



MPA Baseline Program

Annual Progress Report



Principal Investigators - please use this form to submit your MPA Baseline Program project annual report, including an update on activities completed over the past year and those planned for the upcoming year. This information will be used by the MPA Baseline Program Management Team to track the progress of individual projects, and will be provided to all MPA Baseline Program PIs and co-PIs prior to the Annual PIs workshop to facilitate discussion of project integration. Please submit this form to California Sea Grant when complete (sgreport@ucsd.edu, Subject [Award Number, project number, PI, "Annual Report"].)

Project Information

Project Year 2/1/2015 – 1/31/2016 MLPA Region North Coast

Project Title & Number R/MPA-40. Baseline Monitoring of Estuaries on the North Coast of California.

PI name Dr. Frank J. Shaughnessy Co-PI name Dr. Tim Mulligan

PI Contact Info Co- PI Contact Info (please list additional PIs and contact info in the "Project Personnel" section if necessary)

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## Project Goals & Objectives

Our project goals and objectives have not changed since the inception of the grant on 2/1/2014.

### GOALS

Our first goal is to describe the baseline conditions in four estuaries (3 MPA, 1 non-MPA) on the north coast. By “baseline”, we mean metrics of biodiversity, the population structure of focal species, and the summarizing of abiotic variables that capture watershed, estuarine and oceanic effects on estuarine life. The second goal is to use data from the first goal in order to develop recommendations for the testing of future estuarine MPA effects.

### OBJECTIVES FROM BASELINE TASKS & MILESTONES

1. Sample the 4 estuaries (Big River, Ten Mile, Humboldt Bay, Mad River) for biodiversity and target species during June 2015 and January 2016.
2. Process the invertebrate, algal and plant samples collected during the fieldwork prior to, and during, this reporting period.
3. Enter all data into the matrix formats necessary for community and population data analyses.

### STUDY DESIGN

It is important to realize that this baseline project is not using an MPA versus reference site design to test for an MPA effect. The number of exemptions (which allow ‘take’) occurring in the estuarine MPAs means that there is no expectation of a MPA effect. Instead, this project is creating a baseline comparison that could be used by a future BACI analysis. This approach has turned out to have more potential in any case because the tremendous physical and biological differences among estuaries would make it difficult to test for an MPA effect using an MPA versus reference site approach.

## Summary of Project Activities Completed to Date

### *Overview of Project Year \_\_ Activities, including progress towards meeting goals & objectives*

We met all of the objectives for this reporting period that are summarized in the previous section. However, due to changes in the people working on our project (see “unforeseen events” below), we were in a position during this reporting period of having to catch up on the processing of many field samples – about half of which were from before this reporting period.

The June 2015 field sampling of the 4 estuaries (Big River, Ten Mile, Humboldt Bay, Mad River), which includes enumeration of biodiversity (fish, plants, algae, epifauna, infauna, smaller mobile fauna) and abundance as well as body size descriptions of target (focal) animals and plants, was accomplished. This sampling was successfully repeated January 2016.

We got caught up on the lab processing of all the invertebrate and plant samples taken prior to, and during, this reporting period.

Data from all of the field efforts prior to January 2016 (3 surveys) has been entered into matrices, and ~ 50% of the January 2016 data have been entered.

### *Highlights from project progress so far, such as successes achieved, new collaborations or partnerships, or interesting stories from the past year that may be suitable for a blog post or other media venue*

The most striking findings from the baseline monitoring so far are the huge differences in physical context among the 4 study estuaries. The Ten Mile estuary is close to being a lagoon as the beach is perched and freshwater input during the summer is low; the Big River estuary is completely open to the ocean and so experiences a strong daily oceanic effect; the Humboldt Bay MPA location is very oceanic and likely experiences no or only minimal freshwater input; the Mad River beach is only partially perched and so this linear estuary experiences regular oceanic effects as well as daily freshwater input. It remains to be seen how much we can quantify these physical differences since watershed and estuarine monitoring of the relevant variables is inconsistent or absent among the 4 estuaries.

Biologically, there are some organisms that occur in all of the systems despite the large physical differences, such as sculpin and particular crab species. Other organisms, like eelgrass, track more strongly on the degree of oceanic influence – and so the greatest eelgrass cover values occur in Humboldt Bay and Big River.

### *Description of any unforeseen events and substantial challenges, and resulting effects on project activities and progress. Please indicate any issues that may affect other PI's or require coordination with other Baseline partners (e.g., ME, DFG, Sea Grant).*

There were 2 events that required some project adaptation on our part.

1. Dr. Shaughnessy's graduate student, Mr. Zachary Badaoui, died in early February 2015. He was responsible for all of the biodiversity and target species work, except for the fish sampling which was/is

the purview of Dr. Tim Mulligan's graduate student. He had not processed all of the invertebrate and plant samples from the June 2014 and January 2015 field surveys. Rather than bringing on a new graduate student Dr. Shaughnessy had money transferred from the Stipend to the Salary and Benefits line items so that 2 recent HSU alumni with advanced expertise in marine invertebrates could be hired May 2015. This was done and so Eric LeBlanc and Mary Colleen Hannon were able to get the project completely caught up in terms of the lab processing of field samples (mostly invertebrates). Ms. Hannon left the project during August 2015 but Mr. LeBlanc has stayed on to assist/lead the field and lab work.

2. We were unable to attract an intern from the Inter Tribal Sinkyone Wilderness Council community in Mendocino County for the summer 2015 work. This proved to be a lesson in how to do effective outreach. It appeared as if everything done by HSU and the ITSWC would have ensured a positive experience for an intern: HSU Faculty traveled to Ukiah to visit with Council members and ask them what they wanted out of the MPA process (wanted members of their community trained in doing marine science); the Council provided matching Travel funds for the intern; the Council Director and Dr. Shaughnessy jointly wrote the advertisement for the intern job; the Director had it posted in a location where he thought it would get the most attention. There were no applicants. In hindsight, what might have been more effective would have been to talk to high school teachers in the Mendocino school system – who are known and trusted by potential intern applicants – and have the teachers approach particular students and then make recommendations to the project PIs.

Dr. Shaughnessy did end up hiring an intern for the summer 2015 work, but this happened through connections that already existed through HSU and the local Wiyot tribe. Mr. Andrew Perera, an HSU student who is Lakota Souix and a veteran of the U.S. Marine Corps, was hired as the intern and he participated in the summer field and lab work.

*Data status (i.e., paper/raw format or digitized; if digitized, what format?)*

We have Excel files of the raw data for biodiversity and target species. In addition to sampling time and estuary, each estuary is sampled in 2 locations, and each location is stratified into the mid and low intertidal.

**Activities Planned for following Project Year \_\_ (if applicable) – Please describe remaining work and approximate timelines for completing that work, including any anticipated budget variances necessary to complete the project.**

The following activities are planned for post 2/1/2016:

- Lab processing of the January 2016 surveys
- So long as money is moved from the Wiyot and HTH to HSU (they have agreed upon an amount to move) then we will be able to do a June 2016 of the 4 estuaries. As before, the field team will be comprised of Wiyot, HSU and HTH people. January 2016 was the last survey date according to our original proposal, but it could be quite valuable to the baseline monitoring to add another June

sampling since a strong El Niño occurred during the winter-spring of 2016, resulting in much wetter conditions than the same period during 2015.

- Lab processing of the June 2016 surveys
- All data will be entered into Excel matrices – for starters. Some of the simpler project deliverables (e.g. tables of site coordinates, a detailed description of methods, community metrics, species presence-absence) will be completed.
- More thorough uni- and multivariate descriptions of baseline biodiversity and target species will be done by HTH in consultation with Dr. Shaughnessy from August – October 2016. If possible, multivariate descriptions of community structure (e.g. ordination) will be correlated to contextual variables describing oceanic (data from the Bjorkstedt & Largier MPA project) watershed inputs to each estuary.

**Project Personnel** – Please indicate additional project personnel involved in your MPA baseline project, including students and volunteers, or additional PI contact information if necessary, as well as the nature of their assistance in the project project.

	<i>Students Supported</i>	<i>Student Volunteers</i>	<i>Nature of Assistance</i>
<i>K-12</i>		3	<i>fieldwork</i>
<i>Undergraduate</i>	4	11	<i>Field &amp; lab, data entry</i>
<i>Masters</i>	1	3	<i>Fieldwork, data entry</i>
<i>PhD</i>			

*Number of other Volunteers not counted above and the nature of their assistance in the project:*

Adam Frimodig (CA Fish Wildlife), fieldwork

Dave Farrel (Mad River Alliance – nonprofit), fieldwork & data collaboration

The following are donating all of their project time, some of their time, or they are charging a reduced rate:

Frank Shaughnessy (HSU): fieldwork, oversight – 100% time donated

Tim Mulligan (HSU): fieldwork, oversight – 100% time & vessel donated

John Largier (UC Davis): analysis of contextual data? – 100% time donated

Neil Kalson (HTH): fieldwork – reduced rate.

Ken Lindke (HTH): fieldwork, data analysis during summer, fall 2016 – reduced rate.

Sharon Kramer (HTH): project oversight and management, review of analysis and report, fall 2016 – reduced rate.

Stephen Kullmann (Wiyot tribe): fieldwork, oversight – donated hours & vessels

Kelly Brown (HSU); HSU photographer who came to the January 2016 survey of Big River – 100% time donated

*Additional PI contact info not listed on first page:*

Dr. John Largier (UC Davis, Bodega Marine Laboratory), [jlargier@ucdavis.edu](mailto:jlargier@ucdavis.edu)

There are two other groups that are considered Vendors from a SG budgeting perspective, but they are co-PIs from a project implementation perspective. They are:

Stephen Kullmann (Wiyot Tribe)

Neil Kalson (H.T. Harvey & Associates); Neil replaced Adam Wagschal who was the HTH person listed on our original proposal.

**Cooperating Organizations and Individuals** - Please list organizations or individuals (e.g., federal or state agencies, fishermen, etc.) that provided financial, technical or other assistance to your project since its inception, including a description of the nature of their assistance.

<i>Name of Organization or Individual</i>	<i>Sector (City, County, Fed, private, etc.)</i>	<i>Nature of cooperation (If financial, provide dollar amount.)</i>
<i>Adam Frimodig (CA Fish Wildlife)</i>	<i>state</i>	<i>fieldwork</i>
<i>Margaret Perry</i>	<i>private</i>	<i>Gate access down to Ten Mile River</i>
<i>Brian Owens (CA Fish Wildlife)</i>	<i>state</i>	<i>permitting</i>
<i>Renee Pasquinelli (CA Parks)</i>	<i>state</i>	<i>permitting</i>
<i>Dave Farrel (Mad River Alliance)</i>	<i>nonprofit</i>	<i>fieldwork, data collaboration</i>
<i>Gina De La Rosa (CA Fish Wildlife)</i>	<i>state</i>	<i>permitting</i>
<i>Bill Pinnix (US Fish Wildlife Service)</i>	<i>federal</i>	<i>Allowed us to join their NOAA NMFS permit</i>
<i>NOAA NMFS</i>	<i>federal</i>	<i>None</i>

**Project Outputs and Materials:** Please provide any other project-relevant information, such as descriptions of attached materials, media coverage your project has received, presentations, publications, images etc.

Shaughnessy F.J., Kullmann S., Osborn K., Mulligan T., LeBlanc E., Kalson N. & A. Perera. 2015. An unexpected party: The convoluted and rewarding path of estuarine MPA monitoring on the North Coast of California. Western Society of Naturalists. Sacramento, CA.



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Project Information

Project Year: 2/1/2015 to 1/31/2016 MLPA Region: North Coast

Project Title & Number: R/MPA-40 Baseline Monitoring of Estuaries on the North Coast of California

PI name: John L. Largier (this is for UC Davis part of larger project)

Co-PI name

PI Contact Info

Co- PI Contact Info

(please list additional PIs and contact info in the "Project Personnel" section if necessary)

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Phone: (707) 875-1930

Phone



## Project Goals & Objectives

This annual report relates only to the small portion of the project that is being completed through UC Davis, with PI John Largier.

The overall primary goal is to describe the baseline conditions in four estuaries (3 MPA, 1 non-MPA) on the north coast. By “baseline”, we mean metrics of biodiversity, the population structure of focal species, and the summarizing of abiotic variables that capture watershed, estuarine and oceanic effects on estuarine life. The second goal is to use data from the first goal in order to develop recommendations for the testing of future estuarine MPA effects.

The goal of the UC Davis portion is to collate and analyze contextual environmental data for the 4 estuaries (Big River, Ten Mile, Humboldt Bay, Mad River). Data include water levels, water temperature/salinity/oxygen, and external environmental forcing from watershed and ocean.

It is important to realize that this baseline project is not using an MPA versus reference site design to test for an MPA effect. The number of exemptions (which allow ‘take’) occurring in the estuarine MPAs means that there is no expectation of a MPA effect. Instead, this project is creating a baseline comparison that could be used by a future BACI analysis. This approach has turned out to have more potential in any case because the tremendous physical and biological differences among estuaries would make it difficult to test for an MPA effect using an MPA versus reference site approach.

**Summary of Project Activities Completed to Date**

*Overview of Project Year \_\_ Activities, including progress towards meeting goals & objectives*

Within the UC Davis part of the project, activities were comprised of:

- (a) Interactions with larger study group, including participation in fieldwork at southern sites.
- (b) Preliminary characterization of the environmental characteristics of the 4 sites, within a broader view of estuaries in the region that is forming through parallel work on other projects.
- (c) Preliminary downloads of available data from offshore buoys (winds and waves), watershed gages (river flow rate), and “bits and pieces” of historical data and some limited contemporaneous data on abiotic characteristics in these estuaries.

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*Highlights from project progress so far, such as successes achieved, new collaborations or partnerships, or interesting stories from the past year that may be suitable for a blog post or other media venue*

As noted in the report from the parent project, the most striking findings from the baseline monitoring so far are the huge differences in physical context among the 4 study estuaries.

- (a) the Ten Mile estuary behaves as a lagoon with a perched mouth and freshwater input during the summer is low;
- (b) the Big River estuary is completely open to the ocean and so experiences a strong daily oceanic effect;
- (c) the Humboldt Bay MPA location is very oceanic and likely experiences no or only minimal freshwater input;
- (d) the Mad River estuary is constricted but not perched, so this linear estuary experiences regular oceanic effects as well as daily freshwater input.

It remains to be seen to what extent we can quantify these physical differences since monitoring of key watershed, estuary and ocean parameters is mostly absent for these 4 estuaries.

*Description of any unforeseen events and substantial challenges, and resulting effects on project activities and progress. Please indicate any issues that may affect other PI's or require coordination with other Baseline partners (e.g., ME, DFG, Sea Grant).*

Two primary challenges:

- (a) The expected challenge of providing environmental contextualization without any environmental data being collected in parallel with biotic monitoring. In the end, the contextualization will be primarily speculative and anecdotal.
- (b) The primary research staffer, Matt Robart, left the project when he moved to southern California during 2015.

*Data status (i.e., paper/raw format or digitized; if digitized, what format?)*

Data are digital when downloaded.  
NO database exists yet.

**Activities Planned for following Project Year \_\_ (if applicable) – Please describe remaining work and approximate timelines for completing that work, including any anticipated budget variances necessary to complete the project.**

Following fieldwork in 2016, the contextualization of the 4 estuaries over the past 3 years will develop a focus on providing the context and likely scenarios that can explain observed differences in observed biological patterns and temporal changes. Specifically, time-varying conditions will be related to seasonal and interannual differences, as well as events like mouth closure/breaching, intrusion of upwelled waters and river flow events. Attention will be given to the drought conditions observed and how this may relate to conditions in wetter years. We will also seek to link pertinent ocean conditions to those identified and quantified through the parallel MPA Baseline project on oceanic data (Bjorkstedt et al). We are planning a workshop in 2016 in which environmental variability can be linked to biological observations, whether through quantitative methods or narrative methods based on the “best-professional” interpretation of sparse data.

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<i>K-12</i>	Please see report from parent project (Shaughnessy).		
<i>Undergraduate</i>			
<i>Masters</i>			
<i>PhD</i>			

*Number of other Volunteers not counted above and the nature of their assistance in the project:*

Please see report from parent project (Shaughnessy).

*Additional PI contact info not listed on first page:*

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<i>Name of Organization or Individual</i>	<i>Sector (City, County, Fed, private, etc.)</i>	<i>Nature of cooperation (If financial, provide dollar amount.)</i>
Please see report from parent project (Shaughnessy).		

**Project Outputs and Materials:** Please provide any other project-relevant information, such as descriptions of attached materials, media coverage your project has received, presentations, publications, images etc.