

Tijuana River National Estuarine Research Reserve (TRNERR)

Program Manager Reports

Report Period: Jan 1, 2022 through June 30, 2022

TASK: OVERSIGHT AND IMPLEMENTATION OF RESERVE OPERATIONS

Chris Peregrin, TRNERR Reserve Manager, California State Parks

1. Coordinated Implementation of Reserve Programs

The Reserve Management Team worked with the TRNERR Program Managers to respond to the Necessary Action and the Recommendations identified in the Reserve's 312 findings (see Tijuana River NERR Section 312 Evaluation Status Report).

The Reserve Manager contributed to the NERRA appropriations overview training March 2022, and NERRA Congressional outreach meetings March 22, 23.

The Reserve Manager attended the NOAA West Coast Managers meeting, April 28.

The Reserve Manager contributed to the CA NERRS bi-monthly check-in.

The TRNERR Program Managers hosted the quarterly TRNERR Advisory Council meetings on February 8 and May 3.

The Assistant Reserve Manager continued role of Cooperating Association Liaison for the Southwest Wetlands Interpretive Association and is attending the regular SWIA Board Meetings.

The Reserve Manager continued coordination with CA State Parks Peace Officers and seasonal lifeguards to support Reserve operations through public safety.

The Management Team met with the TRNERR Program Managers approximately weekly in virtual format for this term of the grant to ensure programmatic coordination.

The Reserve Manager attended weekly CA State Parks SDCD Manager Team Meetings. One of the goals of this engagement is to ensure effective integration of Reserve programs with CA State Parks operations.

The Management Team worked with the TRNERR Education Program to recruit, interview and hire a new Environmental Services Intern to support the TRNERR Education Program. Welcome Laura Dulin (*see also Education*). Although Laura will focus the majority of her time on programming at Silver Strand State Beach, outside of the Reserve, she will also be supporting the TRNERR Education Program.

The Management Team worked with CA State Parks Administrative office and SWIA Administrative Director to recruit and hold interviews for the new Stewardship support staff.

Congratulations Marya Ahmad! Education Specialist Marya Ahmad accepted a new position with CA State Parks, San Diego Coast District, as a Park and Recreation Specialist. Marya has supported the TRNERR Education Program and Research Program for two decades. We will miss her greatly but are excited to work with her in her new capacity, focusing on planning and environmental review for TRNERR and other units of the State Park system in this District.

COVID-19 continues to spread in the San Diego region resulting in significant operational response and adjustments. The Management Team continues working with CA State Parks management, and TRNERR Program Managers to implement a safe environment for staff and visitors of the Reserve.

The TRNERR Program Managers collaborated in the preparation and planning for the NOAA 312 Review of the TRNERR, scheduled for July 25-28. The '312 Review' is a periodic review, on a 5-year schedule, of the TRNERR conducted by NOAA's Office for Coastal Management.

2. Management of Reserve Budget

The Reserve Manager continued work with the Assistant Reserve Manager and CA State Parks Administration staff to manage the NOAA & CA State Parks operating budgets.

The Reserve Manager supported the Assistant Reserve Manager and CA State Parks Administration staff to manage the Nelson Sloan Quarry Restoration Project grants and administration process. The Nelson Sloan Quarry project is funded through three grant allocations from the State of California- one from CA Department of Water Resources (via San Diego County Water Authority) and the other two through the State Coastal Conservancy. During this reporting period significant effort was focused on processing a final work order amendment with consultant Dudek to enable the continued work on this important project.

3. Protection and Restoration of the Tijuana River Valley

The Reserve Manager worked with contractor ERRG on the Goat Canyon Sediment Basin maintenance activities. During this reporting period efforts focused on the initiation of removal activities for the deposition material excavated in Fall 2021 (*see also Stewardship*). The Reserve Manager worked with ERRG and CA State Civil Engineer to review performance of the Goat Canyon trash boom system. The trash boom has been impacted by stormwater events, resulting in flipping of the floating boom system and reduced trash capture.

The Management Team supported CA gnatcatcher and least Bell's vireo surveys for the 2022 nesting season (*see also Stewardship*).

The Reserve Manager continued work with the Assistant Reserve Manager, design staff from CA State Parks Southern Service Center, CA State Parks Administrative staff, and the State's project consultant (Dudek) to continue on-the-ground studies and design work for the completion of the final design and environmental review for the Nelson Sloan Quarry Restoration and Beneficial Reuse of Sediment Project. During this period, significant focus was placed on alignment of the Nelson Sloan Quarry Project with the TETRP Project (*see also Stewardship*). The Reserve Manager supported the Assistant Reserve Manager and CA State Parks Contracting and Budgets offices to extend the contract agreements for this project (*See also above Management of Reserve Budgets*).

The Reserve Manager continued work with the TRNERR Research Coordinator, SWIA Project Management, US Fish and Wildlife Service, and project consultants to further the design for the Tijuana Estuary Tidal Restoration Program (TETRP) II Phase I project. This project seeks to restore roughly 80 acres of salt marsh within the Reserve. During this period significant focus included preparation of the Draft EIR/EIS for public review; anticipated for release in August 2022 (*see also Stewardship and Research*). The Reserve Manager continued engagement with USEPA to identify issues with water and wastewater infrastructure that contribute toward cross-border pollution, and to prioritize improvements that will address the wastewater and freshwater discharges into the Tijuana River. During this award period, the USEPA released a Draft Environmental Impact Statement outlining priority projects for the \$300million allocation in the federal government through the United States-Mexico-Canada Agreement. The Reserve Manager serves on the Eligible Public Entities Coordinator Group (EPECG; formerly the Inter-Agency Consultation Group) for this effort, representing the CA Natural Resources Agency and the Tijuana River National Estuarine Research Reserve.

The Reserve Manager and Assistant Reserve Manager contributed to the technical advisory committee toward the development of a Tijuana River Valley Sediment Management Plan. This effort is led by the City of Imperial Beach, with consultant Dudek, and funded by the State Coastal Conservancy.

The Reserve Manager continued work with the TRNERR Research Coordinator, CA State Parks resource managers, and external researchers to collaborate on project planning for a dune restoration research project ("Using Green Engineering Techniques to Restore Coastal Sand Dunes in Border Field State Park, San Diego, California") involving California Ocean Protection Council, California Sea Grant Program, and the University of Southern California Sea Grant Program. During this award period site monitoring continued and the project team considered effort toward project expansion with an additional restoration treatment involving sand fencing.

The Reserve Manager worked with the Assistant Reserve Manager, CTP Coordinator, CTP Associate, Research Coordinator, Volunteer Coordinator, and Binational Liaison to continue work on the NOAA Marine Debris North American Marine Debris Prevention and Removal grant opportunity. This grant is supported through USMCA funds (*See also Coastal Training Program*).

The Reserve Manager, Assistant Reserve Manager, and Research Coordinator continued collaboration with the Tijuana River Valley Recovery Team (TRVRT). TRVRT Steering Committee met on June 15.

The Reserve Manager continued some work with CA State Parks Natural Resources Program and Law Enforcement to respond to the oil spill “Pipeline P00547 Incident.” On October 2nd, 2021, an oil spill was detected originating from an underwater pipe connected to the Elly platform about 4.5 miles offshore near Long Beach, California. The spill resulted in impacts along the Southern California Coast, including TRNERR. Response involved regular surveys of coastline and estuarine habitats, including TRNERR, coordination with CA Department of Fish and Wildlife and US Coast Guard, and public communication.

The Reserve Management Team worked with CA State Parks Natural Resource team at the San Diego Coast District on planning and preparation of an *Arundo donax* removal project in Border Field State Park. Supported by wildfire response funding, this project is in early planning phases and anticipated to continue for several years and aimed at treating acres of Reserve land impacted by this invasive plant.

4. Development of TRNERR Partnerships

The Nelson Sloan Quarry Restoration and Beneficial Reuse of Sediment Project has offered additional opportunity to strengthen existing partnership and develop new working relationships. During this review period, the Reserve Management Team continued investment in these partnerships, including:

- Working relationships with the County of San Diego, Department of Parks and Recreation have been strengthened, and collaboration toward future partnerships for sediment management has increased.
- Consultation processes with Kumeyaay Native Americans have included many virtual meetings and also some site visits. These efforts have deepened Reserve understanding of Kumeyaay interest in sediment management in the Tijuana River Watershed. We expect this consultation process to grow into stronger working relationships and shared management strategies.
- Wildlife regulatory agencies have taken an interest in the project, especially in relation to the presence of the Federally Endangered Quino checkerspot butterfly. The presence of this species in this area was first made known through surveys in support of the project. We expect our working relationship with the USFWS and CDFW to strengthen as we continue to develop this project toward implementation.

The Reserve Management Team supported planning and on-site logistics for a site visit by new Executive Director Amy Hutzler of the CA Coastal Conservancy on April 7. The Reserve Manager and Research Coordinator coordinated with CA State Parks Natural Resources lead for the San Diego Coast District to host Ali Feinswog of Representative Levin’s office on April 14.

Reserve staff worked with local NGO Outdoor Outreach to host this organization for an all-staff retreat at the Tijuana Estuary on June 2. Outdoor Outreach mission is to connect youth to the transformative power of the outdoors.

5. Oversight of Reserve Facilities and Public Access Opportunities

The Reserve Management Team worked with State Parks Administration staff, and State Parks maintenance crew, to manage and maintain the TRNERR headquarters and Reserve facilities.

The Reserve Manager continued collaboration with CA State Parks law enforcement and San Diego County Parks to ensure operational alignment with the new County campground in the Tijuana River Valley.

The Reserve Manager coordinated with CA State Parks Southern Service Center design team to further efforts focused on the repair of Monument Road in Border Field State Park.

The Reserve Manager supported the TRNERR Coastal Training Program on the newly funded Resilient Roads and Reserves project. This project will highlight efforts to address coastal flooding and infrastructure issues at the three CA-based NERRS (see also Coastal Training Program).

The Reserve Manager worked with CA State Parks Management Team and the County of San Diego Department of Environmental Health to respond to a newly adopted water quality monitoring technology. The new DNA-based testing is focused on identify sewage contamination of the nearshore coastal environment, allows for same-day results (as opposed to previous 72-hour turn-around) and appears to be extremely more sensitive at detecting sewage-related bacteria. Beaches in southern San Diego County have been closed to public water contact the majority of the calendar year, resulting in challenges for site management and public education. Results of daily testing can be found at the County DEH website [here](#).

6. Develop TRNERR's next set of 5-year evaluation metrics

The Reserve's 5-year evaluation metrics were received by the OCM Evaluation Team on March 7, 2022 and approved by OCM Evaluation Team on June 9, 2022

TASK: EDUCATION PROGRAM

Anne Marie Tipton, TRNERR Education Coordinator, California State Parks

1. Implementation of Education Programs

A. *Formal and Non-formal Teacher Training*

The Reserve conducted one MARSH teacher training for one elementary teacher.

B. *Student-centered Formal and Informal programs*

TRNERR had its first in-person school programs since early 2020 in the first half of 2022. Three elementary, one middle, and one high school program visited with a total of 204 students. The high school program at Border Field State Park had 100 students alone, with 5 rotations- sediment basins, birds, invasive species, nature journaling, and nature documentary. The last two were led by the High Tech High Chula Vista teachers.

Reserve Educators continued carrying out their 3 virtual programs through California State Parks, Parks Online Resources for Teachers and Students (PORTS). The Reserve delivered four high school level *Detecting a Changing Climate*, 18 *Can Salt Marshes Help Fight Climate Change* to middle schoolers, and 139 *Salt Marsh Secrets* to elementary students. A total of 4,214 students were reached through these programs with a total of 6,844 for the whole 2021-22 school year. That's 600 more than last school year.

The Reserve's virtual programs developed for PORTS are available on their own landing page on the PORTS website: [PORTS - Tijuana Estuary Natural Preserve \(ports-ca.us\)](https://ports-ca.us)

C. *Interpretation*

Lunchtime Live, a Facebook Livestream that began in April 2020, continued during this period, every other week. There were 14 programs delivered with a typical length of 20-30 minutes each and totaling 1,719 views. The program was designed to provide outreach and interaction with the public since in-person bird and nature walks had ceased. The series has developed a regular following of watchers who engage with questions, comments, and suggest topics for future programs. All videos are captioned later and are made available on the [Reserve's YouTube page](#).

Education Specialist Holliday presented during World Oceans Day in June on Facebook live with other State Park Interpreters on the California State Parks and PORTS Facebook pages. There were 2,633 views of this multi-park livestream.

The Reserve had a booth for Love Your Wetlands Day at Kendall Frost Marsh in February with 175 people coming by.

The Interpretative Master Plan is still being reviewed at State Parks headquarters. Hopefully, it will be signed by Interpretive Division Chief by late summer 2022.

D. Visitor Services

The Visitor Center had 4,075 visitors from January to June. The year started off strong but got slower in May and June.

2. Production of Outreach Materials

Reserve Education Staff produced an e-newsletter every month of this reporting period including highlighting volunteers, other special events, and accomplishments.

3. Volunteer Capacity Building

EC Tipton is training a youth to be a regular bird walk docent. The Reserve hasn't started group trainings yet.

4. Environmental education and interpretive capacity and leadership roles

The Reserve's Education Coordinator hosted a San Diego Exhibit Experience Group meet up with the San Diego Museum Council in March at the Land of the First Peoples in Old Town San Diego State Historic Park. The group met with State Park interpreters to hear about their consultation with the Kumeyaay California Native Americans to create this beautiful native plant garden.

Task: COASTAL TRAINING PROGRAM (CTP)

**Dr. Kristen Goodrich, TRNERR CTP Coordinator,
Southwest Wetlands Interpretive Association**

1. Deliver training and technical assistance to coastal decision-makers

CTP delivered trainings in this reporting period, notably, CTP co-developed and facilitated the California Social Coast Forum with San Francisco Bay NERR, Elkhorn Slough NERR and NOAA's office for Coastal Management (OCM) in March 2022. The 2-day virtual training began with the OCM Digital Coast offering, [Social Science Basics for Coastal Managers](#) and provided participants an opportunity to: (1) Explore examples of human-dimensions approaches in coastal management; (2) Gain skills in social science techniques; and (3) Connect with other professionals interested in the application of social science.

Other trainings this reporting period include workshops at Universidad Autonoma de Baja California and Universidad Xochicalco regarding circular economy and reducing single use plastic. These workshops leveraged the NOAA Marine Debris Program (MDP)/U.S.-Mexico Canada Agreement (USMCA) grant funded project, "*Improving socio-ecological resilience through marine debris prevention and removal in U.S.-Mexico.*" Additionally, CTP has presented on marine debris related topics to coastal decision-makers, including U.S. Consulate General Tijuana, Comisión Internacional de Límites y Aguas (CILA), Agencia de Seguridad Energía y Ambiente, Surfrider, and Tijuana Recycling Program, among others. In May, CTP was invited to visit a Kumeyaay

(first peoples native to the Tijuana River Watershed) community, San Antonio Necua in order to explore overlap and areas of opportunity between the USMCA and Environmental Protection Agency's Border 2025 initiatives, specifically related to the project's circular economy components. CTP was also invited to participate in the IX Summit of the Americas this June dedicated to understanding needs among environmental NGOs.

In May of this year, CTP hosted Elkhorn Slough and San Francisco Bay NERR's CTP Coordinators to further collaborate on Resilient Reserves and Roads (R3), a NERRS Science Transfer Grant project. Field experiences and working sessions served to provide context, highlight CA State Park and partner perspectives, and to inform synthesis of lessons learned from projects that involve planning for impacts of climate change on infrastructure, like roads, adjacent to critical habitat and that provide access to communities. The CTP Coordinator also continues to serve on the NERRS Science Collaborative advisory board (among other regional advisory bodies), and other system level working groups including on topics of plastics, human dimensions, equity, and disaster resilience.

Various technical assistance was provided to coastal decision-makers in this reporting period including facilitating meetings, providing survey and evaluation assistance, assisting organizations with grant writing, plan/policy revisions, and strategic/action planning. CTP continued to provide ongoing technical assistance to the Baja California State Government this reporting period by facilitating working tables and supporting single-use plastic policy standardization. CTP is also continuing efforts to incorporate the Tijuana River Watershed into a national watershed project through Tijuana Rio Conecta and serving in an advisory role for the Baja California Environmental Network, an NGO coalition engaged in environmental and climate policy development in the state of Baja California. CTP also offered technical assistance to CA and USC Sea Grants, in collaboration with the West Coast Learning Services Coordinator, in development of a stakeholder workshop focused on research needs associated with DDT+. A complete catalog of technical assistance can be found [here](#).

2. Report training and technical assistance outcomes

In this reporting period, after training delivery, CTP administered post-workshop evaluations, collected and analyzed data, and submitted into the performance monitoring database. This detailed technical assistance catalog by award year can be found [here](#). In this reporting period, the technical assistance catalog that CTP began compiling in FY16 has been updated and compiled into a more comprehensive documentation system that allows for sorting and indicating multiple categories of technical assistance when applicable.

TASK: STEWARDSHIP PROGRAM

**Lorena Warner-Lara, TRNERR Assistant Reserve Manager,
California State Parks**

1. Habitats downstream of the Goat Canyon Sediment Basin protected from catastrophic sedimentation and trash inundation

The State contract for maintenance of the Goat Sediment Basin was amended for the second year to use the same contractor, Engineering/Remediation Resources Group, Inc. (ERRG). Work to process and haul approximately 20,000 cubic yards of material off-site will begin in June and run through July. In September, ERRG will begin to excavate an additional 20,000 cubic yards of deposition material from the basins, and initiate work to haul off-site.

Assistant Reserve Manager continues working on the Nelson Sloan Quarry Restoration Project with State Coastal Conservancy and consultant (Dudek) on final design and environmental review. This project will help with long-term stabilization of Goat Canyon activities and can provide a receiving site for future sediment excavated from the Tijuana Estuary Tidal Restoration Program (TETRP) (*see also Oversight & Implementation*).

2. Sensitive plant and animal species habitat protected

The Stewardship Program maintained fencing and signage along dunes and coastal bluffs with US Fish and Wildlife Service.

3. Critical monitoring needs identified to maintain habitat health and monitor impacts to sensitive species and restoration projects

The Stewardship Program facilitated continued monitoring of California gnatcatcher, least Bell's vireo, California least tern, and Western snowy plover in the Reserve. For the 2022 survey season, biologists from CA State Parks Southern Service Center conducted the California gnatcatcher protocol surveys and the State Parks contract for the least Bell's vireo was awarded to Blackhawk Environmental. Regular plover and tern monitoring began in March 2022 and will continue until September 2022. This work is largely accomplished through contract with a private consultant and through our partnership with the U.S. Fish and Wildlife Service staff at Tijuana Slough National Wildlife Refuge.

4. On-going restoration and enhancement projects continue trajectory toward healthy vegetation communities and integrate into functional ecosystem components with continued outreach opportunities

During this period, the Reserve Manager, Assistant Reserve Manager, SWIA Administrative Director and CA State Parks staff worked to develop and hold interviews for a Stewardship Maintenance Aide position. The Assistant Reserve Manager also works as an Environmental Scientist for the Stewardship Program, however, is not funded by this award or counted as match.

Retired Annuitant Environmental Scientist continued maintenance of priority restoration sites.

CSP San Diego Coast District Natural Resources Staff continue work on a stewardship project focused on monitoring, site protection, invasive plant control, seed collection, propagation for restoration of rare plant habitat for Orcutt's liveforever (*Dudleya attenuata ssp. attenuata*) within the Reserve.

Assistant Reserve Manager continued to work with Reserve Manager and Research Coordinator, SWIA Project Manager, USFWS, and project team to support the preparation of the joint EIR/EIS document for the Tijuana Estuary Tidal Restoration Program (TETRP) II Phase I. During this reporting period, the California Department of Parks and Recreation and the U.S. Fish and Wildlife Service worked through internal agency approvals for the release of the Draft Environmental Impact Report/Environmental Impact Statement, expected August 2022. TETRP II Phase I would restore approximately 82 to 87 acres of salt marsh, mudflat, tidal channel, transitional/upland habitats on portions of both Border Field State Park and the Tijuana Slough National Wildlife Refuge. (see also *Oversight and Implementation, CTP, and Research*)

The Assistant Reserve Manager facilitated Tijuana River Action Network meetings with various land managers, public stakeholder groups, and the Reserve's Binational Liaison (CTP), Volunteer Coordinator, and Education Specialist. Planning for the 2022 Tijuana River Action Month (TRAM) has begun. TRAM is a month-long community-based clean-up and outreach event within and adjacent to the Tijuana River NERR. TRAM 2022 will run September 17 through October 15.

5. Identify public access and safety issues within the Reserve

Stewardship staff supported the Reserve Manager in coordination with public and Reserve partners to identify high priority access issues and, where feasible, worked to maintain and enhance public access at key locations throughout the Reserve.

In response to the COVID-19 pandemic, Reserve Manager continues to work with State Parks District staff to incorporate County and State guidelines in development of Public Safety closures and protocols for the Tijuana Estuary Visitor Center, grounds, and Border Field State Park.

State Parks maintenance staff worked to maintain public use facilities at Monument Mesa.

The Reserve Manager worked with the TRNERR Program Managers, and State Park District Chief Ranger, to improve communication around water quality issues and beach closures initiated by the San Diego County Department of Environmental Health.

TASK: INVASIVES

Lorena Warner-Lara, TRNERR Assistant Reserve Manager,
California State Parks

1. High quality nesting habitat for CA Least Tern and Western Snowy Plover

CSP Retired Annuitant Environmental Scientist treated 192 colonies of ice plant (*Carpobrotus edulis*) throughout the dune systems at Border Field State Park. The table shows a comparison over the last ten years. This was the lowest number ever which is likely drought related. The work was completed in January 2022 using a glyphosate-based nonselective herbicide approved for use near water.

Year	# ice plant treated
2022	192 colonies
2021	546 colonies
2020	386 colonies
2019	418 colonies
2018	Too many to count
2017	375 colonies
2016	310 colonies
2015	500 individuals
2014	886 individuals
2013	1,600 individuals

Foliar applications involve spraying the leaves of target species with a low concentration mixture (1.5-5%) of herbicide in accordance with label instructions. Foliage is covered thoroughly, but not to the point of run-off.

Treatment days are determined based on the weather forecast, ideally when there is little to no wind (5 mph or less) and rain is not expected for 8 to 12 hours. These conditions minimize drift and allow the sprayed vegetation to dry completely.

2. High Quality Habitat for Riparian Birds

CSP Retired Annuitant Environmental Scientist, primarily treated castor bean (*Ricinus communis*), giant reed (*Arundo donax*), and tamarisk (*Tamarix ramosissima*) throughout the Goat Canyon drainage this period. Roundup Pro Concentrate, and Pathfinder II, post-emergent, broad-spectrum herbicides were used. Some annual forbs were mowed before herbicide treatment to reduce seed production and increase plant diversity while also creating some fuel reduction.

Annual weeds were hand-pulled around native plantings. Other plants treated included fennel (*Foeniculum vulgare*), lens-pod white top (*Lepidium draba*), and black mustard (*Brassica nigra*), bristly ox-tongue (*Helminthotheca echioides*), black mustard (*Brassica nigra*), and globe daisy (*Glebionis coronaria*). CSP District Natural Resources staff assisted in annual treatment of approximately two acres of St. John's wort (*Hypericum ssp.*).

TASK: TEACHERS ON THE ESTUARY

Anne Marie Tipton, TRNERR Education Coordinator, California State Parks

1. Educators increase their knowledge of and appreciation of estuarine and watershed environments, as well as the necessary skills, to act as stewards of estuarine and watershed resources.

Climate Teachers on the Estuary. Educators in California are implementing strategies to teach science as the Next Generation Science Standards intended, with a focus on scientific phenomena. Environmental educators, climate change planners, and scientists at the Tijuana River National Estuarine Research Reserve worked with the San Diego County Office of Education to help implement its #ProjectPhenomena by co-hosting a Climate Change *Teachers on the Estuary* (TOTE) middle and high school teacher training originally in October 2018, and TRNERR provided a hybrid version in May 2022.

The overarching goals of #ProjectPhenomena are to: (1) develop useful resources to help educators use phenomena as the basis for meaningful learning experiences for students; (2) strengthen collaboration between K-12 teachers, out-of-school educators, higher education institutions, and scientists; and (3) promote pedagogical practices that support learning where students explore, investigate, and explain how and why phenomena occur through explicit use of the three-dimensions of the Next Generation Science Standards.

NERRs are set up to be sentinel sites, to monitor changes due to impacts from climate change such as migrating marshes, a rising sea, and how well a marsh can respond to those changes. The Climate TOTE was based on the phenomena of sea level rise. Local tide level data from the Reserve and Scripps Institution of Oceanography as well as El Niño data from the National Estuarine Research Reserve formed the foundation of the instruction from the Research Coordinator. Teachers were also introduced to climate related field experiences for their students.

Several climate change teacher trainings might provide examples of standards-based instruction, but Climate TOTE goes further by helping teachers ensure for their students emotional/psycho/social resilience to climate change impacts and provide them with civic-based solutions to mitigate climate change. The last in-person day of TOTE included a social worker, who specializes in Positive and Adverse Childhood Experiences (PACE) and works locally and through California's new movement to provide for the emotional climate change resilience of our diverse population. The training ended with an inspirational panel of adult and youth climate change activists so that teachers can empower their students to engage in San Diego's active climate movement. Three informal, one middle, two high school, and two university educators attended the training. Unfortunately, due to substitute issues and last-minute illnesses, only one teacher was present at the end of the in-person day with the youth activists.

TASK: RESEARCH COORDINATION AND IMPLEMENTATION

**Dr. Jeff Crooks, TRNERR Research Coordinator,
Southwest Wetlands Interpretive Association**

1. Research by TRNERR staff increases local knowledge

Despite lingering challenges associated with COVID-19, we continued to advance the outcomes identified in the operations award. We were able to engage our volunteers during some field work, and they have helped with processing soil samples as well as collecting phytoplankton samples for a state-wide [monitoring program](#). We also have a new summer intern through the [California State University COAST](#) program, Nour Nuhaily, from Cal State San Marcos. Nour is working using community science tools (focusing on iNaturalist) to track the appearance of warm water species in Southern California (i.e., tropicalization). We continue to see several of these species, including a tropical fiddler crab, swimming crab, and Mexican brown shrimp. Our Davidson Fellow, Nancy Torres, continues to document pollution trends in the Reserve.

2. The Reserve offers attractive opportunities for researchers

Several In addition to the student work on pollution trends and tropicalization, other projects are underway at the Reserve. These are listed in the Research and Monitoring Database, and include:

- The [NCCOS Coastal Hypoxia Research Project](#), a partnership with Scripps, SWIA/TRNERR, and San Diego State University, is starting to wrap up. This work is also being conducted in partnership with researchers in the Biology Department at San Diego State University. This project is leveraging long-term TRNERR-based monitoring in both the Tijuana Estuary and Los Peñasquitos Lagoon. We have finalized the analysis of effects of lagoon closure and hypoxia on benthos, and are in the process of revising a paper for publication on this topic. We are also synthesizing historical as well as recent information to determine effects of red tide-induced hypoxia to create a hypoxia species watch list. Part of this work also involves the use of mussel and oyster biosentinels, which are wired to track shell gape and heart rate that compared to abiotic conditions (from SWMP loggers). We are also [communicating](#) this information to local resource managers.
- Our NERRS Science Collaborative grant (Luke Miller, SDSU, as PI), [Habitat Heartbeats](#), is expanding on the use of these biosentinels. We are working with an aquaculture facility in San Diego Bay to deploy these shellfish in that context.
- Researchers from San Diego State University are using one of our SWMP sites as a focal area for an expanded suite of monitoring with their deployed dataloggers (e.g. tracking CDOM and tryptophan), and are also starting to examine groundwater dynamics.
- TRNERR continues to lead the next phase of a project on habitat change in the broader Tijuana River Valley (with partial support from the US Navy and US Fish and Wildlife Service).

- A Scripps student and next Davidson Fellow, Natalie Grayson, is examining microbiota as indicators.
- In addition, Dr. Crooks is involved advising or supporting a number of graduate student research projects. Dr. Crooks is on several committees and is chair for two students at the University of San Diego (and one student defended in January). He is also involved in supporting students from a variety of universities, including SDSU, Scripps / UCSD, UCLA, and UC Irvine.

3. Restoration offers opportunities for coupled science / management

The draft EIR / EIS for the Tijuana Estuary Tidal Restoration Project ([TETRP](#)) has been completed, and public release is expected soon. This will provide the framework for the project. We will next engage the Science Advisory Team on the research elements to be embedded within this (related to planting palettes along elevation gradients and use of “starter” channels to aid in the development of creek networks in the marsh). We also continue to conduct pre-restoration monitoring in the TETRP footprint, focusing on vegetation and large fish/ invertebrates using minnow traps.

TRNERR has completed a decade’s worth of monitoring at the [South San Diego Bay Salt Ponds Restoration](#) site, with the latter years focusing on vegetation development. We are currently analyzing long-term trends, including the results of an experiment to assess best methods of cordgrass (*Spartina foliosa*) transplant.

The [San Diego Bay Native Oyster Living Shorelines project](#) has been installed, and Dr. Crooks continues to advise on this project as part of the Advisory Team.

4. TRNERR is used as a reference site

TRNERR is a reference site included in the [mitigation monitoring program for the impacts of the San Onofre Nuclear Generating Station \(SONGS\)](#). Most of the sampling occurs in the fall (conducted by University of California Santa Barbara scientists), but monitoring of birds and water quality, using data from TRNERR SWMP loggers, was conducted during this reporting period.

5. Communication of key research findings and perspectives

Dr. Crooks has continued to be involved in various steering committees and field trips. Activities during this reporting period include:

- California Estuary MPA Monitoring Project Advisory Committee
- Los Peñasquitos Lagoon Restoration Planning (with separate funding)
- HiTIDER (History and Topography to Improve Decision-making for Estuary Restoration) - NERRS Science Collaborative project
- Advise on Topanga Lagoon restoration
- Field trip and guest lecture for students from the University of San Diego
- Advisor for a Scrips Master’s student capstone project related to state-wide sea level rise guidance
- Advise University of San Diego undergraduates on a class project related to

data dissemination for various monitoring projects in the Tijuana River Watershed

- “Talk to a scientist” activities for the Ocean Discovery Institute’s elementary school program
- Serve as a peer-reviewer for scientific papers
- Review research proposals (including Sea Grant, the California State University COAST program, and the Israel Science Foundation)

6. Reporting and Database Entry

Research projects were entered into the database.

TASK: IMPLEMENTATION OF THE SYSTEM-WIDE MONITORING PROGRAM

**Dr. Jeff Crooks, TRNERR Research Coordinator,
Southwest Wetlands Interpretive Association**

1. High quality meteorological and water quality data

NOAA SWMP funding allows SWIA and TRNERR to leverage partnerships to maintain a robust monitoring program that address issues relevant to the Reserve specifically, and the region as a whole. Our partners and funders include California State Parks, the USFWS, the State Coastal Conservancy, the Los Peñasquitos Lagoon Foundation, NOAA NCCOS, and the National Fish and Wildlife Foundation.

We operate three stations in the Tijuana River Estuary, two of them formal SWMP and one is associated with TETRP (and is being maintained in accordance with SWMP protocols). One of these sites, Boca Rio, is associated with an enhanced suite of monitoring conducted by Reserve partners (see above). This includes a web camera deployed as part of the High Performance Wireless Research and Education Network (HPWREN). Two sites are monitored in South San Diego Bay, both SWMP. We also maintain three telemetered sites in Los Peñasquitos Lagoon, which are also being operated in accordance with SWMP protocols. This data is available at torreypines.trnerr.org.

These data are used for a variety of research and management efforts, including management of tidal inlets (see CHRP section as well). Monitoring data are also being used to inform active restoration planning and post-construction monitoring, including TETRP, SONGS mitigation monitoring, South San Diego Bay salt ponds restoration, and Los Peñasquitos Lagoon restoration as part of a TMDL (Total Maximum Daily Load) associated with excess sediment and freshwater.

Dr. Crooks continues to serve as Chair of SWMP Oversight Committee, which helps ensure that high-quality data is produced by the Reserves.

2. Understanding of long-term vegetation dynamics and SSAM-1

We conducted annual vegetation monitoring in the spring, with the aid of volunteers. These sites include transects sampled using SWMP biomonitoring protocols. We have also completed our draft SSAM-1 plan and will be sending it out for review.

3. Integration of monitoring with education and outreach programming

The Reserve conducted a climate-related TOTE training in the spring, which included both in-person and virtual activities. SWMP remains a centerpiece of TOTE activities (see Education program report for more details).

TASK: PROFESSIONAL DEVELOPMENT, TRAINING, PRESENTING

**Dr. Jeff Crooks, TRNERR Research Coordinator,
Southwest Wetlands Interpretive Association**

1. NERRs Integration and Leadership Development

This activity did not occur during this reporting period.

2. Staff Development

This activity did not occur during this reporting period.

3. TRNERR Staff Program Support and Enhancement

Limited travel to field sites has occurred during the reporting period.

TASK: INVASIVE SPECIES - APPLICATION OF RESEARCH TO MANAGEMENT

**Dr. Jeff Crooks, TRNERR Research Coordinator,
Southwest Wetlands Interpretive Association**

1. Improved understanding and management of local invaders

The Reserve continues to examine the distribution and abundance of invasive plants with SWMP biomonitoring transects. This information will have particular importance in the development of a planting plan for the TETRP site. TRNERR is also continuing long-term work on the invasive [Kuroshio Shot Hole Borer](#) (an ambrosia beetle) on riparian habitats in the valley (in part supported, with non-matching funds, by the Navy). Reserve researchers also using community science (iNaturalist) as a tool to track biological invasions.

Dr. Crooks is also adjunct faculty in the Department of Environmental and Ocean Sciences at the University of San Diego, and advises students who are working on invasive species. This includes a study of tissue contaminants in native and invasive snails in the Tijuana Estuary (by our Davidson fellow, Nancy Torres). Results from this suggest that both snails have similar contaminant levels, likely representing their life history in the marsh rather than their evolutionary history in the region. Another student is starting to examine the relationships between architecture of different plant species (both native and exotic) and arthropods (spiders) in the high marsh.

2. Improved regional, national, and international information sharing

Dr. Crooks is Co-President of The Society for the Study of Marine Bioinvasions, which hosts the International Conference on Marine Bioinvasions series. Unfortunately, we have had to postpone the meeting (again), which was to be held in Annapolis in spring, 2022. We are planning for a [2023 meeting](#) to be held at the University of Maryland Institute of Marine and Environmental Technology in Baltimore. The local sponsor for this conference is the Smithsonian Environmental Research Center.

Dr. Crooks also provides information on invasive species in the Tijuana Estuary and the region in general as part of field trips and presentations.

TASK: MARGARET A. DAVIDSON FELLOWSHIP SUPPORT

**Dr. Jeff Crooks, TRNERR Research Coordinator,
Southwest Wetlands Interpretive Association**

1. Successful implementation of Davidson Fellowship

Nancy Torres continues to progress with her work, focusing on sediment and tissue contaminants in the Tijuana Estuary. She has compiled long-term data, and conducted her spring sampling during this reporting period. She collected tissue from a wide range of species in the Reserve, both to understand their potential role as bioindicators and to identify potential food chain effects. This work is being done with input from the US Fish and Wildlife Service Contaminants Division. Because of various delays in completing her proposed work (including those due to COVID), she will be requesting a no-cost extension.