

Morro Bay National Estuary Program
Community Project Applications for Fall 2022
Summary of Projects, Technical Review, and Staff Recommendations

We worked with two project partners to develop potential projects for our Community Projects program. Each partner submitted an application in September 2022. Staff felt one project required Technical Advisory Committee review and one did not. We received feedback on the E&O aspects of the two projects. Based on this input, staff developed their recommendations on these two projects.

The maximum funding amount for a project is \$10,000. Our available funding for FY2023 is \$15,000. Depending on how much funding we distribute in the fall, we may not have a second solicitation in March 2023.

Project 1: Temporal and Spatial Variability of Phytoplankton in the Morro Bay Estuary

Applicant: Dr. Alexis Pasulka, Cal Poly Biology Department

Request: \$8,389

Matching Funding: \$18,062

Total Project Budget: \$26,451

Summary: As phytoplankton form the base of the marine food web, their growth dynamics strongly influence coastal ecosystems. The growth of some phytoplankton groups can be harmful to human health, the environment, and the economy. Commonly known as harmful algal blooms (HABs), low inflow estuaries such as Morro Bay may be particularly vulnerable to HAB events due to stressors such as nutrient loading and reduced precipitation. Thus, it is important to characterize the phytoplankton community in the bay. Sampling efforts at the bay mouth show seasonally similar phytoplankton populations to San Luis Bay. However the back bay exhibits a distinct phytoplankton community relative to the bay mouth.

The project has the following components:

- Sampling: project proposes to monitor phytoplankton in the back bay off Pasadena Point relative to the mouth of the bay over a year. The study focuses on collecting and analyzing weekly samples from each location during high tide and collecting sediment samples for future genetic analysis. Samples will be collected by Estuary Program staff. January 2023 to January 2024.
- Sample analysis and data recording: Undergraduate students to conduct phytoplankton identification and chlorophyll a extractions under the direction of Dr. Pasulka. Likely summer 2024.
- Training: Estuary Program staff will provide training in sample identification and analysis to students. January 2023.
- Data synthesis: Analysis of year-long sampling effort. Look at phytoplankton composition over time and composition links to environmental variability. The team will work with other Cal Poly faculty to tie in the results to oyster mortality events and reach out to shellfish farmers to share results. January 2024 to June 2024.
- Education outreach: Undergraduates will create a poster for display in the Estuary Program Nature Center and the Cal Poly Pier Open House. Summer 2023. Create a scientific poster to be

presented at the Coastal and Estuarine Research Federation conference (Fall 2023) and the Cal Poly undergraduate research conference (Spring 2024).

- Project management: Dr. Pasulka will manage the project including recruiting and hiring students and purchasing supplies. She will coordinate sampling, analysis, and data integration.
- Reporting: Dr. Pasulka will complete project reporting at the end of the project. June 2024.

The requested funding supports the purchase of needed supplies and equipment (\$4,339), an undergraduate fellowship for two students for three quarters (\$2,400), poster printing (\$165), student conference registration fee (\$300), and travel costs for a student to attend the conference (\$1,185).

Dr. Pasulka plans to pursue additional internal funding from Cal Poly to support undergraduate research, and hopes to find support for an additional student to be involved in the project. If she is successful in winning an award, this funding would likely be available as additional match toward the project.

Relevant CCMP Action Plans: MON-2 (Monitor Environmental Indicators), MON-5 (Support Partners), MON-6 (Support Research Activities), ECR-9 (Regional and National Collaboration), USE-2 (Shellfish Farming), EO-1 (Public Education and Outreach).

Technical Reviewer Input: As this proposal is quite technical, the Estuary Program reached out to three experts in the field of phytoplankton for their input. Their feedback is summarized as follows:

- Project goals: Modest but impactful to better understand how back bay biology and plankton communities differ from the bay mouth. Information could be useful for shellfish growing operations. A reviewer suggested adding temperature and salinity measurements, which Dr. Pasulka will include.
- Budget: Very reasonable and highly leveraged by other resources and in-kind support.
- Timeline: Reasonable for the scope of work.
- Experience: The project team is well-qualified to accomplish the proposed work. The analysis is doable and will lead to highly useful data products for partners and end users.
- Education components: The project teaches undergraduates valuable methods for sampling, identifying, and assessing phytoplankton. The project also provides an opportunity to write-up and present results and conduct outreach to local oyster farmers.
- Overall: The proposal was thorough and well thought out, with a high likelihood of success.

E&O Review: The three technical reviewers are affiliated with universities, and all had favorable input on the E&O components of the effort. An additional reviewer comments that outreach at conferences and the Cal Poly Pier Open House will only reach “the converted” and instead suggested students work with local teachers to share the results with the community and students. As this is a research focused project, there is not room within the \$10,000 spending limit to fund a more holistic educational component. As the research itself does not lead to impactful action by the general public, this seems less useful for this particular project. The educational poster will be shared at the Estuary Program’s Nature Center, where thousands of general public visitors will be exposed to the research results, and the students involved will benefit from professional development experience.

Partner Capacity Review: Dr. Pasulka has been involved in phytoplankton monitoring for several years, including a project to compare phytoplankton communities in Morro Bay and San Luis Bay. She has extensive experience in phytoplankton research, as well as all aspects of grant management. Thus, staff

determined that Dr. Pasulka has the capacity to receive and successfully manage Community Project funding.

Staff Recommendation: Staff supports funding this project. We feel that the scope is reasonable and achievable given the budget and the project timeline. Although projects typically span one year, a full year of data collection is needed to capture seasonality. Thus a year-and-a-half timeline is appropriate. We think it is impactful as a pilot project to learn more about phytoplankton communities, as an opportunity for expanded student research, and as a professional development experience for students to attend conferences. The results of the effort will be shared both locally and at a national conference. We recommend funding of \$8,398.

Project 2: Baywood Marine Debris Reduction Program

Applicant: Los Osos Community Services District (CSD)

Request: \$5,991

Matching Funding: \$8,241

Total Project Budget: \$14,232

Summary: The CSD provides services to the community of Los Osos, including water, drainage, parks & recreation, fire emergency, and rescue response. They also play a role in solid waste management. Staff are observing an increase in litter in the Baywood area, in part due to a lack of trash receptacles in an area that's experiencing an increase in use of restaurant take-out food containers. The CSD is proposing to install two receptacles in strategic locations in the area to reduce marine debris. The receptacles will need to be heavy-duty commercial grade units and approved by the County and the solid waste hauling company. As the units will need to be located adjacent to the street to facilitate trash pickup, an encroachment permit from the County will be needed. The effort to reduce marine debris will include an educational sign to be designed and manufactured in conjunction with Estuary Program staff and installed in the area.

The project has the following primary components:

- Project administration: budget management, reporting, and invoicing. (provided as match)
- Trash receptacle installation: Select, purchase, and install two trash receptacles. Coordinate with hauler to make the selection. Establish regular trash pickup services, to be funded by the CSD. Coordinate with the County on required encroachment permit. (\$2,090)
- Educational signage: Work with the Estuary Program to develop content, coordinate with a graphic designer, and contract with a sign manufacturer. CSD will install the sign. (\$3,900)

Relevant CCMP Action Plans: BMP-7 (Support Stormwater BMPs), USE-1 (Recreational Uses), EO-1 (Public Education and Outreach).

Technical Reviewer Input: Staff felt that as the project did not contain technical aspects, technical review was not necessary.

E&O Reviewer Input: The review focused on the limited efficacy of signage in changing behavior, which is a valid point. However, the CSD is not in the position to develop and implement a full outreach effort around this issue. As with all work we do with partners, we will seek opportunities to leverage efforts such as the Community Projects to integrate with our own efforts. Staff recommends proceeding with

the project as proposed, with the understanding that further efforts to address marine debris will likely be needed in the future.

Partner Capacity Review: Information provided by the CSD indicates that they would be able to manage the necessary components of a successful project, including invoicing, budgeting, reporting, etc. The detailed tasks and timeline provided in their application indicates that the project has been well thought out and that they would be able to complete the effort in the one-year timeframe.

Staff Recommendation: Staff recommends that we fully fund this effort at the requested level of \$5,991. Marine debris is a current priority for EPA and an area where we would like to expand our impact and our education efforts.

MBNEP Community Project Application

Project Title: Temporal and Spatial Variability of Phytoplankton in the Morro Bay Estuary

Applicant: Alexis Pasulka

Address: 783 Peppermint Way San Luis Obispo, CA 93401

Contact Information:

Alexis Pasulka

602-206-2208

apasulka@calpoly.edu

Amount requested: \$8389

Total project cost: \$26,451

Amount and source of other funding: \$18,062

This project will be supported by a range of additional funding sources including:

- Summer support for one undergraduate student through the Frost Summer REU program (\$4000)
- Alexis Pasulka will volunteer her expertise in the execution of this proposal and to mentor the undergraduate students involved in this project (200 hours at an hourly rate of \$62.5; \$12,500)
- Kevin Johnson will volunteer his time for our informal discussions with local oyster farmers (25 hours at an hourly rate of \$62.5; \$1562.5)

Project Description

Phytoplankton form the base of the marine food web; consequently, their growth dynamics influence the structure and function of coastal ecosystems. Phytoplankton growth along coastal environments is largely influenced by seasonal changes in the vertical stability of the water column, which in turn determines the availability of light and nutrients. However, within an estuary ecosystem, local variations in the hydrography and chemistry can alter the environment and in turn phytoplankton growth dynamics on shorter time-scales (e.g., days to weeks). The growth of some phytoplankton groups (i.e., harmful algal blooms; HABs) can also have negative impacts on human health, the environment, and the economy. Low inflow estuaries such as Morro Bay may be particularly vulnerable to HAB events due to anthropogenic stressors such as nutrient loading and/or reduced precipitation. Therefore, it is critical to monitor and characterize the phytoplankton community within Morro Bay, and ultimately work to predict HABs in order to mitigate their detrimental effect on our local ecosystem.

Our preliminary analysis of phytoplankton within Morro Bay has revealed that the mouth of Morro Bay is seasonally similar to SLO Bay (the location of our long-term phytoplankton monitoring site along this stretch of coast). However, the back bay exhibits a

distinct phytoplankton community relative to the mouth of the bay. Given these differences in composition, and the fact that the back bay supports local oyster aquaculture and a large biodiversity of marine organisms, it is critical that we better understand the growth dynamics of phytoplankton at different locations within the bay and the potential for the formation of HABs. **In this study, we propose to characterize the phytoplankton composition in the back bay (off Pasadena Point) relative to the mouth of the bay (BM-1) over the course of a year.** Our study will focus on weekly samples collected during high tide to begin to determine temporal and spatial patterns of phytoplankton composition within the estuary. Total chlorophyll *a* and temperature will also be collected weekly at each site. In addition to these sites being accessible from shore (which makes weekly sampling feasible), they are co-located with a monthly time-series of nutrients and dissolved inorganic carbon (via Dr. Emily Bockmon). These additional data will help provide environmental context for the phytoplankton samples and enable us to start to develop some hypotheses for the complex dynamics controlling phytoplankton populations within the bay.

While the focus on this study will be to characterize key phytoplankton groups (e.g., diatoms and dinoflagellates) in the water column via light microscopy, we also aim to take a set of samples to archive for future molecular analysis. More than 10% of marine dinoflagellates (many of which are HAB formers) produce cysts during unfavorable environmental conditions. These resting stages can remain in the sediment layers for months to years. Resuspension of these cysts and subsequent germination during favorable conditions could be important for the spatial variations in bloom dynamics within the estuary. Molecular approaches, such as 18S rRNA gene metabarcoding, are better suited than microscopy for characterizing the cyst community within the sediments. Therefore, in addition to samples for microscopy, we will collect a water sample and small-volume surface sediment sample for future molecular analyses. The analysis of these molecular samples will be supported outside of this community project. However, we will use this community project to collect and archive the samples. All of the work will be carried out under the MBNEP entity permit (which is currently being modified for the sediment work).

This project will engage undergraduate students in research as well as provide critical data to local oyster farmers. While the phytoplankton samples will be collected by Nicholas Soares with the MBNEP, undergraduate student researchers will be responsible for analyzing the samples, which will include observing and identifying phytoplankton via light microscopy and chlorophyll *a* extractions. Through this project, the students will not only learn critical research skills, but will also have the opportunity to develop important communication skills. The undergraduate students will present findings from their work in lab meetings as well as at conferences. At least one of the students will present at the annual Coastal and Estuarine Research Federation (CERF) conference in Fall 2023 and both students will present at the annual Cal Poly College of Science and Math Undergraduate Student Research Conference in Spring 2024. The students will also learn to communicate their project goals and preliminary analyses to informal audiences through the creation of a poster that will be displayed at the Estuary Nature Center and the Cal Poly Pier Open House (annually in October). The goal of these posters will be to educate our community about the importance of phytoplankton in marine ecosystems as well as bring awareness of HABs and why monitoring them is key to maintaining a healthy bay. We will also work with Dr. Kevin Johnson, California Sea Grant Extension

Specialist at Cal Poly, to communicate our findings of key HAB taxa and blooms to local oyster farmers. Dr. Johnson will also communicate with the project team if the local oyster farmers experience any significant mortality events. While we will not set up any formal channels for communication over this first year of collection, the informal communication of our findings along with the farmers observations will allow us to begin honing in on what data would be beneficial to communicate and over what time-scales.

In the face of a changing climate, warmer waters and less rainfall will continue to shift estuary ecosystems and it's important that we start to understand the dynamics at the base of the food web. Ultimately, phytoplankton dynamics in the estuary are complex and will require the consideration of multiple environmental drivers. However, this project is a first step to characterize their temporal and spatial dynamics in the bay and develop testable hypotheses, which could eventually lead to some predictability.

Project Tasks

Sampling – Sampling to characterize phytoplankton abundance and composition, chlorophyll *a* concentration, and temperature will be conducted weekly from surface waters at the mouth of Morro Bay (BM-1, T-pier; 35.371 -120.879) and within the bay at Pasadena Point (co-located with S4 Bockmon sampling site; 35.33, -120.844). Samples for molecular work (water and sediment) will also be collected at Pasadena Point on a weekly basis. Sampling will be carried out by Nicholas Soares (MBNEP) and is estimated to take approximately 1.5 hours (not including drive time) each week. Sampling will be conducted over the course of year from January 2023-January 2024.

Sample analysis and data recording – All samples will be processed in the Pasulka Lab by two undergraduate student researchers. This will include the identification and enumeration of phytoplankton as well as the extraction and measurement of chlorophyll *a*. Data entry will occur weekly and the data will be maintained in an excel spreadsheet. Samples for molecular analysis will be archived in -80°C until extraction and sequencing at a later date (likely Summer 2024).

Training – The classic method for state-wide monitoring of phytoplankton, including harmful algal bloom species, is microscopic examination based on morphological characteristics. Therefore, a critical aspect of this project will be the effective training of students to proficiently identify key phytoplankton groups based on light microscopy. This training will be conducted by Nicholas Soares in for the first four weeks of the project (likely January 2023). In addition to teaching the students phytoplankton identification, Nick will conduct a series of quality control checks by co-analyzing several samples. Dr. Pasulka will train the students on chlorophyll *a* extraction and analysis during this same time-period.

Data synthesis – After a year-long sampling effort, Dr. Pasulka, in conjunction with Nick Soares and colleagues with other datasets in the Bay, will work to synthesize the data. This will likely include an analysis of phytoplankton composition over time as well as efforts to link phytoplankton composition with environmental variability. Data synthesis will take place from January 2024-June 2024.

Education Outreach – In order to engage with both formal and informal audiences, the undergraduate students working on the project will have the opportunities to communicate about their research experience and preliminary findings. This will include an educational poster that will be displayed at the Estuary Nature Center and the Cal Poly Pier Open House after the first summer of the project. This will also include a more formal scientific poster to be presented at the CERF Bi-annual Conference in Fall 2023 (representing the first 6 months of sampling) and the annual CSM Undergraduate conference in Spring 2024.

Project Management – Alexis Pasulka will manage the project including the recruiting and hiring undergraduate students and purchasing supplies in coordination with the MBNEP. This will also include the coordination of sampling, analysis, and data integration. Alexis will facilitate meetings with team members at least once a month as well as engage in quarterly data checks. Alexis will also compile the data and information for reporting.

Reporting – Alexis Pasulka will be responsible for completing project reporting at the end of the data synthesis phase in June 2024

Budget

Item	Amount
Supplies/Equipment	
Filters, collection bottles, reagents	3500
Utermohl settling chamber	839
Personnel	
Undergraduate Fellowship (\$400/quarter); 3 quarters, 2 students	2400
Posters and Conferences	
Poster Printing (\$55 per poster); 3 posters	165
Student Conference Registration Fee	300
Student Conference Travel	
Student Conference Participation (per diem of \$157/day); 5 days	785
Flight to Conference for Student	400
Total Funds Requested	8389

The supplies requested for this project include those needed for collecting, storing, and transporting samples (buckets, bottles, syringes, sample vials, sample labels, small cooler, freezer boxes, pipettes, filters) as well as the reagents necessary to preserve or analyze the samples (acetone, hydrochloric acid, formaldehyde). An Utermohl settling chamber is also needed for phytoplankton enumeration. We have added \$350 (or 10%) to the cost of supplies to account for supply price increases over the course of the project.

We have requested fellowships for two students (\$400/quarter) for 3 quarters. The summer quarter will be supported by the Frost Summer REU program through Cal Poly.

Support is requested for 3 posters (two to be displayed at the Nature Center and Pier Open House and one for the CERF conference). Support is also requested to cover the costs associated with the CERF conference (registration and travel) for one student.

Schedule

PROJECT TASK	2022	2023												2024					
	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J
<i>Recruiting and hiring undergraduates</i>																			
<i>Purchasing supplies</i>																			
<i>Training Students</i>																			
<i>Sampling</i>																			
<i>Sample Analysis and Data Recording</i>																			
<i>Data Synthesis</i>																			
<i>Education Outreach - Poster Displays</i>																			
<i>Education Outreach - Conferences</i>																			
<i>Reporting</i>																			

**Morro Bay National Estuary Program
Community Project Program
Concept Proposal**

Please provide the following information:

Project title:

Baywood Marine Debris Reduction Program

Applicant organization:

Los Osos Community Services District (CSD)

Organization type:

Local Agency

Address:

2122 9th Street Ste. 110
Los Osos, CA. 93402

Contact information:

Ron Munds
805-528-9379
rmunds@losososcsl.org

Amount requested:

The CSD is requesting \$5,991 in funding for the “hard” costs of the project (see table below).

Total project cost:

The following is the estimated total cost of the project:

Component	Estimated Cost
Trash receptacles (2)	\$1,600
Educational Sign design	\$1,400
Educational Sign production/pedestal	\$1,750
Educational Sign installation	\$750
Encroachment permit	\$491
Subtotal	\$5,991
In-Kind & Monetary Contributions	
Project Administration (CSD staff)	\$550
First year collection disposal cost	\$1,000
Educational Sign Installation (CSD staff)	\$700
Subtotal	\$2,250
Project Total	\$8,241

Amount and source of other funding (if applicable):

The CSD will provide in-kind services for the administration and reporting elements of the project and installation of the signage. Additionally, the CSD will pay for the ongoing cost for the collection and disposal of the trash generated. The one-time administrative costs are estimated to be \$550 and the collection and disposal costs for first year to be \$1,000.

If the full amount of requested funding is not available, support for the permitting and purchase of receptacles would allow for improved trash management in the Baywood area even if the educational components cannot be funded.

Note that rapidly rising costs and supply chain issues could delay the project and/or increase the costs. If this occurs, the CSD has adequate funding to make up budget shortfalls.

Project description:

Along with the increase in commercial activity, mainly restaurants and take-out food service, we've seen an increase in litter caused by the lack of trash receptacles in the area. The CSD is proposing to install two receptacles in strategic locations to capture as much of the debris as possible so it does not enter the marine environment. The receptacles will need to be made of heavy duty, commercial grade materials and approved by the County and the solid waste hauling company, Mission Country Disposal.

CSD staff is surveying the 2nd Street area for potential sites. One location will be in close proximity to the pier with the second site to be determined. Since the trash receptacles will need to be adjacent to the street to facilitate trash pickup, a location near the pier (on 2nd Street) will be identified as part of the encroachment permit process.

CSD staff will coordinate with Estuary Program staff to develop an educational sign describing the impacts to the environment of marine debris and steps individuals can take to minimize it. With the addition of many new restaurants to the popular 2nd Street area, the CSD will install the educational sign where it will be viewed by residents and visitors to the area.

Project Tasks:

Project Administration:

This task involves management of all aspects of the project and any Community Project related reporting and invoicing.

Trash Receptacle Installation:

This task involves selection, purchase, and installation of two trash receptacles. CSD will coordinate with the solid waste hauler on style of receptacle to purchase to ensure collection system compatibility. It also involves setting up and maintaining regular trash pick-up service. CSD will coordinate with the county to obtain the required encroachment permit.

Educational Signage:

This task involves CSD working together with Estuary Program staff to create sign content, coordinate with a graphic designer, and contract with a sign manufacturer. CSD will install the sign.

Budget Development:

See table under “Total Project cost” section.

Schedule Development - Once funding is awarded:

Task	Time
Permitting	2 months
Receptacle Purchase	90 days for delivery
Receptacle Installation	120 days
Signage design & production	9 months
Signage installation	30 days after sign delivery