



## Interagency Ecological Program 2023 Work Plan Element Developing an eDNA metabarcoding protocol to improve fish and macroinvertebrate monitoring in the San Francisco Estuary

### Project Manager and Affiliation

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### Principal Investigator and Affiliation

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### Annual Costs (thousands) and Funding Sources

\$80 (CDFW/CA Proposition I)

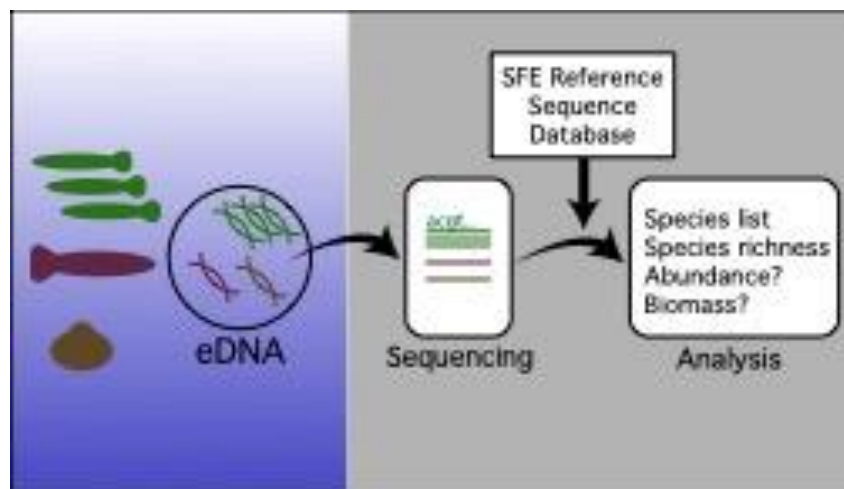


Figure 1: *Environmental (eDNA) metabarcoding complements other monitoring methods*

### Description

We are developing an environmental DNA (eDNA) metabarcoding protocol to complement existing IEP monitoring surveys and assess the effects of management activities such as habitat restoration or flow alteration. We will develop a reference sequence database for native and invasive fish, mussels, and other macroinvertebrates present in the San Francisco Estuary (SFE). We will optimize a molecular and computational pipeline for metabarcoding and ground truth the method against three SFE monitoring efforts, each using different sampling gear. We will investigate the relationship between eDNA sequence read count and fish biomass or abundance (EDSM survey). Finally, we will determine the ability of metabarcoding to detect fish and macroinvertebrate assemblages across large and small spatial scales and over time.

## **Need**

Our overarching goal is to develop a non-invasive, low-cost monitoring tool that can be used in conjunction with existing IEP monitoring programs or used alone to assess biological community composition at locations of interest in the SFE. This proposal is related to the 2020 – 2024 IEP Science Strategy by creating a new monitoring tool that can assist in two main areas: 1) Restoring Bay-Delta native fishes and community interactions and 2) assessing effects of flow alteration on Bay-delta aquatic resources. Broadly, this study will inform management decisions by supporting and augmenting existing monitoring surveys in the SFE. It will also lead to a richer and more complete understanding of SFE ecology. This study is not explicitly required by law or agreement, and to our knowledge is neither a recommended action nor a result from an IEP review or synthesis effort.

## **Objectives**

- Objective 1: Develop robust molecular methods and a computational pipeline for detection of SFE fish and macroinvertebrates by eDNA metabarcoding of water samples.
- Objective 2: Compare eDNA metabarcoding head-to-head with existing and historical monitoring data from three ongoing ecological surveys using diverse conventional sampling gear and evaluate accuracy of fish abundance and biomass estimates from eDNA metabarcoding data.
- Objective 3: Evaluate factors that influence eDNA detection of species of interest (e.g. rare or invasive species) and suites of species (e.g. benthic fishes and invertebrates) on two spatial scales, within and between habitats, along with temporal variation.

## **Schedule of Milestones**

10/1/2019: Project start date

1/1/2020: Permitting completed

1/1/2020: Project study plan completed/submitted

3/1/2020: First quarterly report submitted

3/20/2020: Poster presentation at 2020 IEP Workshop

3/31/2020: Suisun eDNA sampling completed

3/1/2021: Sample collection initiated by EDSM (ongoing)

4/15/2021: DNA sequencing completed for reference sequence database

5/14/2021: Sample collection initiated at Yolo Bypass rotary screw trap (CA DWR)

9/1/2021: Primer selection and sequencing protocol development completed

4/30/2022: All field sampling completed

12/31/2022 (expected): Data analysis completed

3/30/2023 (expected): Final report to be submitted