions undertaken during the PE review period. For example, there may be institutional barriers, emerging issues, project-level complications such as permitting, environmental disasters such as fires, or others. In some cases, no programmatic challenges were identified for a particular goal.
- **Overcoming Pressures**: This section briefly summarizes adaptive management strategies and responses to both the "Pressures" and "Programmatic Challenges" identified above.
- **Key Accomplishments and Conclusions**: This section includes a concise narrative highlighting key accomplishments for the goal and objectives during the reporting period, additional responses to challenges, any relevant conclusions, and in some cases, next steps identified for the subsequent reporting period. Next steps are intended to describe clear, concise "to do" items for the next 5-10 years and may reference the context in which the step should take place. Next steps also reflect consensus building and input from the management conference parties regarding details of action implementation. Additional details can be found in the supporting Attachments ("Key Deliverables", cross-walked to the supporting database).

Figure 3. El Matador beach at sunset with a long exposure (credit: P. House, TBF).

Goal #1: Improve water quality through enhancement of current regulatory framework and collaborative planning and implementation

Goal Summary:

The current federal and state water quality regulatory framework has been credited as the primary force bringing significant water quality improvements over recent decades and should be strengthened to ensure continuing progress. Under the mandate of the CWA and the State Porter-Cologne Water Quality Control Act, major programs for control of point and nonpoint sources of pollution in the Santa Monica Bay watersheds include the Ocean Plan, Basin Plan, TMDLs, the listing of impaired water bodies (303(d) listing), the National Pollutant Discharge Elimination System (NPDES), the coastal cooling water intake and discharge requirement [316(d) requirement], waste discharge requirement (WDR), etc. At the local level, the Los Angeles Regional Water Quality Control Board (LARWQCB) is the primary state agency responsible for implementing these programs. Meanwhile, the ultimate attainment of water quality standards must rely on the joint efforts of the regulators and the regulated communities through collaborative, integrated watershed-wide planning and implementation activities. This goal has a broad and far-reaching series of objectives related to improvements in regulatory, planning, and policy actions to improve water quality throughout the Bay and its watershed. Actions for this goal during the review period primarily consisted of implementing bond-funded multi-benefit projects aimed at reducing pollutant loading from stormwater into Bay waterbodies.

Key Activities or Objectives:

1.1 Attain water quality goals in TMDLs adopted for 303(d) listed waterbodies in the Santa Monica Bay Watershed
1.2 Eliminate and prevent water and sediment quality impairments from both point and nonpoint sources for waterbodies in the Malibu Creek Watershed
1.3 Eliminate biological impacts of water intake and discharge from coastal power and desalination plants
1.4 Eliminate all harmful discharges to Areas of Special Biological Significance (ASBS)
1.5 Institute a reliable regional funding mechanism for storm water quality improvement
1.6 Reduce and prevent non-storm water runoff from urban land uses
1.7 Eliminate nonpoint pollution from on-site wastewater disposal systems (OWDSs)

Partnerships:

SWRCB, LARWQCB, MS4 permittees, LA County, LADPW, LACSD, West Basin Water District, LACDPW, municipalities, USEPA, LVMWD, Caltrans, State Parks, power plant owners, State Energy Commission, NMFS, local water districts, many others

Outputs:

- Worked with watershed stakeholders to develop, implement, and oversee projects that meet BRP objectives and priorities, and achieve TMDL waste load and load allocation targets
- Engaged with County staff to identify collaborative opportunities, and attended IRWMP meetings to provide technical support to IRWMP

- Completed bond funded (Prop. 50 & 84) projects through executing grant agreements, overseeing projects, site inspections, and approving progress reports and invoices for the following projects: Prop. 50: Culver City-Wide BMP Treatment Train Project; Prop 84: Inglewood Catch Basin Inserts Project, Torrance Stormwater Basins Enhancement Project, Milton Green Street, University Park Rain Gardens, Oxford Basin Enhancement Project, and Manhattan Beach Greenbelt Project.

Key Deliverables (Attachments):

- Attachments 29a-i: Final reports for State bond funded water quality improvement projects
- Attachments 29j-l: Example publicly released Request for Proposals (RFPs)
- Attachment 29m: Final Measure W ordinance ballot document

Short-Term Outcomes (2013-2018):

- Completed construction of Inglewood Catch Basin Inserts, Milton Green Street, University Park Rain Gardens (Prop. 84), and Culver City City-wide BMP Treatment Train Projects (Prop. 50) to reduce pollutant loading to Ballona Creek and its tributaries
- Completed construction of Torrance Stormwater Basins Enhancement, Manhattan Beach Greenbelt Low Flow Infiltration, and Oxford Retention Basin Enhancement Projects (Prop. 84) to reduce pollutant loading to Santa Monica Bay
- Completed construction of the Calabasas Catch Basin Insert Project (Prop. 84) to reduce trash and sediment pollution in the Malibu Creek watershed
- Annual reduction in trash loading to Ballona Creek of 72 cubic yards through implementation of the Inglewood Catch Basin Insert Project
- Annual reduction 2.4 kg of oil and grease, 400 gm of metals, and bacteria and trash reduction in Ballona Creek through the implementation of the Milton Green Street Project.
- Annual reduction of .65 pounds of metals, along with bacteria and trash reduction in tributary to Ballona Creek through implementation of University Park Rain Garden Project.
- Annual reduction of trash loading by 68,930 pounds, 10 pounds of metals (copper, lead, zinc), and reductions in bacterial pathogens through implementation of the Culver City City-wide BMP Treatment Train Project
- 50% reduction in Bacterial TMDL exceedances and 100% reduction in trash at shoreline monitoring station through implementation of the Torrance Stormwater Basin Enhancement Project.
- 92% reduction in bacterial loading, and a 100% reduction in wet-weather Bacterial TMDL exceedances at shoreline monitoring station through implementation of the Manhattan Beach Greenbelt Low Flow Infiltration Project
- Dissolved oxygen level greater than 5 mg/L, less than 10% algal cover, and reduction of bacteria, toxicity, and nutrient levels to less than baseline through implementation of the Oxford Retention Basin Enhancement Project

Long-Term Outcomes (>5 years, projected):

- Assist in constituent percentage load reduction targets for waterbodies in the Santa Monica Bay according to TMDL compliance timeline

Pressures (2013-2018):

In general, among the seven objectives under this goal, those that are directly tied to compliance of existing water quality standards such as TMDLs have the highest vulnerability to various impacts of climate change. This is the case for Objective 1.1, 1.2, and to a lesser degree for Objective 1.4, which all call for elimination of the sources of water pollution and prevention of water quality impairment. Some of the pollutants are more sensitive to impacts upstream, while others are more sensitive to impacts downstream or along the beaches. The vulnerability to warmer water and drought are noticeably higher than the other stressors. This higher vulnerability is due to the possibility of more direct impacts on regulated contaminants because adverse effects of pollutants such as eutrophication and toxicity on water bodies increase with increasing temperatures. In the case of drought, one impact is potentially higher concentrations of contaminants, which typically result in more severe adverse effects.

Though addressing water quality, the vulnerability of Objectives 1.6 and 1.7, in general, are lower because they deal with a specific issue: non-storm urban runoff and septic systems, which are subject to a narrower set of stressors.

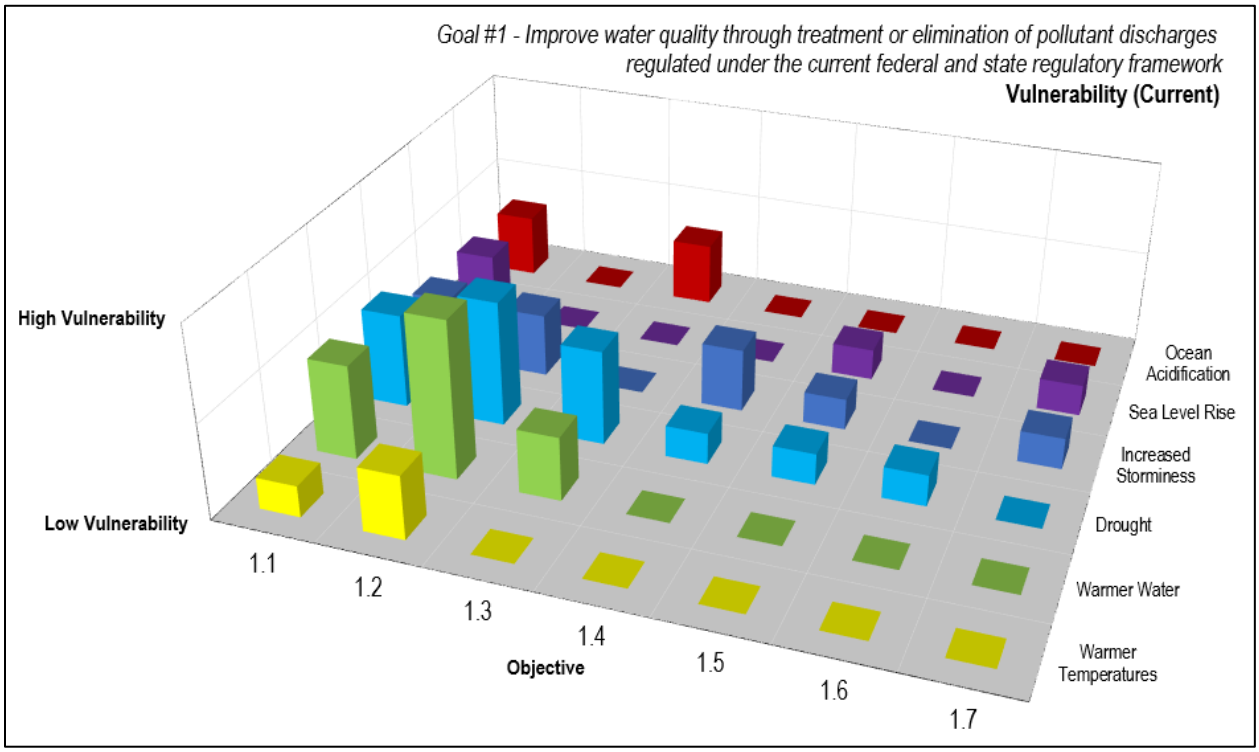


Figure 4. Goal 1 – Current Vulnerability from CCVA.

Programmatic Challenges:

- Implementation delays due to multiple factors including: project design changes, grantee employee turnover, contracting problems, unexpected on-site construction issues, etc.
- Long-term funding opportunities

Overcoming Pressures:
Despite of the passage of several State water bonds over the last twenty years, lack of funding remains one of the main obstacles in attaining water quality goals in adopted TMDLs through implementation of watershed management plans (WMPs) and Enhanced Watershed Management Plans (EWMPs). However, a strong coalition of local municipalities and the environmental community championed and successfully pushed for passage of a County-wide parcel tax (Measure W) during this PE period. The success of this tax measure will provide hundreds of millions of funding annually for storm water quality improvement and reuse projects throughout Los Angeles County, including the Santa Monica Bay watershed.

With regards to grant management, while some challenges had to be resolved by the grantees (employee turnover, etc.), we have found that a hands-on approach to managing grants prevents or reduces delays in project implementation. Attending construction meetings, making frequent site visits, and being proactive in keeping in contact with grantees makes major delays less likely.

Key Accomplishments and Conclusions:
Key accomplishments over the last five years include the completion of the specific projects listed above with significant water quality improvement and stormwater pollutant reduction services provided annually. These capital projects represent competitive allocation of State bond funding and significant oversight and direction from SMBRC staff. Specific quantitative benefits are provided above in the 'Short-Term Outcomes' section. While the primary purpose of the above projects was to meet regulatory requirements for water quality, they all exhibit multi-benefit aspects through providing native habitat, passive recreational and educational opportunities, more natural hydrology regimes, and other benefits.

Next steps include the implementation of the final four Prop. 84 grants over the next few years, i.e., Westwood Greenway Project, Rancho Palos Verdes Catch Basin Inserts, Ladera Park Regional Stormwater Project, and Culver Boulevard Stormwater Infiltration / Retention Regional Project.

Figure 5. Milton Green Street catch basin project before and after.

Figure 6. Oxford Retention Basin Enhancement Project after completion.

Figure 7. Torrance Stormwater Basins Enhancement project after completion.

Goal #2: Improve water quality through pollution prevention and source control

Goal Summary:

Pollutants entering the Bay originate from many different sources, but ultimately, they are the products of the people who live, work, and play in the region. Everyday human activities – the way we build our homes and roads, manage our households, care for our cars, manufacture and consume products – directly influence the amounts and types of pollutants we generate and dispose. Pollutants generated through these activities are transmitted to the Bay via numerous pathways. Major pathways include runoff to creeks and storm drains, sewer lines connected to municipal wastewater treatment facilities, industrial discharges, parking lots and roadways, boating and shipping activities and aerial fallout. Although treatment and safe disposal of waste at the ends of major pathways ("end of pipe") will continue to be the primary waste management tool utilized, ultimate pollution control will require reduction and prevention of wastes at their sources, including changes to the ways that we live, work, and play. Key actions undertaken during the review period for this goal included implementing the Boater Education Program and Clean Bay Certified program to reduce non-point pollution impacts, engagement of the public through Coastal Cleanup Day, trash reductions through policy implementation and trash capture devices, and additional studies informing the effectiveness of LID implementation.

Key Activities or Objectives:

2.1 Increase pervious surfaces and storm water infiltration where feasible by supporting green infrastructure
2.2 Reduce generation of trash through restricting and reducing the use of disposable plastics and polystyrene products
2.3 Reduce aerial deposition of storm water pollutants to the Bay and the Bay Watershed
2.4 Reduce pollution from commercial and recreational boating activities
2.5 Reduce discharge of trash, oil and grease, and other pollutants from commercial and other high density areas
2.6 Sustain and expand annual Coastal Cleanup
2.7 Increase public awareness through Public Involvement and Education (PIE) mini-grant program

Partnerships:

Municipalities, LA County, DBW, SFEP, CRI, CCC, US Coast Guard Auxiliary, US Power Squadrons, boating community, marinas and yacht clubs, volunteers, State Parks, SCC, LACDBH, LARWQCB, harbor management, Social Justice Learning Institute, Environmental Charter Schools, food service establishments, Rethink Disposables, Clean Water Action / Clean Water Fund

Outputs:

- Passed local ordinances and ultimately state legislation restricting the use of plastic bags, straws, and other polystyrene products
- Adopted and began implementation of Santa Monica Bay marine debris TMDL
- Installed additional catch basin trash capture devices throughout the watershed
- Developed and distributed outreach materials in support of the Boater Education Program

- Encouraged participants in the Honey Pot Program to reduce wastewater discharge via an online portal (includes three publications, an instructional video, and quiz)
- Coordinated certification of 350 Clean Bay establishments with city staff and managed online certification lists
- Certified four food service establishments as ReThink Disposable to eliminate single-use disposable items while providing economic benefits
- Partnered with four restaurants on organics management for the Table-to-Farm program
- Completed Culver City Rain Garden pollutant fate soil study and continued pollutant fate plant study in partnership with CRI

Key Deliverables (Attachments):

- Attachments 11a-o: Boater Education Program reports and final outreach materials
- Attachments 12a-e: Clean Bay Certified program outreach materials
- Attachments 41a-d: Table-to-Farm reports and final signs

Short-Term Outcomes (2013-2018):

- New state legislation restricting single-use plastic bags
- New municipality ordinances and policies restricting other single-use disposable plastic items such as straws, polystyrene products, food containers, and others
- Increased adoption of sustainable boating habits and understanding of the impact of boating on aquatic environments to decrease boating related pollutants entering the waterways (e.g., boat sewage, used oil, copper, trash, aquatic invasive species, and household hazardous waste like antifreeze and batteries) as measured by collected Clean Boating Pledges (3,500 annually)
- Increased organics management (e.g., food waste) by 3,841 pounds through restaurants participating in the Table to Farm program
- Eliminated the use of almost 250,000 disposable single use food packaging items from waste stream by restaurants certified by the ReThink Disposable program and saved each establishment an average of $2,000 annually
- Refined and completed methods for microplastics extraction and identification from sandy sediments in partnership with CRI

Long-Term Outcomes (>5 years, projected):

- Full compliance with the Ballona Creek and Malibu Creek trash TMDLs, as well as the Santa Monica Bay marine debris TMDL
- Increase understanding and adoption of sustainable boating habits to reduce boating related pollutants entering waterways (e.g., boat sewage, used oil, antifreeze, bilge water, batteries, copper, trash, and aquatic invasive species)
- Meet 86-100% annual average usability percentage (based on analysis of equipment performance) for all publicly funded sewage pumpout stations throughout Southern CA
- As specified in the Marina del Rey Harbor Bacteria TMDL, assist in meeting Geometric Mean Limits (GMLs) and no days of exceedance of bacteria objectives (e.g., GML for fecal coliform shall not exceed 200 MPN / 100 ml and GML for enterococcus shall not exceed 35 MPN / 100 ml) at any monitoring location during the summer dry-weather season (April 1 to October 31)

and a maximum of three days of exceedance of bacteria objectives during the winter dry-weather season (November 1 to March 31)

- Achieve Clean Bay Certified adoption by 100% of Santa Monica Bay Watershed cities
- Achieve measurable decrease in occurrence of litter prone food packaging in areas surrounding ReThink Disposable food service establishments (i.e., less than 70% of sample litter collected)
- Implement ban on polystyrene food packaging in Los Angeles County and 100% of cities throughout watershed
- Assist participating Table to Farm establishments in achieving AB1826 (Organics Recycling Law) compliance
- Increase understanding of composting as tool to reduce pollutant loads in stormwater and urban runoff

Pressures (2013-2018):

With regard to the impacts of climate change, there does not seem to be any identifiable similarities or common trends among the seven objectives under this goal related to climate change stressors, primarily due to the fact that the sources of pollutants addressed in this section are highly diverse, each of which are sensitive to one or two specific climate stressors, and the impacts were more obvious for some than the others during this PE period. For example, Objective 2.1 focuses on the issue of impervious surfaces in the watershed, which has been more influenced by factors affecting the amount and intensity of water falling on the ground, e.g., drought and storminess that occurred during this PE period. Objective 2.3 focuses on aerial deposition, for which warmer atmospheric temperature experienced during this period also played a role, in addition to the potential stressors of drought and storminess. Objective 2.4, on the other hand, deals with pollution from boating activities, which in addition to storminess is also affected by ocean-focused stressors such as SLR. Objective 2.7 is unique in its inclusiveness as it is a broad-based education program objective, significantly increasing its adaptive capacity more than the other objectives. Despite the lack of a prevailing pattern or trend, drought and increased storminess appear to have more effects on objectives in this section than the other stressors. SLR and OA do not seem to induce noticeable vulnerability at present but start to exhibit impacts in the future time horizons in the subject areas of several objectives.

Figure 8. Students and staff building composting hub for Inglewood restaurants.

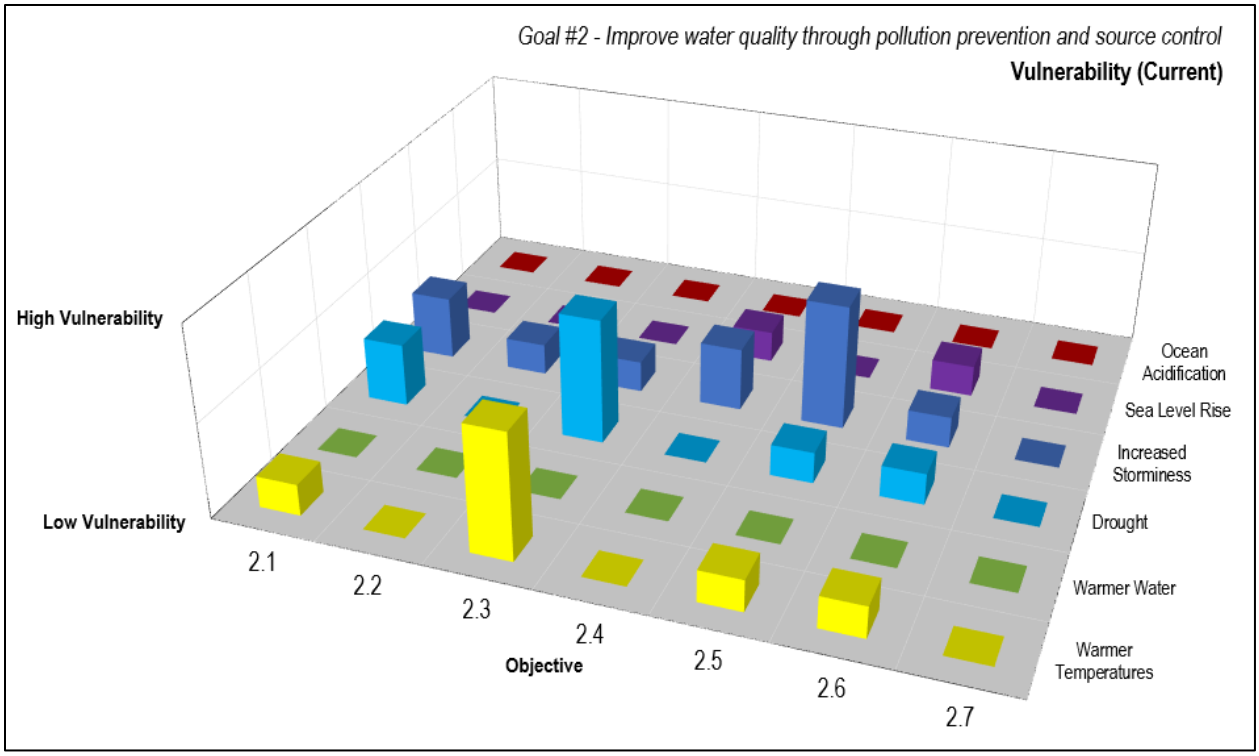


Figure 9. Goal 2 – Current Vulnerability from CCVA.

Lastly, trash and other TMDL identified pollutants continue to be stressors on the waterbodies throughout the Santa Monica Bay region. Individual adaptive management actions for these must be assessed and undertaken at a site or area-specific location.

Programmatic Challenges:

- N/A

Overcoming Pressures:

Substantial policy changes have been undertaken during this PE review period, including restrictions or bans on polystyrene or other plastic items, and other source control methods.

Education and infrastructure planning have been initiated to overcome pressure on Objective 2.4, reduce pollution from boating activities, which included sea level rise and increased storminess. These stressors can physically damage dock infrastructure such as sewage pumpout resources. To overcome this pressure, it is important to educate the general boating community on best management practices in the event of dock damage. It is also important to educate stakeholders regarding the potential pressure and investment opportunities in infrastructure technology available to withstand the pressure.

Key Accomplishments and Conclusions:

During this PE period, with support of SMBNEP, several municipalities in the Santa Monica Bay watershed spearheaded and adopted local ordinances restricting the use of disposable plastics. These efforts eventually led to the passage of state legislations restricting the use disposable plastics

statewide. Thousands of trash capture devices were also installed in catchbasins and storm drain outlets throughout the watershed, and many were funded by State bonds recommended by SMBRC.

TBF's Boater Education Program offers multiple tools to help boaters implement best management practices to reduce non-point discharges to the ocean. New tools developed include the statewide 'When Nature Calls' publication adopted by the USEPA as a model for a national publication, Southern California Boater's Guide revised editions, vessel sewage video, and Pumpout Nav app. TBF's Table-to-Farm Composting for Clean Air program has successfully constructed two compost hubs, educated 360 students about food waste, methane emissions, and compost, and worked with four small business restaurants to reduce food waste sent to landfills by 3,841 pounds. TBF partnered with CWA/CWF to bring ReThink Disposable, a technical assistance program for food service establishments to reduce single-use disposable items, to Los Angeles. In total, four restaurants collectively reduced single-use disposables by 246,570 pieces and prevented 2,637 pounds of waste from entering the waste stream or ending up as litter on our streets and beaches in 2018.

Project next steps include continued production of relevant and useful education and engagement materials including management of Pumpout Nav app. Moving forward, public engagement metrics and specific engagement tools that reduce pollutants to waterways will be researched. Additionally, outreach including fuel spill prevention methods and marine debris reductions and clean-up efforts will be identified and implemented. New funding will be sought to continue and expand the Table to Farm and ReThink Disposable projects. Lastly, SMBNEP will continue to support and develop more marine debris reduction and cleanup efforts, and support additional legislations to reduce the use of disposable plastics and microplastics. Microplastics research will continue and expand in the subsequent period to further elucidate quantitative assessments of multiple components of the fate and transport model of microplastics impacts in our nearshore environments, which will aim to inform adaptive management strategies.

Figure 10. Dockwalkers outreach event at King Harbor on 20 May 2017.

Goal #3: Address potential impacts of contaminants of emerging concern

Goal Summary:

This goal focuses specifically on the issue of emerging contaminants. The list of emerging contaminants is very long, diverse, and continues to expand as research continues. While implementation of the existing water quality improvement programs, especially the program for controlling point source pollution from POTWs, has achieved significant reduction of loading for pollutants such as DDT, PCBs, and heavy metals, many new contaminants are emerging and causing concern due to their potential detrimental impacts on the marine ecosystem and human health. The so-called emerging contaminants include, but are not limited to, polybrominated diphenyl ethers (PBDEs), perfluorinated chemicals, and various pharmaceutical chemicals. The implementation of this goal during the review period included taking steps towards developing strategies to reduce impacts of specific emerging contaminants as well as filling in data gaps. Studies and research were conducted to inform impact assessments and reduction methods. Monitoring of pollutant reduction is addressed in other goals (e.g., Goal #2). Additionally, outreach and education opportunities were explored for emerging contaminants and their effects.

Key Activities or Objectives:

3.1 Institutionalize monitoring of emerging contaminants
3.2 Reduce loading of emerging contaminants in waterways

Partnerships:

SCCWRP, SWRCB, LARWQCB, CRI, POTWs, LACSD, USEPA, municipalities, LASAN, stormwater monitoring agencies, water districts

Outputs:

- Conducted outreach and education on emerging contaminants to the public
- Identified new technologies and methods to identify and study emerging contaminants (e.g., ROV, new sensors)
- Conducted monitoring and research on emerging contaminants
- Instituted permitting requirements on emerging contaminants

Key Deliverables (Attachments):

- Attachment 37b: 2015 State of the Bay Report

Short-Term Outcomes (2013-2018):

- Improved understanding of emerging contaminants and fill regional data gaps
- Explored outreach and education opportunities for effects of contaminants

Long-Term Outcomes (>5 years, projected):

- Reduce impacts of emerging contaminants on key habitats in the Bay and its watershed

Pressures (2013-2018):
Although there was growing awareness and recognition on the need to address emerging contaminants during this review period, there were still many obstacles, and very little has been completed to effectively regulate, institute controls, and reduce loading of emerging contaminants. One of the main obstacles is the difficulty in identifying and studying the impacts of emerging contaminants.

With regards to the impacts of climate change, many unknowns still exist, which makes predictions on the degree of climate change impacts more challenging. General assessments of climate change impacts can be made, and it was found that loading and effects of emerging contaminants may be influenced by warmer water, drought, storminess, and OA. Warmer water and OA primarily affect the chemical properties (e.g., toxicity) of certain contaminants, while drought and storminess mainly affect the treatment capability of POTWs. Drought in particular can be troublesome because it will likely result in more concentrated contaminants, which are difficult to manage.

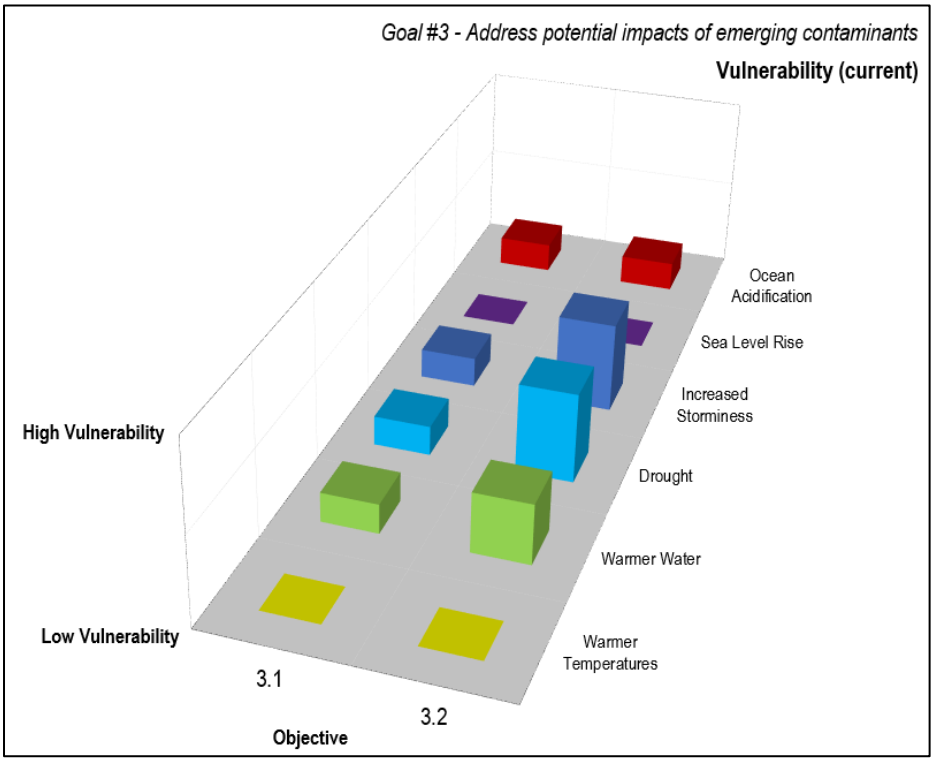


Figure 11. Goal 3 – Current Vulnerability from CCVA.

Programmatic Challenges:

- Lack of clear policy and regulatory framework to address emerging contaminants

Overcoming Pressures:
Additional research was undertaken during this reporting period to overcome some of the obstacles identified above, including the establishment of a tiered approach to new monitoring requirements. Supplemental data will support new policy, research avenues, and long-term monitoring of some of the identified constituents of concern.

Key Accomplishments and Conclusions:

A State-wide panel of experts was convened to examine the level of understanding and recommend the best approach to address emerging contaminants. Based on the panel recommendations, State Water Resources Control Board adopted a tiered approach in regulating emerging contaminants, including new monitoring requirements for emerging contaminants known to pose high environmental risk. There has also been more funding for studies for characterization of the contaminants' environmental risks.

Significant strides were accomplished by Dr. James Landry of CRI in the form of a draft adapted microplastics extraction protocol and manuscript, a refinement that will further this field of research. Additional next steps for microplastics research includes filling data gaps in the nearshore fate and transport conceptual model. Next steps for other emerging contaminants include the development and implementation of a comprehensive strategy which facilitates additional studies to determine the environmental risk of new compounds, establishment of standards and routine monitoring for contaminants known to pose high environmental risk, and expansion of outreach and education to reduce the loading of emerging contaminants for which the risks are better known.

Figure 12. CRI Interns and Faculty microplastics extraction and workshop.

Goal #4: Create and support policies and programs to protect natural resources

Goal Summary:

The lack of enforceable regulations and/or conservation policies is a major historical cause of the loss of land-based habitats, such as riparian corridors and wetlands, due primarily to land encroachment, and the decline of ocean fishery resources due to overharvesting. Therefore, new regulations and policies should be developed and executed to prevent further loss of the remaining habitat areas and living resources within the watershed and Bay. Goal 4 primarily relates to the creation and support of policies to support the protection of natural resources. The specific objectives vary from stream protection (4.1), to marine programs (4.2 – 4.4), to water quality and watershed-based programs (4.6) to very broad-based objectives that incorporate Bay-wide monitoring (4.5 and 4.7). Activities conducted during this review period focused on informing policy through conducting aerial surveys of boating and fishing activities in the Southern California Bight, supporting partners in policy developments, conducting a climate change vulnerability assessment and other climate stressor research, completion of a comprehensive State of the Bay Report including new indicators and assessments, and the start of a revision of SMBNEP's Comprehensive Monitoring Program.

Key Activities or Objectives:

3.3 Facilitate development and adoption of natural stream protection ordinances and/or policies
3.4 Enhance assessment and effective management of Marine Protected Areas in the Bay
3.5 Evaluate and establish additional management measures to improve protection of fishery resources
3.6 Promote and create programs to increase the supply of healthy local sustainable seafood
3.7 Evaluate and address potential impacts of climate change on Santa Monica Bay
3.8 Facilitate and coordinate water quality improvement and habitat restoration programs in key subwatersheds
3.9 Implement a Comprehensive Bay Monitoring Program

Partnerships:

LightHawk, Vantuna Research Group, 14 MPA Collaboratives, CDFW, MDR Anglers, CSULB, FCEC, LAC Lifeguards, CRI, UCLA, many universities, State Parks, LA County, SWRCB, LARWQCB, municipalities, Heal the Bay, LA Waterkeeper, OPC, NPS, USC SeaGrant, local fisherman, USEPA, LACSD, SCCWRP, CCC, SCC

Outputs:

- Conducted quarterly aerial surveys and produced an annual report on boating activities in the Southern California Bight
- Aerial survey data published in a scientific journal
- Started ROV operation and monitoring protocols and conduct nine nearshore surveys
- Mapped existing extent of eelgrass beds in the Bay to inform restoration methods and locations
- Actively participated in regional Marine Protected Areas (MPA) Collaborative meetings and workshops
- Conducted a climate change vulnerability analysis on the current Bay Restoration Plan
- Engaged local fishing industry/community to participate in kelp restoration efforts

Key Deliverables (Attachments):

- Attachments 6a-c: Aerial monitoring reports
- Attachments 13a-g: Final report, visualizations, and presentations for the Climate Change Vulnerability Assessment project
- Attachment 17g: Journal publication for aerial survey and distribution modeling
- Attachment 37b: 2015 State of the Bay Report

Short-Term Outcomes (2013-2018):

- Enhanced understanding of boating activities and practices (geographically) in Southern California and informed Marine Protection Area (MPA) uses
- Enhanced understanding of nearshore and marine environments (e.g., eelgrass, deep reefs) and filled data gaps for State of the Bay Report and Comprehensive Monitoring Program
- Conduced a Climate Change Vulnerability Assessment of the Bay Restoration Plan
- Monitored Bay habitats to inform development of the State of the Bay Report

Long-Term Outcomes (>5 years, projected):

- Inform agency enforcement plans and long-term adaptive management of MPAs, assist with fishery related public health advisories
- Assist a minimum of one municipality in the watershed in the adoption of a stream protection policy
- Enhance functions and conditions of nearshore and marine environments (e.g., eelgrass, deep reefs) in the Bay
- Implement climate adaptation projects that increase resilience of natural resources in the Bay
- Restore 2-5 acres of eelgrass to the Bay

Pressures (2013-2018):

Pressures affecting this goal and objectives primarily include those identified in the 2016 CCVA. Each objective has some level of vulnerability to warmer waters and marine related objectives are vulnerable to OA. In general, while the specific habitats referenced within the objectives can be vulnerable to different stressors, objectives within this goal are fairly adaptable and have high rankings for adaptive capacity. During this period, climate change stressors became increasingly important to incorporate in planning, policy, monitoring, and natural resource protection. Weather associated with El Niño storms and high wave events created limitations on monitoring.

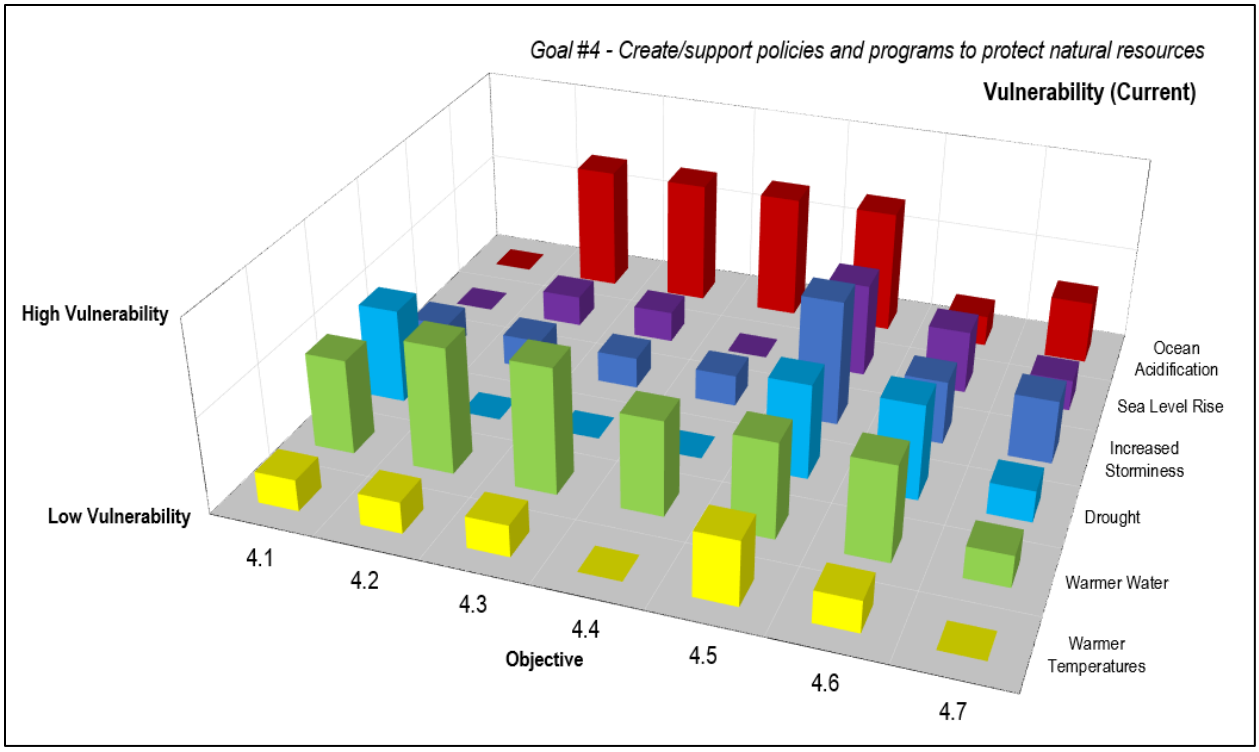


Figure 13. Goal 4 – Current Vulnerability from CCVA.

Programmatic Challenges:

- Private foundation funding sources no longer available to support aerial surveys

Overcoming Pressures:

TBF allocated a small portion of EPA 320 funds for staff time, and our project partner, Lighthawk, continued to coordinated volunteer pilots to support the ongoing quarterly aerial flights. We have successfully continued the project and avoided data gaps since grant funding from private foundations ended in 2017.

Key Accomplishments and Conclusions:

Over 20,000 data points describing vessel type, location, and activity have been collected since the aerial survey project began in 2008. Survey flights were conducted pre- and post-implementation of the South Coast MPA Network. These data allow in-depth descriptions and analyses of trends in fishing activities and compliance with the new regulations associated with this network. In 2018, Vantuna Research Group and TBF published a peer reviewed scientific paper in the journal Ocean and Coastal Management. This information is very useful in the adaptive management and enforcement of the MPA network. Therefore, TBF has identified this project as a priority and will make an effort to continue conducting aerial surveys on a quarterly basis tracking fishing and boating trends in Southern California into the near-term future.

Additional accomplishments included the start of a revised CMP in 2017 and 2018 led by the TAC. This extensive effort began by evaluating the list of Bay habitats, creating new indicator categories and priorities, and developing subgroups comprised of TAC members and external expert scientists to inform

the indicator lists and monitoring plan development. The revised CMP is projected to be completed in 2019 and brought before SMBNEP's Management Committee for approval.

Climate adaptation was a key component of the 2018 CCMP Action Plan and has included integration of new data sets, targeted research, and additional partnership development.

Figure 14. Flights with Lighthawk pilots as part of aerial vessel monitoring efforts.

Goal #5: Acquire land for preservation of habitat and ecological services

Goal Summary:

Acquisition of private lands (through purchase or conservation easements) in the Santa Monica Bay (Bay) watershed provides protection of habitat for sensitive plant and wildlife species, recreational opportunities, and enables better maintenance of coastal water quality by preventing conversion to impervious surfaces. The Santa Monica Mountains National Recreation Area, which encompasses more than 150,050 acres of public parkland and lands in other private or other government ownership, is the largest urban-adjacent park in the United States. Public access to the area and its recreational facilities is made possible primarily by more than 30 years of continuous land acquisition by federal, state, and local public agencies, but also through required access easements to mitigate the impacts of private development on public access. Acquisition of habitat in the Santa Monica Mountains should be focused on lands with highest diversity or to create wildlife corridors. Areas adjacent to or supporting recreational trails and areas that are at risk of conversion to some other land use such as intensive agriculture or urban development should also be prioritized for acquisition and preservation. During this reporting period, substantial land acquisition for protection or restoration occurred.

Key Activities or Objectives:

5.1 Acquire 2000 acres of priority open space in the Santa Monica Mountains
5.2 Acquire priority parcels in urbanized areas of the watershed

Partnerships:

SCC, RCDSMM, SMMC, NPS, MRCA, municipalities, LA County, land conservancies, MRT, CNRA, private donors or landowners

Outputs:

- Acquired over 1,700 acres of land through ownership transfer to agencies or municipalities for the purpose of habitat conservation and / or restoration

Key Deliverables (Attachments):

- Attachment 33a: NEPORT Habitat reporting summary
- Attachments 33c-h: NEPORT Habitat reports by year

Short-Term Outcomes (2013-2018):

- 1,722 acres acquired during the PE review period

Long-Term Outcomes (>5 years, projected):

- Acquire 2,000 acres of priority open space in the Santa Monica Mountains through acquisition of private parcels into public ownership for preservation of habitat and ecological services
- Acquire priority parcels in urbanized areas of the watershed to implement stormwater capture or other LID and BMP practices

Pressures (2013-2018):

Goal 5 is primarily related to land acquisition and preservation, thus the climate change stressors of OA and SLR do not really affect the vulnerability of this BRP goal. Conversely, drought makes both objectives in this goal more vulnerable to climate change due to the possibility of wildfires and associated landslides or erosion. Similarly, storminess may increase the vulnerability of both Objectives, but primarily 5.2, due to storm surge or flooding. There is an associated increase in the vulnerability for several of the climate change stressors over time, notably both drought and storminess due to increased exposure and intensity. Overall, Objective 5.2 is vulnerable to more stressors than Objective 5.1. Both objectives have an inherently high adaptive capacity for the climate change stressors due to their focus on acquisition.

As the effects of climate change are expected to accelerate, shifts in vegetative communities are likely. Changes in temperature and precipitation patterns may also drive these transitions. This perspective should be included into further planning as a valued habitat that currently dominates a portion of the landscape may in the near future transgress vertically, latitudinally, or longitudinally.

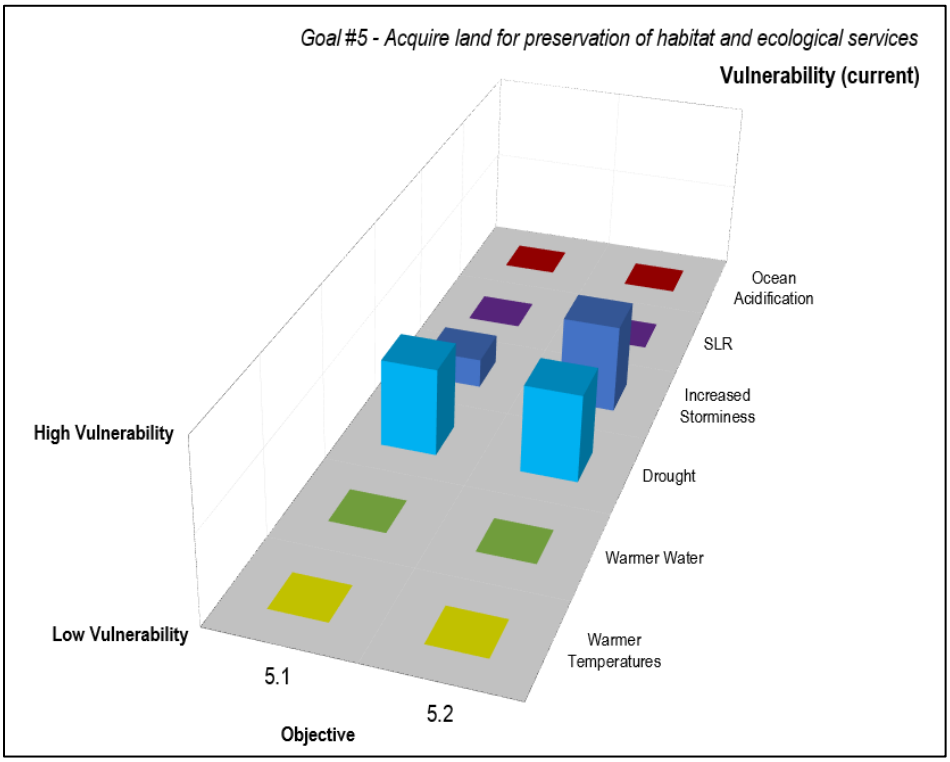


Figure 15. Goal 5 – Current Vulnerability from CCVA.

Programmatic Challenges:

- Lack of willing sellers
- Real estate values in Southern California, especially in coastal areas, makes it extremely difficult to compete for very limited funding

Overcoming Pressures:
A lack of available land and willing sellers makes transferring land to the public domain complicated. In the Los Angeles region, acquiring over 1,700 acres in a five-year period is laudable. Highly developed partnerships with land conservancies and continued support of SMBNEP's Management Conference by these entities is one of the key strengths in overcoming challenges identified for this goal.

Key Accomplishments and Conclusions:
Each acquired acre of land is important and valuable to SMBNEP, including priority areas that may be connected (or consist of) ecologically valuable habitat(s) or providing considerable services to people. Next steps will include continued participation on resources agency Technical Advisory Committees, State bond funded acquisitions, and partnership support in identification and prioritization of key acquisition or conservation easement properties.

Figure 16. Open space looking out to Santa Monica Bay in Malibu.

Goal #6: Manage invasive species

Goal Summary:

Invasive plants and animals have become globally recognized in recent years as a major threat to the integrity of natural resources. These species have the ability to invade natural systems and proliferate, often dominating a community to the detriment and sometimes to the exclusion of native species. Introduced species often also compete directly with native species for nutrients, sunlight, space, water, and other resources; they cause further indirect impacts by altering the food web or physical environment, impacting soil quality and chemistry, and reducing the production of ecosystem services provided by native species. Invasive species may also prey on or hybridize with natives. Native species with limited population size or ecological range are particularly susceptible to displacement by aggressive exotic or translocated species. Goal 6 has five objectives that range in scope from invasive species removal programs, to outreach and education, to policy objectives regarding invasive species such as preventing the importation and sale of invasive plants. Prevention methods should be foremost, but in an urbanized environment, many of our native habitats are already impacted by invasive species. Key achievements during this time period include further informing invasions of New Zealand mudsnails (NZMS), active invasive vegetation removal, improving BMPs to reduce transport and spread of invasive species, and additional research and monitoring programs to inform invasion of non-native species.

Key Activities or Objectives:

6.1 Achieve 303d listing for aquatic invasive species
6.2 Coordinate and fund public education and outreach on invasive species
6.3 Develop and adopt a plan and policies for invasive species control and prevention
6.4 Prevent importation and sale of known invasive species
6.5 Fund and conduct invasive species removal programs and projects

Partnerships:

SCC, State Parks, SWRCB, SMMC, CDFW, municipalities, LA County, MWD, NMFS, LARWQCB, Heal the Bay, NPS, RCDSMM, MRCA, Caltrans, LAWA, SCCWRP, LACDBH, LACC, PVPLC, UCSB, Pepperdine University, CRI, Cal-IPC, additional agencies, additional NGOs, additional universities

Outputs:

- Implemented invasive species removal and management projects at multiple habitats in the Bay
- Implemented best management practices to avoid spread of invasive species (e.g., NZMS)
- Increased knowledge of invasive species through monitoring and mapping efforts
- Conducted outreach and education on invasive species through community restoration events, LADWP education projects, and other outreach opportunities
- Coordinated with partners on ongoing efforts of invasive species monitoring and management to contribute to best management practices and early detection
- Partnered with MRT to conduct the invasive crayfish removal project in the Santa Monica Mountains (Las Virgenes subwatershed of the Malibu Creek watershed)

Key Deliverables (Attachments):

- Attachments 8a-b: Reports on iceplant removal efforts through community restoration at the Ballona Wetlands Ecological Reserve
- Attachments 25a-c: NZMS monitoring reports
- Attachment 38n: Outreach infographic on invasive species
- Attachment 42a: MRT crayfish removal summary report

Short-Term Outcomes (2013-2018):

- Conducted biennial NZMS surveys and report on presence and impacted stream systems
- Funded research on the impacts of New Zealand mudsnails in the Santa Monica Mountains
- Implemented invasive crayfish removal project in the Malibu Creek watershed
- Conducted invasive species removal in accordance with priority assessments across multiple restoration project sites

Long-Term Outcomes (>5 years, projected):

- Reduce impacts of non-native, invasive species on native habitats throughout the Bay and its watershed, including further invasions of high impact species (e.g., *Arundo donax*, pampas grass, iceplant, crayfish, bullfrogs, and others)
- Reduce sale and importation of non-native, invasive species
- Preserve ecosystem services of impacted habitats
- Track invasive impacts through the Comprehensive Monitoring Program

Pressures (2013-2018):

Pressures on the environment associated with this goal primarily came from the 2016 CCVA and the goal itself (i.e., impacts from non-native, invasive species). Objective 6.4 (preventing sale of invasive species) has the least overall vulnerability, the least vulnerability over time, and the fewest climate change stressors that increase its vulnerability. The other objectives are primarily vulnerable to warmer temperatures and warmer waters, in part due to temperature driven redistributions of species ranges, and the increased potential for species invasions in stressed habitats. Drought, storminess, and OA may each play a role in increasing the vulnerability of several of the objectives as well. Migration patterns or transgression of various native and non-native species may be affected by drought, increased storminess, warmer temperatures, warmer waters, sea level rise, and ocean acidification.

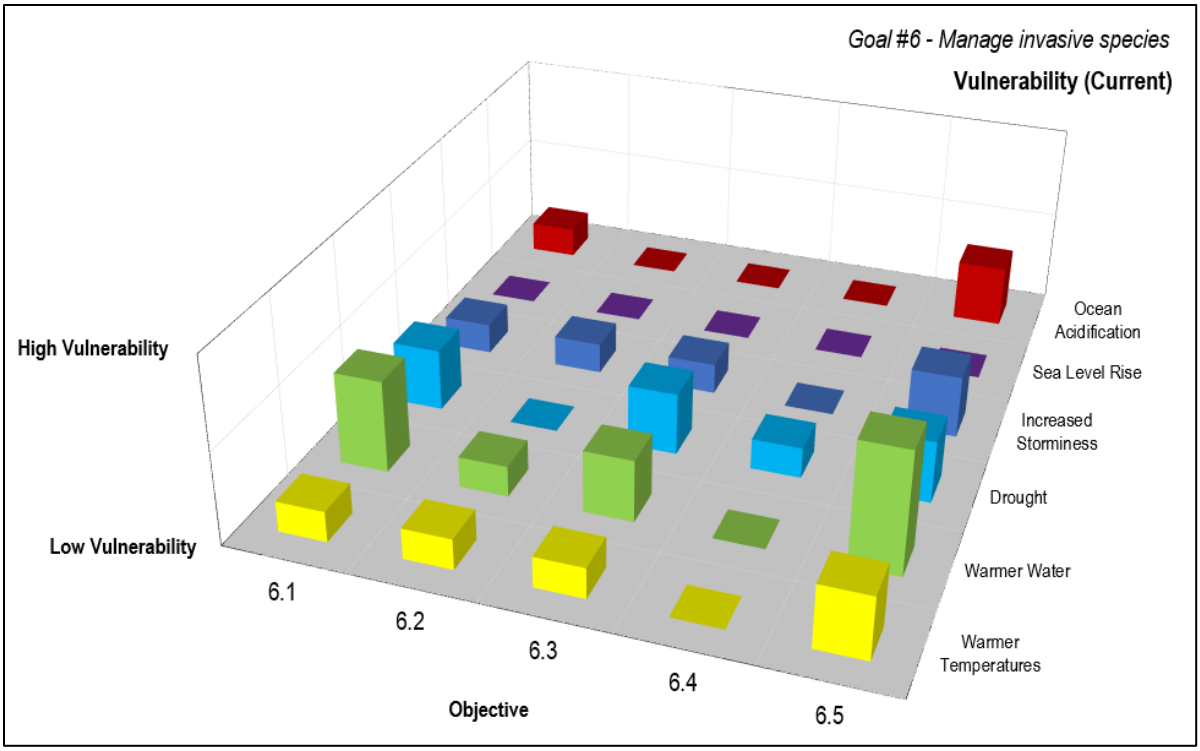


Figure 17. Goal 6 – Current Vulnerability from CCVA.

Programmatic Challenges:

- Implementing invasive species management in degraded, urbanized, habitats continued to create ongoing challenges and involved prioritizing the most impactful species
- Lack of staff and funding to conduct yearly NZMS surveys
- Nurseries are reluctant to discontinue selling popular plants when customers can travel a short distance to other suppliers
- Agencies have refused to consider banning the sale of live crayfish for bait

Overcoming Pressures:

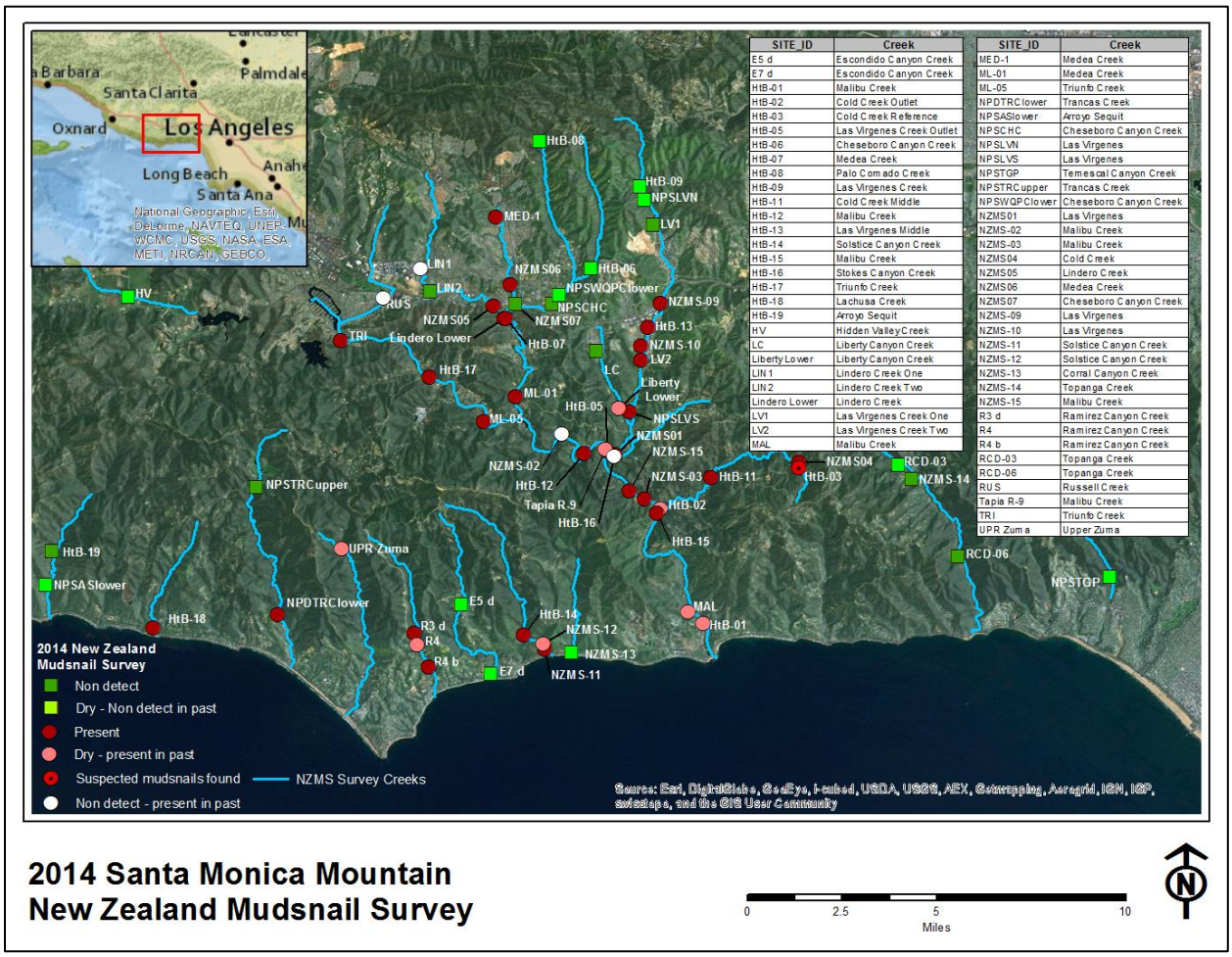
While the scale of invasive species problems varies among sites, implementing invasive species management and removal programs in highly degraded, urbanized, habitats poses challenges. Overcoming these challenges have included finding additional resources to implement invasive species management, prioritizing work based on scientific monitoring, and continuing to collaborate and expand relationships with key stakeholders in the Bay. Additional efforts to overcome challenges are ongoing.

Key Accomplishments and Conclusions:

During this period, comprehensive surveys on invasive New Zealand mudsnail presence continued and numerous invasive vegetation species management programs were implemented in habitats including wetlands, riparian areas, urban rain gardens, coastal strand/beaches, and dunes. Monitoring and data collection efforts expanded and provided an important resource towards science-based invasive species removal programs. Community restoration events continued to focus on invasive vegetation management at project sites, providing education on the importance of managing invasive species

through hands-on stewardship. One of the strengths during this reporting period was public engagement in active stewardship of multiple sites, with thousands of volunteer participants. Additionally, numerous opportunities to educate the community and public through tabling events and K-12 classroom visits occurred during this period.

Next steps will be focused on continuing New Zealand mudsnail surveys, attending and participating in Invasive Species Council of California and regional meetings focused on management of invasive species, conducting additional studies and outreach efforts to control impacts of, manage, or reduce the sale of invasive species, continuing targeted research and monitoring programs to inform priority actions, continuing partnership development and expansions, and continuing to build community restoration programs.



SITE_ID	Creek
E5 d	Escondido Canyon Creek
E7 d	Escondido Canyon Creek
HtB-01	Malibu Creek
HtB-02	Cold Creek Outlet
HtB-03	Cold Creek Reference
HtB-05	Las Virgenes Creek Outlet
HtB-06	Cheseboro Canyon Creek
HtB-07	Medea Creek
HtB-08	Palo Comado Creek
HtB-09	Las Virgenes Creek
HtB-11	Cold Creek Middle
HtB-12	Malibu Creek
HtB-13	Las Virgenes Middle
HtB-14	Solstice Canyon Creek
HtB-15	Malibu Creek
HtB-16	Stokes Canyon Creek
HtB-17	Triunfo Creek
HtB-18	Lachusa Creek
HtB-19	Arroyo Sequit
HV	Hidden Valley Creek
LC	Liberty Canyon Creek
Liberty Lower	Liberty Canyon Creek
LIN 1	Lindero Creek One
LIN 2	Lindero Creek Two
Lindero Lower	Lindero Creek
LV1	Las Virgenes Creek One
LV2	Las Virgenes Creek Two
MAL	Malibu Creek

SITE_ID	Creek
MED-1	Medea Creek
ML-01	Medea Creek
ML-05	Triunfo Creek
NPDTRClower	Trancas Creek
NPSASlower	Arroyo Sequit
NPSCHC	Cheseboro Canyon Creek
NPSLVN	Las Virgenes
NPSLVS	Las Virgenes
NPSTGP	Temescal Canyon Creek
NPSTRCupper	Trancas Creek
NPSWQPClower	Cheseboro Canyon Creek
NZMS01	Las Virgenes
NZMS-02	Malibu Creek
NZMS-03	Malibu Creek
NZMS04	Cold Creek
NZMS05	Lindero Creek
NZMS06	Medea Creek
NZMS07	Cheseboro Canyon Creek
NZMS-09	Las Virgenes
NZMS-10	Las Virgenes
NZMS-11	Solstice Canyon Creek
NZMS-12	Solstice Canyon Creek
NZMS-13	Corral Canyon Creek
NZMS-14	Topanga Creek
NZMS-15	Malibu Creek
R3 d	Ramirez Canyon Creek
R4	Ramirez Canyon Creek
R4 b	Ramirez Canyon Creek
RCD-03	Topanga Creek
RCD-06	Topanga Creek
RUS	Russell Creek
Tapia R-9	Malibu Creek
TRI	Triunfo Creek
UPR Zuma	Upper Zuma

Figure 18. 2014 Santa Monica Mountain NZMS survey.

Goal #7: Restore wetlands, streams, and riparian zones

Goal Summary:

Wetlands, streams and riparian zones are the lifeline of the Bay watershed ecosystem and their preservation and restoration is a high priority of SMBNEP. Wetlands are areas of transition between land and water, where soils, plants, and animals are adapted to periods of inundation and saturation. Wetlands are one of the most productive ecosystems in nature, providing essential habitat for a variety of species, including birds, fish, reptiles, invertebrates, and mammals. Wetland also provide substantial ecosystem services to people, including water and air filtration, carbon sequestration, flood and erosion protection, groundwater recharge, recreational and cultural values, economic benefits, fisheries support, and improvements to coastal resiliency. Today most of the streams, wetlands, and riparian zones in SMBNEP's study area have been, culverted, paved or channelized, which has resulted in the loss of their natural ability to cleanse water, recharge water supplies and store floodwater. There are eight objectives within Goal 7, primarily related to wetland restoration and stream barrier removal in the Bay and its watershed. Considerable progress has been made in this goal during this reporting period, including active restoration and monitoring projects at wetland and riparian habitats including the Ballona Wetlands Ecological Reserve, Malibu Lagoon, Stone Canyon Creek, Arroyo Sequit Creek, and many others. Additional progress has been made towards restoration planning for smaller lagoon systems in the northern Bay, via research and monitoring data, land acquisition, and environmental reporting documents. Notably, the lead agencies for the Ballona Wetlands Restoration Project (i.e., CDFW and Army Corps) released the Draft Environmental Impact Statement and Report in September 2016. TBF contributed comprehensive scientific baseline data to the process and made progress with state partners on standardizing wetland monitoring methods.

Key Activities or Objectives:

7.1 Restore Ballona Wetlands
7.2 Restore Malibu Lagoon
7.3 Remove fish barriers and open 20 miles of stream habitat to migrating steelhead trout
7.4 Restore urban streams, including daylighting culverted streams and removing cement channels
7.5 Restore Topanga Lagoon
7.6 Restore Oxford Lagoon to provide native species habitat, improved water quality, improved flood storage, and greater public access
7.7 Restore Del Rey Lagoon to improve water quality and increase wetlands habitat and public access
7.8 Restore Trancas Lagoon

Partnerships:

CDFW, Army Corps, SCC, State Parks, RCDSMM, NPS, municipalities, CNRA, SWRCB, LACFCD, LACDBH, CalTrans, FBW, Heal the Bay, City of Malibu, CRI

Outputs:

- Implemented the Arroyo Sequit Creek fish barrier removal and restoration project
- Provided technical assistance to lead agencies (CDFW and Army Corps) for the development of the Draft EIS/R for the Ballona Wetlands Restoration Project

- Conducted ongoing invasive plant removal efforts and biological monitoring at the Ballona Wetlands Ecological Reserve within a 3-acre area
- Conducted ongoing invasive plant removal efforts and long-term biological, physical, and chemical monitoring at Malibu Lagoon
- Completed the Wetland Program Development Grant to consolidate regional Level 3 wetland monitoring data
- Conducted ongoing invasive plant removal efforts and monitoring at Stone Canyon Creek and develop a long-term stewardship plan for the site

Key Deliverables (Attachments):

- Attachment 7a: Final report for the Arroyo Sequit fish barrier removal project
- Attachments 8a-o: Ballona Community Restoration Project
- Attachments 9a-g: Ballona Reserve Monitoring
- Attachments 23a-f: Malibu Lagoon Long-Term Monitoring Program
- Attachment 29g: Final Report for Oxford Basin Enhancement Project
- Attachments 38a-o: Wetland Outreach
- Attachments 39a-d: Wetland Program Development Grant (through 2015)
- Attachments 40a-d: Wetland Program Development Grant (through 2019)

Short-Term Outcomes (2013-2018):

- Removal of three fish barriers, including one check dam and two Arizona stream crossings at Arroyo Sequit Creek and construction of two bridges
- Enhanced several acres of wetland and transition habitat through invasive species removal and native vegetation planting
- Acquired funding to initiate and continue community-based restoration efforts at the Ballona Wetlands Ecological Reserve, including partnership development
- Encouraged recreation and stewardship at the Ballona Wetlands Ecological Reserve in the form of community restoration and education events, tours, and student classroom engagement
- Maintained the 12-acre restoration project at Malibu Lagoon as an ecologically functioning native wetland and adjacent habitat system in accordance with permit requirements
- Enhanced statewide understanding of coastal wetland systems and assisted with the standardization of wetland monitoring
- Continued to manage invasive species along a remnant stream reach (approximately 200 m) at UCLA's Stone Canyon Creek
- Enhanced understanding of the spread of invasive species and impacts to native species through long-term monitoring, targeted research, and CMP implementation
- Increased understanding in the extent of climate change impacts and community support for climate change adaptation planning

Long-Term Outcomes (>5 years, projected):

- Restore 577-acre Ballona Wetlands Ecological Reserve to improve wetland, transition, and upland habitats, functions, and services

- Create public access trails and bike paths and encourage recreation and stewardship at the Ballona Wetlands Ecological Reserve
- Maintain and expand the 12-acre restoration project at Malibu Lagoon as an ecologically functioning native wetland and adjacent habitat system
- Maintain an ecologically functioning, native stream reach (> 200 m) at UCLA's Stone Canyon Creek
- Determine if NZMS impacts are severe enough to warrant the use of biological control methods through an evaluation of long-term data trends
- Increased understanding and stewardship of Bay and watershed habitats

Pressures (2013-2018):

Across the board, this goal has high vulnerability to many of the identified climate change stressors, most notably to warmer water. Impacts to Goal 7 objectives due to warmer waters may include an increase in the potential for eutrophication in shallow water systems, lowering levels of dissolved oxygen, impacting fish and invertebrate life cycles, altering primary productivity, etc. While organisms in shallow water systems may have a higher tolerance (i.e., adaptive capacity) for thermal variation, higher exposure levels are already occurring, and many species are highly sensitive to warmer water temperatures, thus presenting a high level of vulnerability for all Goal 7 objectives.

Coastal wetlands are highly vulnerable to SLR, but would have some adaptive capacity through transgression upslope, if there was adjacent open space for restoration. However, most of the coastal wetland systems in the Santa Monica Bay Watershed are surrounded by urbanization and have very constrained boundaries, reducing their capacity to shift habitats upslope with SLR, and lowering their adaptive capacity.

The sensitivity ranking for storminess was often indicated as high in many of the objectives in this goal. Both open and closed coastal estuarine systems are sensitive to both wave erosion and flooding from urban, impervious watersheds. Some of the projects (e.g., Objective 7.1: Ballona Wetlands) may have restoration elements designed to accommodate altered storm patterns, thus increasing their adaptive capacity and lowering the overall vulnerability ranking for that objective.

Drought may potentially impact both streams and coastal wetland systems, altering hydrology, causing less freshwater input to both systems, and having the potential to have cascading trophic impacts over time. Both drought and increased storminess have the potential to alter hydrological patterns, salinity, and water quality. OA has some level of vulnerability across many of the objectives in this goal, primarily due to potential impacts to shellfish or invertebrates. The exception to OA vulnerability is Objective 7.4, which is related to urban stream restoration.

Overall, Objectives 7.2, 7.5, 7.7, 7.6, and 7.8 have similar vulnerability for many of the climate change stressors because they are all describing small coastal wetland systems. Impacts caused by multiple climate change stressors may be related to species invasions or stress to different groups of species, and impacts to food webs or productivity. Vulnerability for all objectives increases in 2050 and 2100, especially for warmer water in 2050 and for increased storminess and SLR in 2100, primarily due to increases in exposure and intensity of these stressors over time.

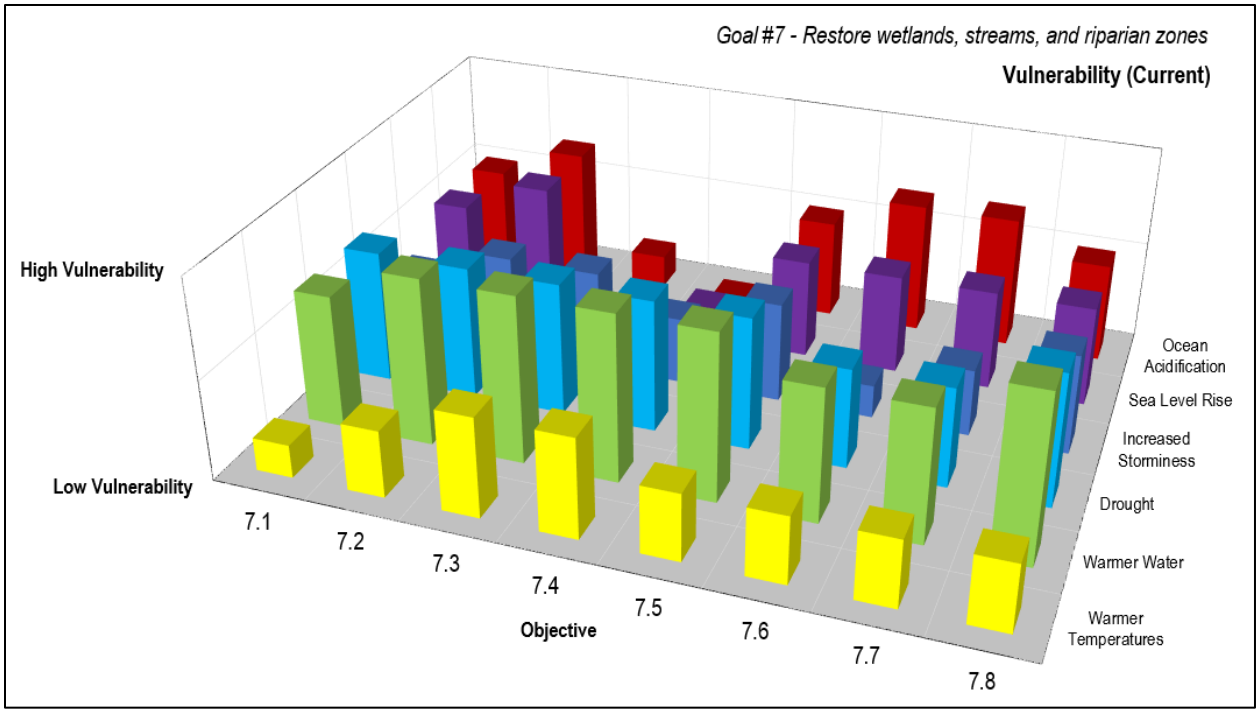


Figure 19. Goal 7 – Current Vulnerability from CCVA.

Additional pressures or stressors include invasive species, alteration of natural flow regimes, deposition of excessive sediments, and habitat alterations.

Programmatic Challenges:

- Extensive permitting processes for invasive species removal

Overcoming Pressures:

The community restoration projects identified in the short-term outcomes above all benefit from substantial volunteer support and partnerships from key stakeholder groups who show extensive commitment to active stewardship of sites (i.e., UCLA, Friends of Ballona Wetlands). Continuing to expand innovative partnerships and conduct robust and scientific analyses in the form of repeated monitoring surveys allows for meaningful progress and engagement on these important projects and furthers the conversations with permitting agencies such as the CA Coastal Commission.

Key Accomplishments and Conclusions:

Notably, Objectives 7.2, Restore Malibu Lagoon and 7.6, Restore Oxford Lagoon to provide native species habitat, improved water quality, improved flood storage, and greater public access were completed during this review period. Reports are available in the form of key deliverables listed above, and these actions will continue to generate monitoring data and assessments in the subsequent review period. The long-term comprehensive monitoring program for the Malibu Lagoon Restoration and Enhancement Project evaluated the condition of the post-restoration Lagoon through biological, physical, and chemical surveys. In 2018, a five-year Comprehensive Monitoring Report was completed and released in July, and a subset of surveys continued into a final year of monitoring. The Lagoon

continues to have improved circulation, water quality, and overall condition. Public restoration events are held monthly to remove non-native, invasive vegetation.

During this review period, the Arroyo Sequit Fish Passage project (supporting Objective 7.3) was implemented by State Parks between August 2014 and March 2017. The project required the removal of one five-foot-tall and thirty-foot-wide check dam and the replacement of two at-grade Arizona stream crossings with free span bridges. To determine the success of the project, State Parks designed a monitoring program to conduct steelhead trout snorkel surveys, collect benthic macro-invertebrate samples using the Storm Water Ambient Monitoring Protocol (SWAMP), and to conduct topographic stream channel surveys.

The Community-Based Restoration Project at the Ballona Reserve removed iceplant and invasive, non-native, vegetation from approximately 0.75 acres through June 2018 in heavily degraded habitats through community restoration events. Since the beginning of community restoration events in 2016, and during this PE period, over 20 restoration events have been held with over 200 volunteers participating. Two publicly available annual reports were released in July 2017 and July 2018. Year 2 results indicated a significant reduction in non-native vegetation cover in most areas as compared to the baseline, and an increase in native vegetation cover. Ongoing invasive vegetation removal, monitoring, and revegetation efforts will continue in 2019.

Restoration efforts through community restoration events to manage invasive, non-native, vegetation continued at Stone Canyon Creek at UCLA. Efforts continued during this PE period towards increasing regional understanding of the condition of local coastal wetland systems and applying that knowledge towards standardizing wetland monitoring across the state of California. This long-term program has many partners and scientific stakeholders and will be completed in 2019.

Figure 20. Left: Fish survey at Malibu Lagoon on 20 February 2019.; Right: National Estuaries Week Restoration Event at the Ballona Wetlands Ecological Reserve on 19 September 2018.

Figure 21. Top, before, and bottom, after, restoration event at BWER on 8 February 2019. TBF and the Los Angeles Conservation Corps removed non-native vegetation and seeded with native species.

Figure 22. Arroyo Sequit barrier removal project and bridge construction.

Figure 23. CRI Intern and partners conducting monitoring at Malibu Lagoon.

Goal #8: Restore coastal bluffs, dunes, and sandy beaches

Goal Summary:

Sandy beaches in Santa Monica Bay extend for approximately 51 km, with 56% of those beaches actively managed through implementation of grooming (raking) of the sand. The beaches of the Bay are iconic and provide significant services in the form of socio-economic benefits of recreational activities. Bay beaches have changed dramatically over the last century, primarily through beach nourishment which added tens of millions of cubic meters of sand to the shore resulting in wider, flattened beaches. Similarly, large coastal dunes have experienced impacts and significant reductions due to development, with remnant dune systems managed by Los Angeles World Airports (LAWA), Hyperion, Chevron, at the Ballona Reserve (CDFW), and in smaller areas along beachfront properties. These dune areas are largely located in the South Bay, though foredune systems also extend as far up as Malibu. The costal dunes, bluffs, and sandy beaches are important habitats that support a variety of plant and animal species, including several rare native plants that are uniquely adapted to this environment. They also provide the only remaining habitat for the El Segundo Blue Butterfly, California Least Tern, and Western Snowy Plover, all of which are federally listed endangered species. Many sandy beaches in the Bay are also important sites for grunion runs during their annual spawning season. During this reporting period SMBNEP and their partners engaged in active dune restoration and improved sandy beach management practices to benefit native vegetation, wildlife, improved coastal resilience, and benefits to people. Many of SMBNEP's partners, including LAWA, LA County, City of Santa Monica, City of Malibu, City of Manhattan Beach, and City of Los Angeles, have taken significant efforts to improve implementation of BMPs along beaches and take active efforts towards habitat restoration, in partnership with NGOs such as Audubon Society and Friends of Ballona Wetlands.

Key Activities or Objectives:

8.1 Restore native coastal bluff and upland scrub habitat
8.2 Protect and manage sandy beach habitats

Partnerships:

State Parks, LAWA, Cities of Santa Monica, Malibu, Manhattan Beach, Los Angeles, additional coastal municipalities, LACDBH, SCC, UCSB, USGS, CRI, CDFW, PVPLC, USFWS, CCC, FOLD, Friends of Ballona Wetlands, Audubon Society (multiple chapters), stakeholders and volunteers, universities

Outputs:

- Assisted LAWA in Coastal Development Permit (CDP) requirements for the Coastal Dunes Improvement Project at the LAX Dunes (6-acre parcel area) through biological monitoring and non-native, invasive plant management
- Assisted LAWA in maintaining a larger 48-acre northern dune area at LAX Dunes through non-native, invasive plant removal and monitoring efforts
- Continued long-term monitoring and maintenance of Santa Monica Beach Restoration Pilot Project to inform restoration to improve coastal resilience in accordance with the Monitoring and Implementation Plan

- Continued work to develop restoration and monitoring plans, conduct community engagement, and obtain necessary permits to begin implementation of the Malibu Living Shorelines Project
- Identified funding for the Los Angeles Living Shoreline Project

Key Deliverables (Attachments):

- Attachments 30a-i: Final materials for the Santa Monica Beach Restoration Pilot Project
- Attachments 21a-d: Reporting materials for restoration and monitoring efforts at the LAX Dunes (SCC Explore the Coast and reporting for LAWA)

Short-Term Outcomes (2013-2018):

- Continued efforts to restore and maintain the 6-acre Coastal Dunes Improvement Project and larger 48-acre northern dune area at the LAX Dunes to improve native dune functions and provide habitat for rare species
- Provided coastal access and stewardship opportunities at dune and beach habitats for underserved communities and youth through monthly community restoration events
- Restored 3 acres of ecologically functioning coastal strand and dune habitat along Santa Monica Bay beaches to increase coastal resilience, evaluate soft-scape adaptation, and provide habitat for wildlife
- Increased regional understanding of beaches as adaptive management strategies for climate change stressors through long-term monitoring and targeted research
- Increased understanding in the extent of climate change impacts and community support for climate change adaptation planning

Long-Term Outcomes (>5 years, projected):

- Restore 48 acres of LAX Dune Preserve system to improve native dune functions and provide habitat for rare species
- Restore 10 acres of ecologically functioning coastal strand and dune habitat along Santa Monica Bay beaches to increase coastal resilience and as habitat for rare species
- Inclusion of climate change adaptation measures in at least half of the 12 local coastal jurisdictions general plans (or equivalent) amendments
- Increased understanding and stewardship of Bay and watershed habitats

Pressures (2013-2018):

Goal 8 includes a diverse set of habitats with sandy soils vulnerable to different climate change stressors. However, both objectives in this goal include some similar potential impacts, including species invasions, increased competition and use of water resources, and impacts to bird migration patterns and the Pacific Flyway. Temperature driven species redistributions are likely to be seen in several of these habitat types. Both objectives are likely to see climate change-related impacts to sediment management directly related to drought and increased storminess, potentially increasing the consideration of management alternatives relating to hard-scape structures (e.g., armoring, levees).

Both objectives are vulnerable to drought and increased storminess, but, due to its geographical proximity to the ocean and associated stressors, Objective 8.2 has several additional climate change stressors and is increasingly more vulnerable overall, over time.

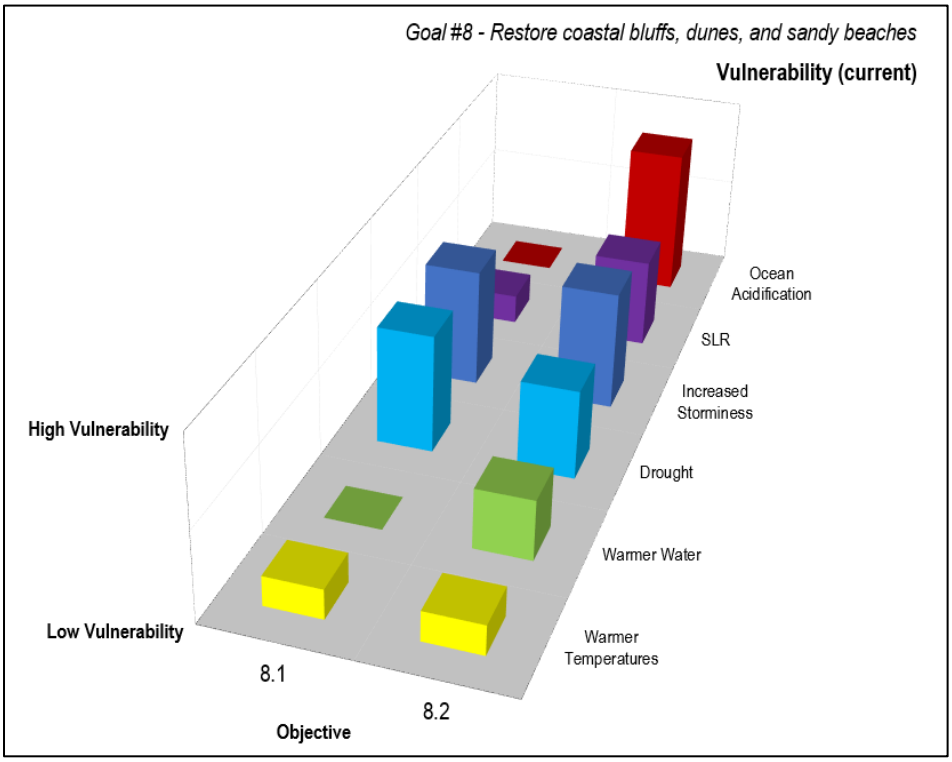


Figure 24. Goal 8 – Current Vulnerability from CCVA.

Programmatic Challenges:

- Funding limitations
- Stakeholder engagement

Overcoming Pressures:

As new projects are developed in response to the need for real demonstrations of coastal adaptation solutions, funding limitations have been overcome by engaging stakeholders and opportunistically applying for grant funding. Additionally, stakeholder engagement pressures continue to be overcome by forming stronger partnerships, presenting at important city council or local government meetings, and developing strategies to incorporate adaptation solutions to restore coastal bluffs, dunes, and sandy beaches into planning documents. This goal has a number of success stories tied to substantial public engagement efforts and incorporating stakeholder feedback into planning efforts.

Key Accomplishments and Conclusions:

In partnership with Los Angeles World Airports and Friends of the LAX Dunes, TBF conducted monthly volunteer restoration events at the LAX Dunes system from 2015-2018 to remove invasive vegetation and teach the local community about the importance and resilience of coastal dune systems. Additionally, TBF coordinated biological monitoring activities in 2017/18 and lead partners in larger-

scale invasive plant removal efforts. In 2018 alone, 689 volunteers completed over 2,000 hours and pulled over 650 bags of invasive, non-native vegetation. In 2018, the program had volunteer participants from over 200 unique zip codes, with many of them from disadvantaged inland communities. Lastly, the project engaged the Los Angeles Conservation Corps to conduct large-scale invasive vegetation removal. Two reports were produced in June 2018, the Year 2 Report summarizing community restoration efforts and an Ecological Monitoring Report.

Figure 25. Top: Community restoration event at the LAX Dunes on 23 February 2019.; Bottom: Coastal Cleanup Day at the LAX Dunes on 15 September 2018.

The Santa Monica Beach Restoration Pilot Project is restoring approximately three acres of sandy coastal habitat on the beach in the City of Santa Monica. The project is reestablishing native vegetation on the beach aiming to create a sustainable coastal strand and foredune habitat complex resilient to sea level rise. Beginning in December 2016 when the project was implemented, native dune vegetation and sand hummocks began to establish, and a long-term monitoring program was established to inform climate change resiliency planning and the City of Santa Monica's Local Coastal Plan Update. A Year 2 Annual Report was produced in August 2018 identifying the growth of plant hummocks in some areas of the site of up to 1 meter. This project has continued to engage the community and has become a beacon of hope in the face of sea level rise for coastal municipalities across the region.

Figure 26. Top: Santa Monica Beach Restoration Pilot Project on 13 December 2016, shortly after implementation; Bottom: Project post-restoration.

Additional efforts in this reporting period worked to fill important data gaps identified in the Comprehensive Monitoring Program in partnership with CRI, including the implementation of a beach characterization study aimed at informing indicators in the CMP. Targeted studies were also conducted on rare species such as the El Segundo Blue Butterfly and Western Snowy Plover. The monitoring program also worked towards the development of a site-suitability analysis to determine additional potential areas for beach and dune restoration projects. Additional research was conducted on the potential benefits of restored beaches on human health (e.g., reduced cortisol levels).

Next steps will build on the successful models developed during this PE review period, including at least three new living shoreline and beach/dune restoration projects (i.e., Malibu Living Shoreline Project at Zuma Beach, Los Angeles Living Shoreline Project at Dockweiler Beach, and the Manhattan Beach Dune Restoration Project along northern Manhattan Beach). New partnerships will also continue to be explored.

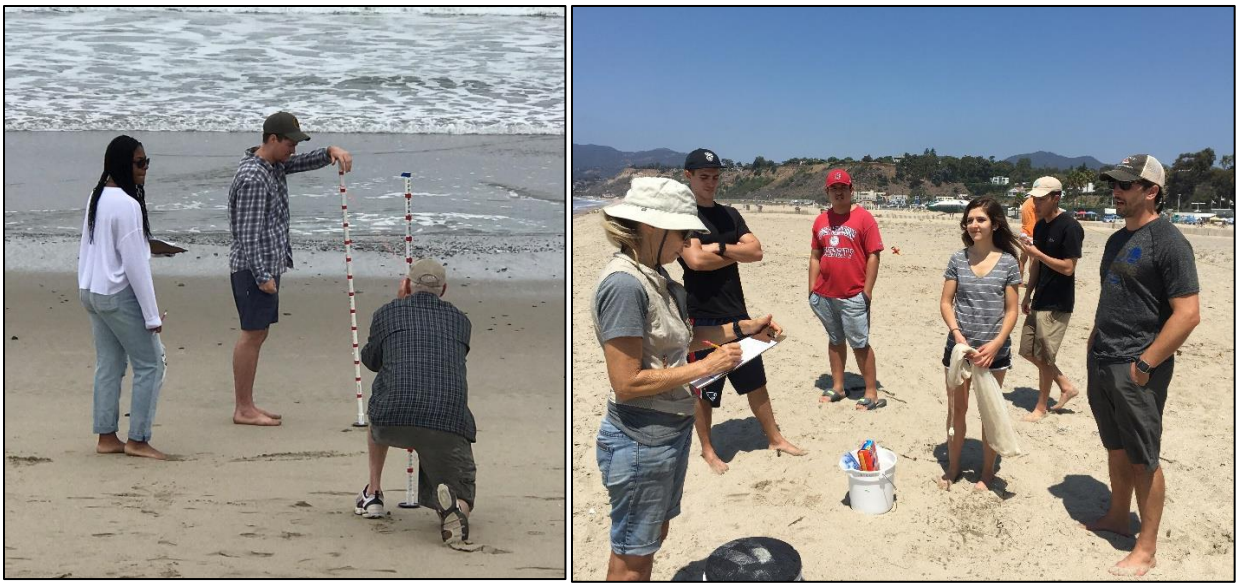


Figure 27. Left: Dr. John Dorsey (Loyola Marymount University) with students conducting beach surveys in partnership with the Coastal Research Institute on 24 May 2018.; Right: CRI Interns and partner organizations conducting monitoring at the Santa Monica Beach Restoration Pilot Project.

Goal #9: Restore intertidal and subtidal habitats

Goal Summary:

Intertidal zones are transition areas which are exposed during low tides and submerged during high tides and which comprise approximately 31 km of the Bay's shores (38% of shoreline). Subtidal habitats are part of the nearshore ocean environment that are relatively shallow but submerged by water. The subtidal zone in Santa Monica Bay is characterized by hard-bottom rocky reefs and outcrops along the Malibu and Palos Verdes coasts and soft bottoms in mid-Bay. This environment provides habitat for species of algae such as giant kelp, and many invertebrates; abalone, lobster, rock scallops and crab that are important to recreational and commercial fishing interests. Rocky intertidal habitats are home to hundreds of species of birds, fish, mammals and other wildlife. Organisms living in the rocky intertidal habitats are important links in the aquatic food web and serve as indicators of the overall health of the marine habitat. Significant progress was made during this reporting period in reaching some of the outcomes identified in this goal, including restoration of rocky reef kelp forests, benefits to several species of abalone, and initial research towards seagrass and eelgrass restoration.

Key Activities or Objectives:

9.1 Restore and monitor sixty acres of kelp forest
9.2 Protect and manage rocky intertidal habitat
9.3 Re-introduce and restore abalone population
9.4 Assess and protect seagrass habitats

Partnerships:

NOAA, CDFW, MSRP trustees, NMFS, Vantuna Research Group, Commercial Sea Urchin Harvesters, SCMI, SCC, State Parks, LACDBH, Cal Poly Pomona, NFWF, UCLA, Bodega Marine Lab, White Abalone Recovery Consortium, Southwest Fisheries Science Center, SCCOOS

Outputs:

- Conducted urchin culling and pre- and post-restoration compliance monitoring for 6 kelp restoration sites
- Conducted quarterly monitoring of green outplanting locations
- Maintained and supported the Abalone Research Laboratory at SCMI
- Spawned and reared red abalone larvae and juveniles to improve techniques and increased success of these efforts
- Acquired endangered species permit to begin holding and rearing of endangered white abalone in southern California
- Constructed second abalone research laboratory at SCMI
- Collected additional data on ocean acidification to improve regional OA models
- Completed kelp forest hydrodynamic monitoring and water chemistry study in one restored site

Key Deliverables (Attachments):

- Attachments 1a - 1f: Abalone restoration final reports
- Attachment 16a: Kelp forest hydrodynamics study final report to SCC

- Attachments 18a - 18o: Kelp restoration final reports
- Attachment 26a: UCLA report on kelp forests as OA refugia

Short-Term Outcomes (2013-2018):

- Restored 46.9 acres of kelp forest to improve habitat functions, local fisheries, and coastal resilience
- Increased kelp, invertebrate, and overall fish diversity and biomass in restoration areas; 168% increase in red urchin gonad (uni) weight in restored sites (fishery benefit)
- Informed Abalone Recovery and Management Plan (ARMP) through monitoring
- Increased understanding in the extent of climate change impacts and community support for climate change adaptation planning
- Increased understanding on the spatial extent of the Bay and Southern California Bight vulnerable to ocean acidification and hypoxia
- Helped predict and visualize historical, current, and future habitat compression for ecologically and economically important fish and invertebrate species due to ocean acidification or hypoxia (e.g., oysters, urchins, mussels, abalone)
- Increased understanding of kelp forest influence on wave attenuation and ocean chemistry as potential local buffers from climate change impacts such as OA and increased storminess

Long-Term Outcomes (>5 years, projected):

- Restore 150 acres of kelp forest to improve habitat functions, local fisheries, and coastal resilience
- Establish 2-3 minimally viable green and red abalone populations (at least 2,000 abalone per hectare) in the Bay
- Establish 1-2 viable white abalone populations (at 2,000 abalone per hectare) in the Bay
- Increased understanding and stewardship of Bay and watershed habitats

Pressures (2013-2018):

2015-2016 proved to be one of the most powerful El Niño signatures recorded on the west coast of the United States. This El Niño event followed and was perhaps strengthened by the persistence of "the blob", a large area of atypically warm ocean surface water that impacted the California Current. For Palos Verdes and elsewhere in southern California, these environmental factors resulted in abnormally high sea surface temperatures, which were only punctuated periodically by localized upwelling events. The thermal related stress associated with the confluence of these stressors slowed or prevented the development of giant kelp and other macroalgae and may have contributed to the virulence and mass wasting of several genera of sea stars and in the fall of 2015 a seemingly similar yet less widespread wasting of sea urchins. Urchin numbers decreased significantly during this time period and culling operations were halted to monitor how the urchin population was changing in the area. Restoration work resumed after nine months when all signs of the disease had passed, and it was determined that high urchin density persisted in the barren areas. These conditions also affected wild abalone broodstock, collected for deck spawning experiments. Gonad development was poor due the lack of food (kelp) and warmer waters and none of the spawning attempts resulted in viable larvae.

All four objectives under this goal will be affected at varying degrees by climate change stressors. The stressor that was ranked with the highest initial vulnerability for all four objectives was warmer water. This stressor is already affecting these nearshore habitats and is having significant impacts on the community structure. The ability of these systems to be resilient to prolonged exposure to warmer waters is low, and the objectives all have either a medium or low ranking for adaptive capacity to this stressor. The intertidal habitats (i.e., Objectives 9.2 and 9.4) are also vulnerable to SLR, with the potential to convert to subtidal habitats over time.

One of the largest unknowns for this goal is OA. This stressor has the potential to have significant effects on intertidal and subtidal habitats, especially Objective 9.3, restoring abalone to the Bay. Overall, several of the stressors that are prominent in this goal area also showing a medium level of current exposure, as the effects and impacts are already being expressed in the systems (e.g., warmer waters and OA).

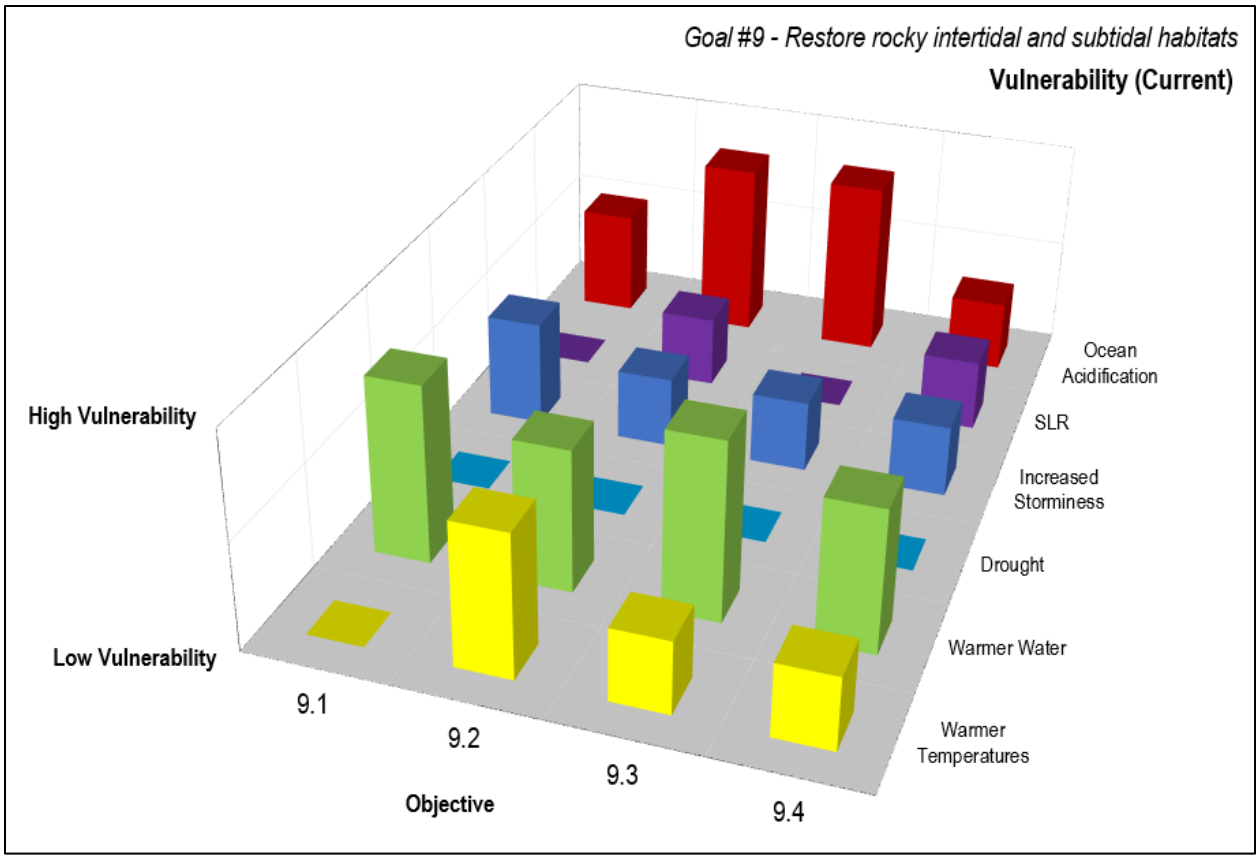


Figure 28. Goal 9– Current Vulnerability from CCVA.

Programmatic Challenges:

- Equipment needs, including boat and abalone laboratory
- Construction of second abalone research lab required additional staff support to care for the animals and systems.

Overcoming Pressures:
The large scale and increased scope of the kelp and abalone restoration projects required additional diver support, which prompted TBF to purchase a research vessel in 2017. This vessel can accommodate 6-8 divers and all required gear to carry out project activities. Additional fulltime staff were hired on to the Marine Programs team to assist with dive operations and abalone husbandry.

Key Accomplishments and Conclusions:
The Kelp Forest Restoration Project made considerable advancements during this reporting period, including baseline monitoring, restoration activities, and post-restoration monitoring. Commercial fishermen and TBF scientists restore and monitor these reefs, respectively, as they are transformed from urchin barrens to kelp forests. A total of 46.9 acres have been restored since the project began in 2013. Scientific divers and commercial sea urchin harvesters have logged over 7,500 hours underwater restoring and monitoring the rocky reefs.

Figure 29. Kelp restoration project, Honemoon Cove, before restoration.

Figure 30. Kelp restoration project, Honemoon Cove, after restoration.

Juvenile green abalone were outplanted in a restored kelp forest site off Palos Verdes in 2015. Through quarterly monitoring surveys we have observed an increase in abalone within the 10m by 10m site from 10 individuals to over 150. The construction of two abalone research laboratories at SCMI increased the capacity to hold and rear red and green abalone as well as provided opportunity to further improve spawning and culturing techniques. One lab has been solely dedicated to support white abalone recovery efforts off the southern California coast and will serve a staging center for future outplanting of this endangered species.

The Southern California Kelp Forest Hydrodynamics Study was implemented at one restoration site to assess the potential for kelp forests to attenuate wave energy, possibly providing additional protection to adjacent shorelines by decreasing sediment transport and/or damping waves before they reach the shoreline. Preliminary results from this project contributed to a successful proposal, funded through USC Sea Grant, which aims to investigate the feedbacks between chemical and physical processes within the kelp forest. The continuation of this work will provide important environmental and physical context for the restoration efforts that will benefit interpretation of results of restoration efforts and partner projects.

Next steps include continuing to implement the kelp forest restoration project, conducting biological response monitoring of restoration areas, developing recommendations for the deposition of materials from Rindge Dam or other suitable sources to augment sediment supply, continuing the hydrodynamics study, and conducting carbon sequestration assessment of kelp restoration project. Further next steps include establishing abalone outplanting sites and conducting juvenile and larval outplanting, continuing to monitor abalone restoration and reference sites, captive spawning abalone, and maintaining the aquaculture facility for multiple species of abalone.

Figure 31. A green abalone in a rock crevice next to a purple urchin.

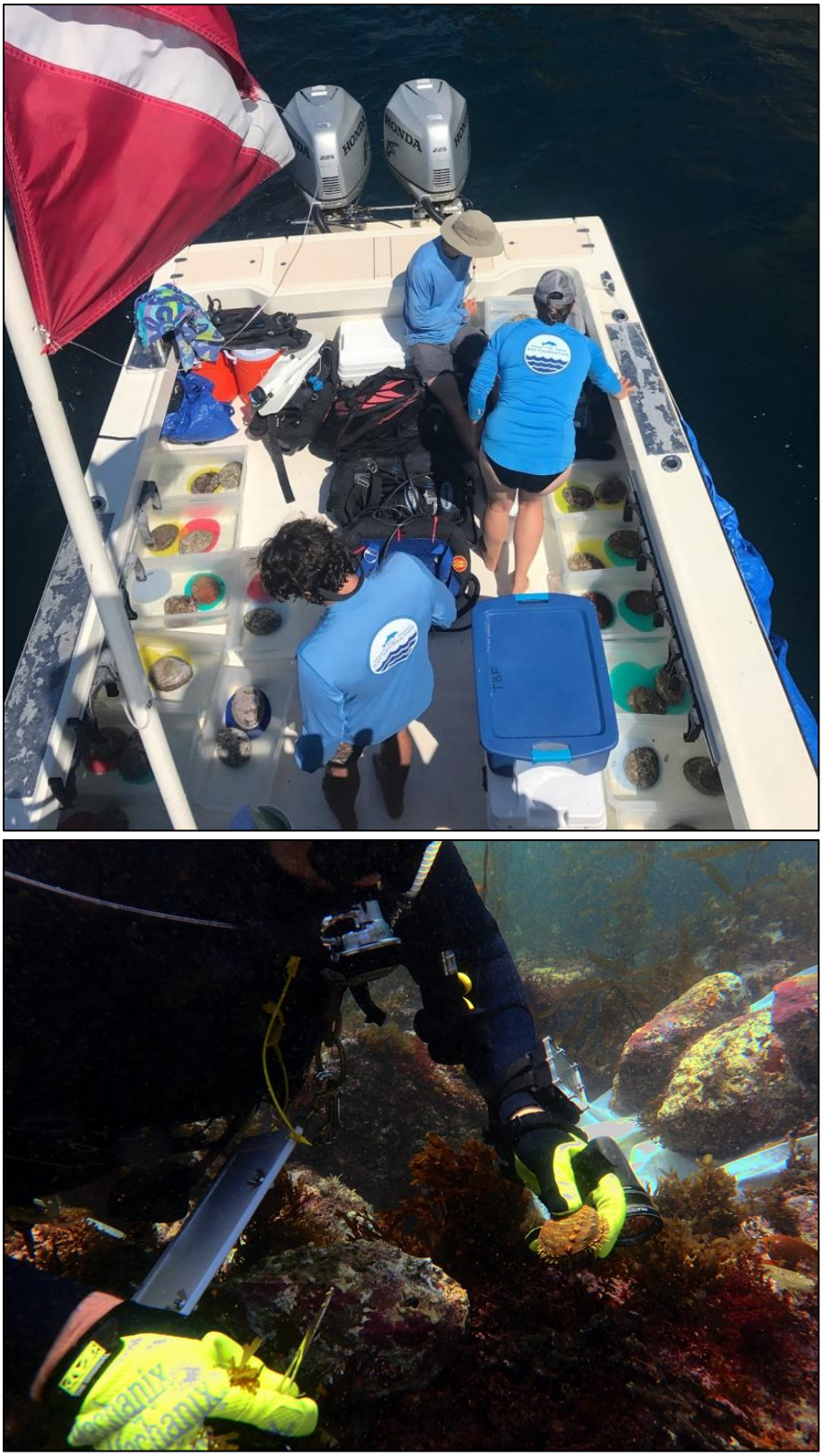


Figure 32. Top: Green abalone deck spawning off Catalina Island; Bottom: Collecting tissue samples for genetic analysis from juvenile abalone at outplant site.

Goal #10: Protect and restore open ocean and deep water habitats

Goal Summary:

The 306 square miles of open ocean in Santa Monica Bay provides three types of marine habitats: pelagic, soft-bottom, and hard-bottom. The pelagic habitat, or open waters community, is volumetrically the largest habitat in the Bay, extending from the surface to depths of over 1,600 feet. The pelagic environment supports a wide range of organisms of all trophic levels including planktonic (e.g., bacteria, phytoplankton, and zooplankton) and nektonic (e.g., fish, sharks, and whales). The pelagic environment also supports pinnipeds (seals and sea lions) and cetaceans (e.g., whales, porpoises, and dolphins). Major threats to the health of the pelagic habitats include overfishing, pollutant loading, impingement and entrainment, climate change, and harmful algal blooms. Aside from bathymetry, much of the sea floor of the Bay is unexplored, despite its proximity. Advancements in remote technologies and environmental monitoring have removed or reduced the barriers to the exploration of these habitats. While Goal 10 only has two objectives, they are very different, with Objective 10.1 as an expansion of knowledge and understanding for unique habitats, and Objective 10.2 as an evaluation of open ocean harmful algal blooms, or HABs, and their associated impacts. Progress made during this reporting period included new data inclusion into the CMP and additional information to support filling regional data gaps.

Key Activities or Objectives:

10.1 Update and expand knowledge of unique habitats within Santa Monica Bay
10.2 Assess harmful algal bloom and its causes and impacts on the Bay's Ecosystem

Partnerships:

SCCWRP, LACSD, SCCOOS, CRI, UCLA, Blue Robotics, LA Waterkeeper, other universities

Outputs:

- Conducted test dives with TBF's ROV, R2Deep2 in the Bay including a new 'arm' attachment
- Deployed sensor array off Palos Verdes Peninsula to fill ocean acidification data gap
- Partnered with SCCOOS to bring the Santa Monica Pier water quality station back online and its associated live data stream to the public (including a chlorophyll sensor that acts as a proxy for HAB detection)

Key Deliverables (Attachments):

- Attachment 26b: Ocean acidification in Santa Monica Bay webinar

Short-Term Outcomes (2013-2018):

- Increased understanding of the extent of climate change impacts from ocean acidification through deployment of OAH sensor array off Palos Verdes Peninsula
- Increased understanding of unique habitats within the Bay, e.g., deep reefs and canyons

Long-Term Outcomes (>5 years, projected):

- Development and implementation of adaptation strategy addressing impacts of ocean acidification in the Bay
- Increased understanding of unique habitats within the Bay, e.g., deep reefs and canyons
- Enhance functions and conditions of deep marine environments (e.g., deep reefs) in the Bay

Pressures (2013-2018):

Goal 10 has two objectives that are quite different, with one relating to unique habitats and the second an evaluation of HABs and their associated impacts. As the goal is focused on open ocean habitats, it is likely that several of the stressors tied to oceanic waters will increase the vulnerability of both objectives, primarily warmer water, increased storminess, and OA. Overall, the vulnerability for these aforementioned stressors are higher for Objective 10.2 because the extent of harmful algal blooms are known to be more directly tied to warmer water, increased nutrient loading from larger storms, and OA. While both objectives are tied to evaluations and monitoring which can be restructured adaptively, both objectives are identified as data gaps for our region and need significantly more information to derive good conclusions.

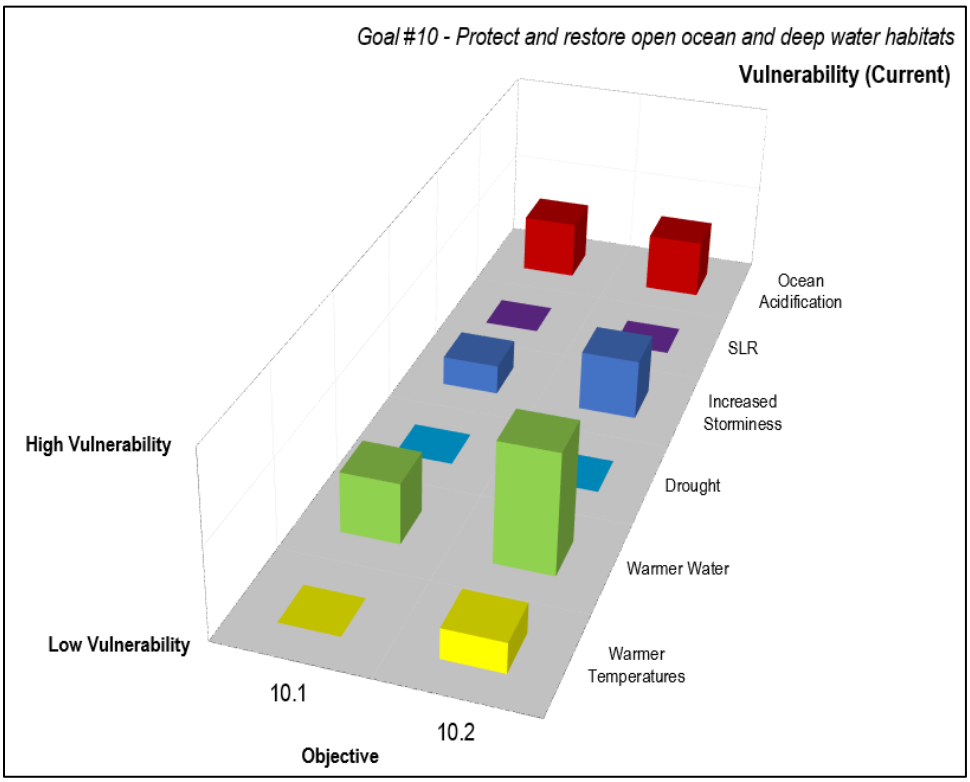


Figure 33. Goal 10 – Current Vulnerability from CCVA.

Programmatic Challenges:

- Technological availability and cost

Overcoming Pressures:
New and innovative technology, with lower cost ranges, have provided opportunities to acquire technology to aid in implementing objectives under Goal 10. Additionally, exploring new partnerships through local government agencies, universities, and private companies such as Blue Robotics have provided increased capacity towards collecting and analyzing data and utilizing equipment.

Key Accomplishments and Conclusions:
During this PE period, partnerships were initiated to develop innovative ways to use technology and expand knowledge of unique habitats in Santa Monica Bay. Efforts have been made to field test and deploy an ROV and explore methods to utilize this technology to aid in data collection.

Next steps will be focused on continuing and expanding ROV deployments in additional habitats to collect multiple forms of data, to continue to identify and apply emerging technology and techniques to better characterize Bay habitats in support of CMP implementation, and to continue to build new and existing partnerships with universities such as CRI to broaden data and research objectives. The development of funding and partners to generate fine scale accurate bathymetric maps and images will remain a high priority for SMBNEP.

Figure 34. Underwater ROV, R2Deep2, deployment in Santa Monica Bay with scientific divers.

Goal #11: Protect public health

Goal Summary:

With its natural beauty and rich resources, Santa Monica Bay is one of Southern California's most popular recreation destinations. Nearly 10 million people live within an hour's drive of the Bay. Popular recreational activities include swimming, surfing, sunbathing, biking, sport fishing, diving, boating, kayaking, tidepooling, and whale and bird watching, etc. The adjacent Santa Monica Mountains and waterways are also popular for activities such as hiking, biking, fishing, wildlife viewing, and general sightseeing. By one estimate, the Bay on average generates over one billion dollars annually for the economy of southern California. The protection of the valuable recreational uses of the Bay is a high priority for public agencies and local communities. Public health and access are the two most important issues that affect the recreational uses of the Bay. This goal and affiliated objectives address the health risks associated with swimming in the Bay's surf zone and with eating contaminated seafood.

Key Activities or Objectives:

11.1 Achieve minimum beach closures and postings at Santa Monica Bay beaches
11.2 Develop and adopt new pathogen indicators and source identification tools
11.3 Update seafood consumption and advisories and risk communication messages
11.4 Maintain and enhance institutional control measures (enforcement, monitoring, and education) through coordination with partner agencies to reduce the risk of consumption of contaminated fish in high risk ethnic communities
11.5 Remediate contaminated sediments

Partnerships:

SWRCB, LA County, State Parks, municipalities, park agencies, LARWQB, SCCWRP, USEPA, CDPH, CDFW

Outputs:

- Contributed to development of new tools to support access to Santa Monica Bay beaches, identification of pathogens, and faster response mechanisms
- Improved seafood advisories and risk communication messaging
- Remediated contaminated sediments off the Palos Verdes Peninsula

Key Deliverables (Attachments):

- Attachments 31a-f: Updates on this goal can be found in SMBNEP's semi-annual reports

Short-Term Outcomes (2013-2018):

- Maintenance and further improvement of good beach water quality as indicated by letter grades on Heal the Bay's Beach Report Card, with water quality monitoring conducted by local municipalities
- Improved messaging for seafood contamination warnings
- Enhanced enforcement of fishing ban area and catch limits

- Completed masters project thesis (LMU) on a 30-year trend assessment of fecal indicator bacteria along the Bay's beaches, including recommendations and an evaluation of dry-weather LID implementation over time

Long-Term Outcomes (>5 years, projected):

- Improved wet-weather beach water quality measured by number of days exceeding pathogen indicator criteria and beach water quality grades
- Improved beach access through improved water quality
- Reduction of sediment contamination and fish tissue concentration below human health risk threshold.

Pressures (2013-2018):

Despite significant improvement in beach water quality, a few hot spots with poor grades still persist. Wet weather beach water quality remains problematic and is not expected to improve soon. New, molecular biological indicator monitoring tools have been developed and include improved rapidness and accuracy but may still be years away from broad application.

Remediation of contaminated sediments off the Palos Verdes Shelf becomes more challenging as capping has been deemed ineffective based on the results of a pilot capping project. Recent monitoring of offshore sediment at the Palos Verdes Superfund site indicates high spatial diversity of contaminated sediment at relatively small scales and overall decreases in concentrations of DDT. The condition of the area is considered to be improving, and the need to actively remediate the site is diminishing.

Among the six climate stressors, relatively low vulnerability was determined, generally speaking, with warmer water and increased storminess having a somewhat higher level of vulnerability across all five objectives, though the underpinning mechanisms differ in essence between objectives addressing swimming and seafood-related issues. The main cause of swimming risks is pathogen-contaminated urban runoff and storm water discharge. Warmer water may foster growth of pathogenic bacteria and viruses, and increased storminess may result in larger volumes of storm water discharge. Locally, the main cause of seafood risk stems from several species of fish contaminated with DDT and PCBs which were historically deposited in the sediment on Palos Verdes shelf. Warmer waters may result in shift in pattern of fish movement and distribution, and increased storminess may cause new or more resuspension of the contaminated sediment.

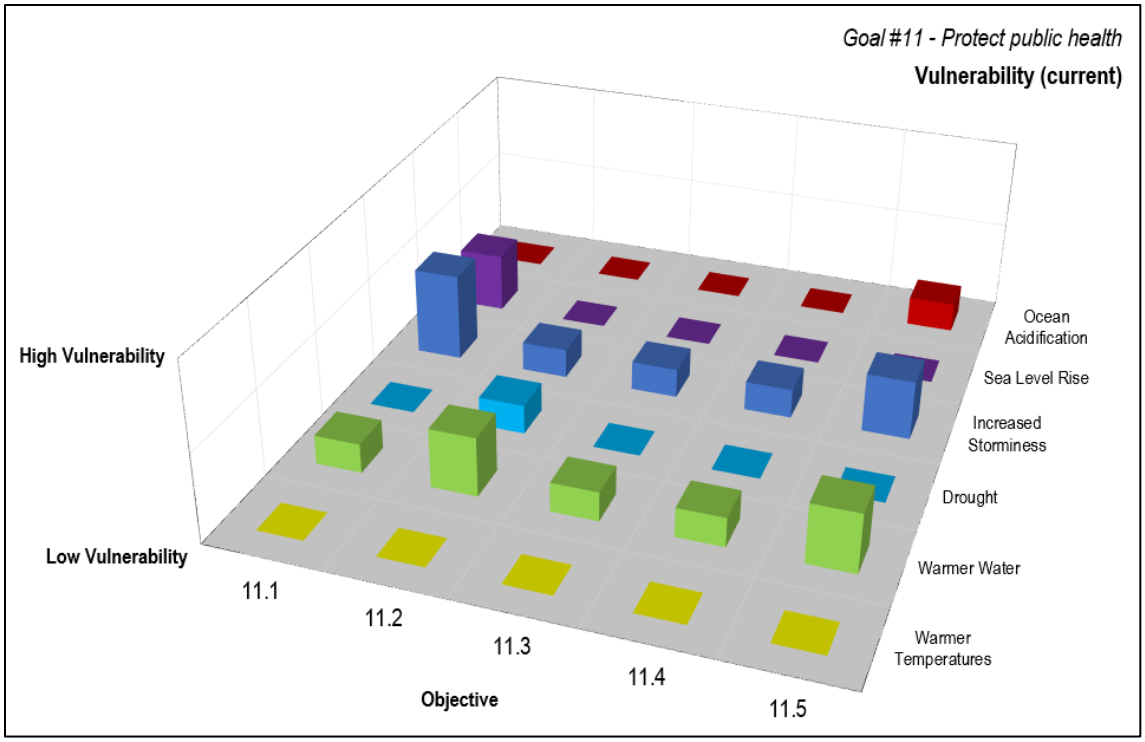


Figure 35. Goal 11 – Current Vulnerability from CCVA.

Programmatic Challenges:

- N/A

Overcoming Pressures:

Research and work continue on overcoming and adapting to stressors from climate change, though the vulnerability for this goal was predominantly identified as warmer waters. Additional research in partnership with universities and other stakeholders, including completion of the rapid grade response system for beach water quality, which will further the determination of pressures related to beach water quality. Regarding the Palos Verdes Shelf Superfund site, since the condition of the area is considered to be improving, the need to actively manage or remediate the site seems to be diminishing.

Key Accomplishments and Conclusions:

Beach water quality began to improve significantly since early 2000, and the trend continued during this reporting time period. Except for a few hot spots, most beaches in Santa Monica Bay regularly receive an “A” rating on Heal the Bay’s Beach Report Card and are deemed safe to swim during dry-weather. Monitoring conducted by EPA and Los Angeles County Sanitation District during this reporting period has shown that the sediment contamination level of DDT and PCB at the Superfund site on Palos Verdes Shelf has decreased significantly over the last 20 years. Although fish contamination still persists, EPA continued to make progress in reducing exposures of anglers and local seafood consumers to contaminated fish through its institutional control program, especially the Fish Contamination Education Collaborative (FCEC), a partnership with State and local agencies, Health Departments, and environmental and community organization.

Next steps include reducing beach contamination during wet-weather through implementation of LID and BMP practices and projects. Further, new pathogen indicators and source identification tools should be developed. Lastly, seafood consumption advisories should be updated based on new monitoring data, and further development should occur for the remediation plan for contaminated sediments on the Palos Verdes Shelf.

Figure 36. Before and after installation of a storm drain.

Figure 37. Santa Monica Beach Restoration Pilot Project.

Goal #12: Maintain/increase natural flood protection through ecologically functioning floodplains and wetlands

Goal Summary:

Natural floodplains not only provide buffer zones that attenuate the flood damage but also improve habitat value typically associated with a riparian corridor. Similarly, besides their well-known habitat value, wetlands work as a sponge that absorb and release flood water during a storm. However, the standard urbanization practice that has been applied throughout region has been to make more space for development, even if it results in encroachment of floodplains and wetlands. Additionally, flood control has been achieved by directing and sending storm water to the ocean in the fastest and shortest route through channelization. Such practices have contributed to the loss of natural streams, riparian corridors, and wetlands in our region. Goal 12 is primarily tied to acquiring and restoring ecologically functioning floodplains, wetlands, and river systems. Since there is significant overlap in this goal and Goal's #1 and #7, please refer to the narratives associated with the other two goals for details.

Key Activities or Objectives:

12.1 Acquire and restore priority parcels to increase acreage of ecologically functioning floodplains and wetlands

12.2 Develop and implement a comprehensive regional sediment management plan for restoring natural hydrological functions of river systems

Partnerships:

SCC, MRCA, LACFCD, Army Corps

Outputs:

- Land acquisition providing protection of riparian corridors
- Sediment management strategic plan

Key Deliverables (Attachments):

- Attachment 33a: NEPORT Habitat reporting summary
- Attachments 33c-h: NEPORT Habitat reports by year

Short-Term Outcomes (2013-2018):

- Completion and implementation of sediment Management Plan by Los Angeles County Flood Control District

Long-Term Outcomes (>5 years, projected):

- Acres of land or linear miles of riparian corridors protected through land acquisition
- Increased natural sediment supply to beaches along the Bay through pilot projects

Pressures (2013-2018):

Nearly one hundred years of flood control and coastal development have constructed roads, culverts, bridges, sea walls, damns, detention basins, and other structures, which all attenuated the delivery of sediment to the coast of Santa Monica Bay. Much of the landscape is now a built environment and conversion of the urbanized areas to a more background level for sediment transport is largely infeasible.

With regards to climate change impacts, much of the vulnerability comes from stressors tied to impacts to flooding and erosion, including increased storminess, drought, and SLR. However, there is some adaptive capacity associated with both objectives due to the potential to acquire properties that will expand the floodplain through restoration and replenishment of natural sediment transport processes in coastal wetlands and on beaches to protect coastal features against sea level rise.

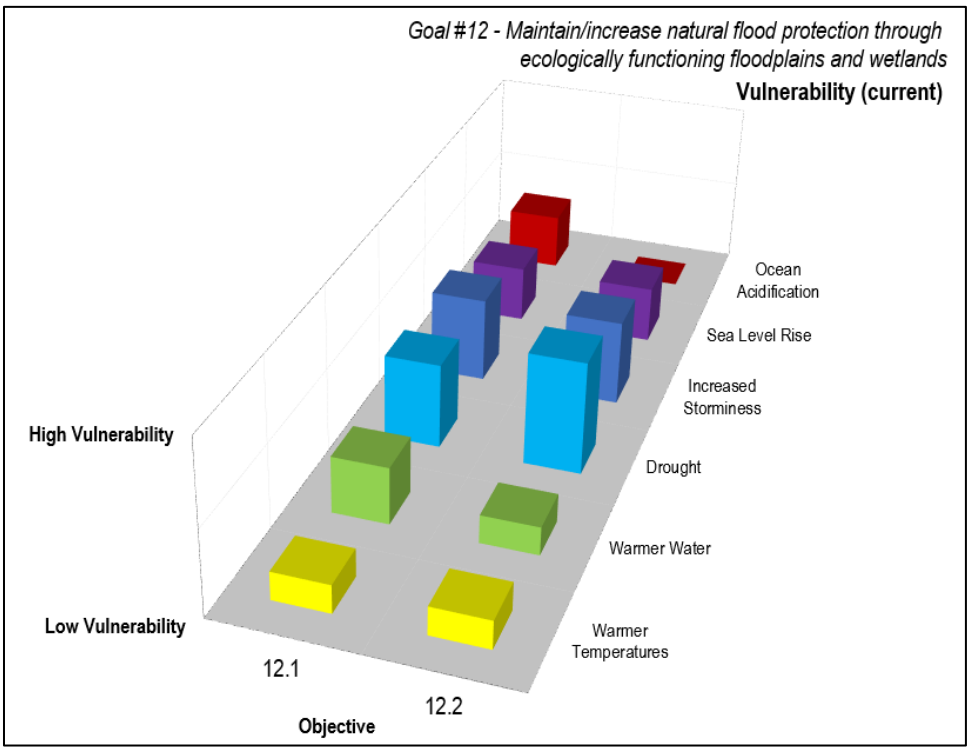


Figure 38. Goal 12 – Current Vulnerability from CCVA.

Programmatic Challenges:

- N/A

Overcoming Pressures:

The Sediment Management Strategic Plan developed and completed by Los Angeles County Flood Control District identified challenges and opportunities for the following 20 years. As a living document, the plan may be revised with new information or adaptive management strategies.

Key Accomplishments and Conclusions:

LACFCD completed a Sediment Management Strategic Plan with input from a broad group of stakeholders, including SMBNEP. The plan identified challenges and opportunities for the following 20 years. The plan was an encouraging first step, but may need to be revised with new information or adaptive management strategies. Also see key accomplishments and conclusions sections for Goal #1 and Goal #7.

Next steps include updating existing plans to promote sediment transport and deposition along the coast based on hydrodynamic modeling and analyses. Pilot scale projects conducted in the study area will increase the expertise of local resource managers and help inform the public to the impacts of the geoengineering. Additional resources may "come on line" in the form of beneficially reused sediments from harbor dredging in SMBNEP's study area or from the neighboring post complex of Los Angeles Long Beach. The potential in the port is a result of successful implementation of TMDLs for the Los Angeles River and its tributaries, meaning that as the water quality has improved, so has the quality of the sediment, and soon the sediment may be clean enough for beneficial resuse projects.

Figure 39. Santa Monica Beach near Santa Monica Beach Restoration Pilot Project.

Figure 40. Torrance beach in Santa Monica Bay.

Goal #13: Increase public access to beaches and open space

Goal Summary:

Parks, public beaches, and preserves can provide the opportunity for escape and relaxation for residents and others. Outdoor experiences are culturally valued and are an important and inexpensive form of relaxation. Open space, in and of itself, provides perceptible benefits by its simplicity, quiet, and freedom from roads, traffic, buildings or human made structures. It provides the visual and sensory "breathing room" that people need to feel comfortable, as well as in touch with natural surroundings. Open spaces and parklands also have the potential to provide ecosystem servies in the form of groundwater replenishment, improvements to water quality, and recreational opportunities, among others. Goal 13 is directly related to public access for beaches and open spaces throughout the Santa Monica Bay Watershed. During this reporting period, partnerships were expanded to support public access goals at key points within the watershed, including beaches and evaluation of public access at the Ballona Wetlands Ecological Reserve. Efforts were also made to improve connectivity of biking and walking pathways along Ballona Creek.

Key Activities or Objectives:

13.1 Increase public access to Santa Monica Mountains through purchase and enhancement of open space
13.2 Increase acreage and access to parks and open space in urbanized areas through acquisition and conversion of private parcels
13.3 Increase public access points to Ballona Creek and wetlands
13.4 Increase public access to Santa Monica Bay beaches

Partnerships:

CCC, SMMC, municipalities, State Parks, NPS, MRCA, CDFW, Baldwin Hills Conservancy, SLC, LACDBH, Army Corps, Caltrans, CRI, others

Outputs:

- Increased access to the Ballona Wetlands Ecological Reserve through community restoration events
- Increased access to the LAX Dunes through monthly community restoration events
- New forms of public engagement at beaches through living shoreline projects and research

Key Deliverables (Attachments):

- Attachments 8a-g: Ballona Wetlands community restoration project materials
- Attachments 21b-c: SCC Explore the Coast grant final reports
- Attachments 30a-i: Final products for the Santa Monica Beach Restoration Pilot Project

Short-Term Outcomes (2013-2018):

- Increased access to special habitats in Santa Monica Bay through community restoration programs

Long-Term Outcomes (>5 years, projected):

- Improve access to the coast and enhance coastal experiences through linking and expanding the California Coastal Trail
- Develop partnerships that support the implementation of natural infrastructure throughout the Bay watershed

Pressures (2013-2018):

Overall, this goal exhibited low vulnerability to most of the climate change stressors. In fact, out of all of the goals, it was one of the least vulnerable. Objectives 13.1, 13.2, and 13.3 all displayed similar trends to each climate stressor and similar trends over time. Objective 13.4 was more vulnerable because of the increased vulnerability of its focal habitat: sandy beaches. Objectives 13.1, 13.2, and 13.3 all displayed some low level vulnerability to drought or increased storminess, which increased slightly over time. Drought and storminess combined have the potential to cause erosion or to affect trail closures.

For all the objectives except 13.4, there was low vulnerability displayed for warmer temperatures, warmer waters, SLR, and OA. Most of the objectives also displayed a high level of adaptive capacity for most of the climate change stressors, due to the fact that public access points can be modified and updated over time, while factoring in climate change stressors.

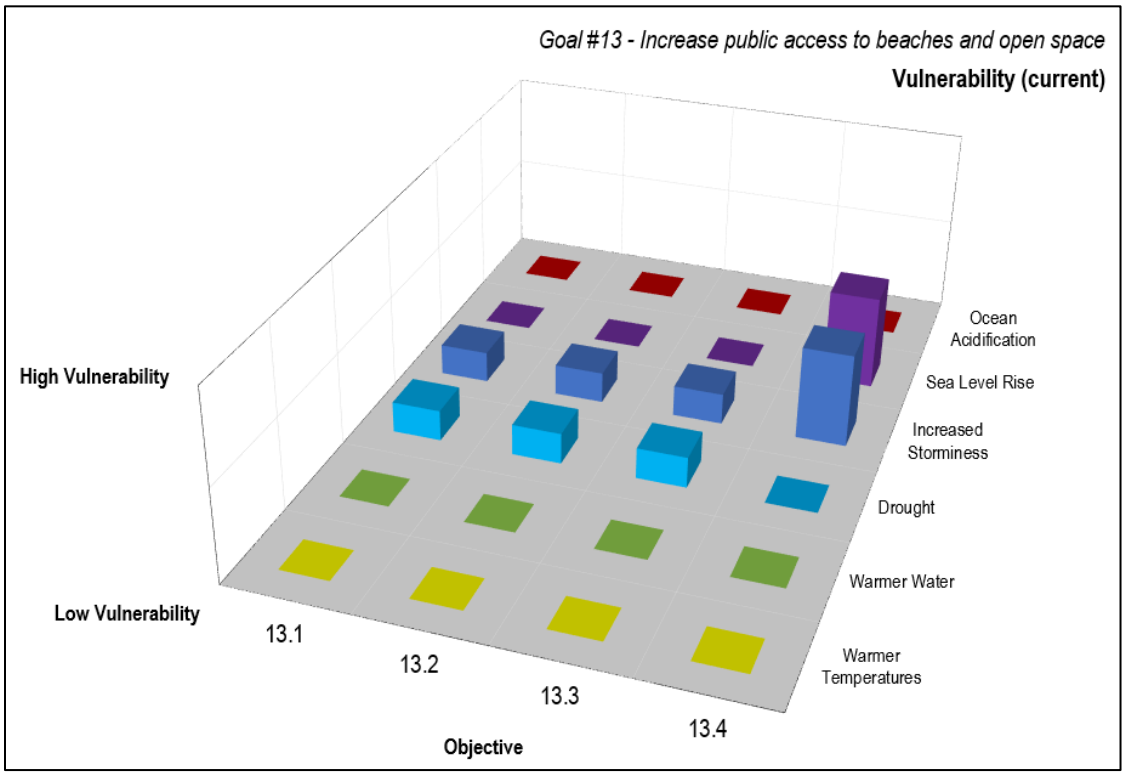


Figure 41. Goal 13 – Current Vulnerability from CCVA.

Programmatic Challenges:

- N/A

Overcoming Pressures:
Efforts to improve on coastal resiliency through adaptive management, including living shoreline projects, continues to be a priority of SMBNEP. These efforts are largely summarized in other goals.

Key Accomplishments and Conclusions:
SMBNEP continues to prioritize and provide opportunities for the public through community restoration events, education events, tours, and other access points to restricted coastal areas (e.g., LAX Dunes, Ballona Wetlands Ecological Reserve). Next steps for this goal include supporting implementation of identified actions within plans such as the LACDBH Sea Level Rise Vulnerability Assessment, continuing to implement living shoreline projects to improve resiliency and inform long-term coastal adaptive management processes, supporting creation of increased public transit to and from beaches to enable access, and continuing to advise BMPs for beaches that promote habitat condition improvements and support for unique species.

Figure 42. Students participate in hands-on restoration at a LAX Dunes Community Restoration Event on 2 May 2015.

Goal #14: Conserve water and increase local water supply

Goal Summary:

Rehabilitation and expansion of recharge facilities, modified operations of existing storage facilities, and rehabilitation and enlargement of operational practices could improve the utilization of local water sources. Recharge or direct reuse of runoff from urbanized areas is generally limited by concerns about the presence of contamination. To increase the utilization of this local resource, runoff capture and infiltration could be expanded (where appropriate), the quality of surface runoff improved, and projects implemented to capture, treat, and utilize storm water for either non-potable direct use or recharge. During this reporting period, several projects focused on water conservation and outreach, public engagement, water conservation policy and programs, and water reuse. Significant progress was made towards policy to improve water recycling and reuse standards and objectives.

Key Activities or Objectives:

14.1 Increase local water supplies
14.2 Enhance water conservation
14.3 Further increase wastewater recycling and reuse

Partnerships:

Municipalities, LADWP, MWD, LVWMD, LARWQCB, water districts, LA County, NGOs, LACSD, SWRCB

Outputs:

- Improved outreach for water conservation and reuse efforts
- Evaluated the performance of installed rain gardens

Key Deliverables (Attachments):

- Attachments 24a-b: Products for the Metropolitan Water District Rain Garden project
- Attachments 19a-l: Final reports and outreach materials for the 2014/15 water and energy conservation grant from LADWP
- Attachments 20a-e: Final reports and outreach materials for the 2016/17 water and energy conservation, and climate change outreach grant from LADWP

Short-Term Outcomes (2013-2018):

- Partnered with MWD to install and monitor four demonstration residential rain gardens that replaced traditional lawns
- Completed two projects with LADWP to promote water conservation through education and distribute water saving devices
- Reached over half a million people through the water conservation outreach initiatives

Long-Term Outcomes (>5 years, projected):

- Help reduce dependence of the Los Angeles region on imported water and lower the percentage of imported water use by water agencies

Pressures (2013-2018):

Because the focus of this goal and affiliated objectives is water resource and supply, drought is undoubtedly the dominant climate stressor, followed by increased storminess that affects their achievement. Drought may generate more support for water conservation and increase demand for recycled water. Existing drought already greatly impacts local water supply and may get worse in the future, primarily because there will be a lack of water for conserving, recycling, and reuse. Increased storminess may reduce the local water supply capability as local storage facilities are not able to retain the storm water from the more intense but fewer storm events.

Warmer temperatures may have impacts including increased evaporation rates as well as increased water consumption. SLR may affect local water supply if desalination facilities along the coastline experience infrastructure or operational issues. Despite significant effort and progress made in water conservation and recycling amid current drought, the achievements have taken most, if not all low-hanging fruit, which can make further progress difficult, especially if drought and impacts of other climate stressors get worse over time.

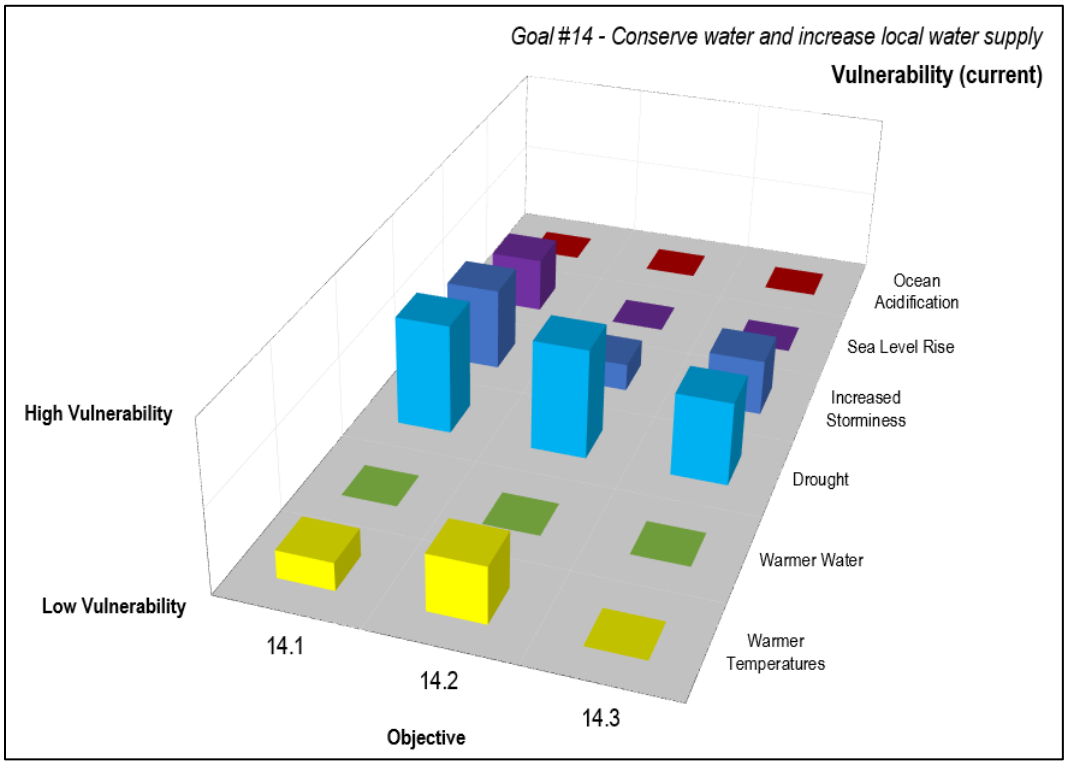


Figure 43. Goal 14 – Current Vulnerability from CCVA.

Programmatic Challenges:

- N/A

Overcoming Pressures:

Drought will continue to pose a threat for southern California on many fronts, but SMBNEP will continue to apply outreach and education techniques to provide the public with the tools they need to eventually

become water-independent. The City of Santa Monica is an excellent example of a key municipality in the SMBNEP project area striving towards water-independence through significant financial commitments to LID and BMPs along with complete overhauls on the policies and regulations.

Key Accomplishments and Conclusions:

In July 2016, a report was published summarizing implementation and monitoring efforts associated with the installation of four residential rain-garden demonstration projects in partnership with MWD and homeowners. The primary goals of the project included: installing rain gardens on four residential properties, conducting pre- and post-monitoring for potable water savings and infiltration potential, conducting pre- and post-monitoring of polluted runoff volume reductions, and analyzing cost-effectiveness. All sites showed significant total water use reductions ranging from 70 to 94% as compared to pre-implementation values and the potential to have substantial reductions in pollutant loading to residential runoff.

Figure 44. Residential rain garden installed and monitored as part of the MWD grant funded project.

Two projects were funded through LADWP grants in 2015 and 2017 that focused on education the public and school-aged youth on water and energy conservation. The 2015 project focused on creating an innovative outreach strategy to encourage the public to implement water and energy conservation practices, including three Public Service Announcements (PSAs) while educating a diverse community of stakeholders. Local television stations played the PSAs developed by TBF and our partners and reached

an estimated 170,000 individuals (based on viewership numbers provided by the stations). Additionally, the total YouTube views for the PSAs were tracked, with almost 20,000 views for all three PSAs combined. The 2017 project focused on developing water and energy conservation educational material specific to middle school aged youth and engaging students in classrooms. Through this project, TBF directly engaged 286 students and seven teachers from three LAUSD schools through in-classroom visits and presentations. A project dedicated website made all materials available to educators, parents, and students citywide and at no cost, and a press release and online news sources have helped promote the program further.

Figure 45. Tabling outreach event as part of the LADWP community education project to promote water and energy conservation in Los Angeles.

Additional key accomplishments have been significant strides by regional water agencies to recognize and prioritize water resiliency in the face of climate change and other stressors. A recent announcement from the Mayor of the City of Los Angeles established the cessation of open ocean discharge from the Hyperion sewerage treatment plant by 2035. The reuse of the effluent of the treatment plant to drinking water is significant, upward of 175 million gallons per day flow from the plant. This, in addition to other sources of treated stormwater and wastewater, will greatly increase success as determined by this goal. SMBNEP will continue to support these and related efforts by municipalities and agencies in our study area to reduce dependence on imported water and to improve conservation and reuse strategies.