



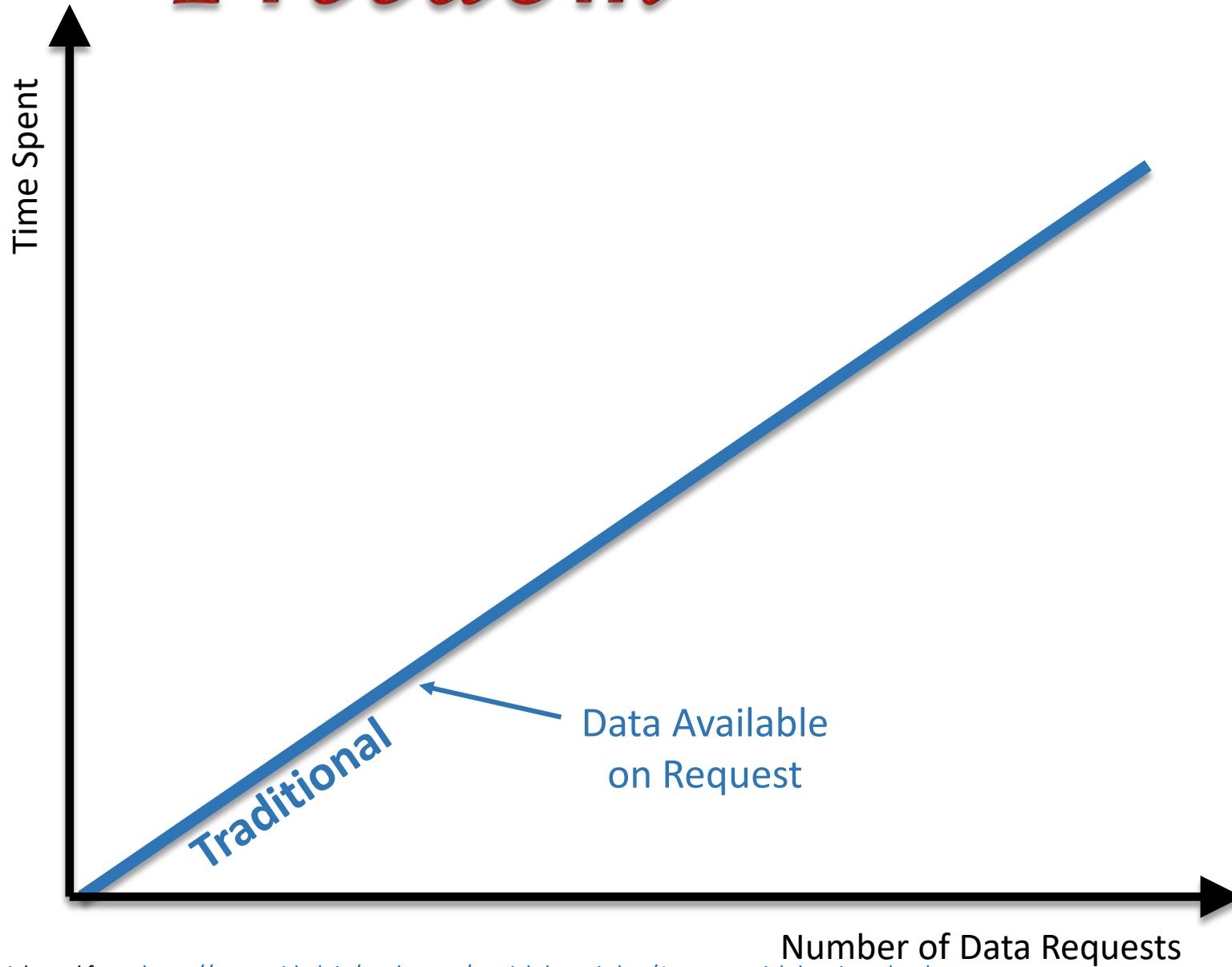
# Fame, Freedom & FAIRness with Open Data



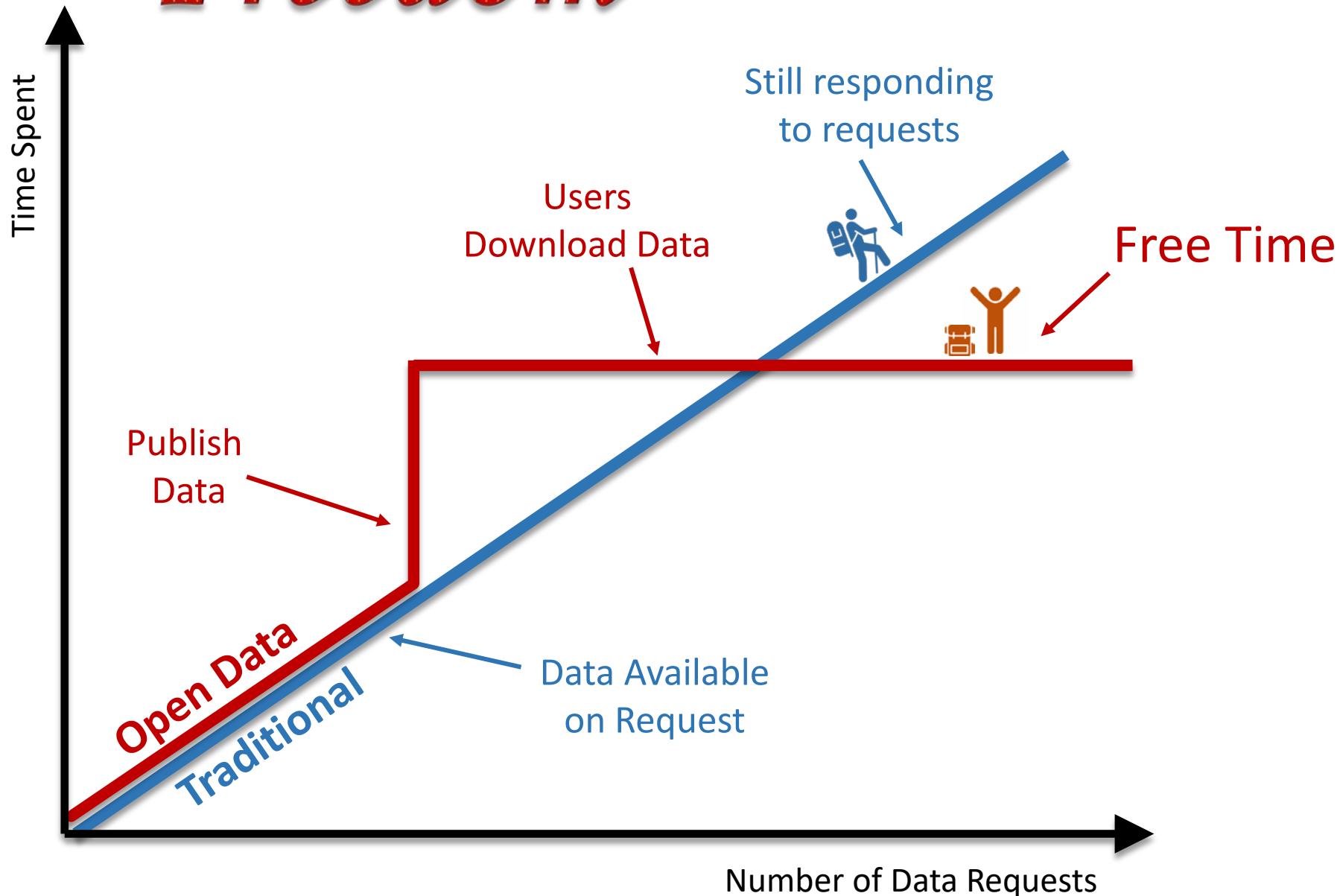
<https://www.um.edu.mt/library/departments/openscience>

IEP Workshop – March 6<sup>th</sup> 2019

# *Freedom*



# *Freedom*



# *Freedom*

Open data can reduce the workload  
of data producers and data users

Will we have access  
to our data?

Of course you will.

Just submit a formal request  
and provide us with an ample  
budget and time to respond.



[freshspectrum.com](http://freshspectrum.com)





*Fame*

The logo consists of the word "Fame" written in a stylized, flowing script font. The letters are primarily white with black outlines, set against a red background that features numerous small, glowing yellow circles, resembling marquee lights or a city skyline at night.

Management

Decision-Making

Information

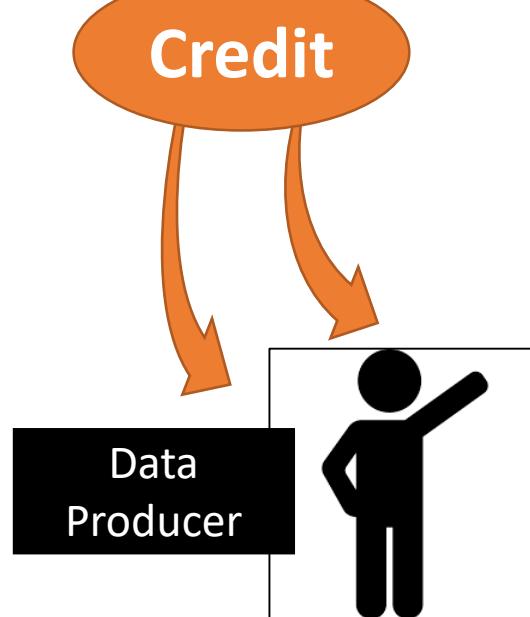
Visualization, Analysis  
& Synthesis

Data

Collection

Monitoring

# Fame



Management

Decision-Making

Information

Visualization, Analysis  
& Synthesis

Data

Collection

Monitoring



Open data helps develop  
trust, credibility, and  
reputation

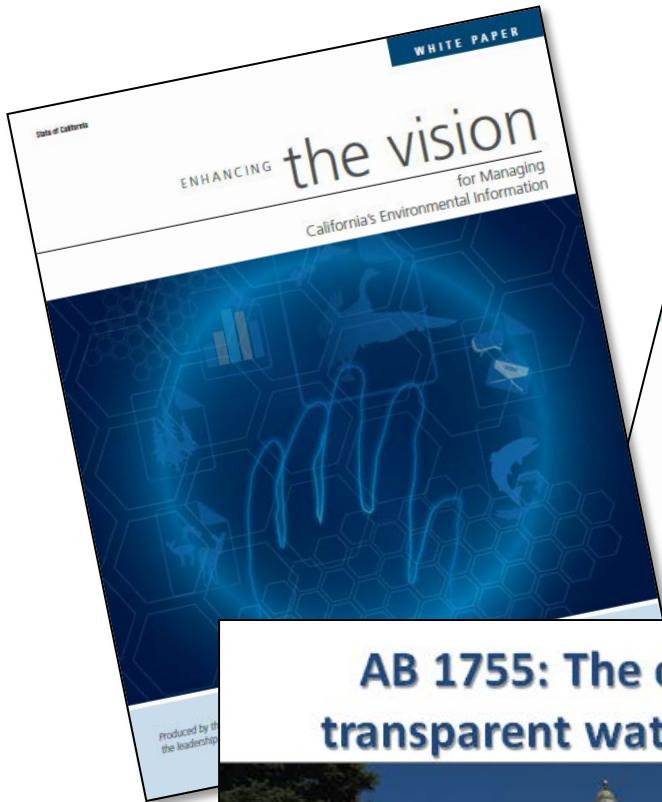


Auke Herrema  
<https://www.elsevier.com/connect/open-science-needs-open-minds>

If you're still not convinced....



# In some cases, sharing is required...

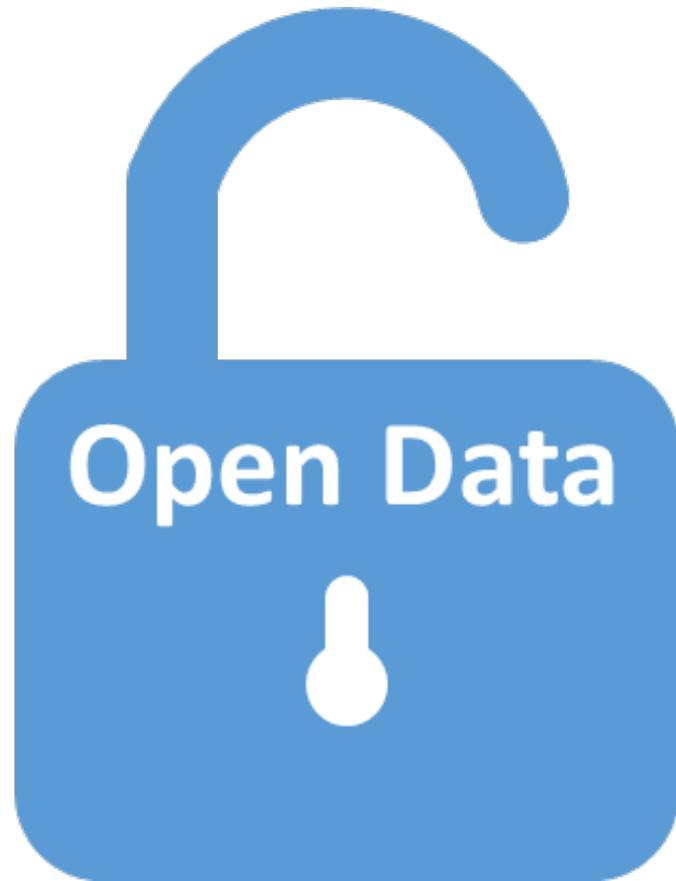


SCIENTIFIC REPORTS

Availability of materials and data

An inherent principle of publication is that others should be able to replicate and build upon the authors' published claims. Therefore, a condition of publication in Scientific Reports is that authors are required to make materials, data and associated protocols promptly available to readers without undue qualifications in material transfer agreements. Any restrictions on the availability of materials or information must be disclosed to the publisher at the time of submission. Any restrictions must also be disclosed in the manuscript, including details of how readers can obtain materials and if materials are to be distributed by a for-profit company, this must be stated

# What is....



# Characteristics of Open Data

Findable

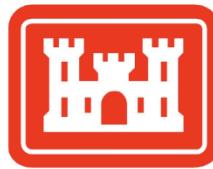
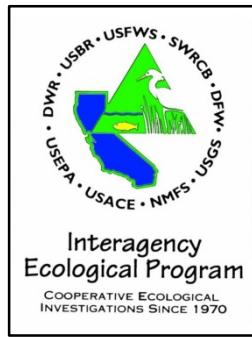
Accessible

Interoperable

Reusable



# Why is this relevant to IEP?



# IEP collects large amounts of data



# We sometimes use each other's data...

## LIMNOLOGY and OCEANOGRAPHY

### Ecosystem variability along the estuarine salinity gradient: Examples from long-term study of San Francisco Bay

James E. Cloern ,<sup>1\*</sup> Alan D. Jassby,<sup>2</sup> Tara S. Schraga,<sup>1</sup> Erica Nejad,<sup>1</sup> Charles Martin<sup>1</sup>

<sup>1</sup>U.S. Geological Survey, Menlo Park, California

<sup>2</sup>Department of Environmental Science and Policy, University of California, Davis, California



*Limnol. Oceanogr.* 00, 2017, 00–00  
© 2017 The Authors. Limnology and Oceanography published by Wiley Periodicals, Inc.  
on behalf of Association for the Sciences of Limnology and Oceanography  
doi: 10.1002/limo.10537

*Transactions of the American Fisheries Society* 145:44–58, 2016  
© American Fisheries Society 2016  
ISSN: 0002-8487 print / 1548-8659 online  
DOI: 10.1080/00028487.2015.1100136

#### ARTICLE

### Population Dynamics of an Estuarine Forage Fish: Disaggregating Forces Driving Long-Term Decline of Longfin Smelt in California's San Francisco Estuary

Matthew L. Nobriga\*

*U.S. Fish and Wildlife Service, Bay Delta Fish and Wildlife Office, 650 Capitol Mall, Suite 8-300,  
Sacramento, California 95831, USA*

Jonathan A. Rosenfield

*The Bay Institute, Pier 39, Box Number 200, San Francisco, California 94133, USA*

### Multidecadal trends for three declining fish species: habitat patterns and mechanisms in the San Francisco Estuary, California, USA

Frederick Feyrer, Matthew L. Nobriga, and Ted R. Sommer

**Abstract:** We examined a 36-year record of concurrent midwater trawl and water quality sampling conducted during fall to evaluate habitat trends for three declining fish species in the San Francisco Estuary, California, USA: delta smelt (*Hypomesus transpacificus*), striped bass (*Morone saxatilis*), and threadfin shad (*Dorosoma petenense*). Generalized additive modeling revealed that Secchi depth and specific conductance were important predictors of occurrence for delta smelt and striped bass, while specific conductance and water temperature were important for threadfin shad. Habitat suitability derived from model predictions exhibited significant long-term declines for each species: the south-

## SAN FRANCISCO SCIENCE ESTUARY & WATERSHED

Published by the California Bay-Delta Authority Science Program and the John Muir Institute of the Environment

### Variation in Spring Nearshore Resident Fish Species Composition and Life Histories in the Lower Sacramento- San Joaquin Watershed and Delta

Larry R Brown\*

Jason T. May

U. S. Geological Survey

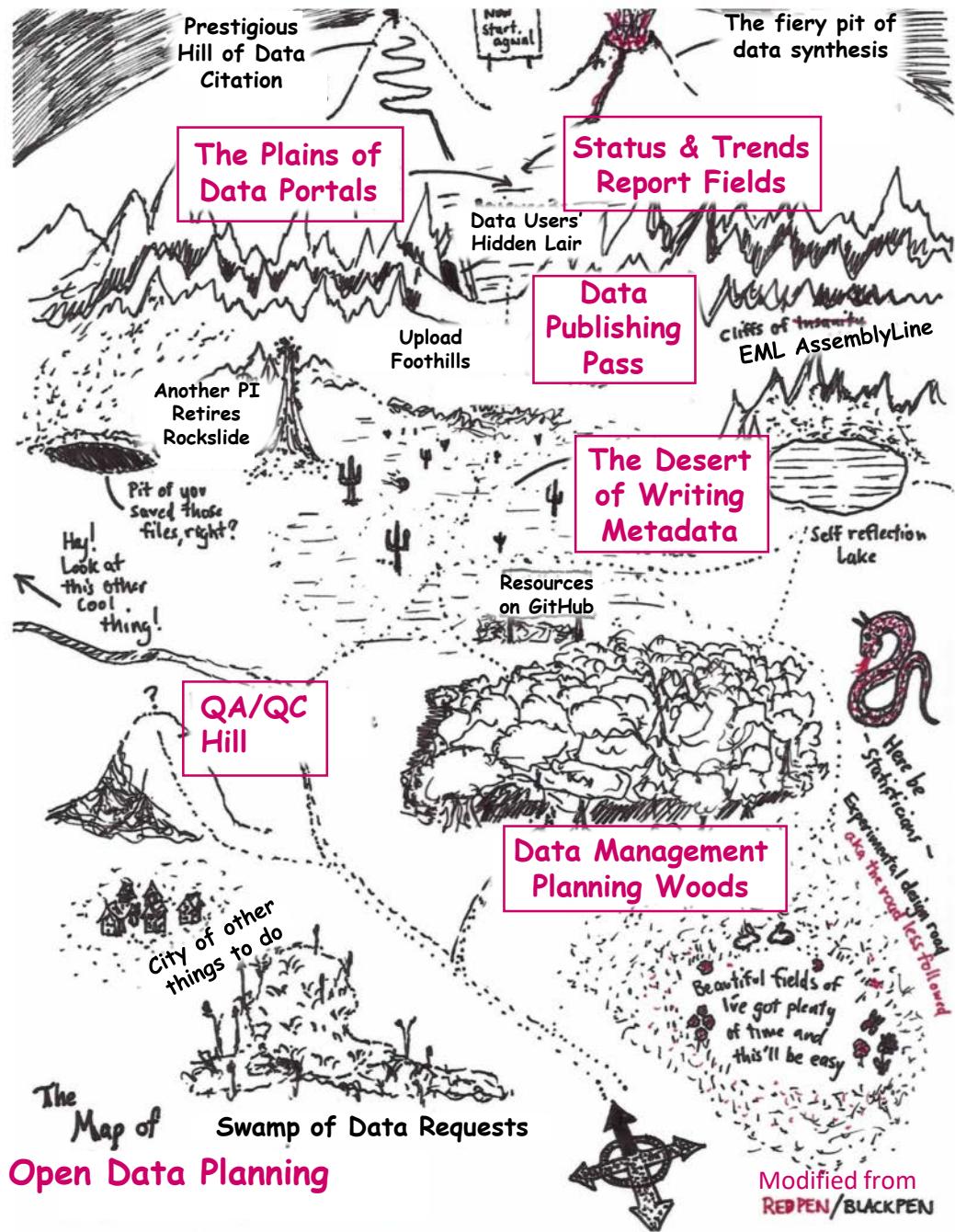
\* Corresponding author: [lrbrown@usgs.gov](mailto:lrbrown@usgs.gov)

## SAN FRANCISCO SCIENCE ESTUARY & WATERSHED

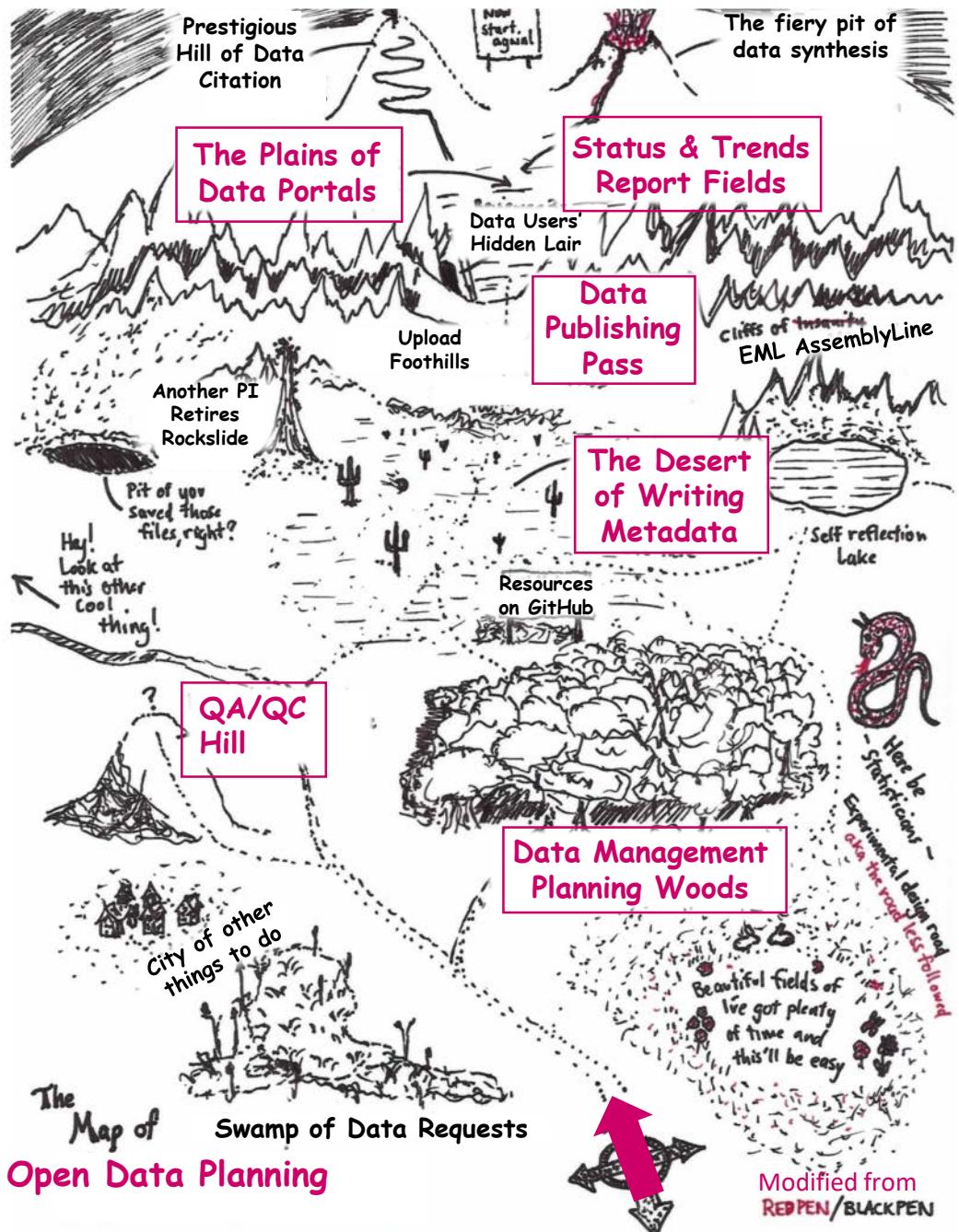
Sponsored by the Delta Science Program and the UC Davis John Muir Institute of the Environment

### Variation of Fish Habitat and Extent of the Low-Salinity Zone with Freshwater Flow in the San Francisco Estuary

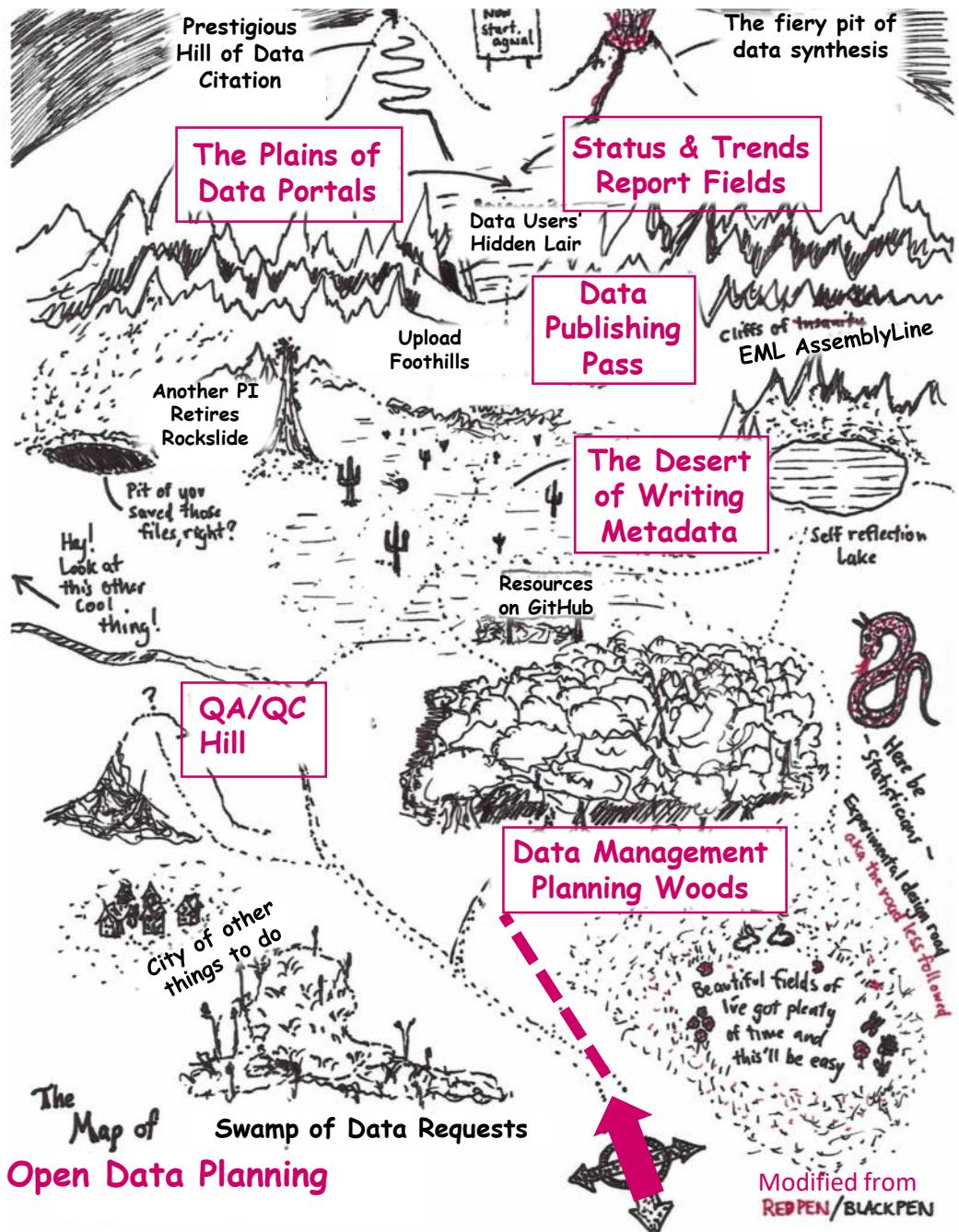
Wim J. Kimmerer\*, Michael L. MacWilliams<sup>1</sup>, and Edward S. Gross<sup>2</sup>



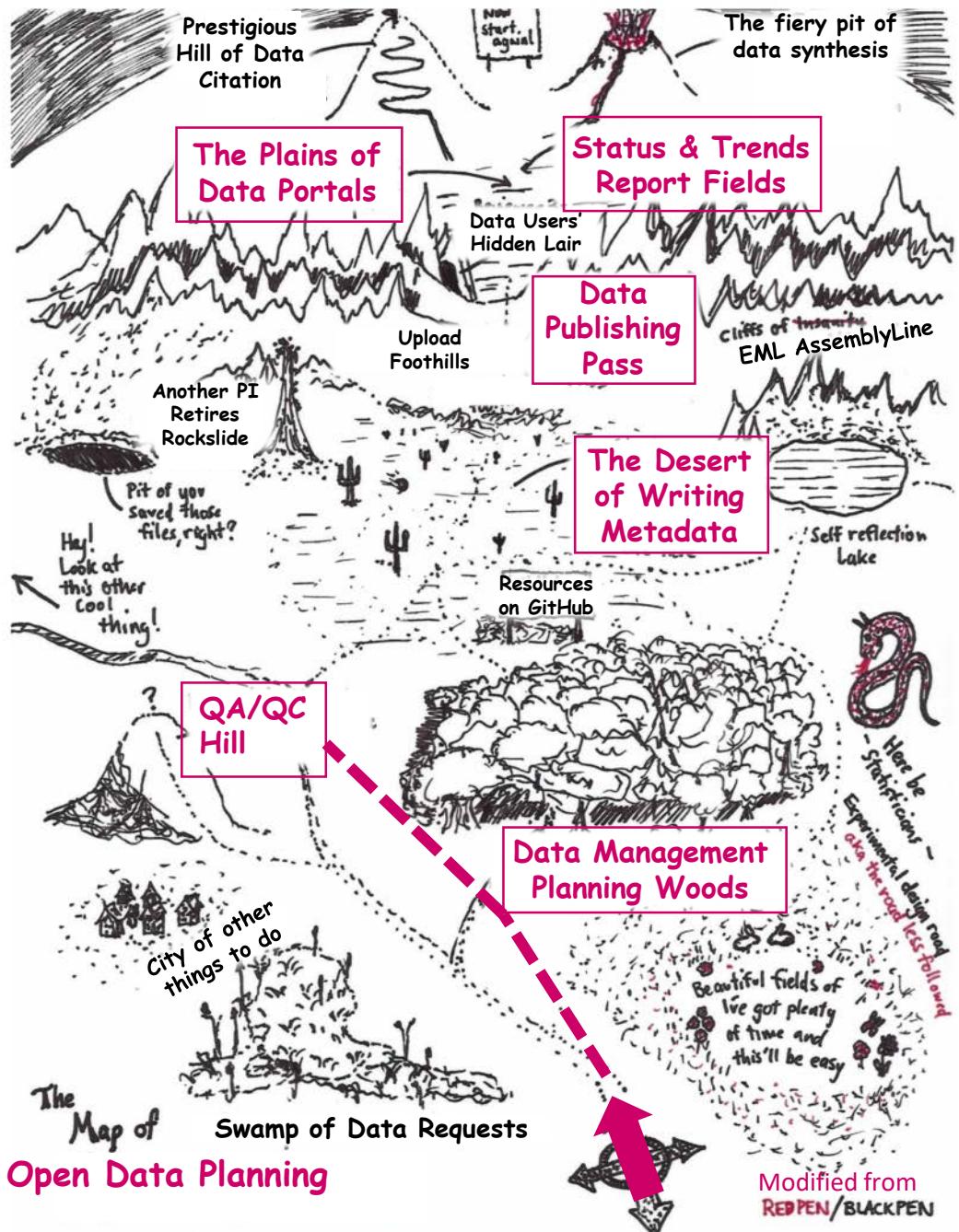
# The Map of Open Data Planning



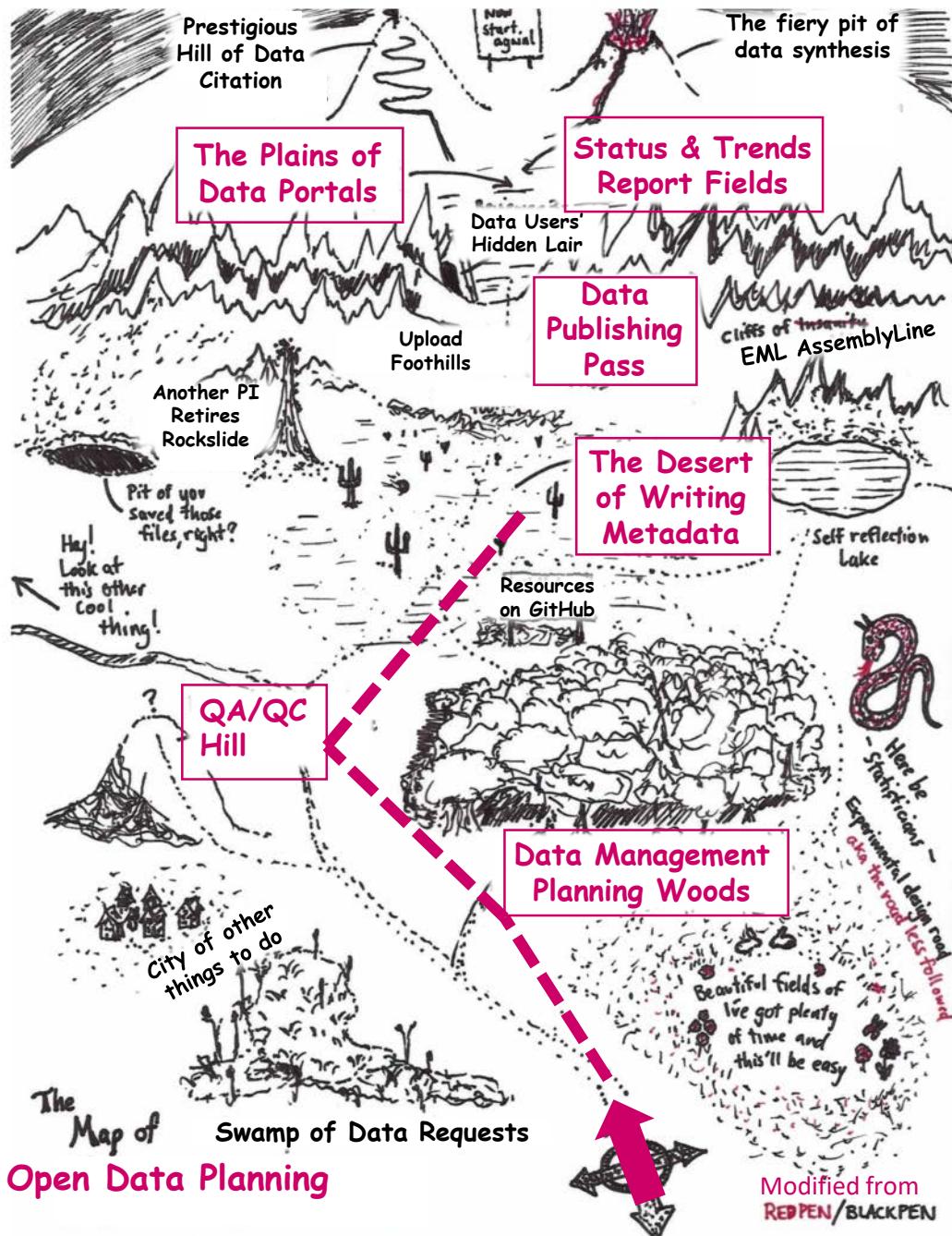
# The Map of Open Data Planning



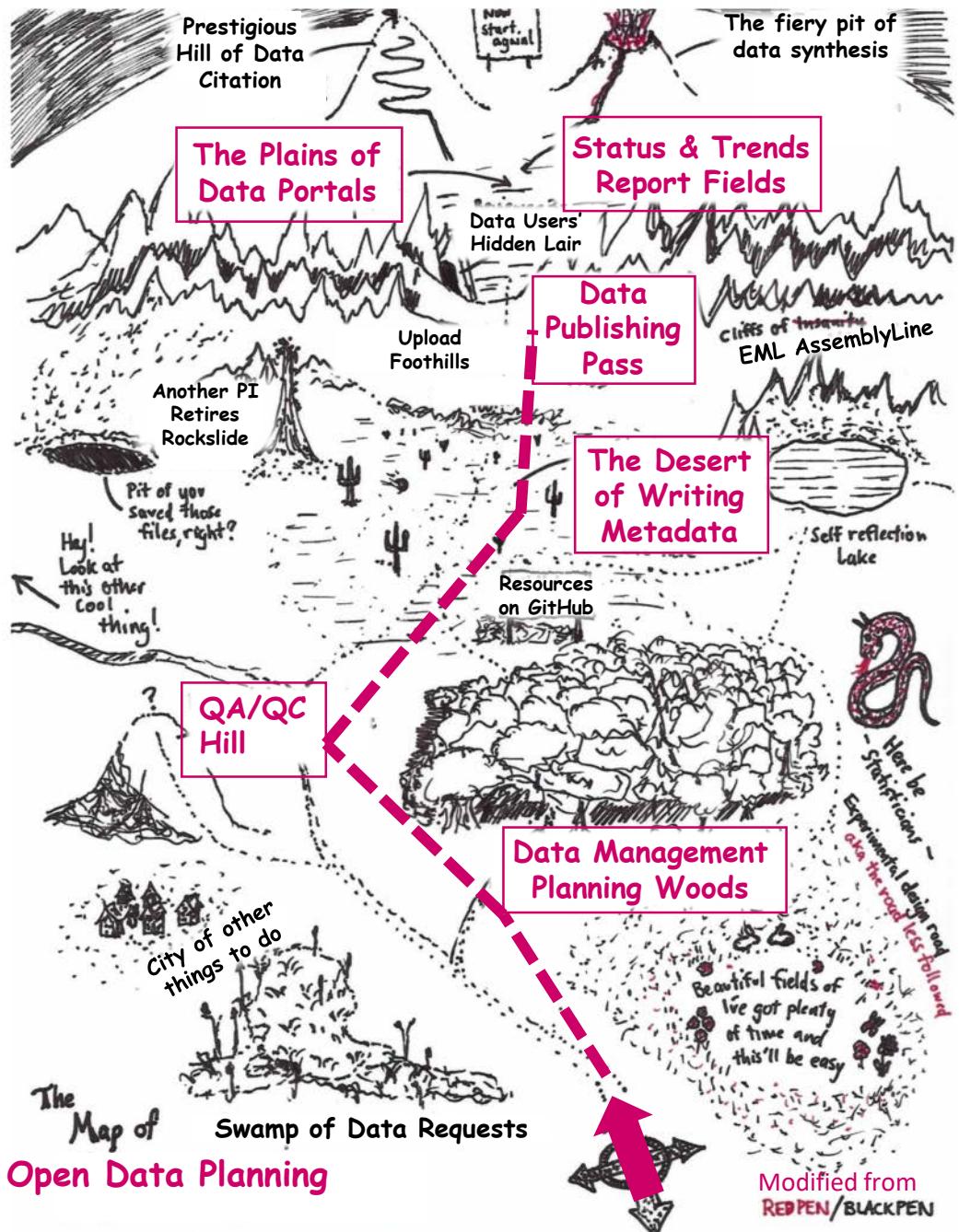
# The Map of Open Data Planning



# The Map of Open Data Planning



# The Map of Open Data Planning



# The Map of Open Data Planning



# The Map of Open Data Planning

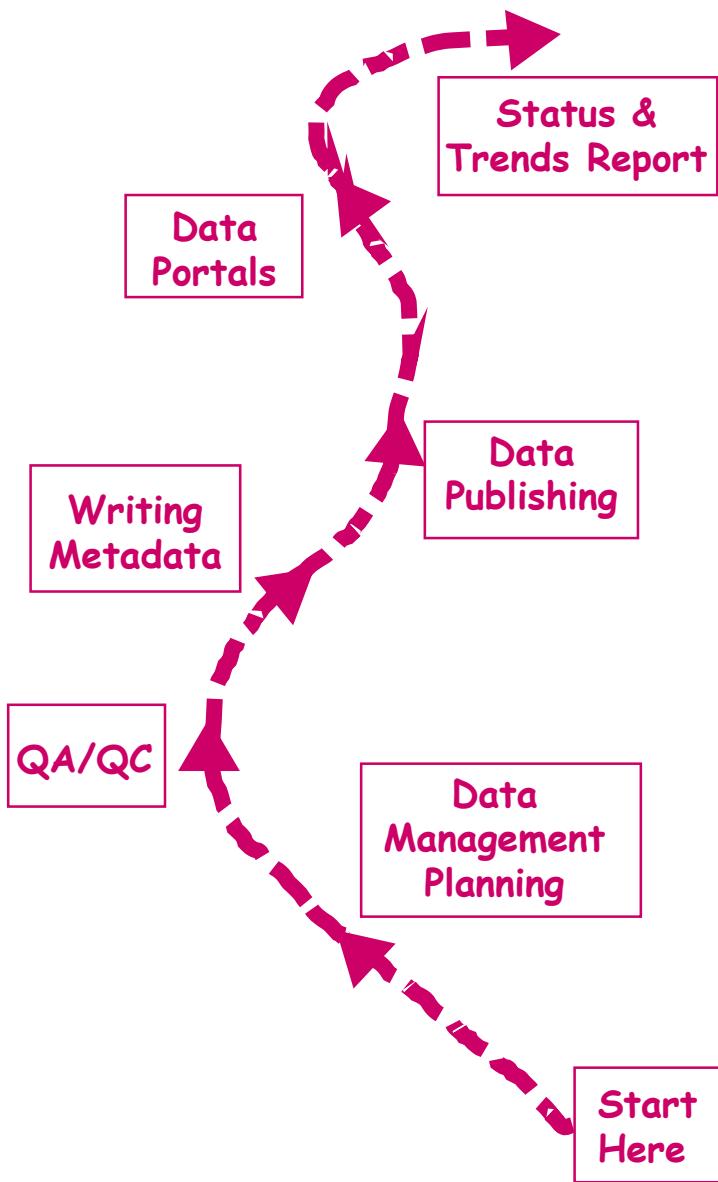


# The Map of Open Data Planning

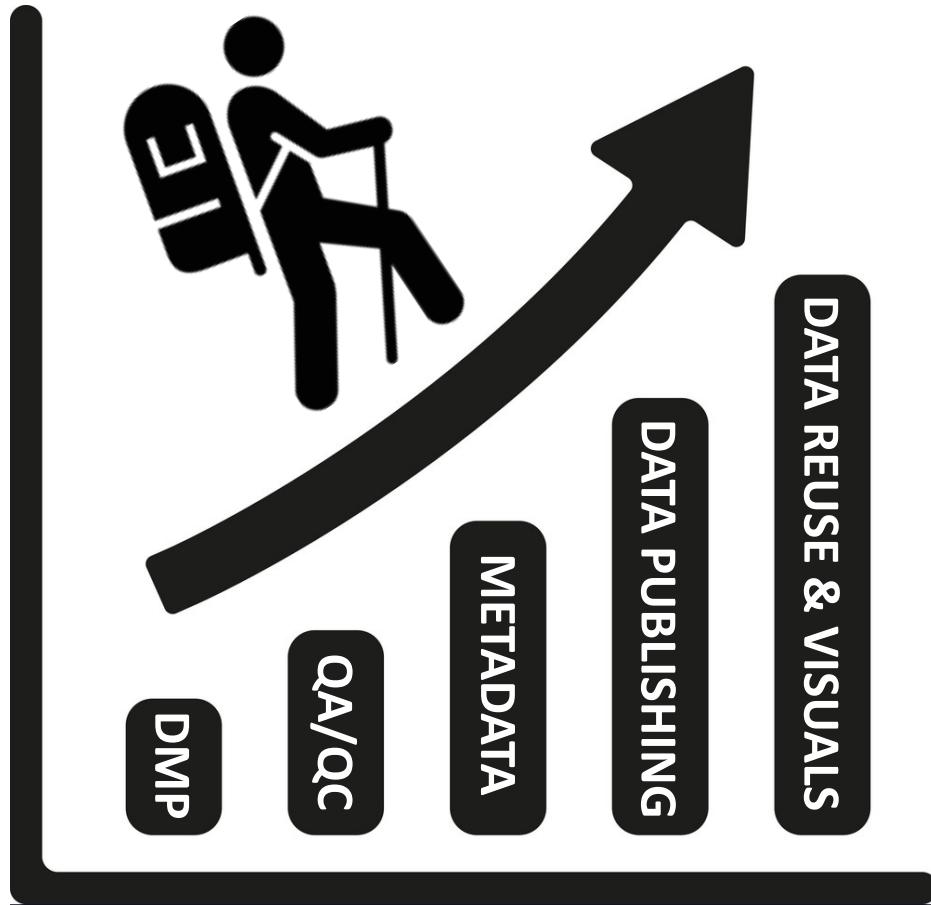


# The Map of Open Data Planning

# The Map of Open Data Planning



# IEP DUWG



Join our data journey

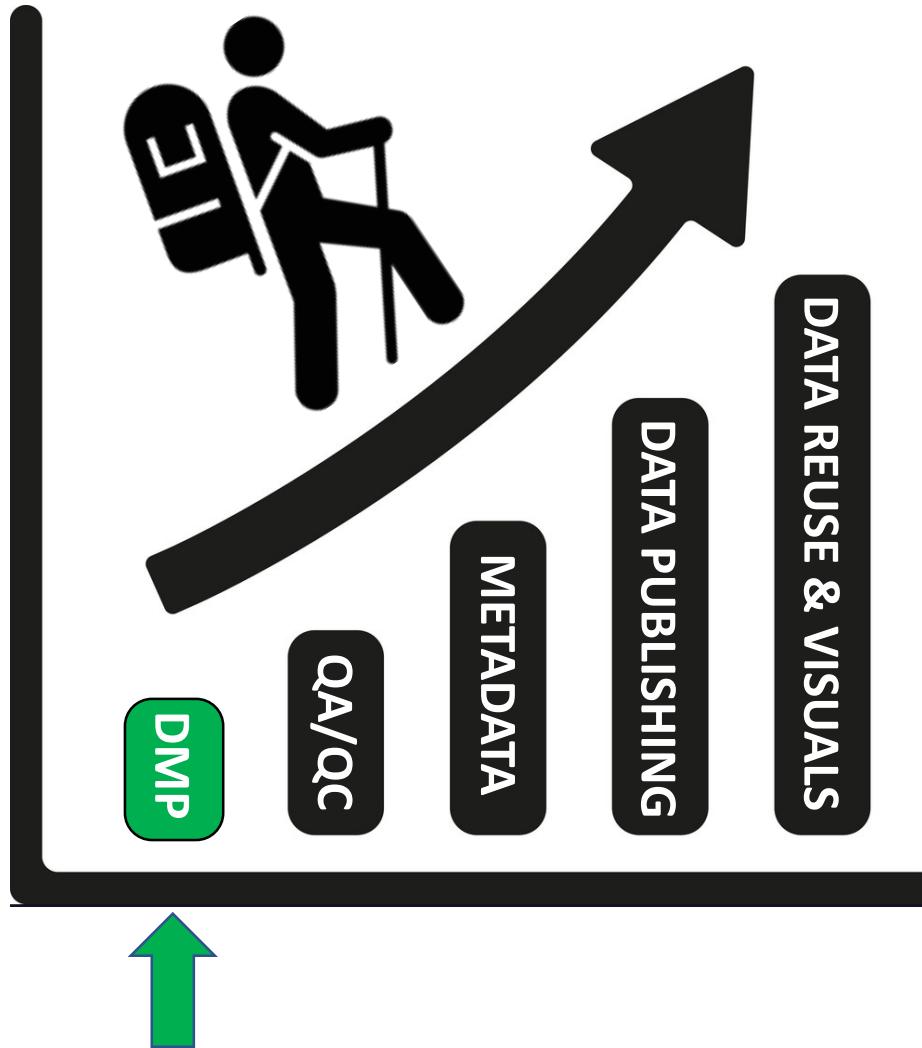
# Online Polling

Go to [www.menti.com](http://www.menti.com) and use the code 56 23 0

Which category best describes you?

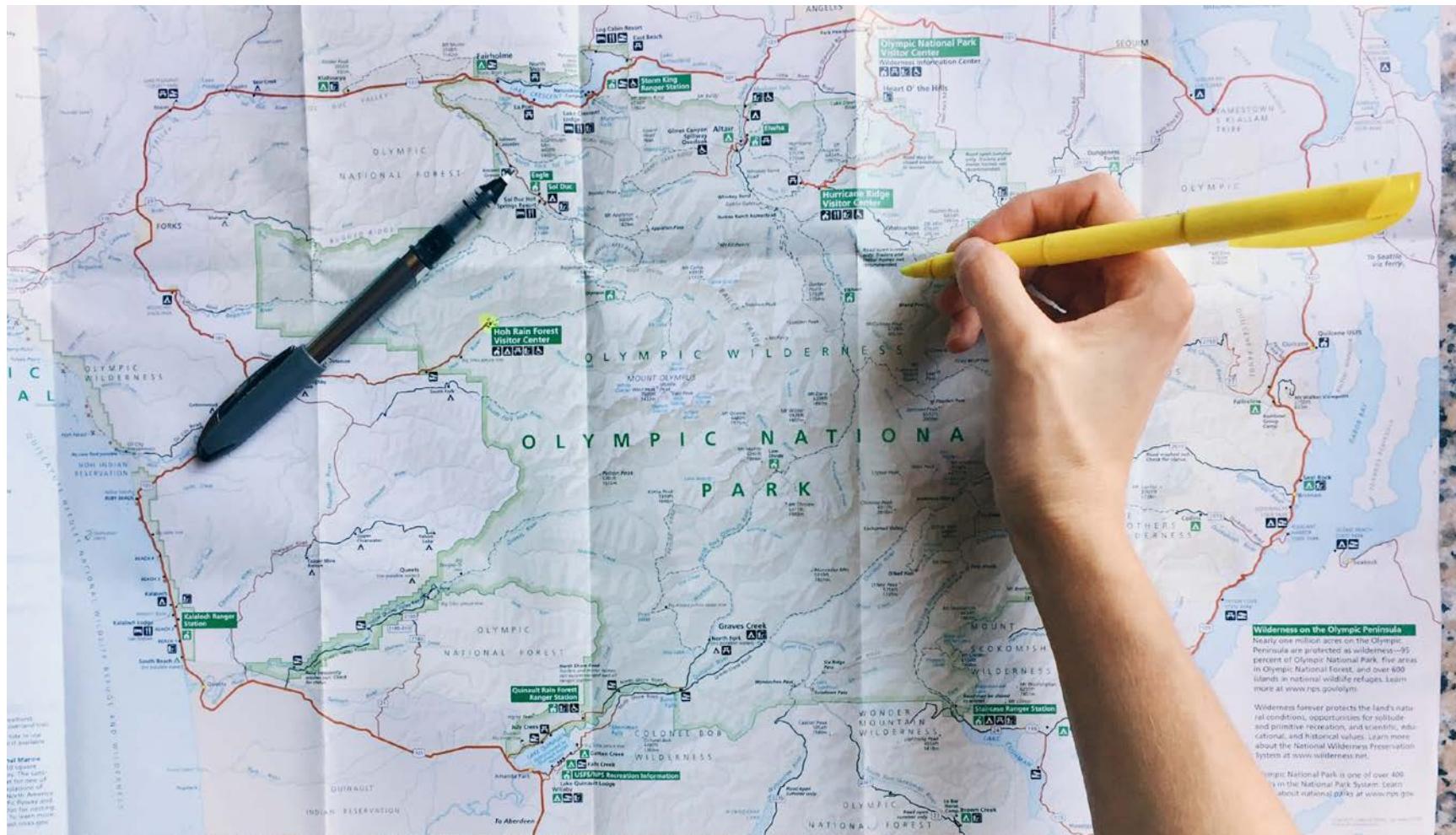
- Scientist
- Supervisor/PI
- Manager
- Other

# Data Management Plans



# Data Management Plans

You can't get where you're going if you don't know where you are going.



#### Wilderness on the Olympic Peninsula

Nearly one million acres on the Olympic Peninsula are protected as wilderness—95 percent of Olympic National Park, five areas of the Olympic National Forest, and over 600 islands in national wildlife refuges. Learn more at [www.nps.gov/olymp](http://www.nps.gov/olymp).

Wilderness offers opportunities for solitude and primitive recreation, and scientific, educational, and historical values. Learn more about the National Wilderness Preservation System at [www.wilderness.net](http://www.wilderness.net).

Olympic National Park is one of over 400 areas in the National Park System. Learn more about national parks at [www.nps.gov](http://www.nps.gov).

# DMPs now required by IEP workplan



# Why do we make you do DMPs?

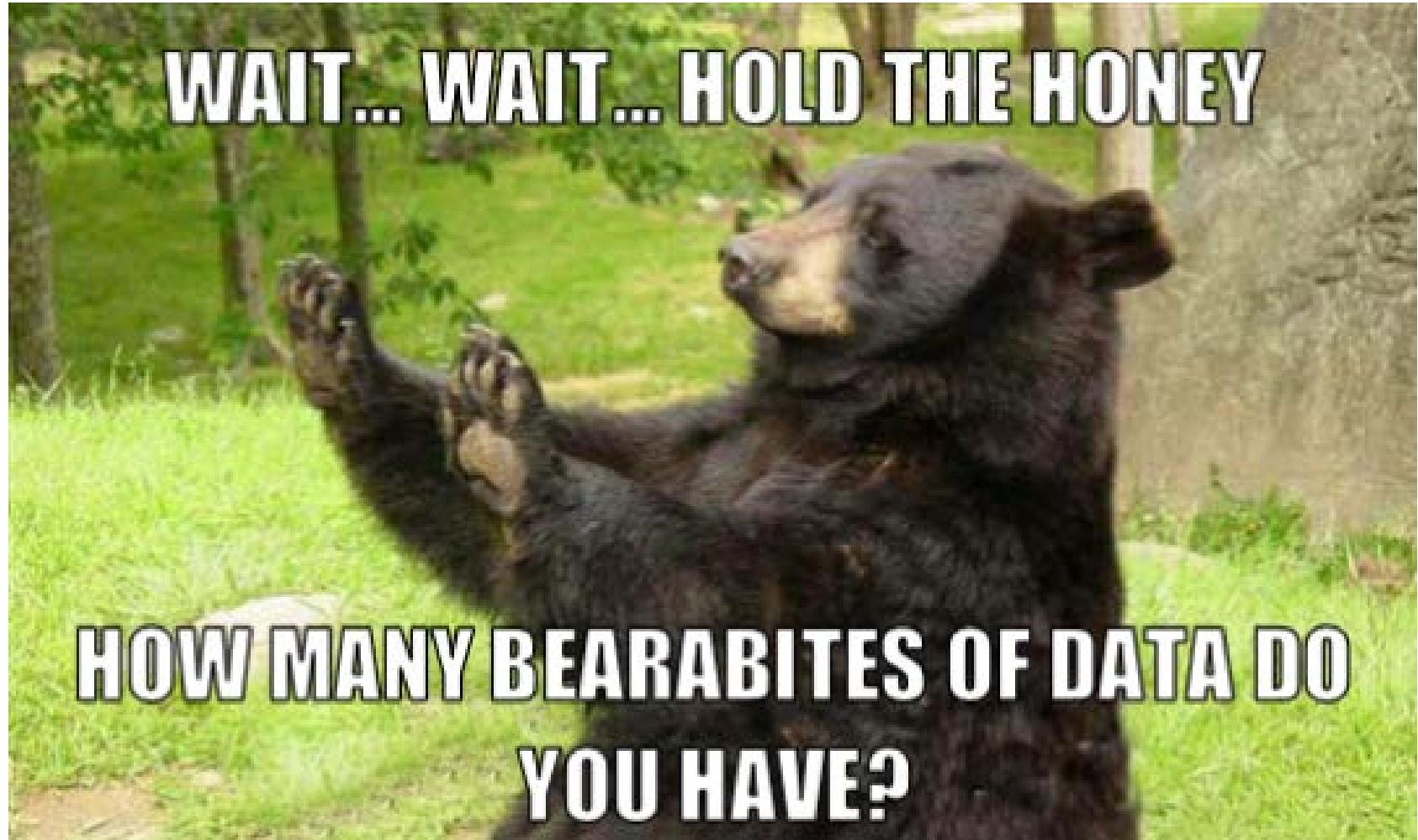
Increase transparency and  
openness



# Managing data is easier if you plan ahead



DMPs make large datasets more manageable



**WAIT... WAIT... HOLD THE HONEY**  
**HOW MANY BEARABITES OF DATA DO  
YOU HAVE?**

Think about what you might be missing



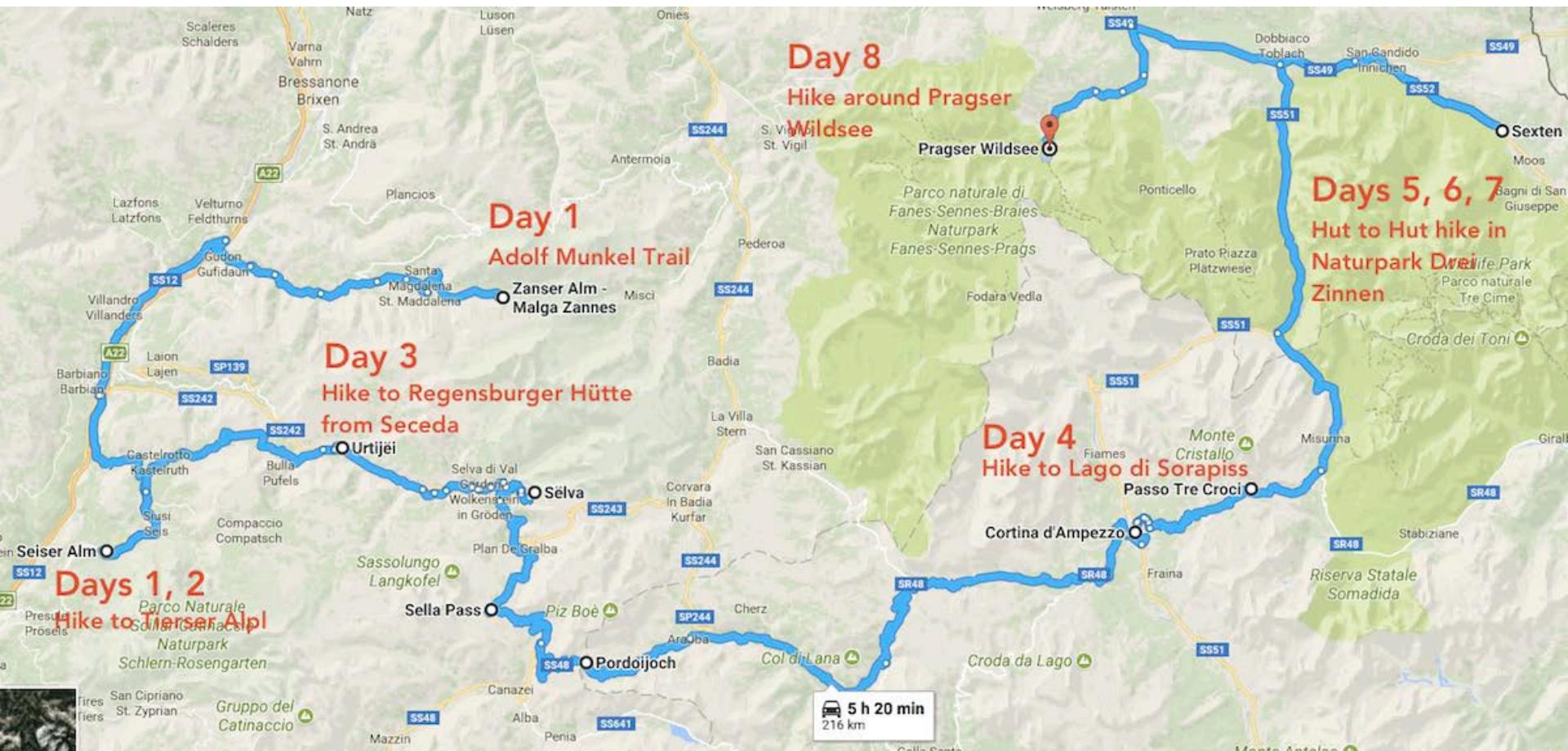
# IEP's DMP template

- Contact info
- Data description
- Metadata description
- Backups
- Archiving
- Sharing
- Formats
- Quality assurance
- Rights and requirements

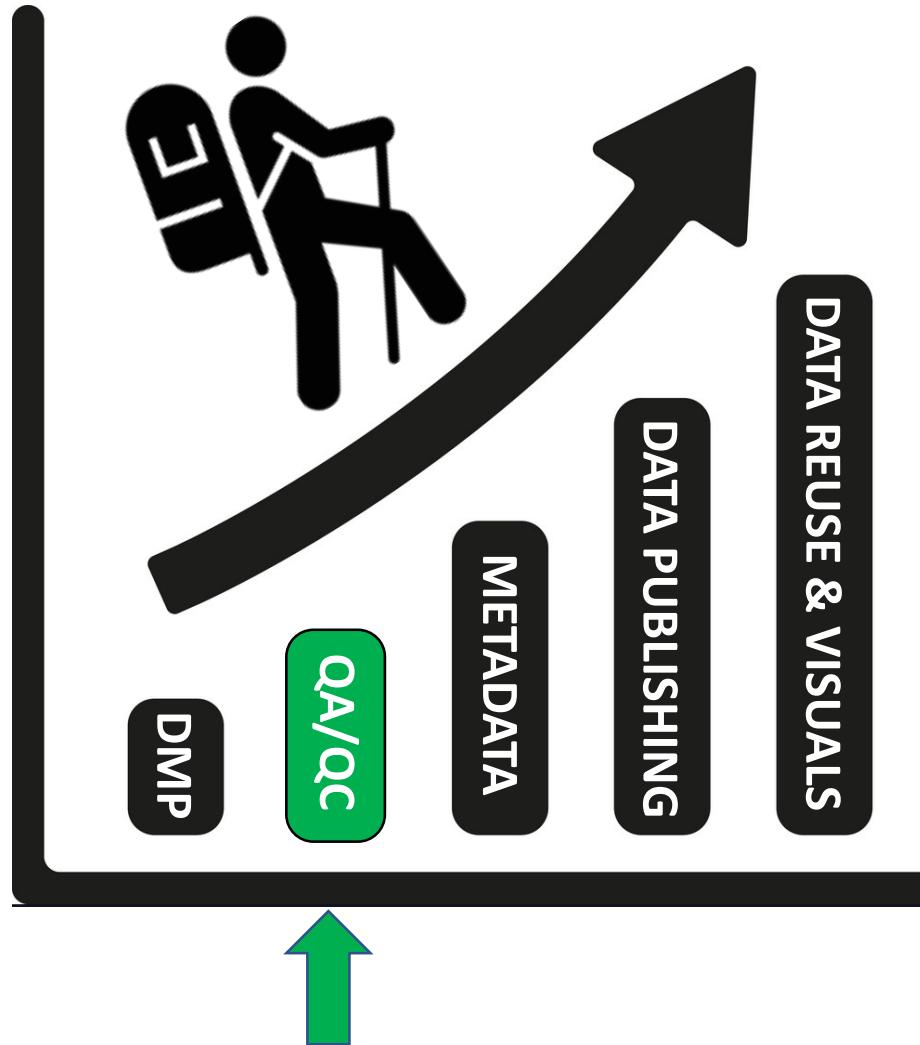
TWO PAGES



# DUWG will help you plan



QA/QC



A photograph of a person from behind, wearing a large blue backpack and a green beanie, looking out over a forested landscape at sunset. The sky is a warm orange and yellow.

# Quality Assurance: A critical step on the journey towards open data

# What is Quality Assurance and Quality Control and Why Do We Care?

- Quality Assurance is an integrated system of management activities
- Quality Control is an overall system of technical activities
- Quality Assurance is a foundational component of open data



# The Vision of Open Data and Quality Assurance

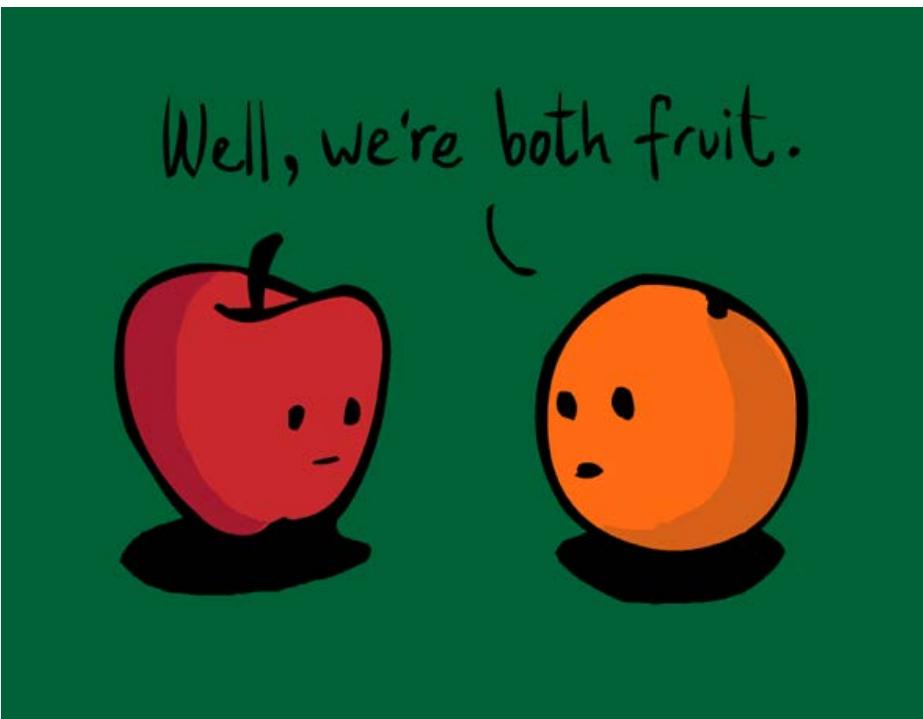
- Comparability
- Compatibility
- Transparency



# Comparability

Determined by evaluating  
QC documentation and QA  
planning documents

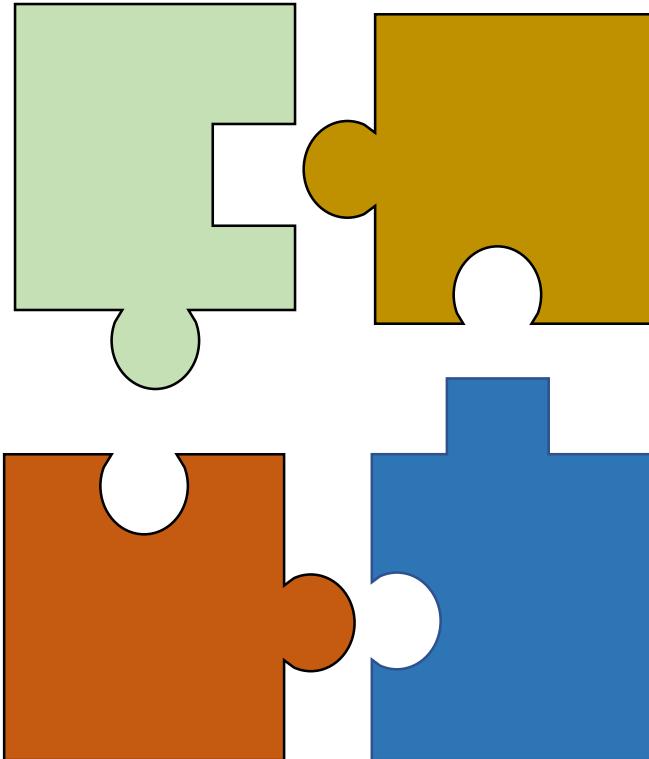
- Appropriate use
- Data quality objectives



# Compatibility

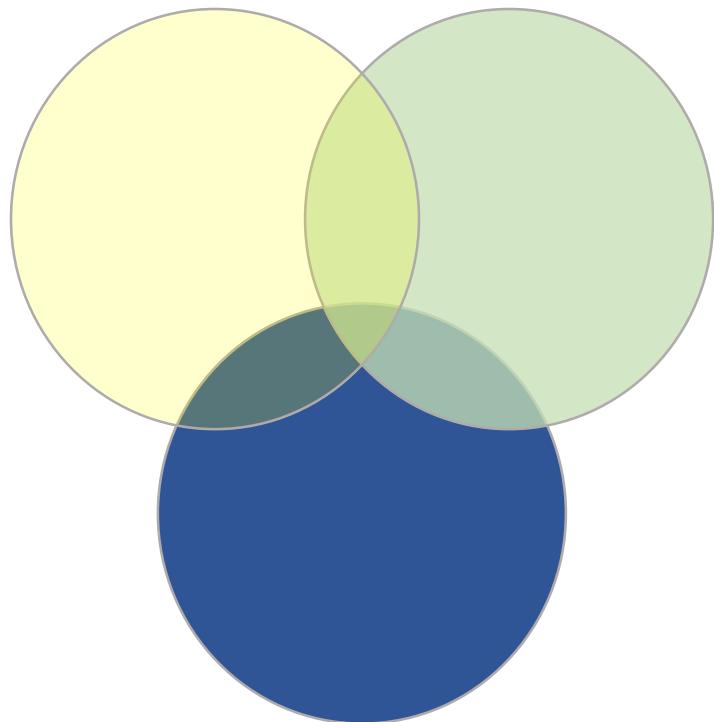
The next piece in the puzzle

- Data format
- Frequency of data collection
- Units of the data



# Transparency

- How, what, when, where, and why was the data collected?
- Handling of the data
- Intended Use
- Data format
- Storage, archival, publication



# Examples of Quality Assurance Tools



Study  
Question

Study  
Question

Study Plans  
QAPPs, DMPs  
Metadata

Study  
Question

Study Plans  
QAPPs, DMPs  
Metadata

Identify  
sampling types  
& procedures

Study  
Question

Study Plans  
QAPPs, DMPs  
Metadata

Identify  
sampling types  
& procedures

SOPs

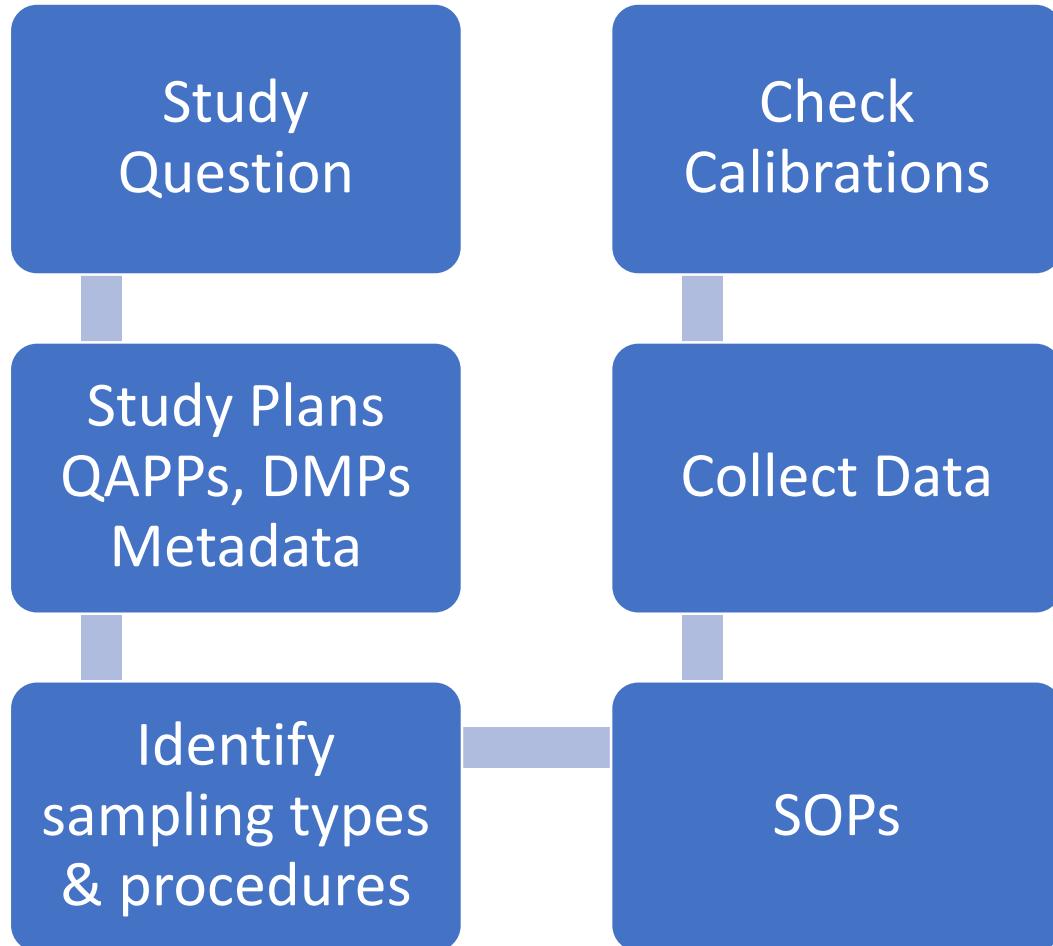
Study  
Question

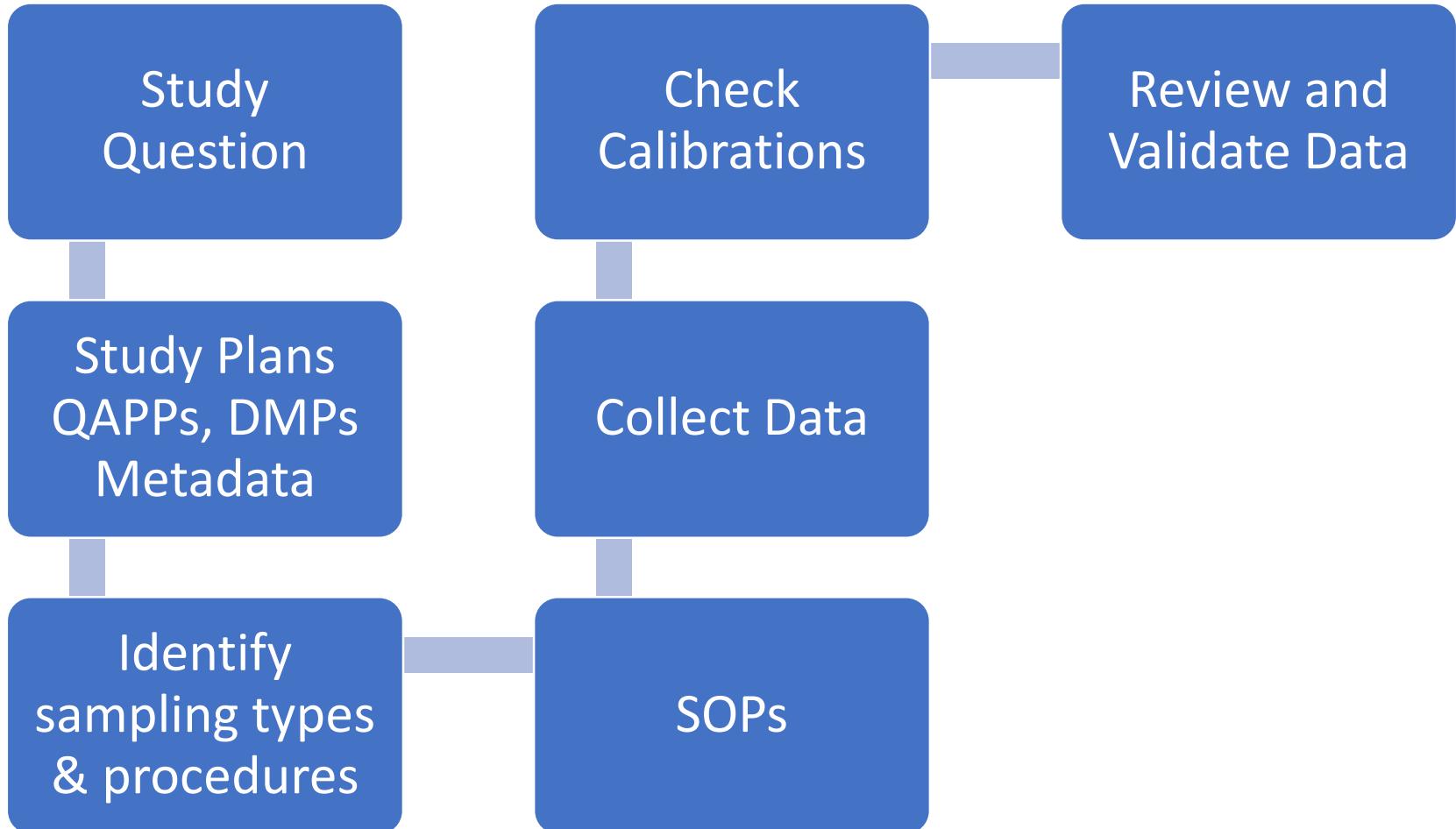
Study Plans  
QAPPs, DMPs  
Metadata

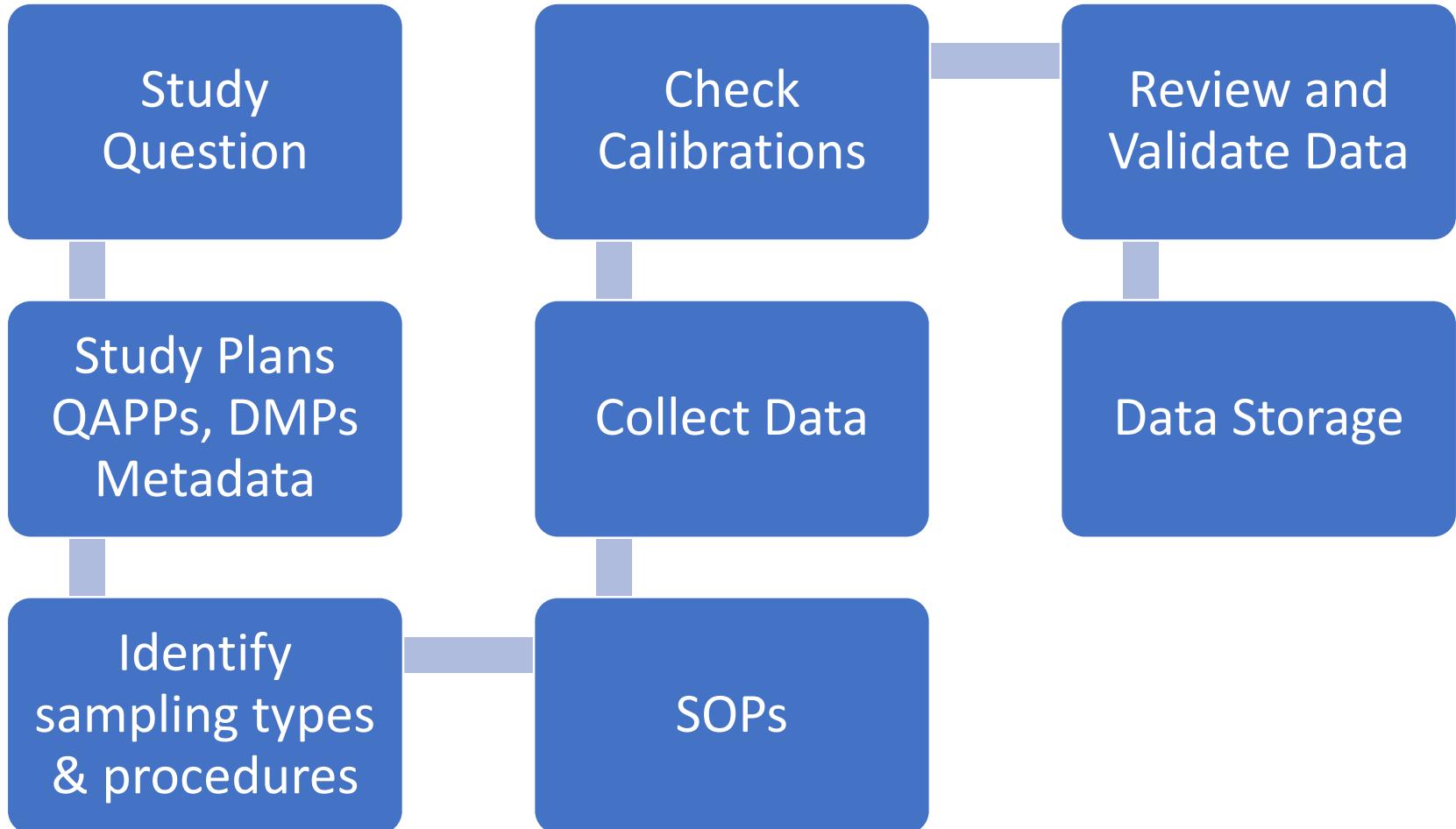
Identify  
sampling types  
& procedures

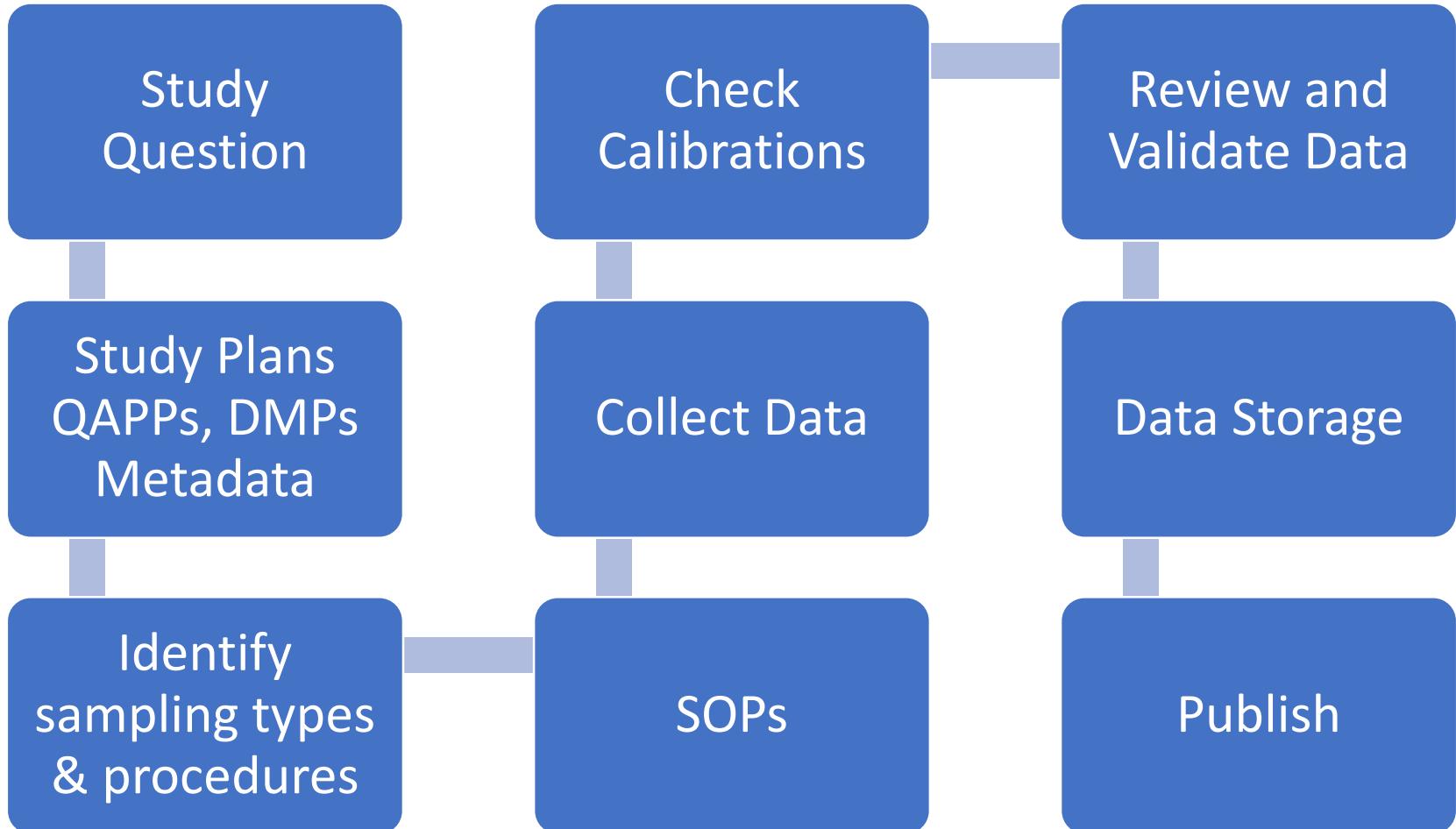
Collect Data

SOPs



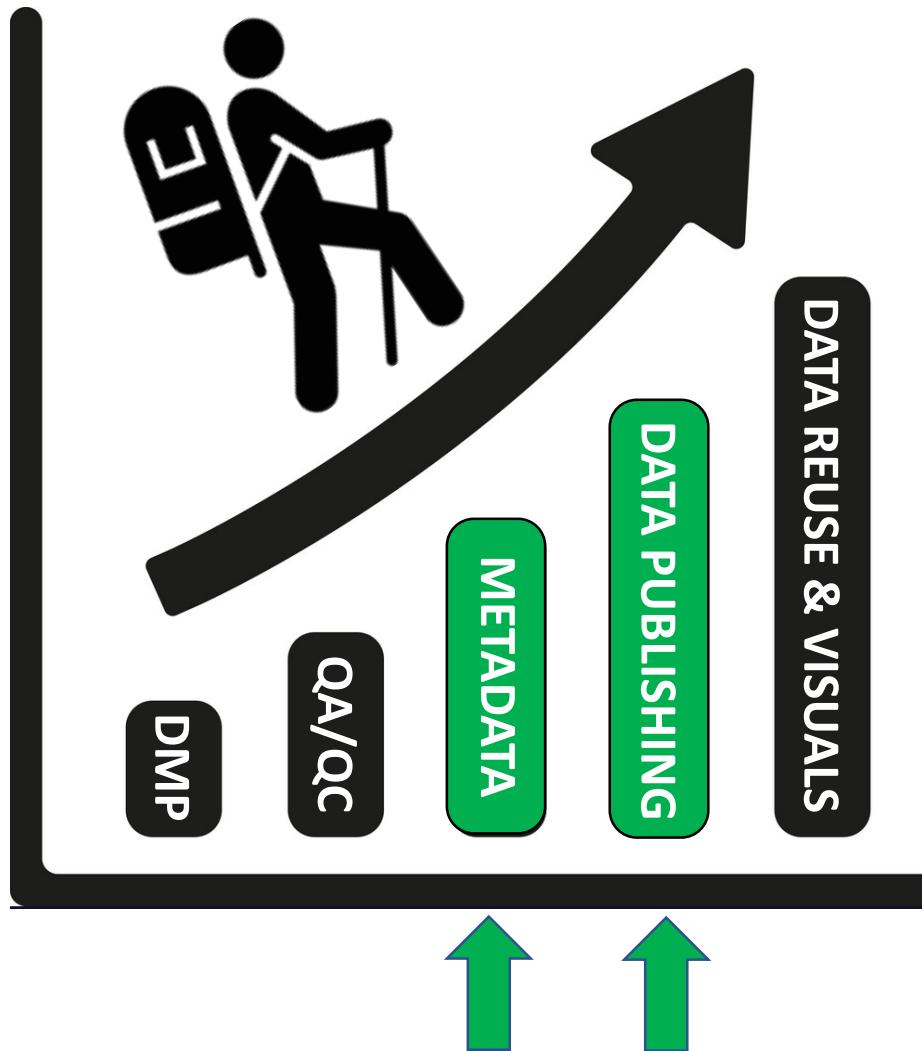




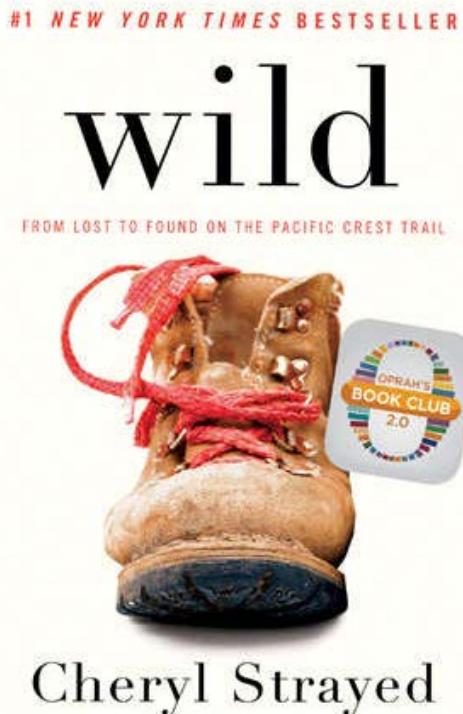




# Metadata & Data Publishing



# Publishing Your Journey (aka Dataset)



Sharing is caring

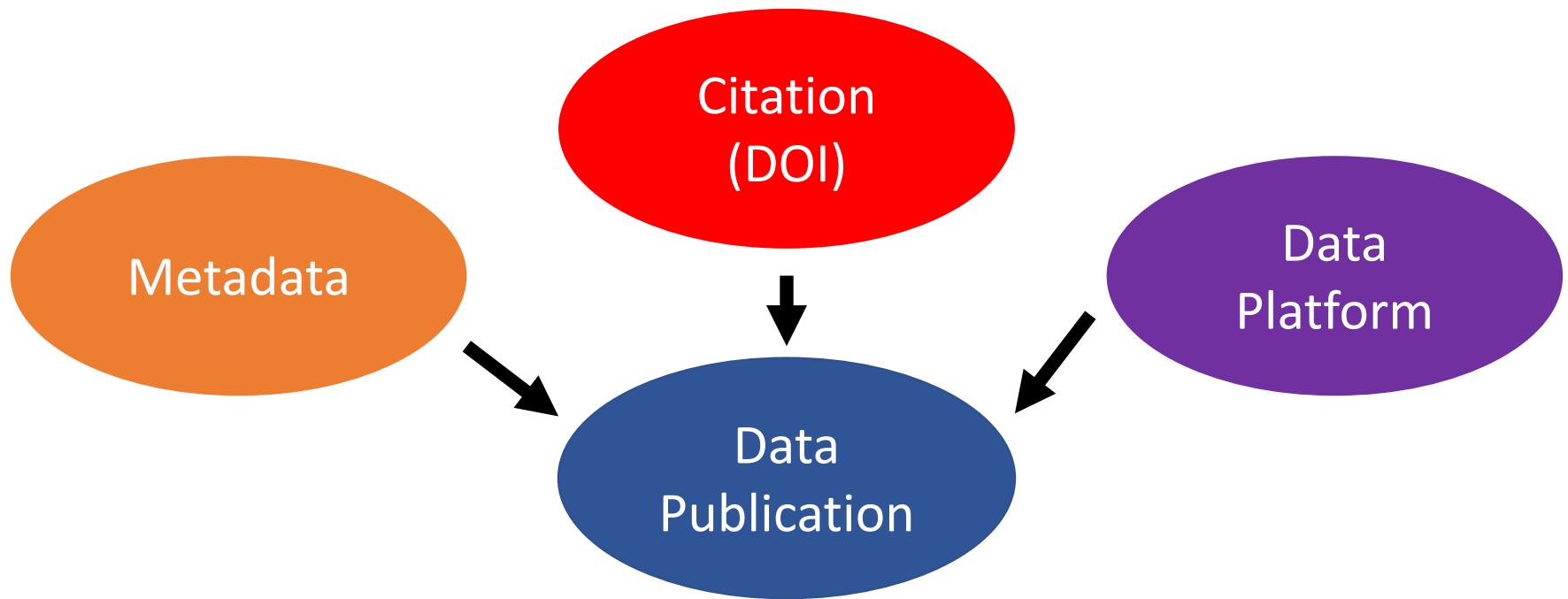
- Promote common knowledge
- Increase transparency
- Spark creativity



# Data Publishing in a Nutshell



Supports data discovery, access, use, & citation



# Metadata: Data about Data

WHO created the data?

WHAT is the content of the data?

WHEN were the data created?

WHERE is it geographically?

HOW were the data collected?

WHY were the data developed?

Metadata are essential to understanding a dataset.



# Metadata: Data about Data

## *IEP tools to create standardized metadata*

IEP Metadata Template (2018)<sup>1</sup>

Dataset Title

Abstract

Investigators

Other personnel names and roles

Field crew, data entry etc. with e-mail addresses, organization and ORCID ID.

| First Name | Middle Initial | Last Name                            | Organization                             | e-mail address | ORCID ID (optional) | Role in project |
|------------|----------------|--------------------------------------|--|----------------|---------------------|-----------------|
|            |                | Interagency Ecological Program (IEP) |  |                |                     | creator         |
|            |                | PI                                   |  |                |                     | contact         |
|            |                | Data Manager                         | California Department of Water Resources |                |                     | contact         |
|            |                |                                      |  |                |                     | Field staff     |
|            |                |                                      |  |                |                     | Data QC         |

Keywords

Funding of this work:

| Title of Grant/Fund | Funding Agency | Funding Identification Number |
|---------------------|----------------|-------------------------------|
|                     |                |                               |

Timeframe

- Period of record (*dates data was collected*):
  - Begin date:
  - End date:
- Is data collection ongoing or completed?

Geographic location

- Verbal description (*General region where data was collected, e.g. "Suisun Marsh and Grizzly Bay"*):
- North bounding coordinates (decimal degrees): 3
- South bounding coordinates (decimal degrees):
- East bounding coordinates (decimal degrees):
- West bounding coordinates (decimal degrees):

Methods

## Ecological Metadata Language (EML)

The diagram illustrates the workflow from the IEP Metadata Template to the EML interface. On the left, the 'IEP Metadata Template (2018)' shows various data entry fields. An orange arrow points from this template to the 'Machine readable' section of the EML interface. Another orange arrow points from the 'Machine readable' section to the 'Easy web-applications' section, which displays a screenshot of the EML interface. The EML interface itself is a web-based application with a sidebar of metadata categories and a main form for entering data like 'Title' and 'Abstract'. A large orange arrow points from the 'Machine readable' section towards the 'Easy web-applications' section.

```
63 EMLassemblyline::make_eml(  
64   path = path_to_templates,  
65   data.path = path_to_data,  
66   eml.path = path_to_eml,  
67   dataset.title = 'Interagency Ecological Program: Discrete dissolved  
oxygen monitoring in the Stockton Deep Water Ship Channel, collected by  
the Environmental Monitoring Program, 1997-2018',  
68   data.files = data_file_names,  
69   data.files.description = c('water quality data from the Stockton Deep  
Water Ship Channel', 'Geospatial data'),  
70   temporal.coverage = c('1997-08-04', '2018-11-08'),  
71   maintenance.description = 'ongoing',  
72   user.id = c('iep', 'csmith'),  
73   affiliation = c('EDI', 'LTER'),  
74   package.id = 'edi.276.1'  
75 )
```

## EML assembly line in R

Template and instructions available on IEP GitHub



# Citations with doi



DIGITAL  
OBJECT  
IDENTIFIER

## What Is a DOI?

Unique string assigned by a registration agency to identify content & provide a persistent link to its location on the internet.

**Example:** Delta Juvenile Fish Monitoring Program's DOI

<https://doi.org/10.6073/pasta/ea00fc37f0658dae21b817b1f93911cf>

## Why Should You Want One?

*Enables Preservation, Re-Use, & Exchange of Data*

- Universally recognized
- Facilitates data discovery, transparency, & usage tracking
- Document dataset versions
- Retain relationship between dataset & metadata

# IEP's Chosen Data Platform

## Environmental Data Initiative

- Create . Package . Archive . Discover . Reuse -



- Generates DOIs
- Focused on curation & archiving of ecological data
- Rigorous metadata standards (EML) & QC checks
- Fast data exports & code generation



Analyze this data package using:

MatLab

R

SAS

SPSS

tidyR

- Free, yet has considerable resources & personal support
- Support for data synthesis

# Citations for Datasets in EDI

- Interagency Ecological Program (IEP), B. Mahardja, J. Speegle. 2018. Interagency Ecological Program: Over four decades of juvenile fish monitoring data from the San Francisco Estuary, collected by the Delta Juvenile Fish Monitoring Program, 1976-2017. Environmental Data Initiative. <https://doi.org/10.6073/pasta/ea00fc37f0658dae21b817b1f93911cf>. 
- Interagency Ecological Program (IEP), B. Schreier, B. Davis, N. Ikemiyagi. 2018. Interagency Ecological Program: Fish catch and water quality data from the Sacramento River floodplain and tidal slough, collected by the Yolo Bypass Fish Monitoring Program, 1998-2018. Environmental Data Initiative. <https://doi.org/10.6073/pasta/0ab359bec7b752c1f68621f5e1768eb0>. 
- Interagency Ecological Program (IEP), S. Lesmeister, J. Rinde. 2019. Interagency Ecological Program: Discrete dissolved oxygen monitoring in the Stockton Deep Water Ship Channel, collected by the Environmental Monitoring Program, 1997-2018. Environmental Data Initiative. <https://doi.org/10.6073/pasta/4f254205afb605220a6453d933fb5d47>. 
- California Department of Fish and Wildlife, R. Hartman, S. Sherman, D. Contreras, D. Ellis. 2018. Fish catch, invertebrate catch, and water quality data from the Sacramento-San Joaquin Delta collected by the Fish Restoration Monitoring Program, 2015-2017. Environmental Data Initiative. <https://doi.org/10.6073/pasta/ab6a5e42df9a3bbc0dba13c1a4f9bd74>. 

# Usage Tracking

## Data Downloads

### Yolo Bypass Fish Monitoring Program

edi.233.1  
View Full Metadata (1059 views)

View Data Package Report

Download Data

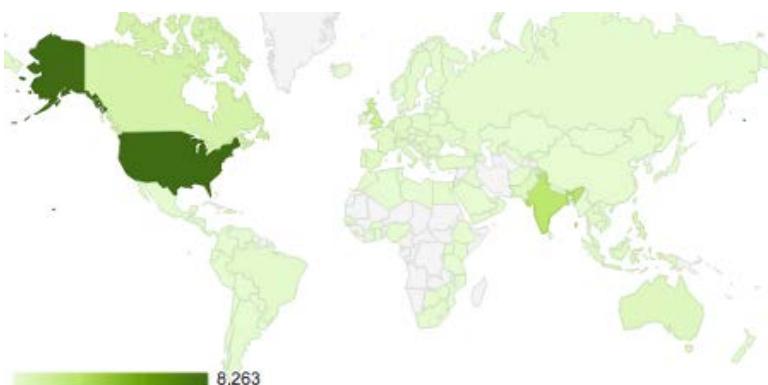
1. Name: YBFMP\_fish\_and\_water\_quality\_data\_1998\_2018.csv

File: YBFMP\_fish\_and\_water\_quality\_data\_1998\_2018.csv (24.7M 88 downloads)

## Users



## Locations



## Traffic Source



|                   |                     |
|-------------------|---------------------|
| ■ Search Engines  | 108,797.00 (61.88%) |
| ■ Direct Traffic  | 39,351.00 (22.38%)  |
| ■ Referring Sites | 27,668.00 (15.74%)  |

# Featuring our Data on a Global Scale



Environmental Data Initiative

- Create . Package . Archive . Discover . Reuse -



Environmental Data Initiative

- Create . Package . Archive . Discover . Reuse -

WELCOME

ABOUT ▾

DATA ▾

NEWS ▾

EVENTS ▾

RESOURCES ▾



Interagency Ecological Program: Fish catch and water quality data from the Sacramento River floodplain and tidal slough, collected by the Yolo Bypass Fish Monitoring Program, 1998–2018.

Interagency Ecological Program (IEP), B. Schreier, B. Davis, N. Ikemiyagi. 2018. Interagency Ecological Program: Fish catch and water quality data from the Sacramento River floodplain and tidal slough, collected by the Yolo Bypass Fish Monitoring Program, 1998–2018. Environmental Data Initiative. <https://doi.org/10.6073/pasta/0ab359bec7b752c1f68621f5e1768eb0>.

WELCOME

ABOUT ▾

DATA ▾

NEWS ▾

EVENTS ▾

RESOURCES ▾



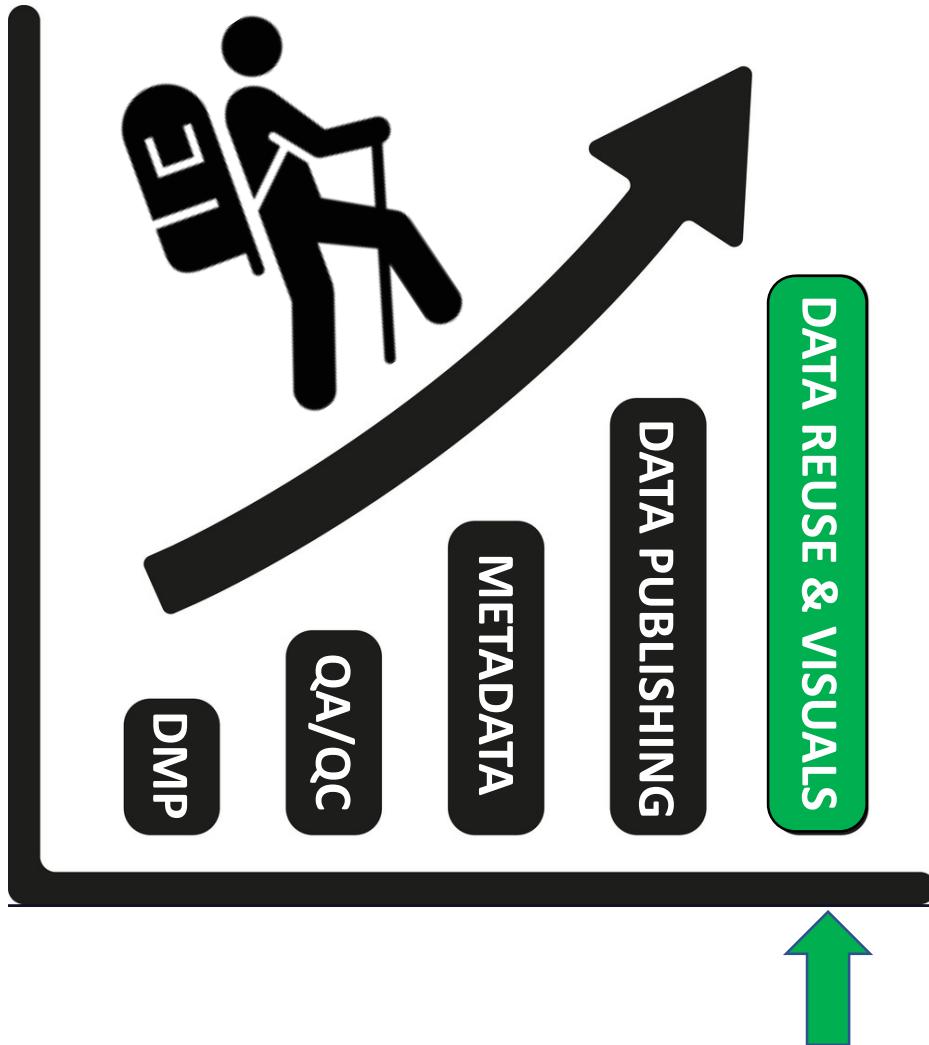
Interagency Ecological Program: Over four decades of juvenile fish monitoring data from the San Francisco Estuary, collected by the Delta Juvenile Fish Monitoring Program, 1976–2017.

Interagency Ecological Program (IEP), B. Mahardja, J. Speegle. 2018. *Interagency Ecological Program: Over four decades of juvenile fish monitoring data from the San Francisco Estuary, collected by the Delta Juvenile Fish Monitoring Program, 1976–2017*. Environmental Data Initiative.

<https://doi.org/10.6073/pasta/ea00fc37f0658dae21b817b1f93911cf>.

<https://environmentaldatainitiative.org/data/edis-featured-data-contributions>

# Data Portals







# Data Management Practices

- QA/QC
- Metadata
- Data Mgmt Plans



## Data Platforms

- EDI
- CNRA
- WDL
- CDEC
- BIOS

## Data Management Practices

- QA/QC
- Metadata
- Data Mgmt Plans



# Data Visualization Tools

- Bay Delta Live
- Estuary Portal
- SacPAS



# Data Platforms

- EDI
- CNRA
- WDL
- CDEC
- BIOS



# Data Management Practices

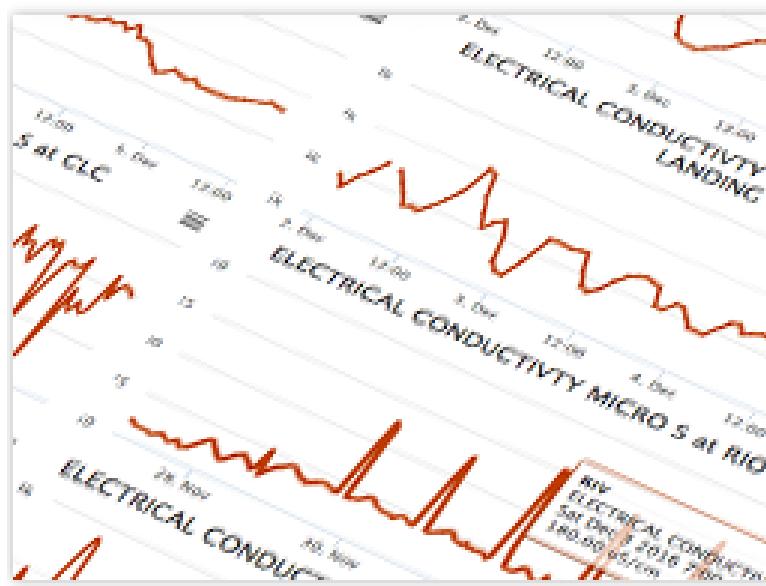
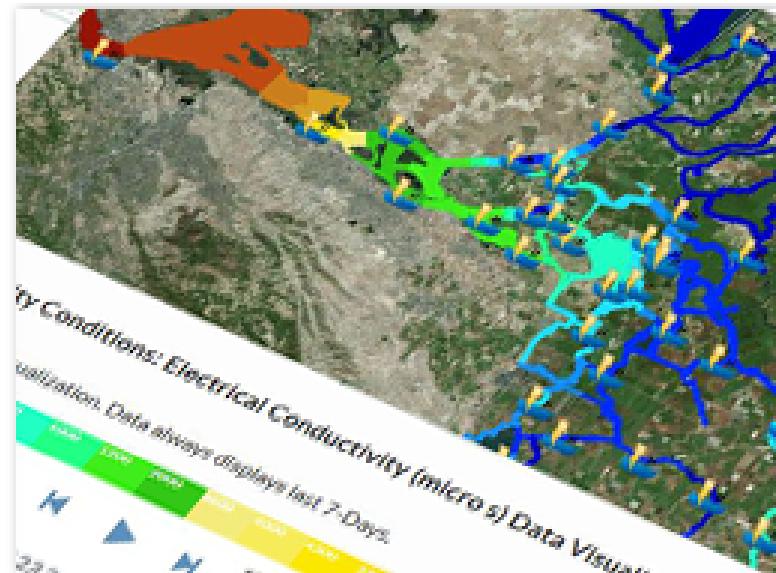
- QA/QC
- Metadata
- Data Mgmt Plans

A photograph of a forest floor covered in green moss and ferns. A dirt path leads through the center of the frame, branching into two distinct paths that curve off to the left and right. The background is filled with tall, dark evergreen trees.

When sharing data...

...what path to choose?

# Bay Delta Live



# California Estuary Portal

The screenshot shows the homepage of the California Estuary Portal. At the top left is the California state seal. On the right are a "Login" button and a user icon. Below the header is a blue navigation bar with links: Home, Explore Data, Maps & GIS, Photos / Videos / Docs, Projects, and Wiki. To the right of the navigation bar are back and forward navigation icons.

**Where Are California's Estuaries?**

Hundreds of estuaries are found in California, including the San Francisco Estuary (SF Estuary), Santa Monica Bay, and Morro Bay.

[Learn More](#)

A large aerial photograph of a coastal area, likely Morro Bay, showing the coastline, a large industrial facility with tall chimneys, and a town extending along the shore.

**Welcome to the California Estuary Portal**

The goal of the California Estuaries Portal is to provide data, information, and tools for discovery and management of California's estuaries. The first step in building the portal is focused on California's largest estuary, the San Francisco Estuary. The portal is seeking information and data from other California Estuaries--[join us!!](#)

**EXPLORE CALIFORNIA'S ESTUARIES WITH STORIES, MAPS, AND DATA.**

**EXPLORE CALIFORNIA'S ESTUARIES**

# California Estuary Portal

PHYTOPLANKTON IN THE SAN FRANCISCO ESTUARY

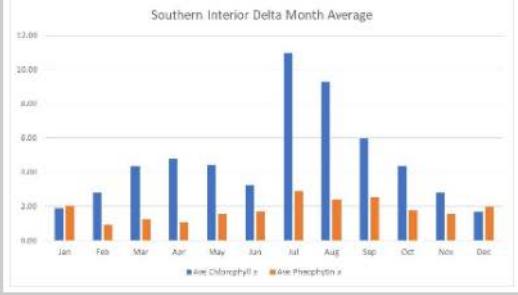
Phytoplankton in the San Francisco Estuary 

Tools

What Are Phytoplankton? Phytoplankton Monitoring Reporting Requirements Explore Phytoplankton Data Download Data And Metadata

Cyanobacteria were dominant most of the year, with peaks of green algae in spring and summer (Figure 4). Cryptophytes and centric diatoms also had small peaks in spring and summer.

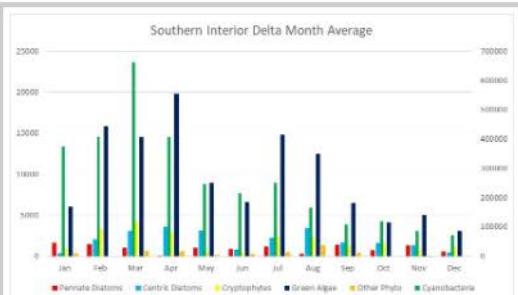
Southern Interior Delta Month Average



| Month | Avg Chlorophyll a | Avg Pheophytin a |
|-------|-------------------|------------------|
| Jan   | ~2.5              | ~2.5             |
| Feb   | ~3.5              | ~3.5             |
| Mar   | ~4.5              | ~3.5             |
| Apr   | ~4.5              | ~2.5             |
| May   | ~4.5              | ~2.5             |
| Jun   | ~3.5              | ~2.5             |
| Jul   | ~12.5             | ~3.5             |
| Aug   | ~10.5             | ~3.5             |
| Sep   | ~6.5              | ~3.5             |
| Oct   | ~4.5              | ~3.5             |
| Nov   | ~3.5              | ~3.5             |
| Dec   | ~3.5              | ~3.5             |

Caption: Figure 3: 2017 Southern Interior Delta Chlorophyll a and Pheophytin a

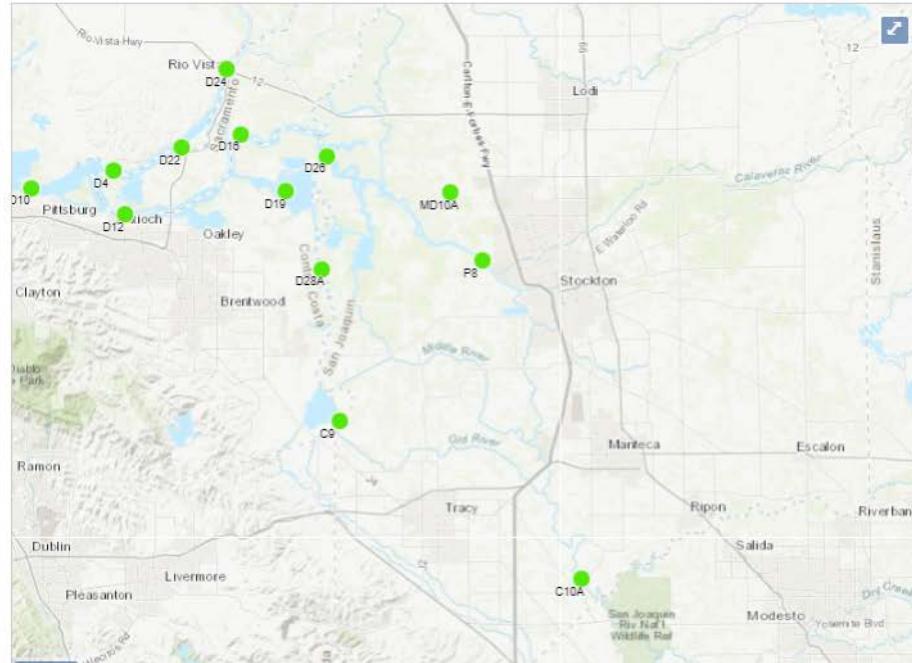
Southern Interior Delta Month Average



| Month | Pennate Diatoms | Centric Diatoms | Cryptophytes | Green Algae | Other Phyto | Cyanobacteria |
|-------|-----------------|-----------------|--------------|-------------|-------------|---------------|
| Jan   | ~5000           | ~10000          | ~1000        | ~1000       | ~1000       | ~1000         |
| Feb   | ~10000          | ~15000          | ~1000        | ~1000       | ~1000       | ~1000         |
| Mar   | ~25000          | ~10000          | ~1000        | ~1000       | ~1000       | ~1000         |
| Apr   | ~15000          | ~10000          | ~1000        | ~1000       | ~1000       | ~1000         |
| May   | ~10000          | ~10000          | ~1000        | ~1000       | ~1000       | ~1000         |
| Jun   | ~8000           | ~10000          | ~1000        | ~1000       | ~1000       | ~1000         |
| Jul   | ~12000          | ~10000          | ~1000        | ~1000       | ~1000       | ~1000         |
| Aug   | ~10000          | ~10000          | ~1000        | ~1000       | ~1000       | ~1000         |
| Sep   | ~8000           | ~10000          | ~1000        | ~1000       | ~1000       | ~1000         |
| Oct   | ~6000           | ~10000          | ~1000        | ~1000       | ~1000       | ~1000         |
| Nov   | ~5000           | ~10000          | ~1000        | ~1000       | ~1000       | ~1000         |
| Dec   | ~4000           | ~10000          | ~1000        | ~1000       | ~1000       | ~1000         |

Quick Links

Northern Interior Delta Southern Interior Delta Central Delta Confluence Grizzly Bay And Suisun Bay  
San Pablo Bay Sacramento San Joaquin Delta



# SacPas

## SacPAS: Central Valley Prediction & Assessment of Salmon

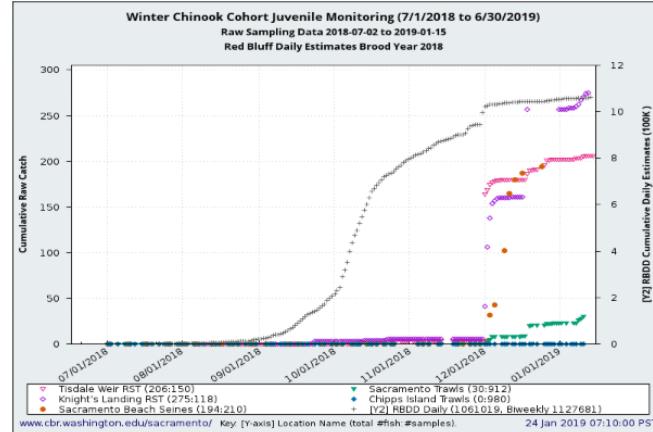
| Home                  | Data Queries & Alerts   |                           |                                | Fish Model              |                  |                 |  |
|-----------------------|-------------------------|---------------------------|--------------------------------|-------------------------|------------------|-----------------|--|
| Data Queries & Alerts | Alert: Weir Overtopping | RPAs: Temperature Targets | Juvenile Monitoring & Sampling | Juvenile Loss & Salvage | Adult Escapement | River Condition |  |

### Juvenile Monitoring & Sampling

Analysis & Queries: [Cohort Juvenile Monitoring](#) || [Juvenile Salmonid Monitoring](#) || [Red Bluff Daily Table with Biweekly](#) || [Red Bluff Daily Graph with Biweekly](#) || [Migration Timing and Conditions](#)

#### Cohort Juvenile Monitoring

- ♦ [Cohort Juvenile Monitoring](#) at Sacramento River rotary screw traps, beach seines, and trawls with Red Bluff Estimates

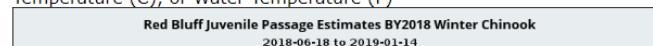


#### Red Bluff Daily Table

- ♦ [Red Bluff Juvenile Daily Estimates Table Query](#) with Biweekly Totals

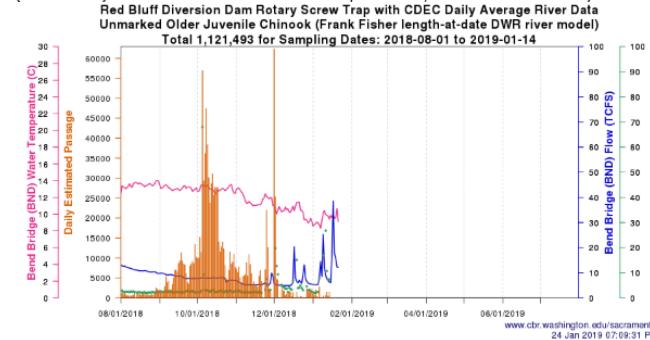
#### Red Bluff Daily Graph

- ♦ [Red Bluff Daily Graph](#) with Biweekly Estimated Totals, Fork Length, Flow, Turbidity, Water Temperature (C), or Water Temperature (F)



#### Juvenile Salmonid Monitoring

- ♦ [Unmarked Older Chinook](#), ♦ [Fry/Smolt Chinook](#), and ♦ [Steelhead](#) at Sacramento River (Red Bluff, Tisdale), Lower Sacramento River (Knight's Landing, Sacrar (Mossdale) with associated Water Temperature, Flow and Turbidity

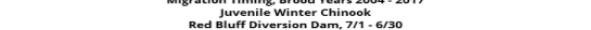


updated: Thursday, 24-Jan-2019 07:09:31 PST

#### Migration Timing and Conditions

- ♦ [Migration Timing & Conditions](#) at Red Bluff, Sacramento River rotary screw traps, beach

Migration Timing Characteristics, Temperature and Flow Exposure



# IEP Data and Metadata Table



CALIFORNIA DEPARTMENT OF  
**WATER RESOURCES**



Water Basics



What We Do



Programs



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## IEP Data and Metadata Portal

The Interagency Ecological Program (IEP) monitoring studies have collected hydrodynamic, water quality, and biological data in the San Francisco Bay-Delta since 1959.

Over the decades, surveys have been added or modified in both geographic scope or in protocol. Surveys vary with respect to their period of record, their geographic and seasonal coverage, and in the types of the data they collect.

The goals of this page are to provide an overview of IEP surveys and the diversity of data they collect, and to provide direct access to metadata and data for all possible surveys.

Table 1 provides an overview of existing long-term monitoring programs of IEP and illustrates the data types currently collected by each survey. Tables 2-4 provide detailed information and links to metadata and data for individual surveys focused on water quality, phytoplankton, invertebrates, and fish. Fish surveys found in Table 4 include additional data types collected along-side fish sampling, such as discrete water quality and zooplankton.

Table 1.

| Program                 | IEP PEN   | Hydrodynamics | Discrete Water Quality | Continuous Water Quality | Phytoplankton | Zooplankton | Benthic Invertebrates | Fish |
|-------------------------|-----------|---------------|------------------------|--------------------------|---------------|-------------|-----------------------|------|
| Fall Midwater Trawl     | 003       |               | X                      |                          |               | X           |                       | X    |
| Summer Trawl Survey     | 007       |               | X                      |                          |               | X           |                       | X    |
| Bay Study               | 011 / 012 |               | X                      |                          |               |             | X                     | X    |
| Bay Salinity Monitoring | 029       |               | X                      | X                        |               |             |                       |      |
| Delta Flow network      | 030       | X             |                        | X                        |               |             |                       |      |
| 20-mm Survey            | 033       |               | X                      |                          |               | X           |                       | X    |

# CNRA Open Data Platform



Welcome to

## CALIFORNIA NATURAL RESOURCES AGENCY OPEN DATA

Our mission is to restore, protect and manage the state's natural, historical and cultural resources for current and future generations.

Search Datasets

Get started by searching from 1357 datasets and maps from across California

### Topics

As datasets are published, they are tagged with categories so you can learn about popular topics. Explore them below.

|   |   |   |
|---|---|---|
|  |  |  |
| Wildlife  | Water   | Oceans  |
|  |  |  |

Datasets Activity Stream About

 Search datasets...

Order by: Relevance

**85 datasets found**

Organizations:

California Department of Water Resources  Groups

Water 



#### Periodic Groundwater Level Measurements

The DWR Periodic Groundwater Levels dataset contains seasonal and long-term groundwater level measurements collected by the Department of Water Resources and cooperating agencies.

Updated on January 30, 2019

[CSV](#) [ZIP](#)



#### 2018 Sustainable Groundwater Management Act (SGMA) Basin Prioritization

The following data and resources were used to support the 2018 SGMA Basin Prioritization of California's groundwater basins and subbasins. The Department of Water Resources is mandated...

Updated on January 29, 2019

[XLSX](#) [PDF](#) [CSV](#) [ZIP](#)

<https://data.cnra.ca.gov/>

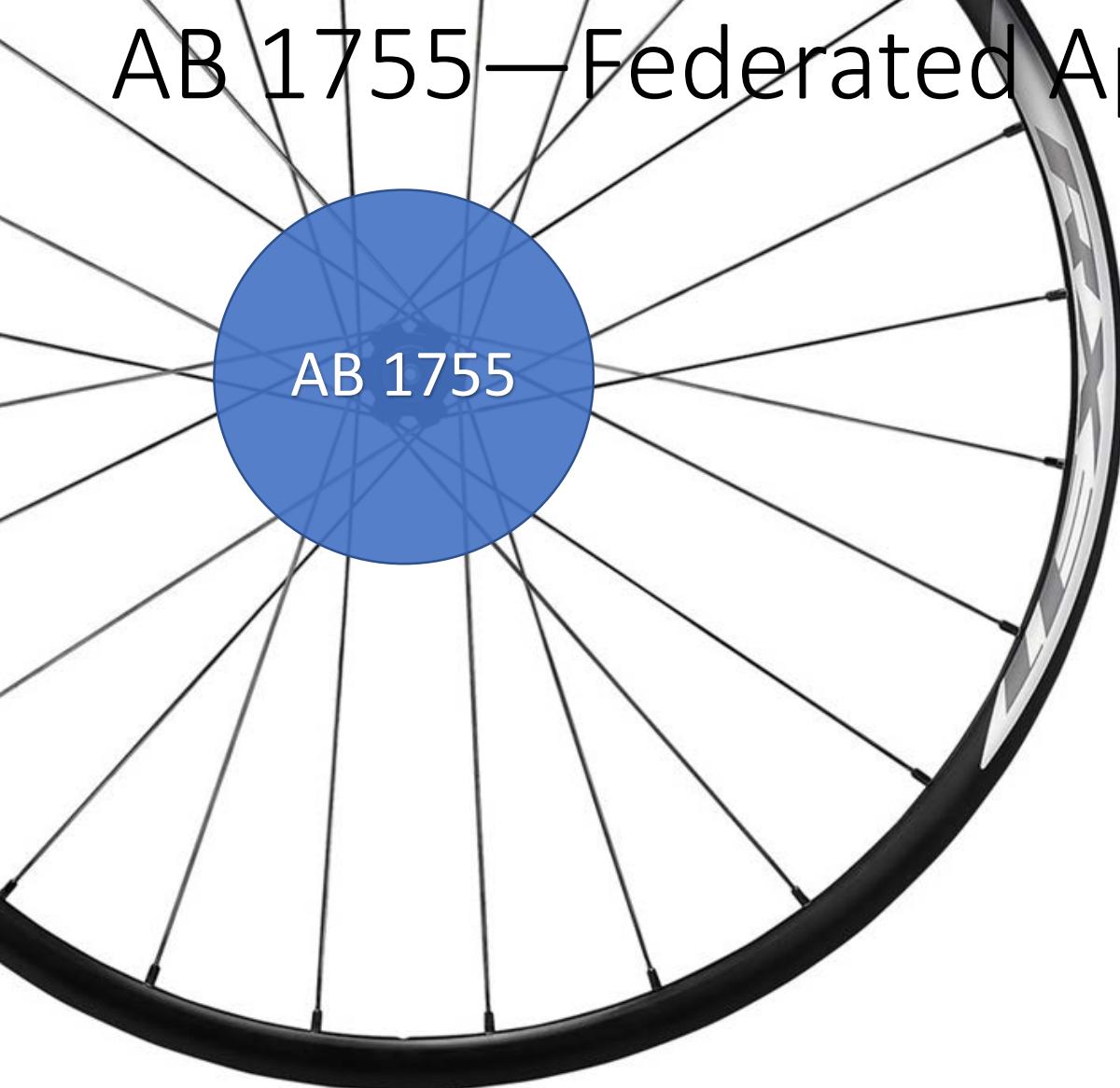
# Renewed Focus on Open Data



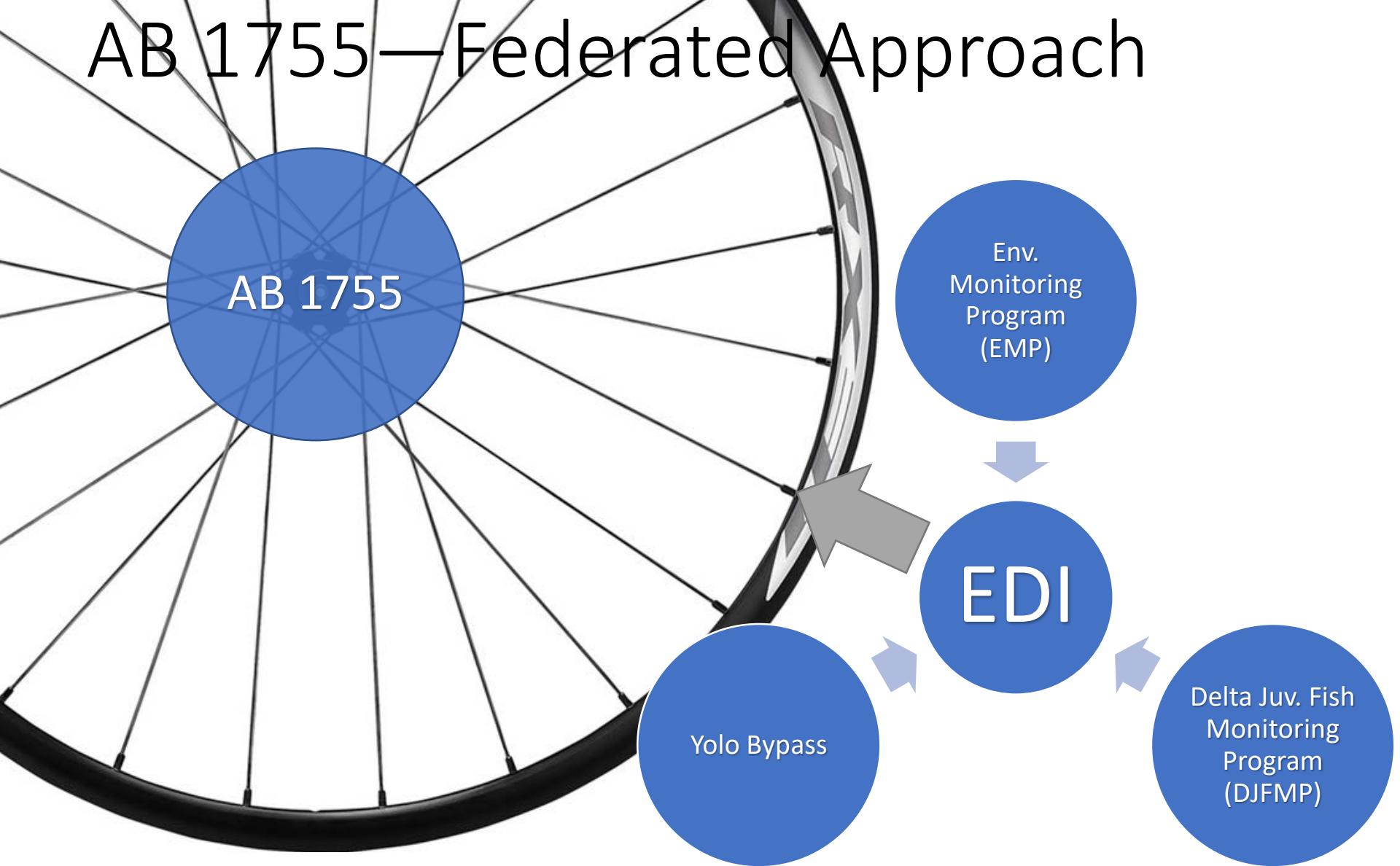
## AB 1755 Goals:

- Coordinate/integrate existing water data
- Develop Protocols
- Create, operate, and maintain statewide integrated data platform

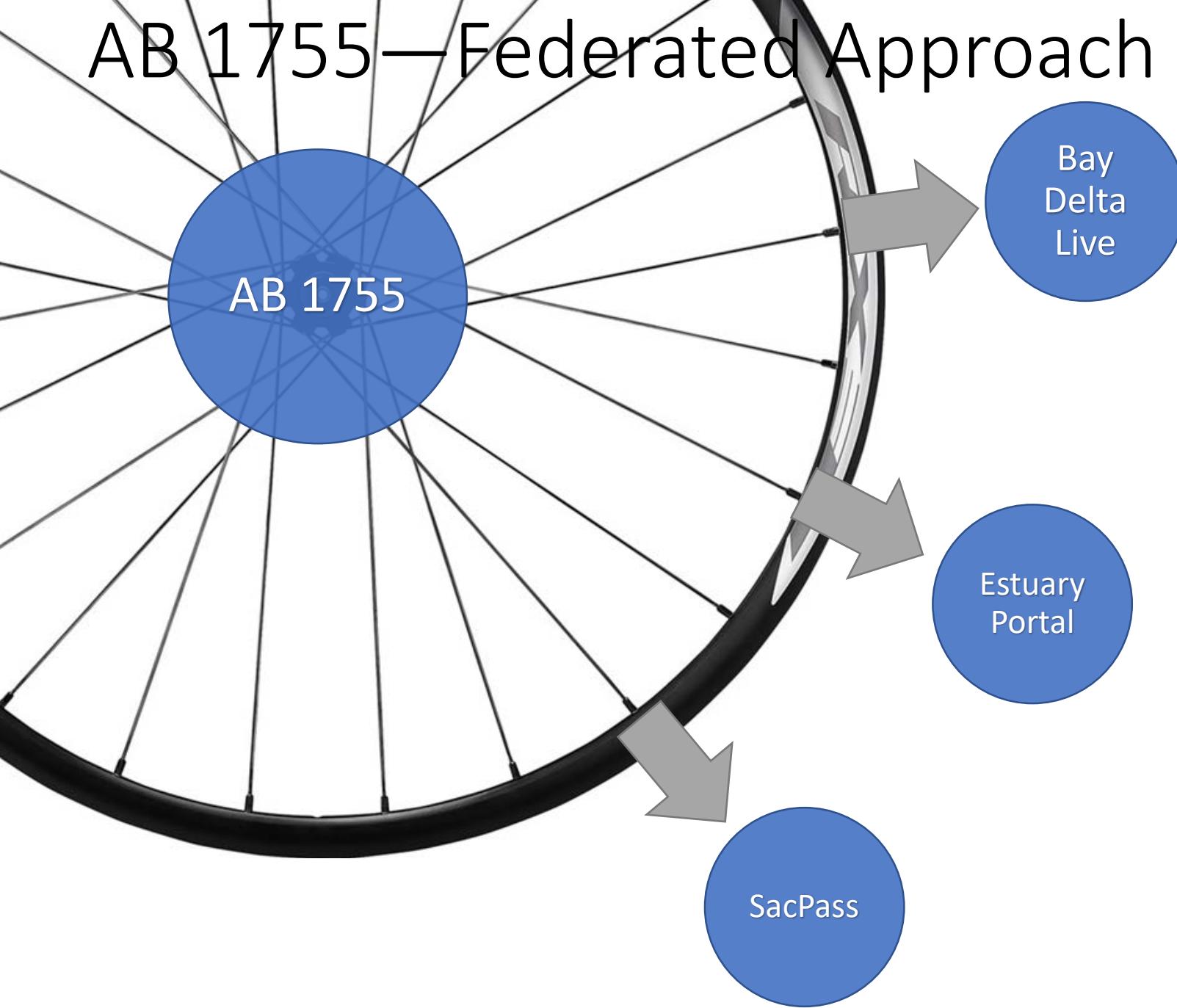
# AB 1755—Federated Approach



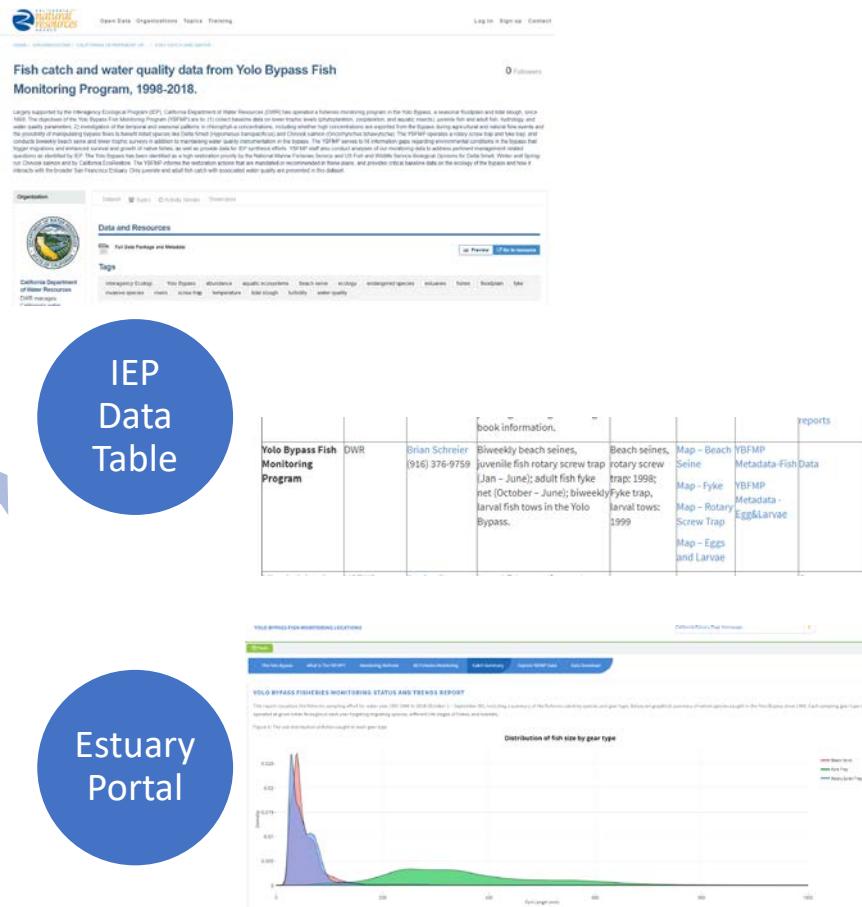
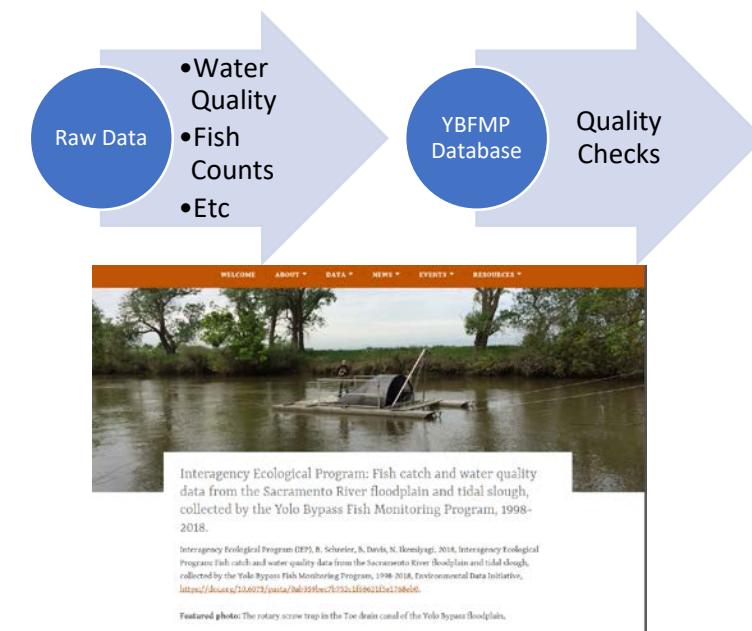
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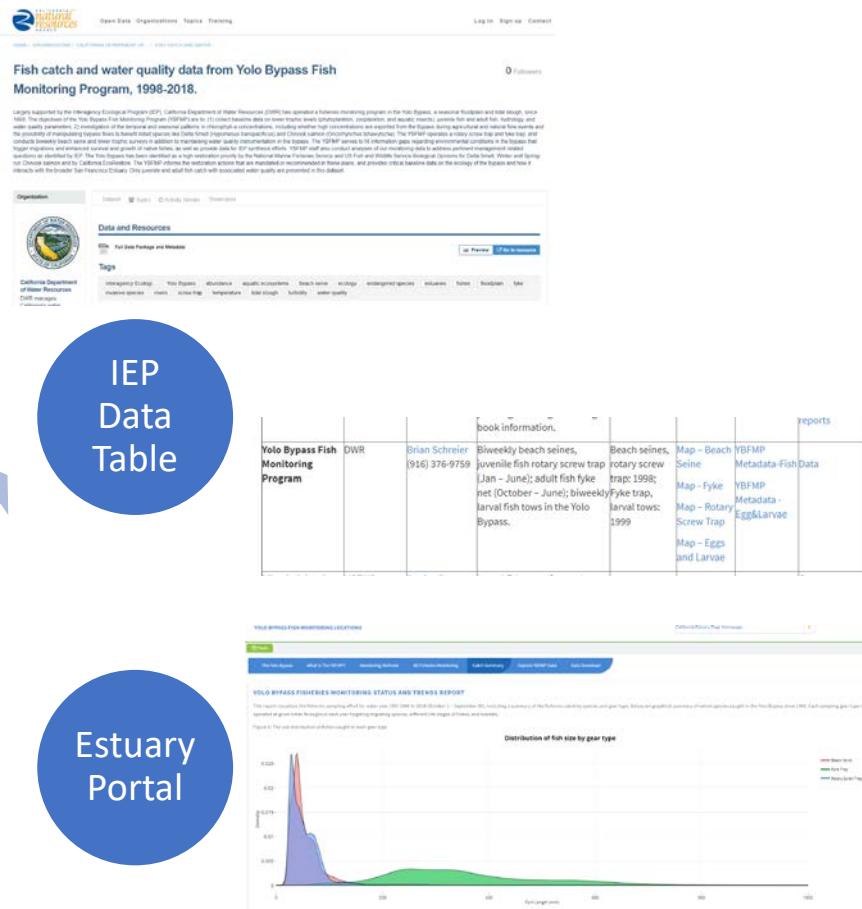
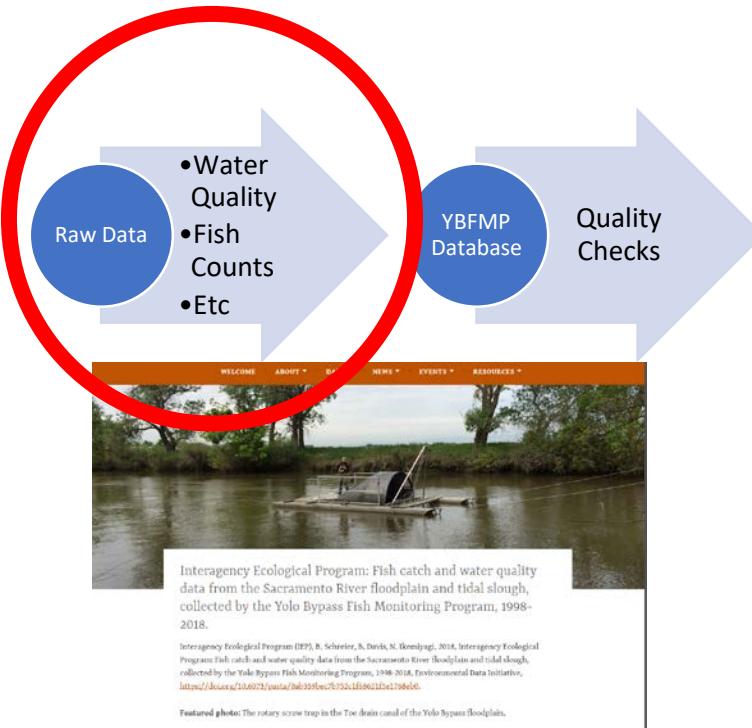
# Yolo Bypass Fish Monitoring Program



## Role of freshwater floodplain-tidal slough complex in the persistence of the endangered delta smelt

Brian Mahardja , James A. Hobbs, Naoaki Ikemiyagi, Alyssa Benjamin, Amanda J. Finger

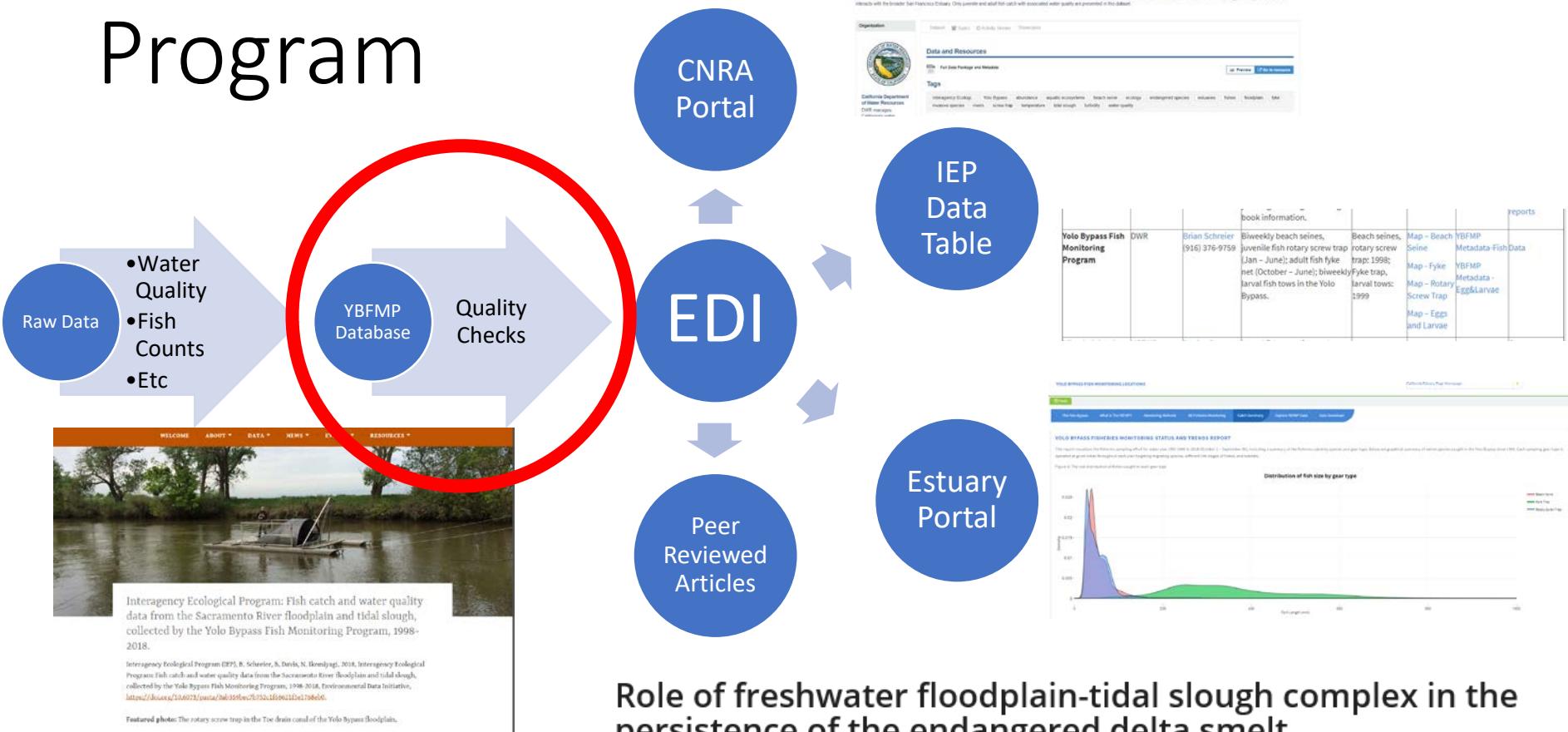
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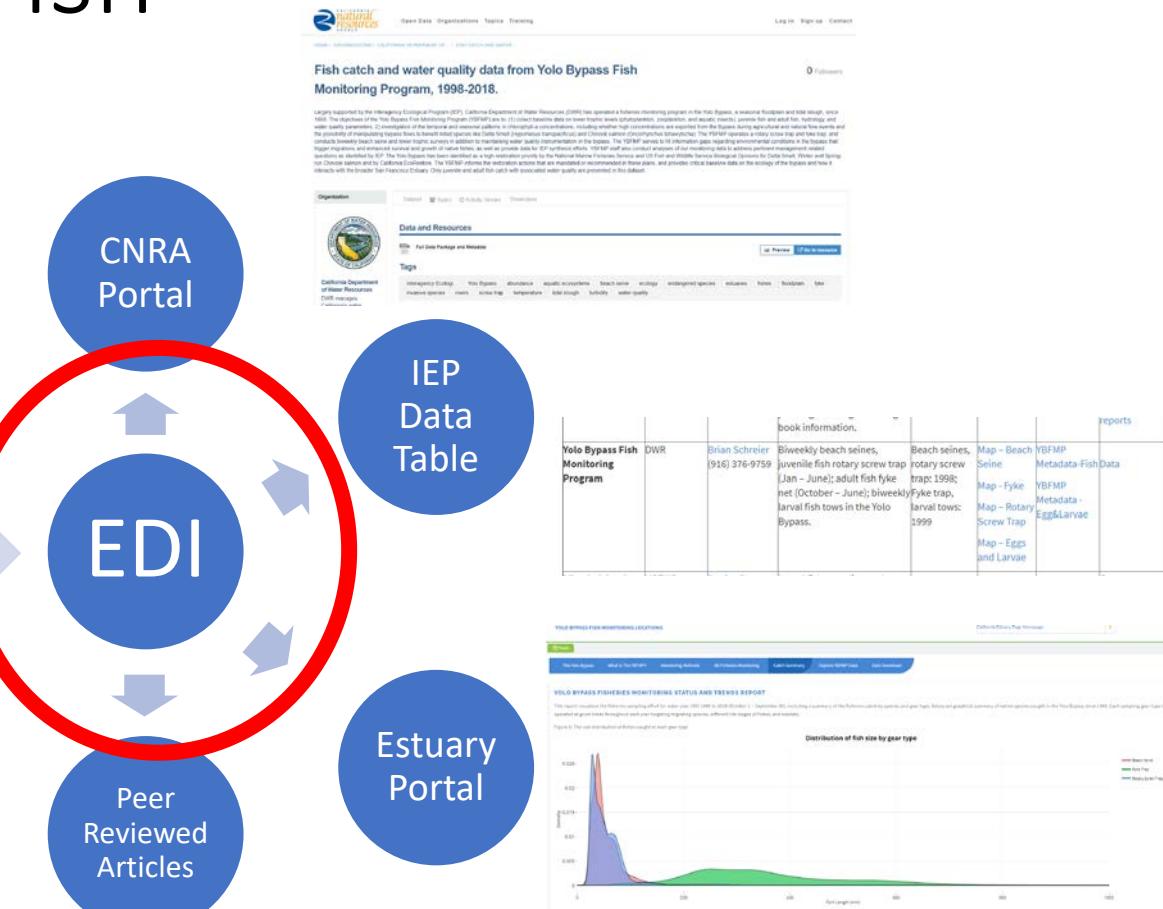
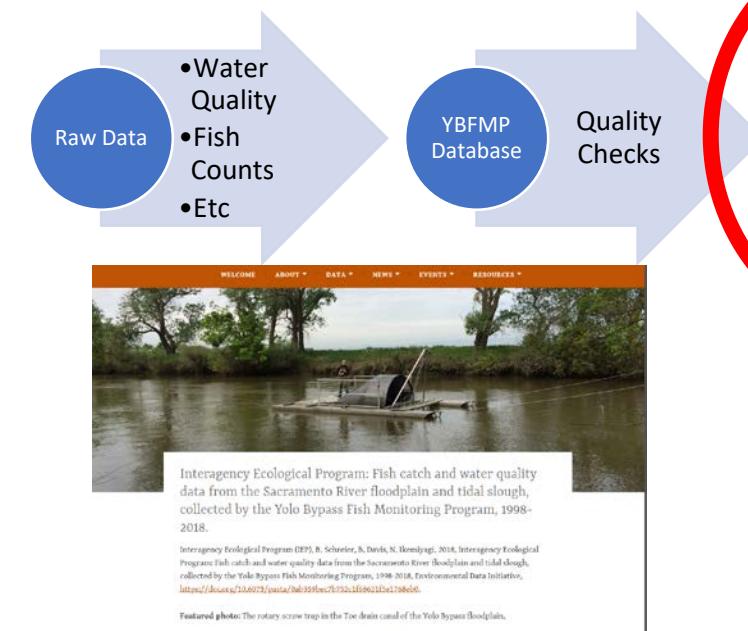
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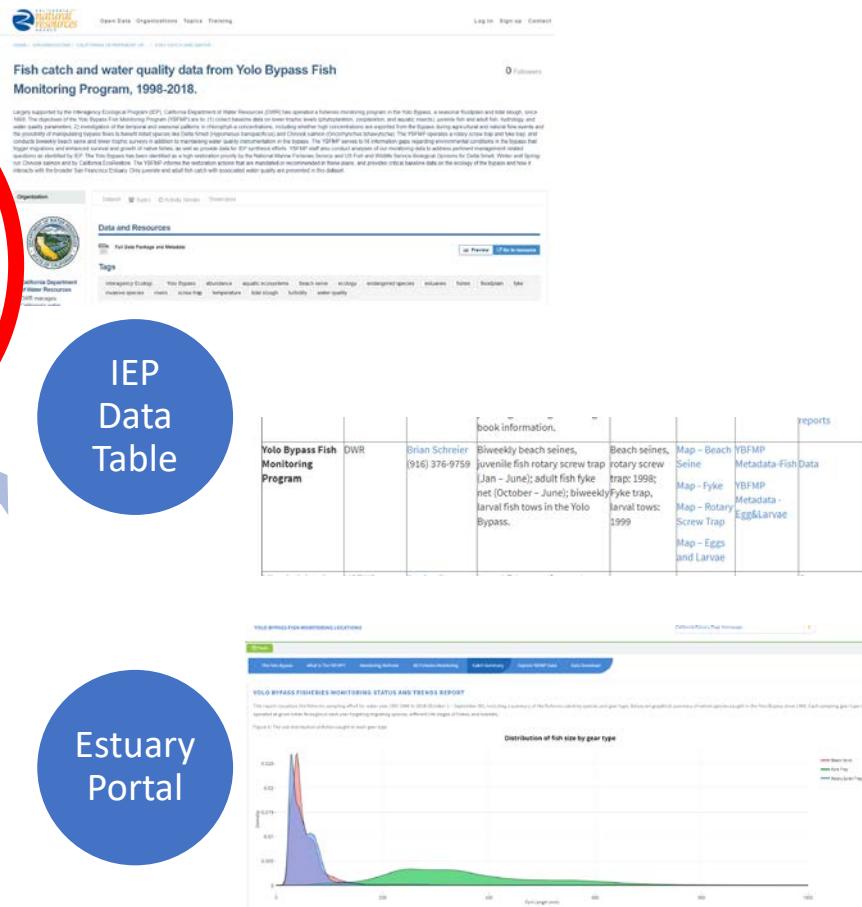
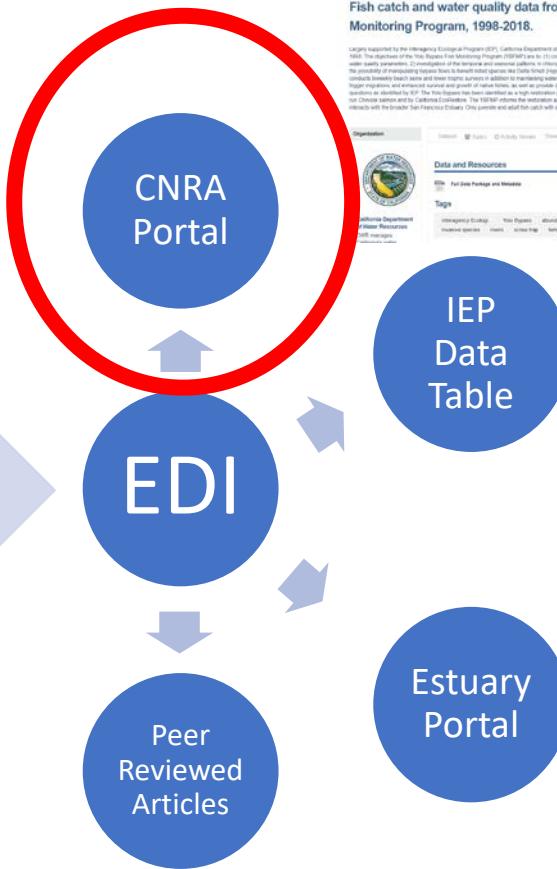
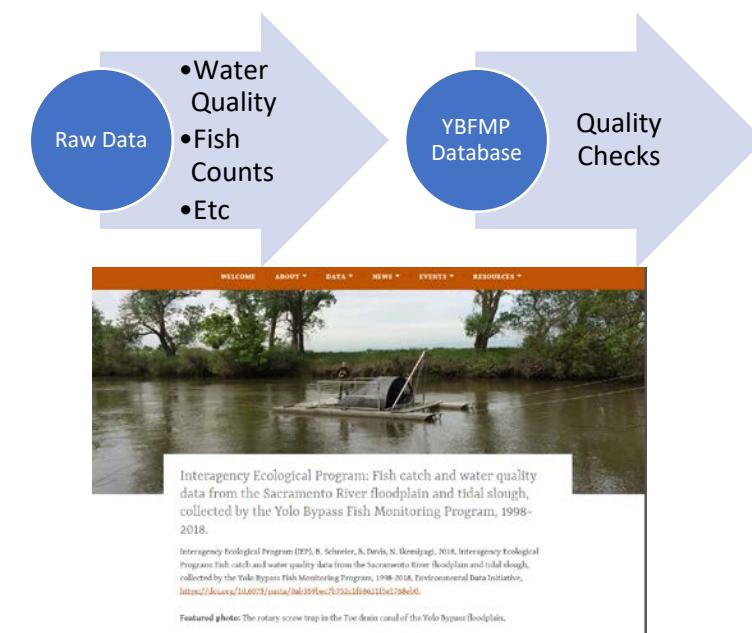
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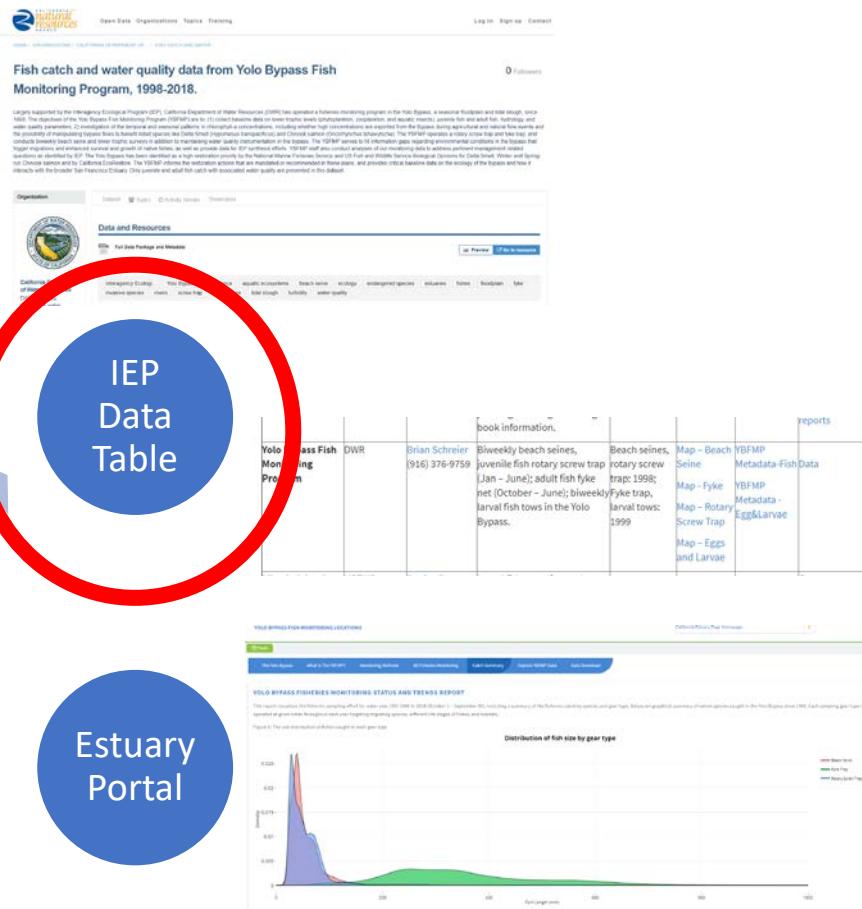
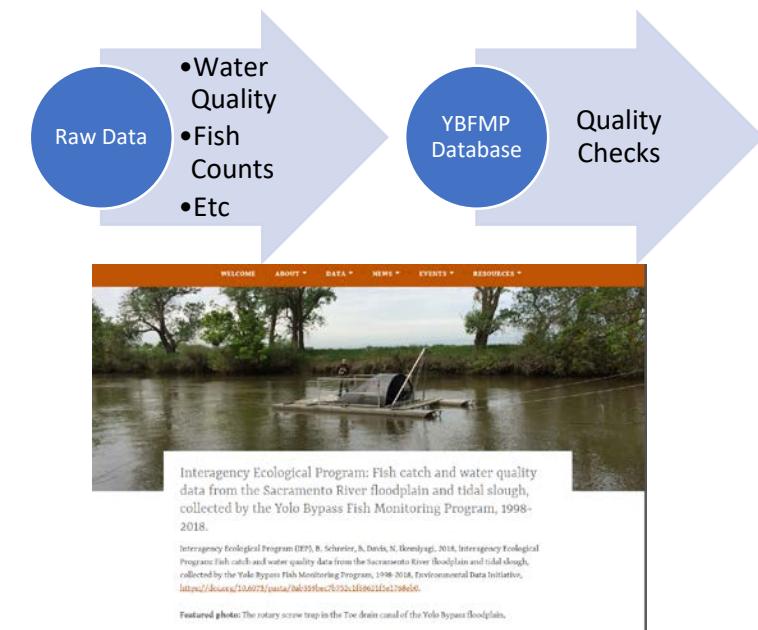
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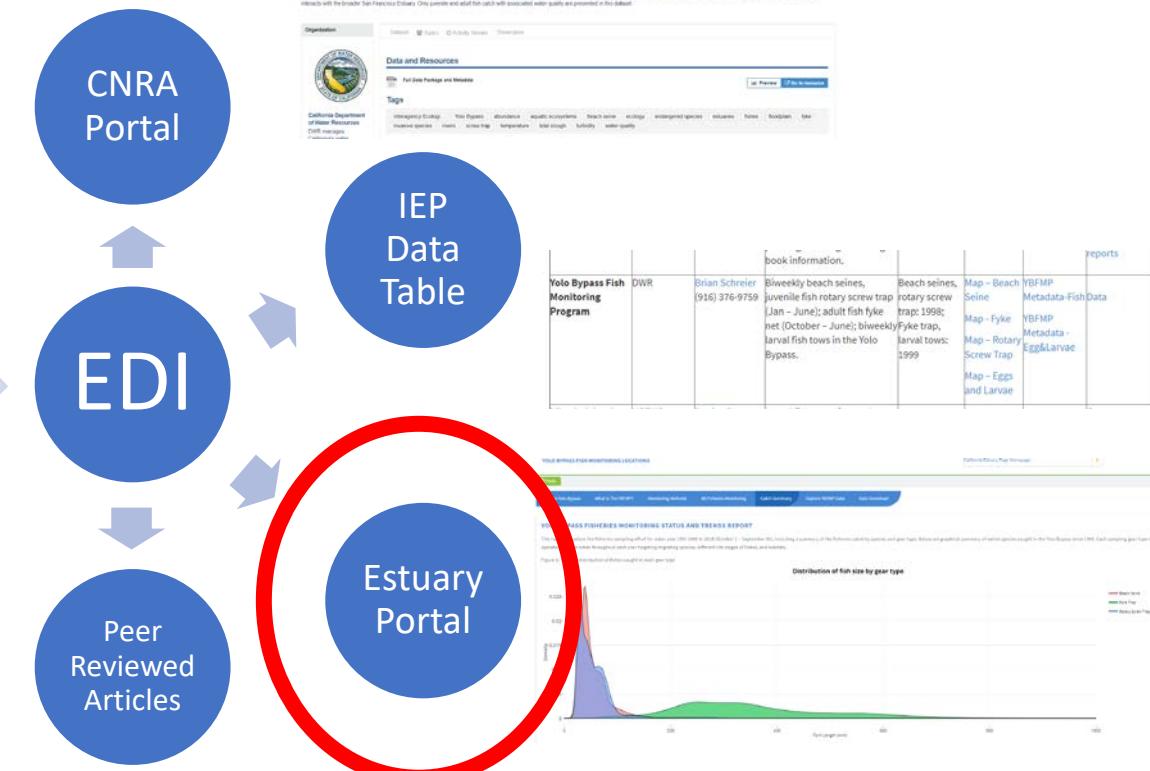
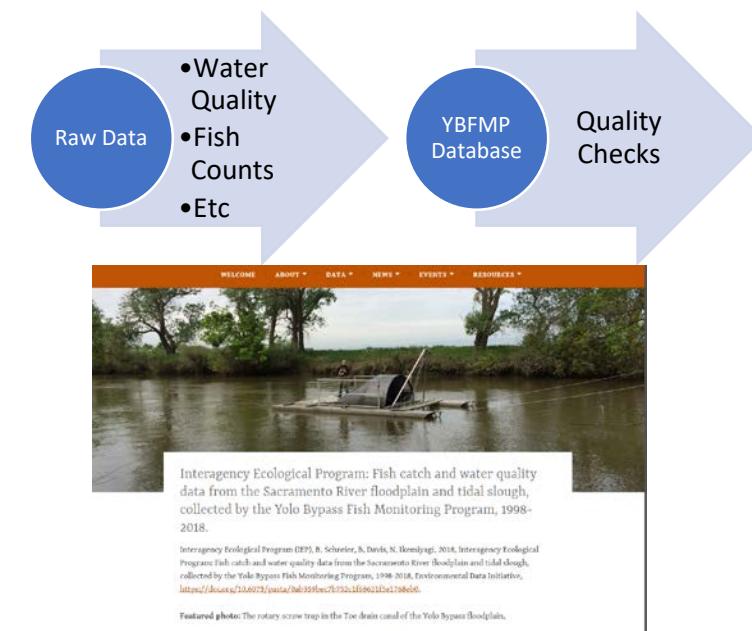
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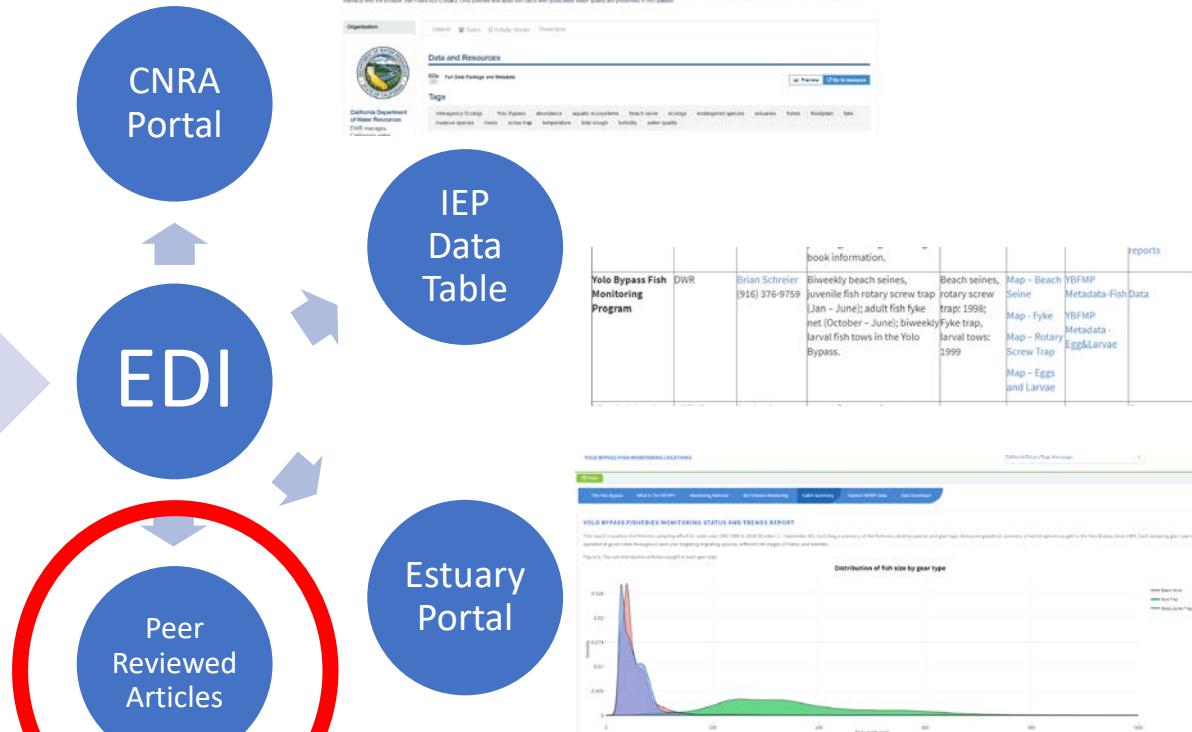
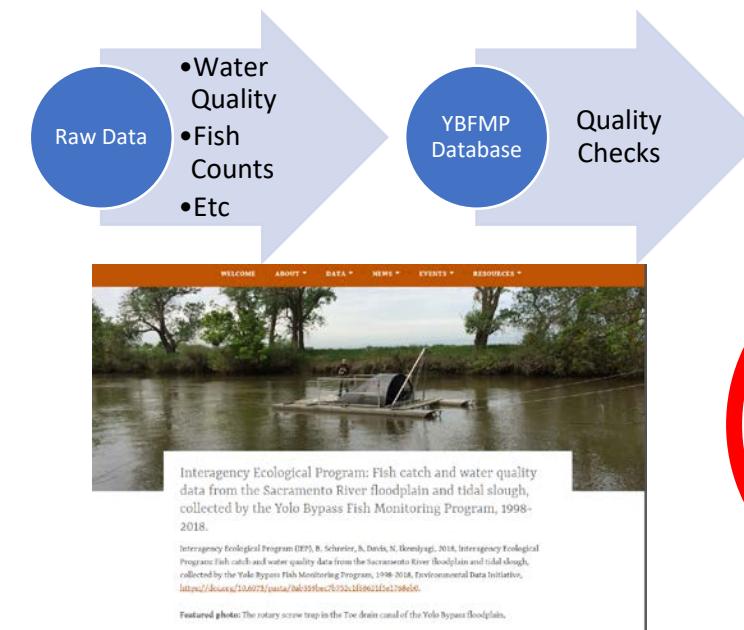
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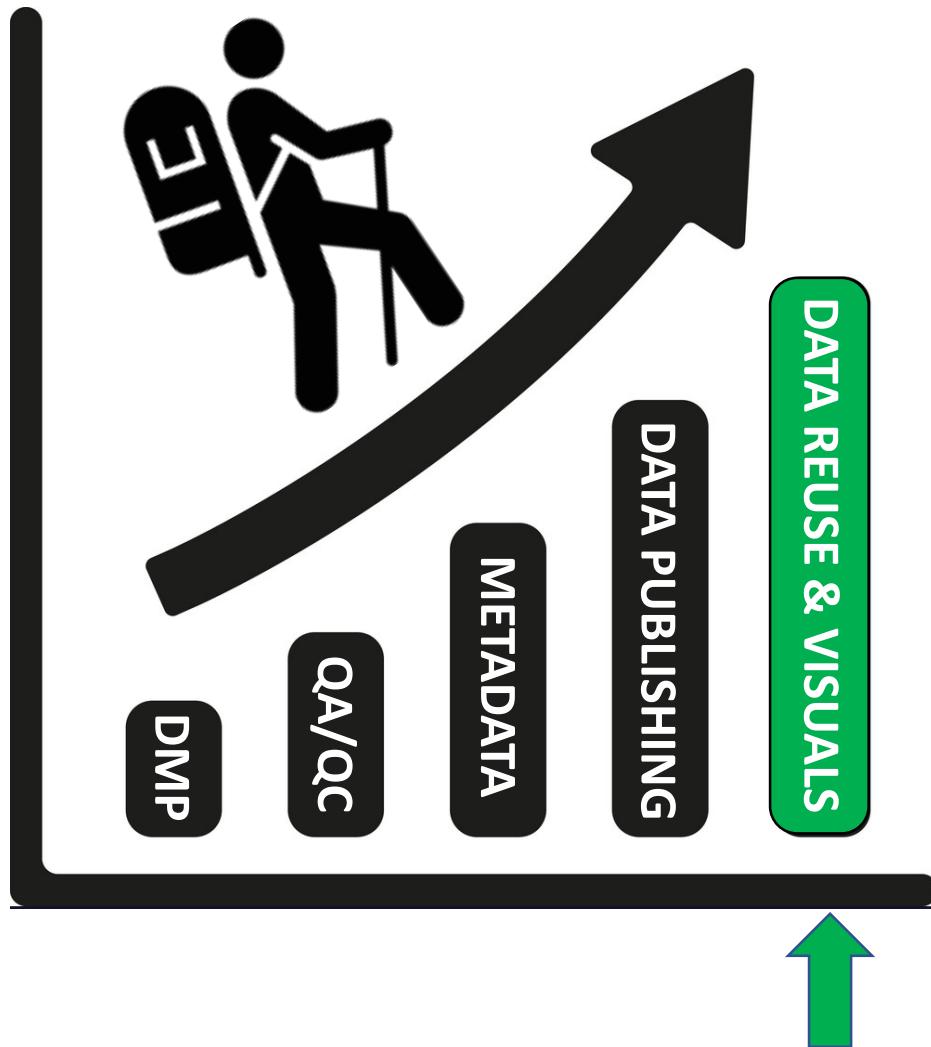
Brian Mahardja James A. Hobbs, Naoaki Ikemiyagi, Alyssa Benjamin, Amanda J. Finger

# Online Polling

Go to [www.menti.com](http://www.menti.com) and use the code 56 23 0

What is your greatest barrier to implementing open science?

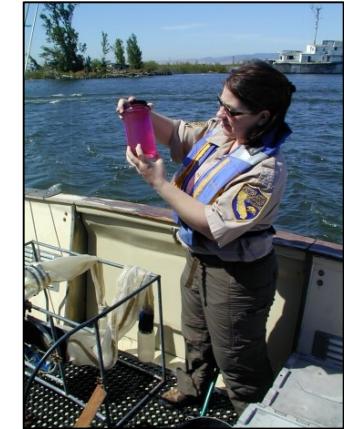
# Status & Trends Report



# Why a Status & Trends Report?

# Why a Status & Trends Report?

- Long-term ecological surveys are a core IEP function



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- But IEP survey data are distributed across many websites and data formats

# Why a Status & Trends Report?

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## Index of /Delta Smelt

[parent directory]

| Name                               |
|------------------------------------|
| 20mm Data File Format1995-2016.pdf |
| 20mm Metadata1995-2016.pdf         |
| 20mm Net Dimensions.ppt            |
| 20mm_New.mdb                       |
| 20mm_New.zip                       |
| 20mm1995-2016.mdb                  |
| 20mm1995-2016.zip                  |
| 20mmDatabaseEditLog.xls            |
| 20mmDataFileFormat_New.pdf         |
| 20mmMetadata_New.pdf               |
| 20mmNew_ReadMe.pdf                 |
| DSLS Data File Format.pdf          |
| DSLS metadata.pdf                  |
| DSLS.mdb                           |
| NBA Data File Format.pdf           |
| NBA Metadata.pdf                   |
| NBA.mdb                            |
| SKT.mdb                            |
| SKT.zip                            |
| SKT_Metadata.pdf                   |
| SKTDatabaseEditLog.xls             |
| SLS Data File Format.pdf           |
| SLS.mdb                            |
| SLS.zip                            |
| SLS_Metadata.pdf                   |
| SLSDatabaseEditLog.xls             |

Table 1.— Sampling effort, weekly passage estimates, median fork length (Med FL) and juvenile production indices (JPI's) for winter Chinook smolt at Diversion Dam (RK 391) for the period July 1, 2016 through June 30, 2017 (brood year 2016). Full sampling effort indicated by assigning a value of 1.00 to all weeks. Sampling effort was assigned to weeks consisting of four 2.4-m diameter rotary-screw traps sampling 24 hours daily, 7 days per week. Results include estimated passage (Est. passage), total smolt/smolts (> 45 mm FL), total (fry and pre-smolt/smolts combined) and fry-equivalents. Fry-equivalent JPI's were generated by weighting passage by the inverse of the fry to pre-smolt/smolt survival rate (59% or approximately 1.7:1; Hallock undated).

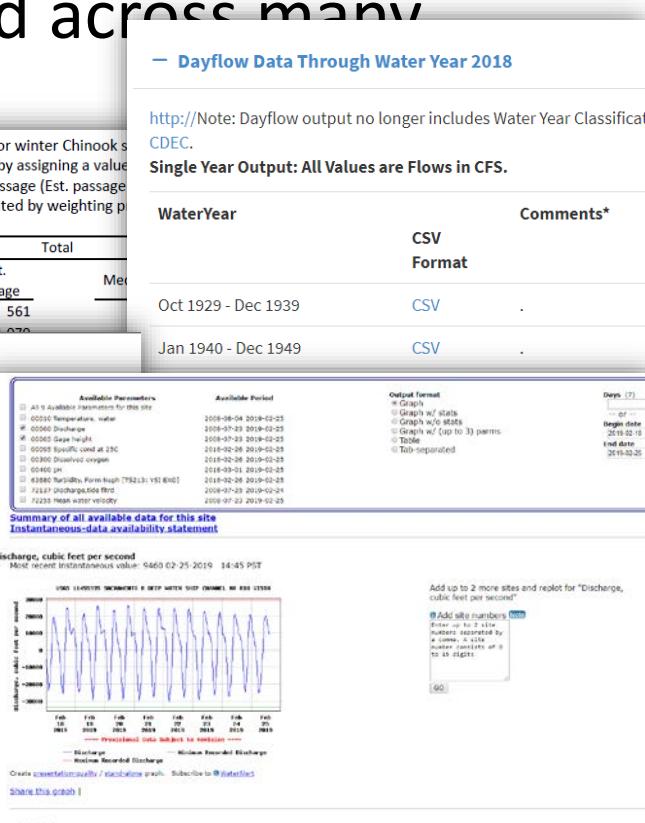
| Week     | Sampling Effort | Fry          |        | Pre-smolt/smolts |        | Total        |        |
|----------|-----------------|--------------|--------|------------------|--------|--------------|--------|
|          |                 | Est. passage | Med FL | Est. passage     | Med FL | Est. passage | Med FL |
| 27 (Jul) | 0.46            | 561          | 33     | 0                | -      | 561          | -      |
| 28       | 0.00            | 1,070        | 24     | 0                | -      | 1,070        | -      |
| 29       |                 |              |        |                  |        |              |        |
| 30       |                 |              |        |                  |        |              |        |
| 31 (Aug) |                 |              |        |                  |        |              |        |

## FTP directory /IEP\_Zooplankton/ at ftp.dfg.ca.gov

To view this FTP site in File Explorer: press Alt, click View, and then click Open.

[Up to higher level directory](#)

|                    |   |
|--------------------|---|
| 11/06/2018 02:39PM | Directory ..  |
| 11/06/2018 02:39PM | Directory ..  |
| 04/27/2018 12:00AM | 11,316,701 <a href="#">1972-2017CBMatrix.xlsx</a>       |
| 04/27/2018 12:00AM | 3,228,183 <a href="#">1972-2017MysidMatrix.xlsx</a>     |
| 04/27/2018 12:00AM | 6,067,824 <a href="#">1972-2017PumpMatrix.xlsx</a>      |
| 04/27/2018 12:00AM | 13,509 <a href="#">ReadMeZooplanktonStudyMatricesA</a>  |
| 05/01/2008 12:00AM | 202,752 <a href="#">ZP Monitoring Station Map Histo</a> |
| 10/31/2017 12:00AM | 199,023 <a href="#">ZPCoreAndCurrentStationsAug2017</a> |
| 45                 | 1.00  |
| 46                 | 1.00  |
| 47                 | 0.80  |
| 48 (Dec)           | 0.71  |
| 49                 | 1.00  |
| 50                 | 0.19  |
| 51                 | 0.54  |



# Why a Status & Trends Report?

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## Index of /Delta Smelt/

[parent directory]

### Name

- 20mm Data File Format1995-2016.pdf
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- 20mm Net Dimensions.ppt
- 20mm\_New.mdb
- 20mm\_New.zip
- 20mm1995-2016.mdb
- 20mm1995-2016.zip
- 20mmDatabaseEditLog.xls
- 20mmDataFileFormat\_New.pdf

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| Week     | Fry             |              | Pre-smolt/smolts |              | Total  |              |
|----------|-----------------|--------------|------------------|--------------|--------|--------------|
|          | Sampling Effort | Est. passage | Med FL           | Est. passage | Med FL | Est. passage |
| 27 (Jul) | 0.46            | 561          | 33               | 0            | -      | 561          |
| 28       | 0.36            | 1,070        | 34               | 0            | -      | 1,070        |
| 29       |                 |              |                  |              |        |              |
| 30       |                 |              |                  |              |        |              |
| 31 (Aug) |                 |              |                  |              |        |              |
| 32       |                 |              |                  |              |        |              |

FTP directory /IEP\_Zooplankton/ at [ftp.dfg.ca.gov](ftp://ftp.dfg.ca.gov)

To view this FTP site in File Explorer: press Alt, click View, and then click Open

Dayflow Data Through Water Year 2018

<http://>Note: Dayflow output no longer includes Water Year Classification CDEC.

Single Year Output: All Values are Flows in CFS.

| WaterYear           | CSV Format | Comments* |
|---------------------|------------|-----------|
| Oct 1929 - Dec 1939 | CSV        | .         |
| Jan 1940 - Dec 1949 | CSV        | .         |

Welcome to

CALIFORNIA NATURAL RESOURCES AGENCY OPEN DATA

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Open Data Organizations Topics Training

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Get started by searching from 1201 datasets and maps from across California

Topics

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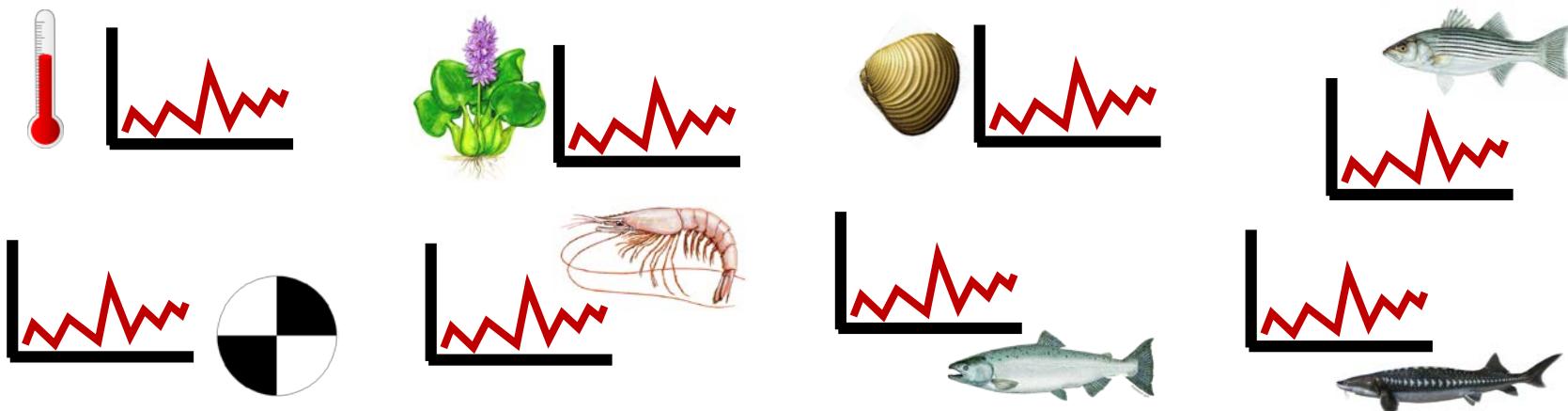
# Our Goal

- Develop reports that:
  - Showcase a diversity of key IEP data sets



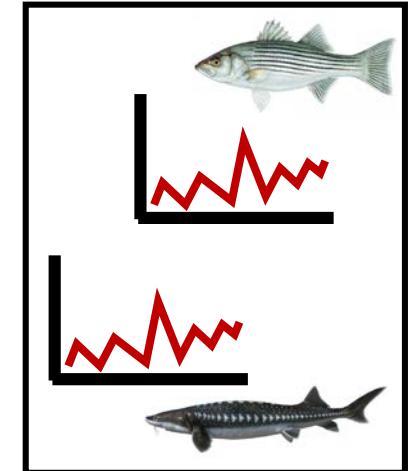
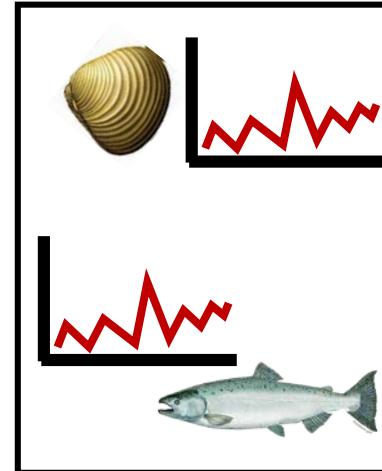
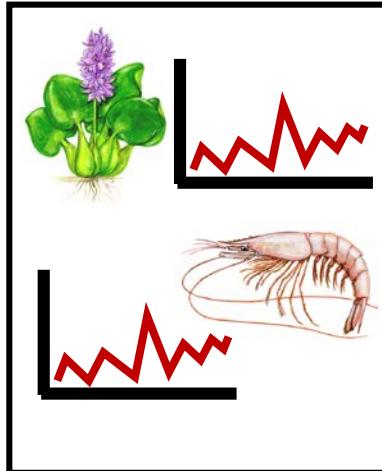
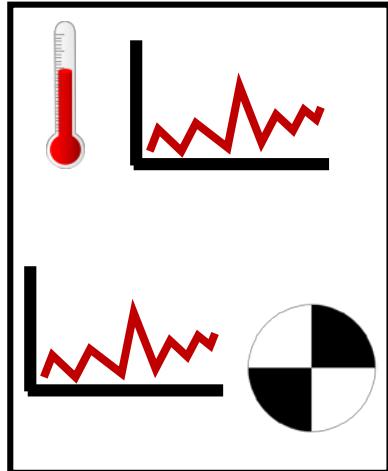
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- Develop reports that:
  - Showcase a diversity of key IEP data sets
  - Standardize plots across data sets
  - Elucidate general patterns across space and time



# Our Goal

- Develop reports that:
  - Showcase a diversity of key IEP data sets
  - Standardize plots across data sets
  - Elucidate general patterns across space and time
  - Present data in a very short format



These reports are NOT...

# These reports are NOT...

...a replacement for the IEP Newsletter reports

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■ Interagency Ecological Program for the San Francisco Estuary ■



## **IEP NEWSLETTER**

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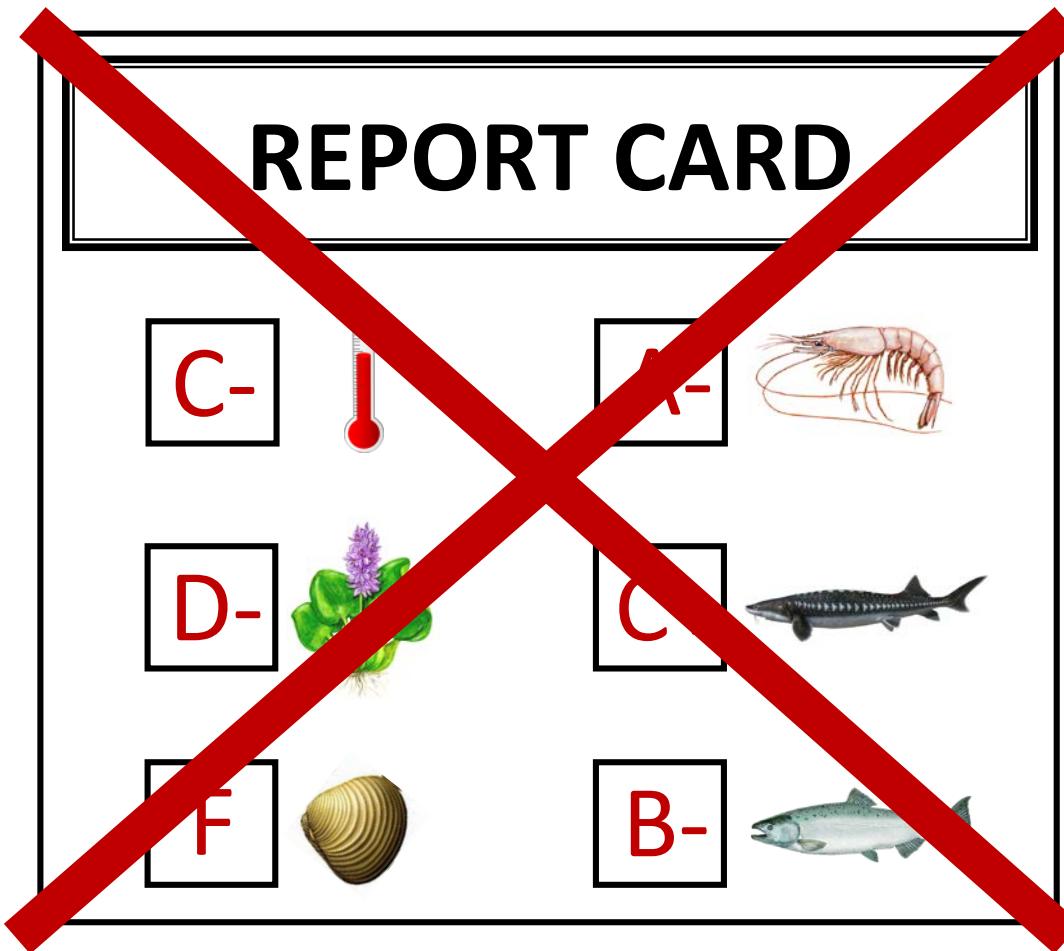
VOLUME 31, NUMBER 1, 2018

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|  |          |
|--|----------|
| <b>OF INTEREST TO MANAGERS .....</b>   | <b>2</b> |
| <b>STATUS AND TRENDS .....</b>   | <b>3</b> |
| Fish Salvage at the State Water Project's and Central Valley Project's Fish Facilities | 3        |
| during the 2017 Water Year .....   | 3        |
| 2017 20-mm Survey .....  | 9        |

# These reports are NOT...

...a report card on estuary health



# These reports are NOT...

...comprehensive coverage of all IEP surveys



# Who is it for?

# Who is it for?

- IEP stakeholders, partners, collaborators, and the public



# Who is it for?

- IEP stakeholders, partners, collaborators, and the public



- IEP directors and program managers

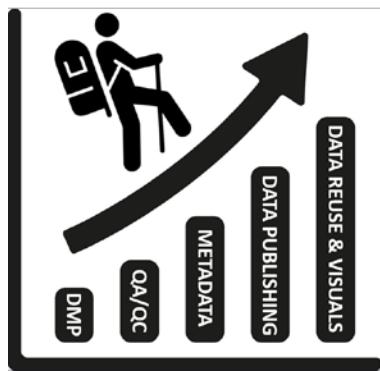


US Army Corps  
of Engineers®

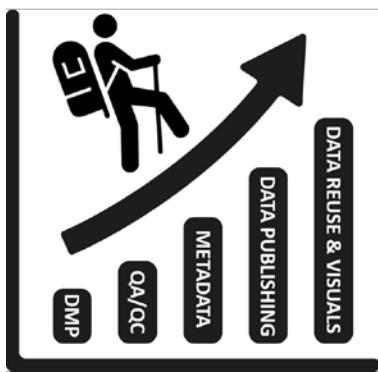


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FISHERIES

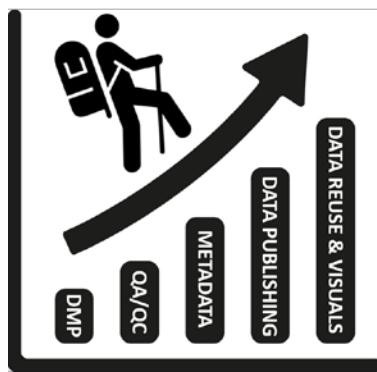
# Open Science



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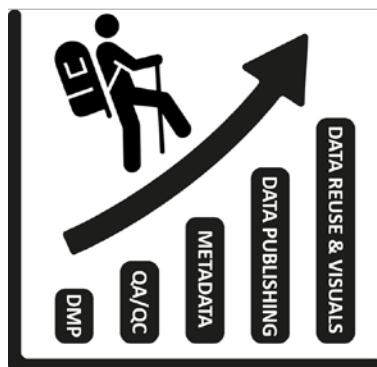
# Open Science



Source data pulled from  
websites using code



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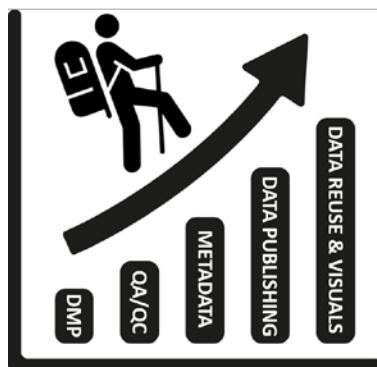
Source data pulled from  
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Code available online

**GitHub**

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Reports & metadata posted on IEP webpage

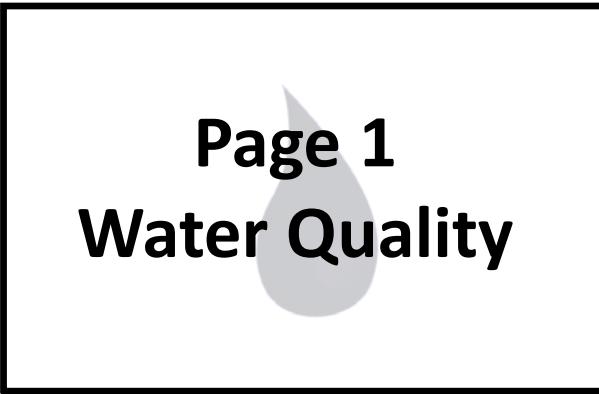


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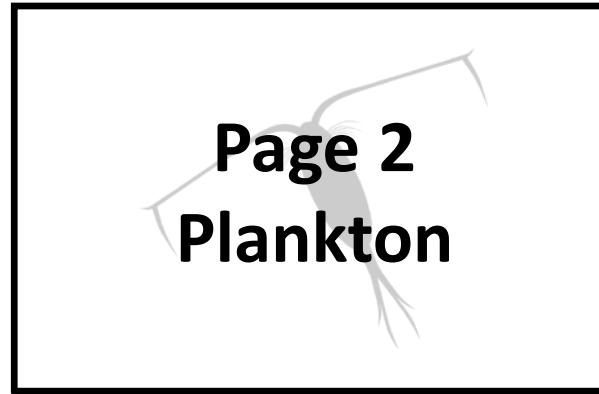
**Page 1**  
**Water Quality**



# Report Format



**Page 1  
Water Quality**



**Page 2  
Plankton**



# Report Format

**Page 1**  
**Water Quality**

**Page 2**  
**Plankton**

**Page 3**  
**Fishes**

# Report Format

**Page 1**  
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**Plankton**

**Page 3**  
**Fishes**

**Page 4**  
**Recent  
Trends**



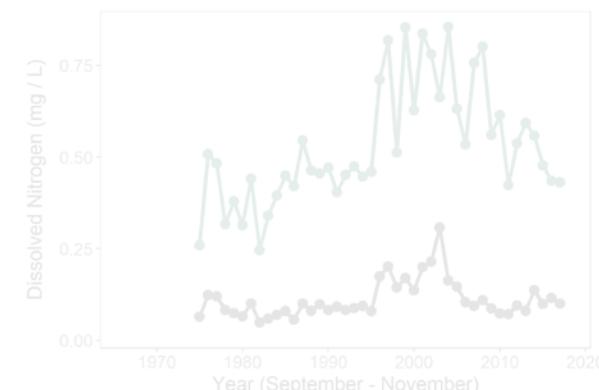
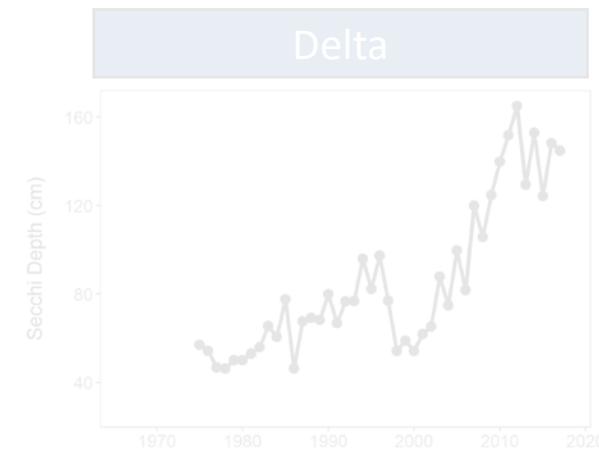
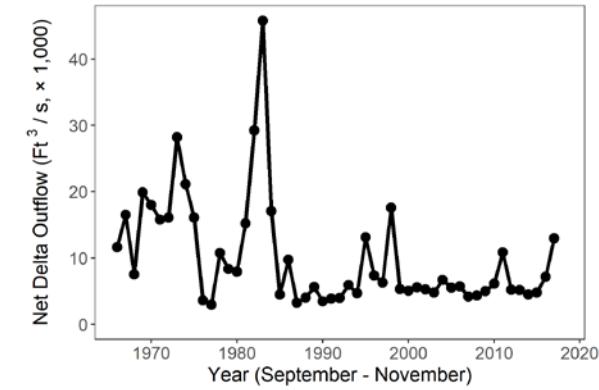
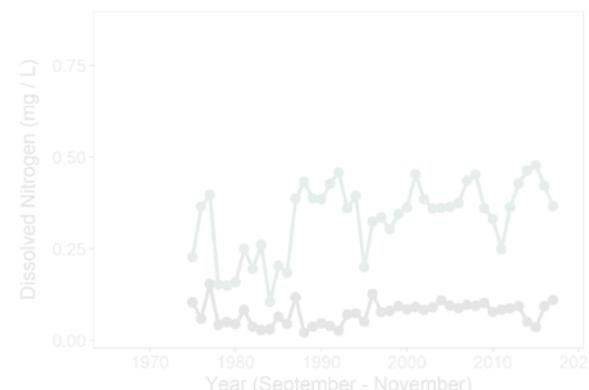
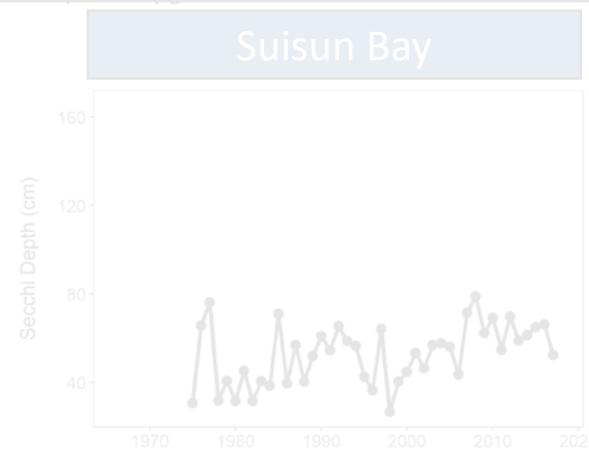
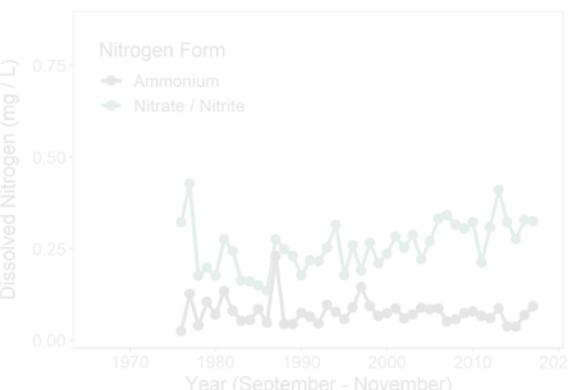
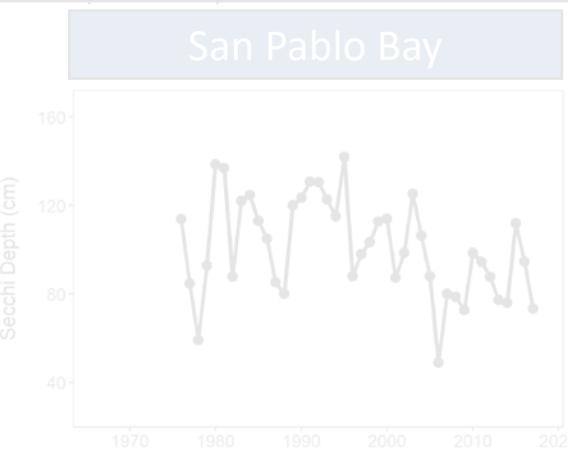
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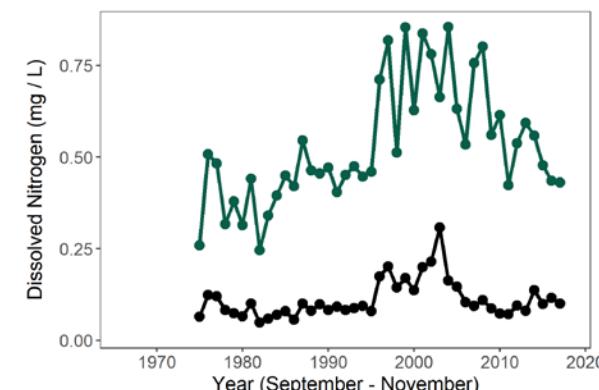
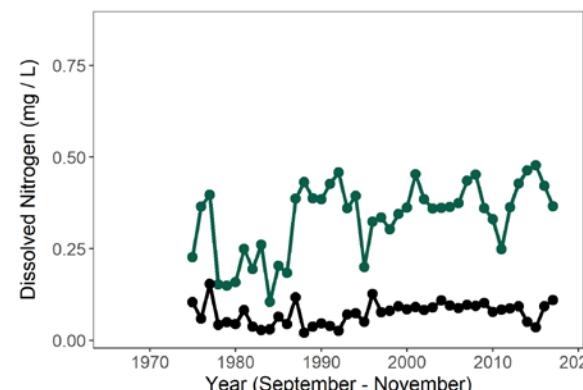
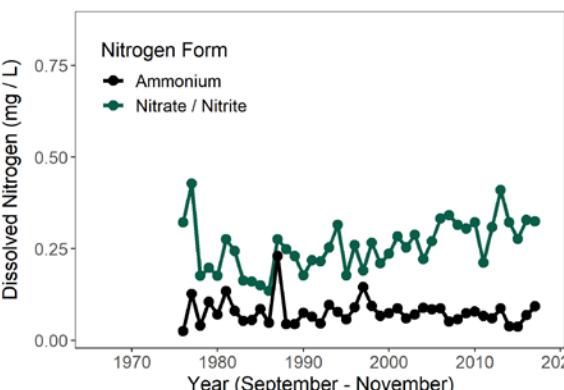
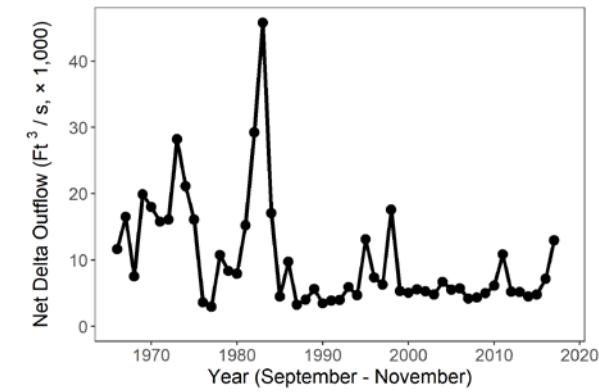
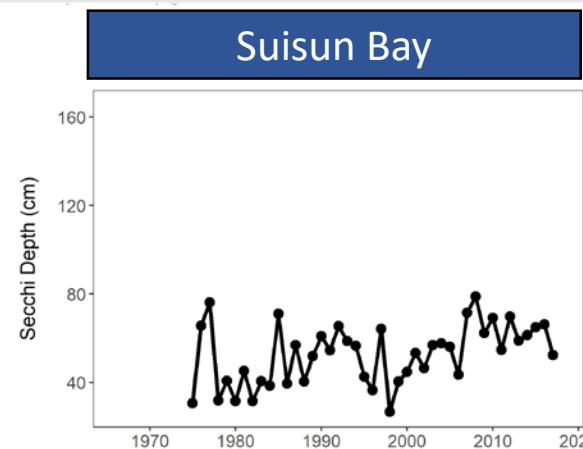
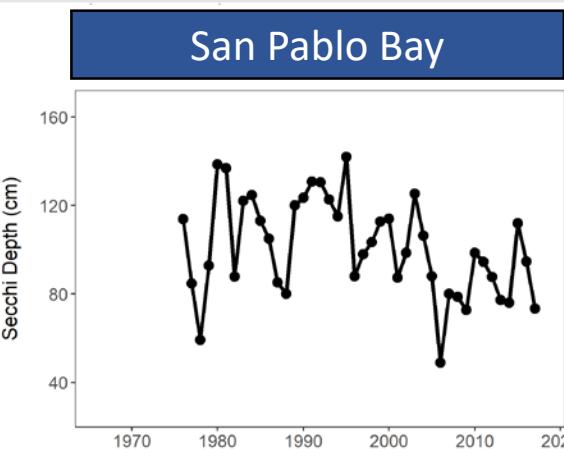
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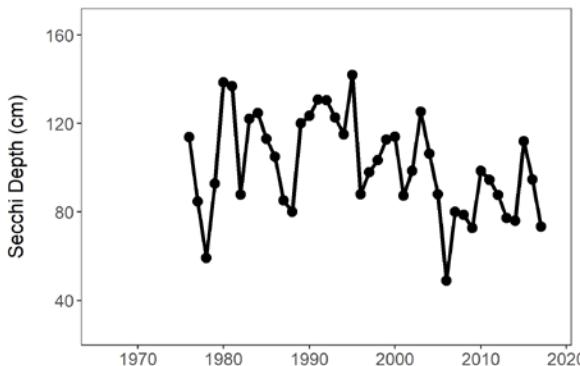
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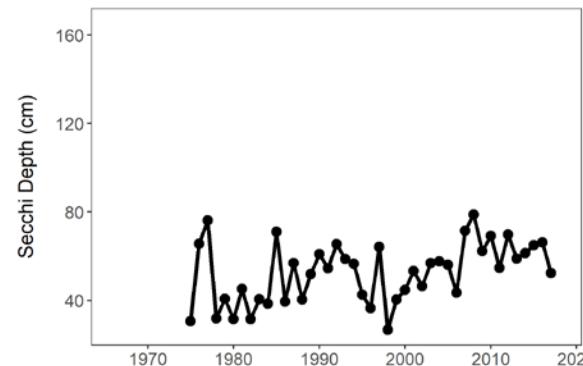


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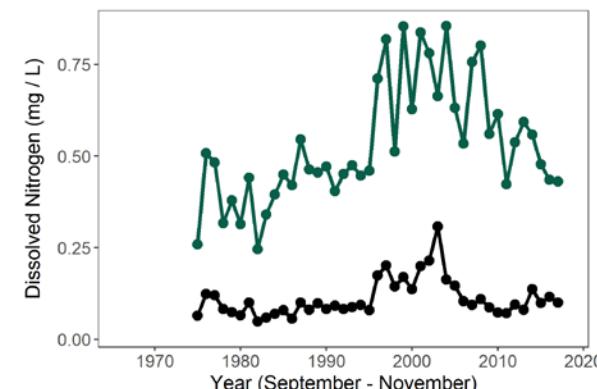
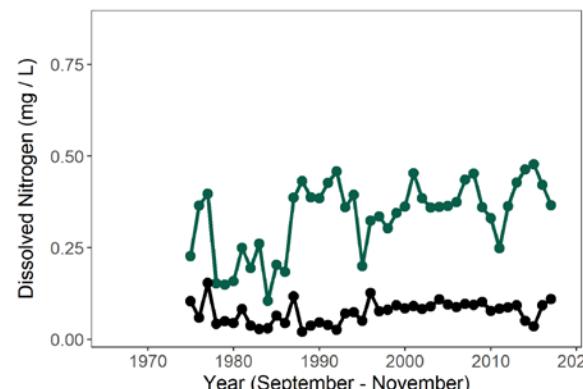
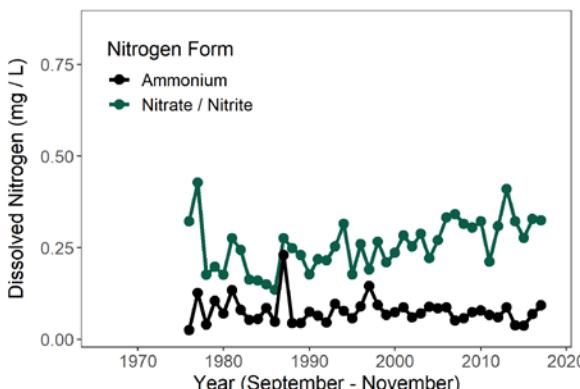
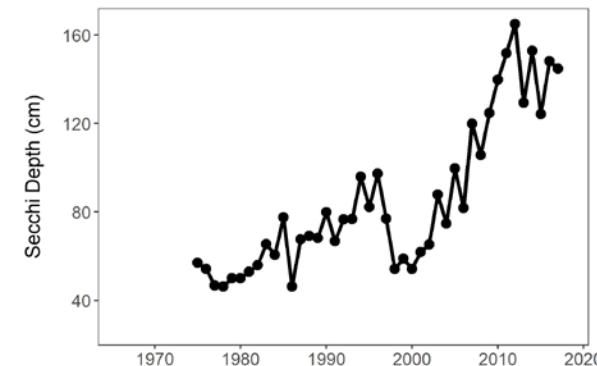
**San Pablo Bay**



**Suisun Bay**



**Delta**





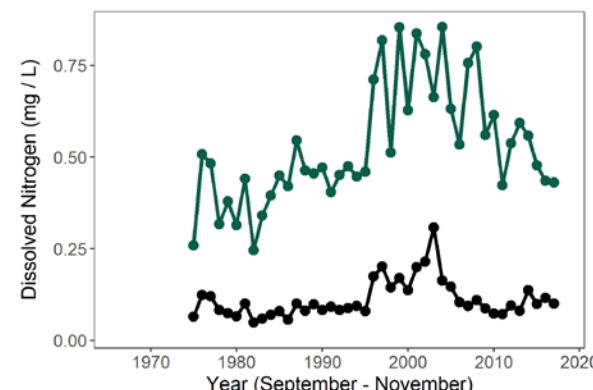
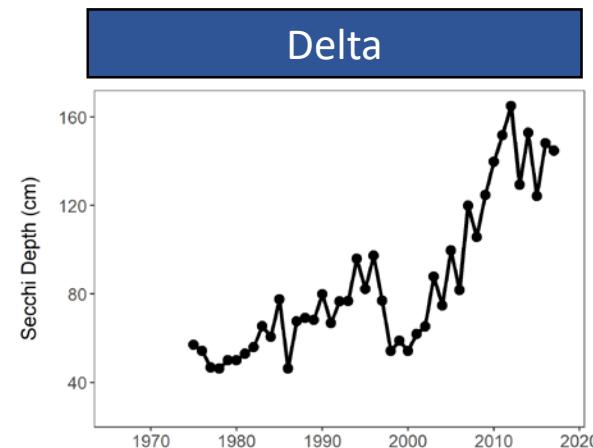
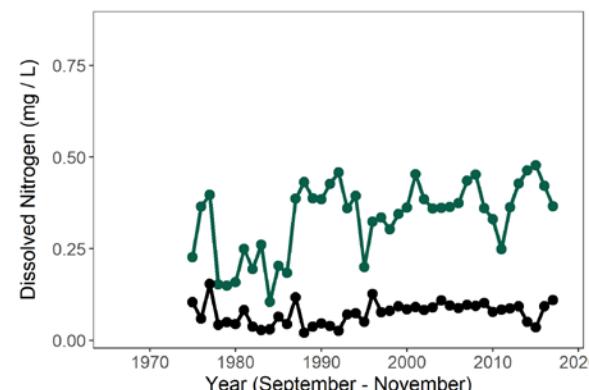
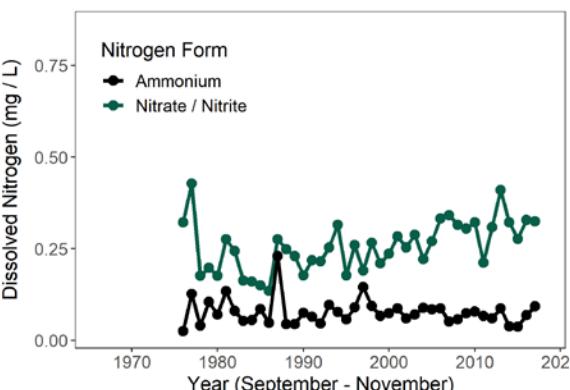
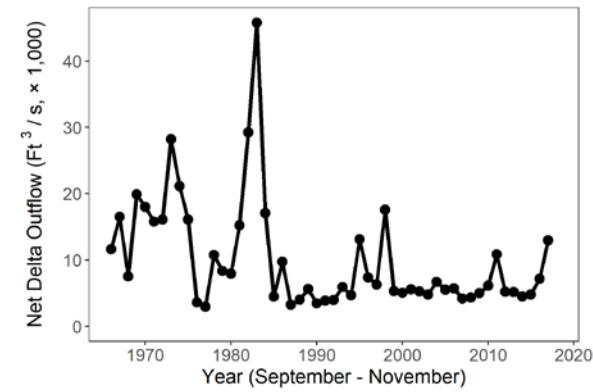
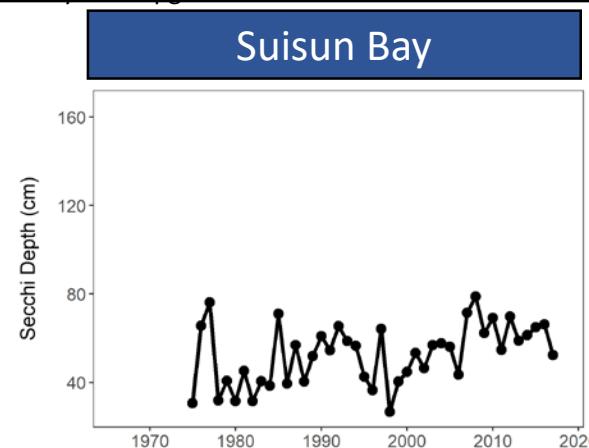
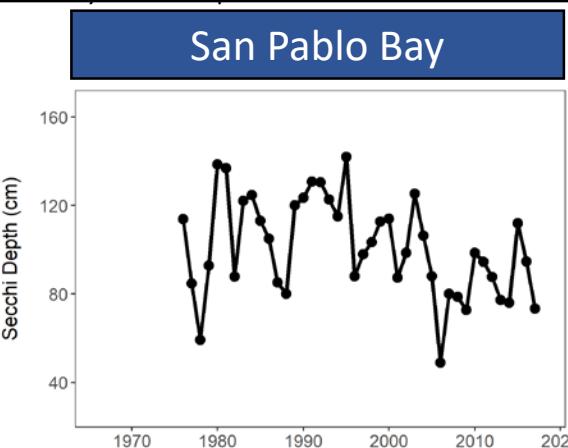
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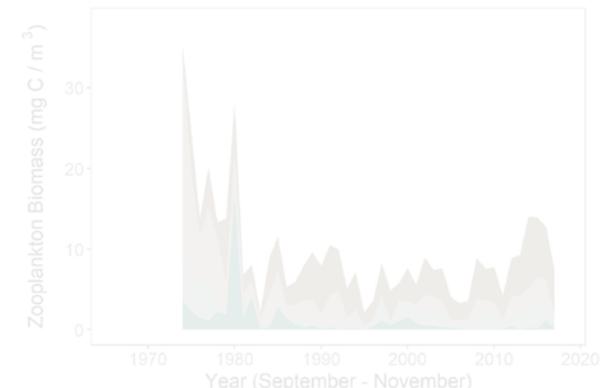
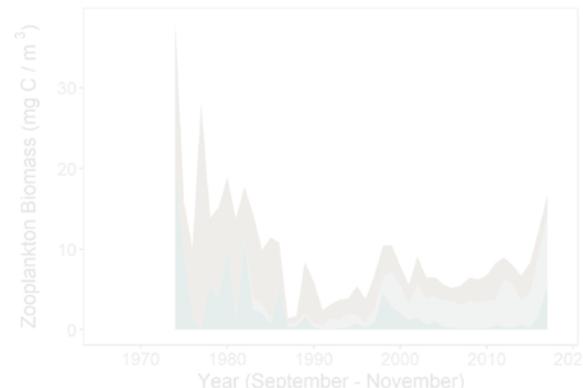
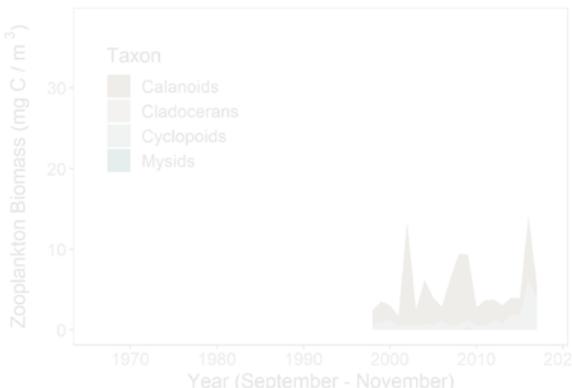
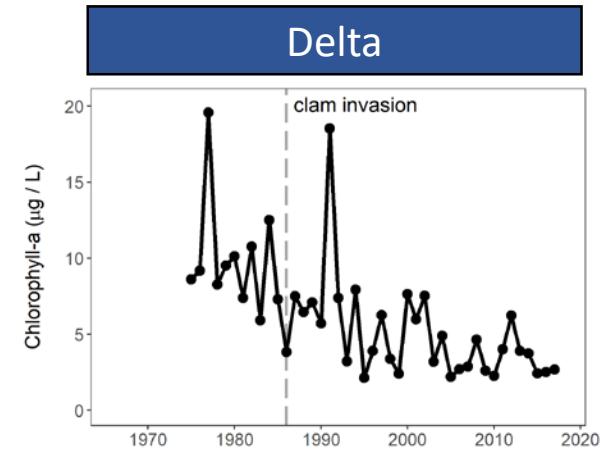
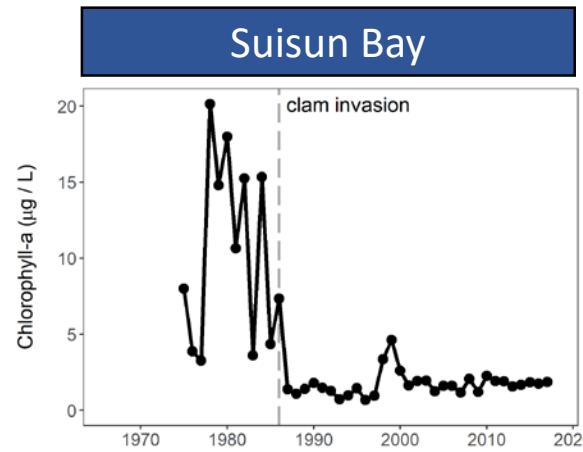
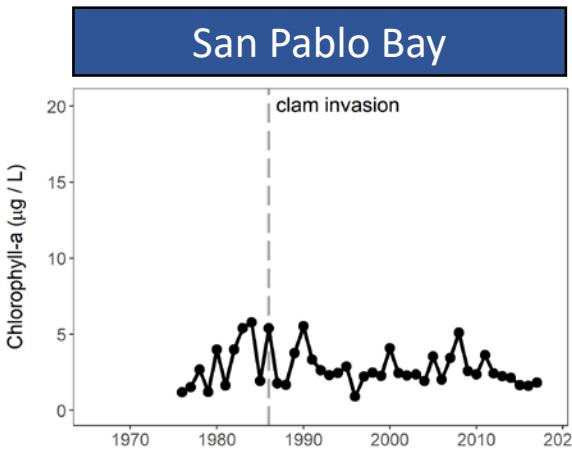
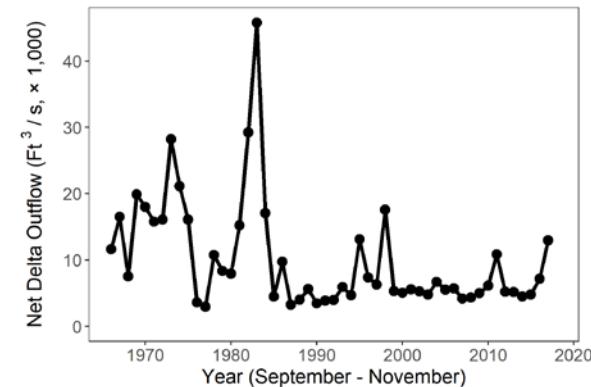


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# Interagency Ecological Program Status & Trends 2017 Fall Season Report Plankton: 1975 - 2017



- Plankton densities and composition have shown large shifts since surveys began in 1975.
- The most dramatic shift occurred after the invasion of the overbite clam in 1986. Filter feeding by these clams caused a substantial decline in chlorophyll-a, a proxy for phytoplankton productivity.
- Zooplankton represent an important food source for many fishes, and like phytoplankton, declined after arrival of the overbite clam. Mysids, calanoid copepods, and cladocerans are large-bodied zooplankton and generally offer a more nutritious food source compared to the relatively smaller cyclopoid copepods.



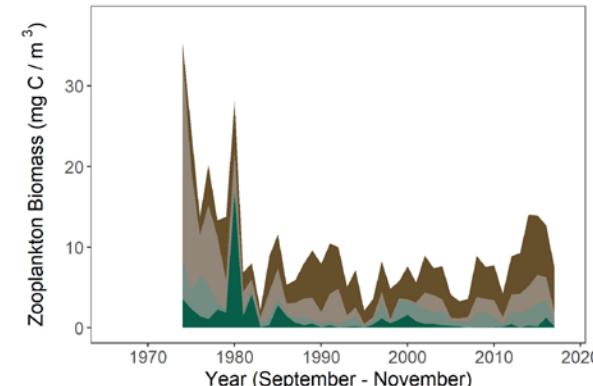
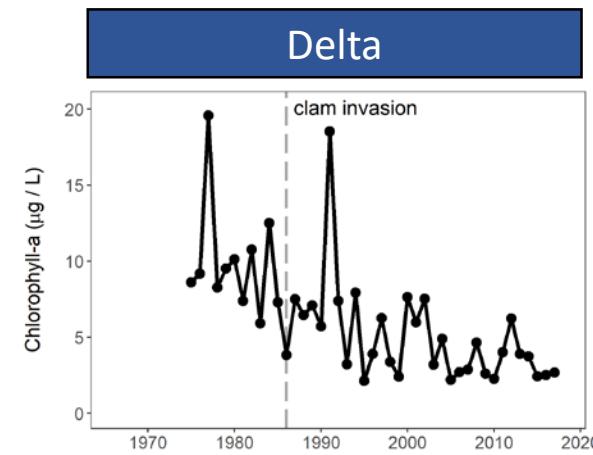
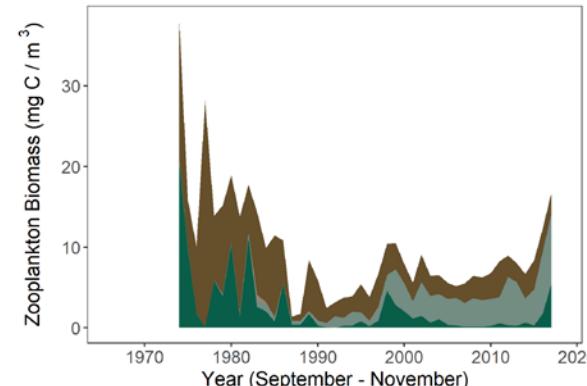
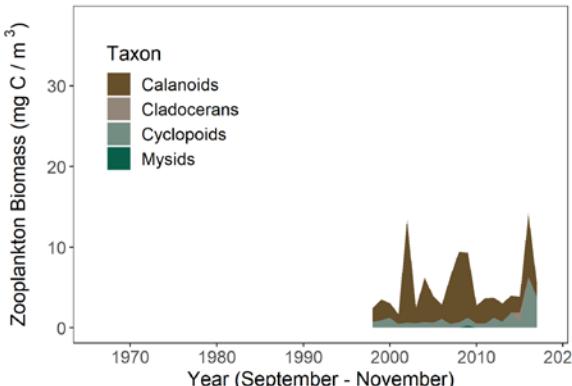
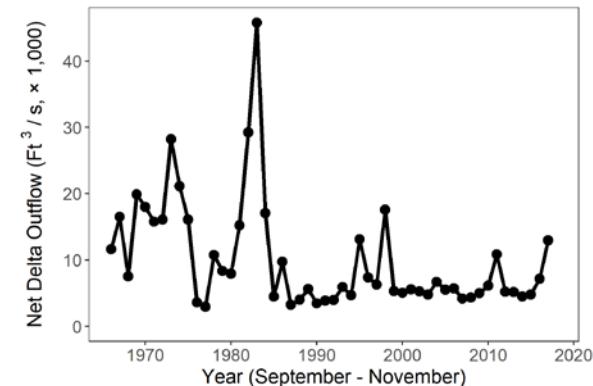
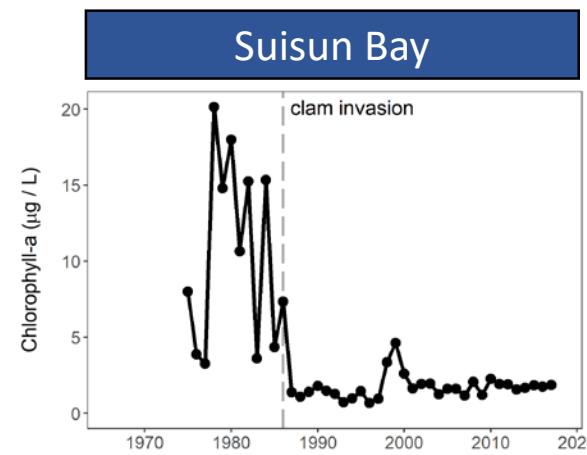
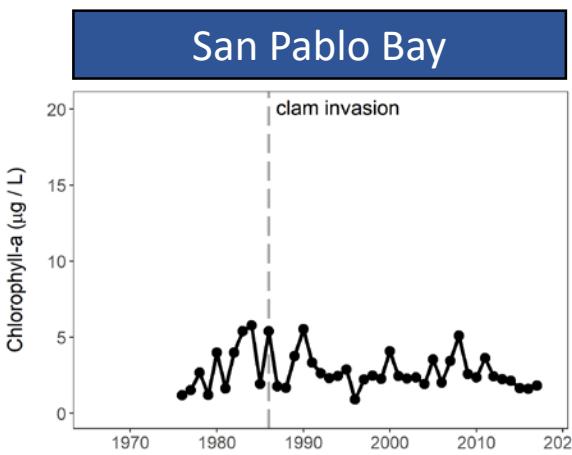
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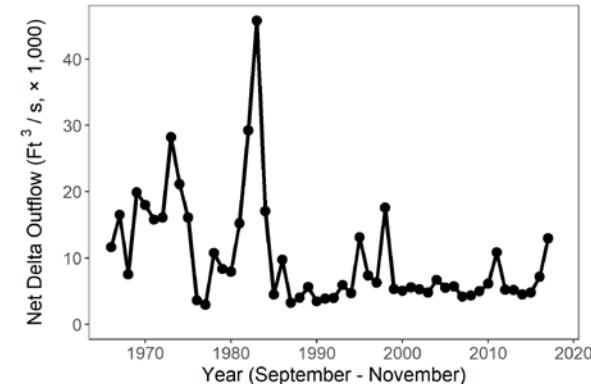
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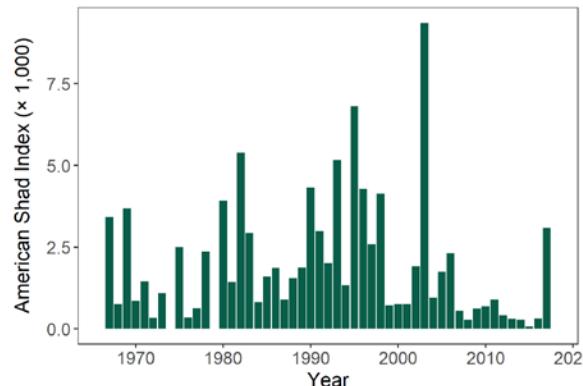
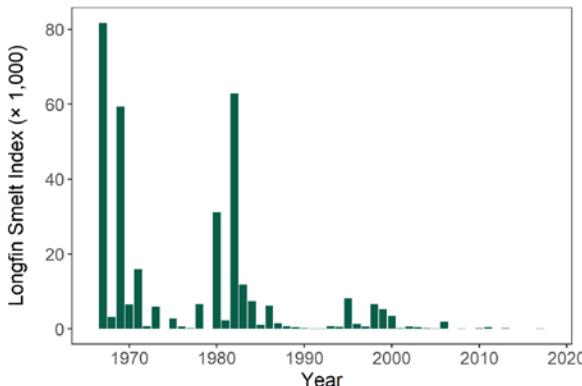
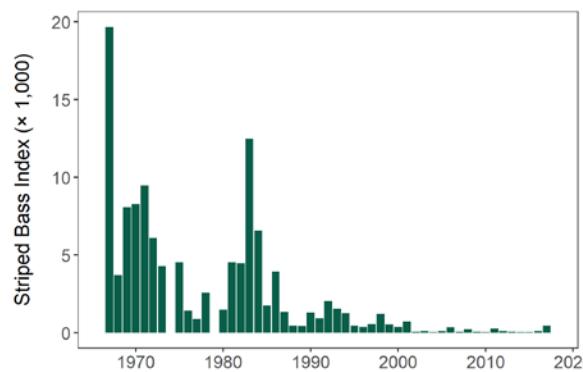
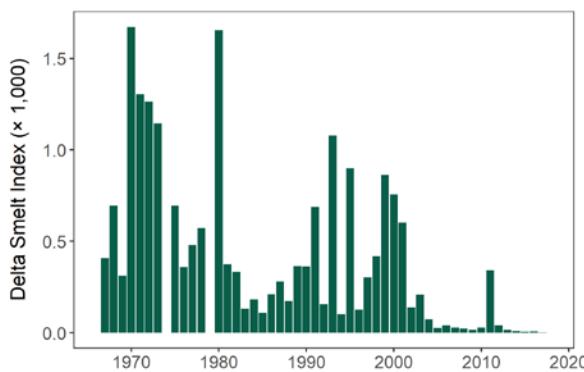
Fishes: 1967 - 2017



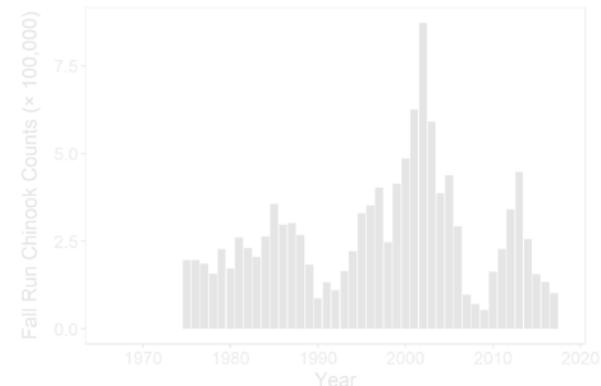
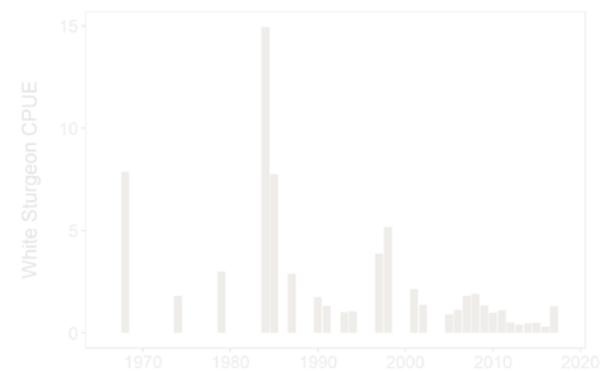
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- White Sturgeon is a species of concern and a popular target of recreational fishing. Catch per unit effort is based on trammel net surveys.
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### Fall Midwater Trawl



### Other Surveys



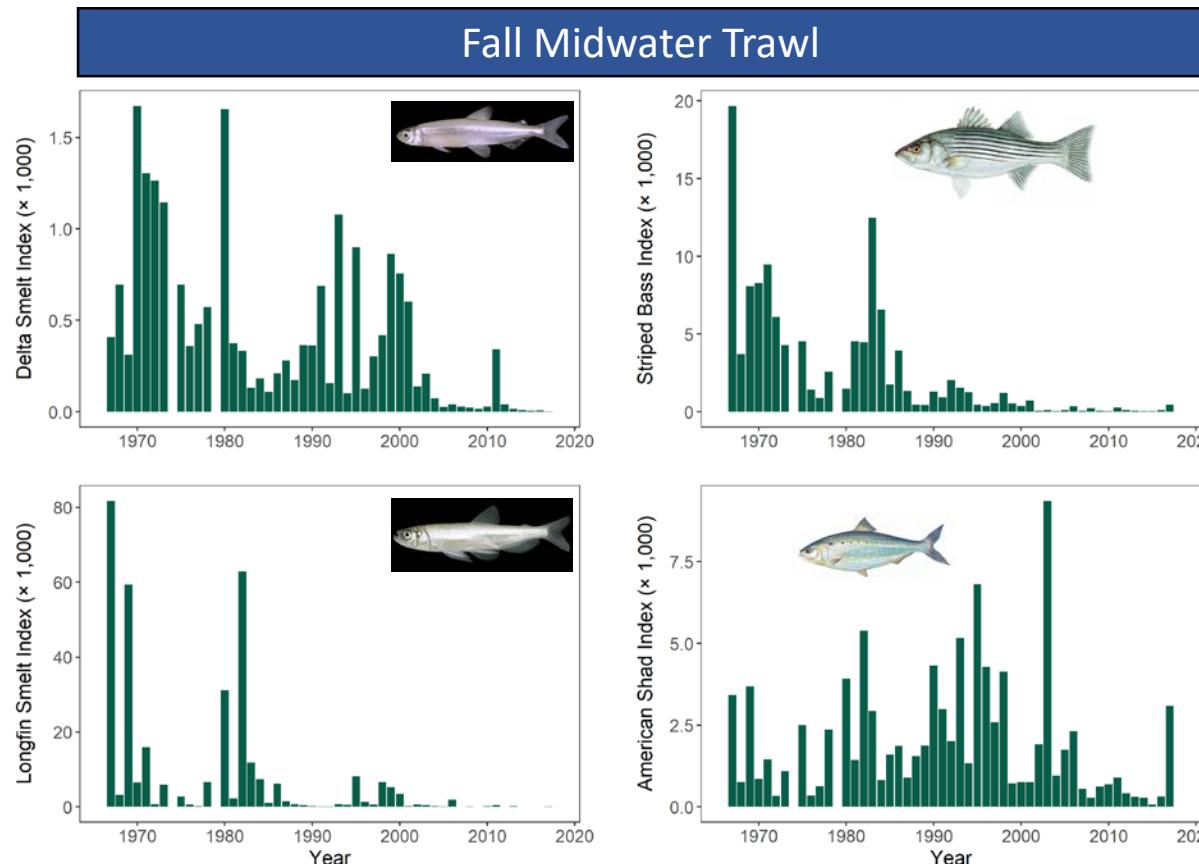
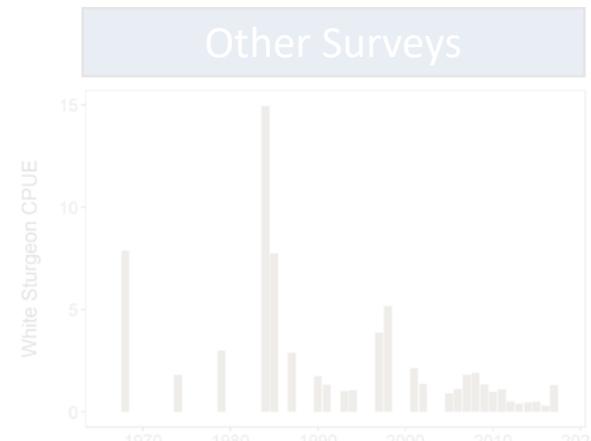
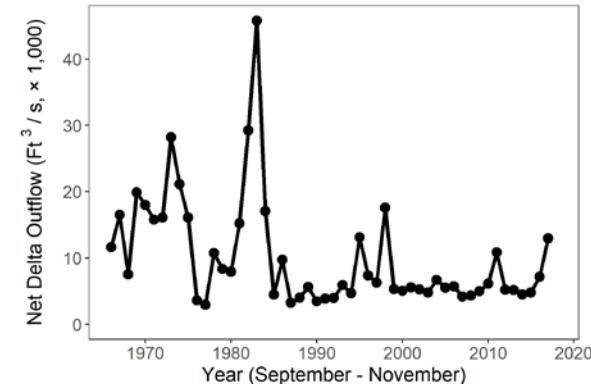
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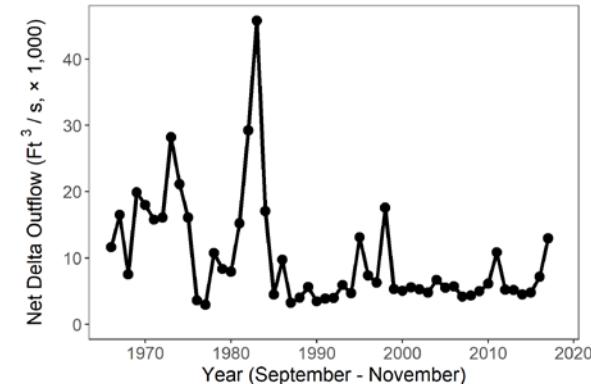
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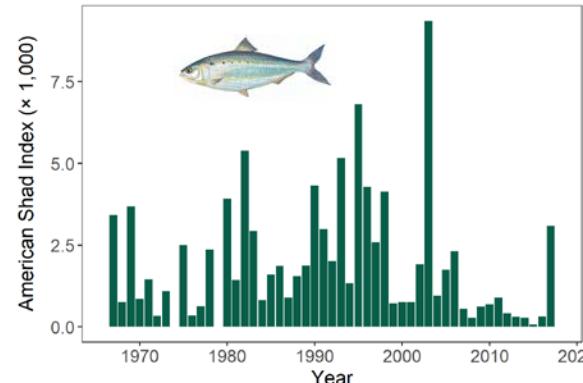
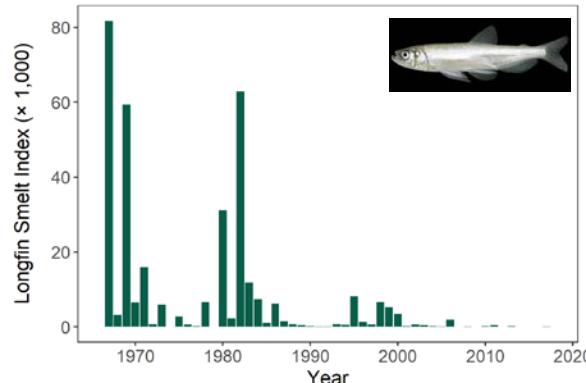
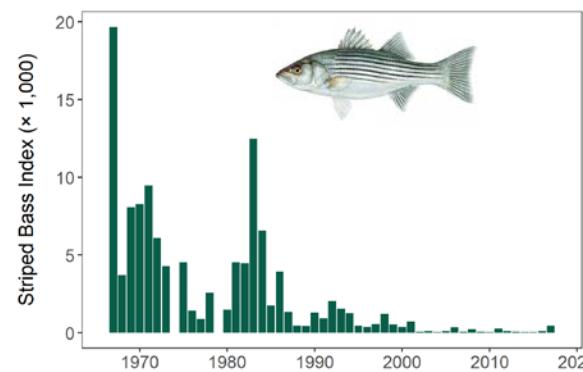
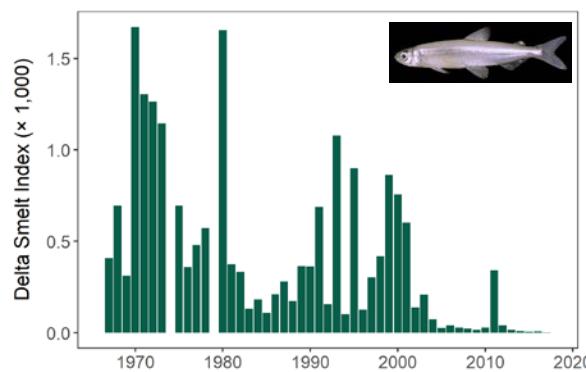
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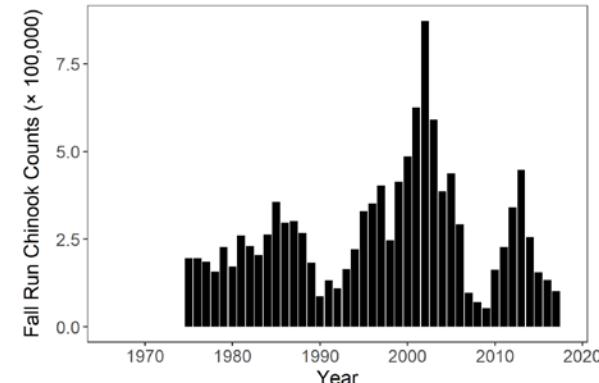
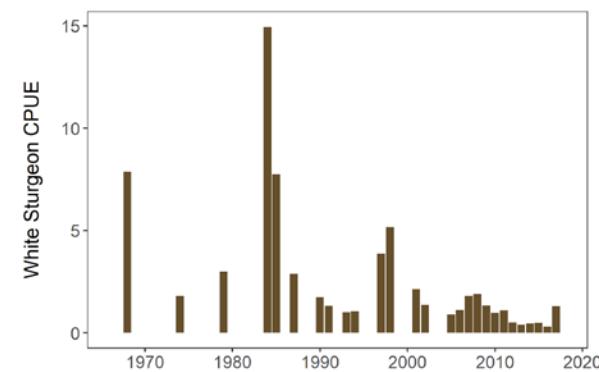
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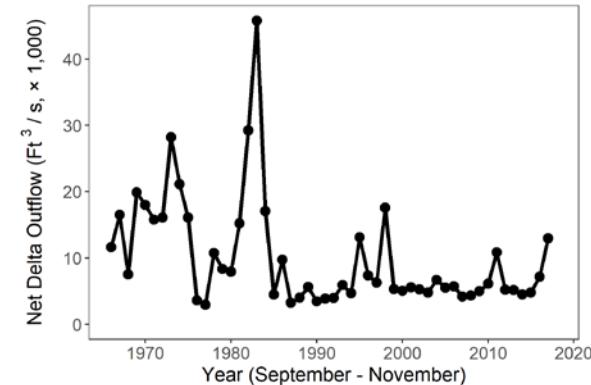
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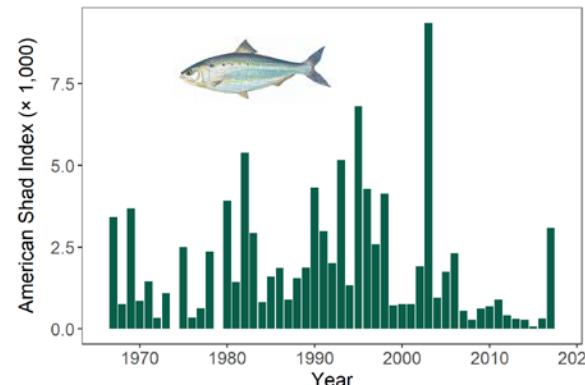
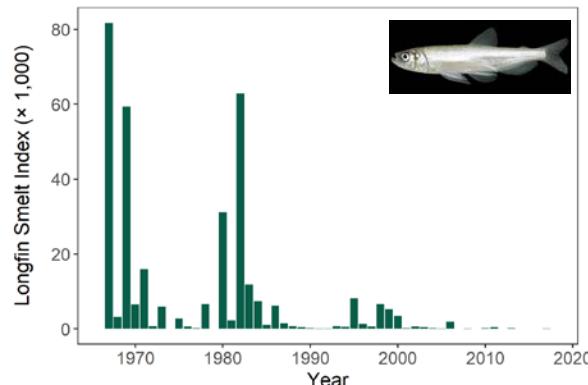
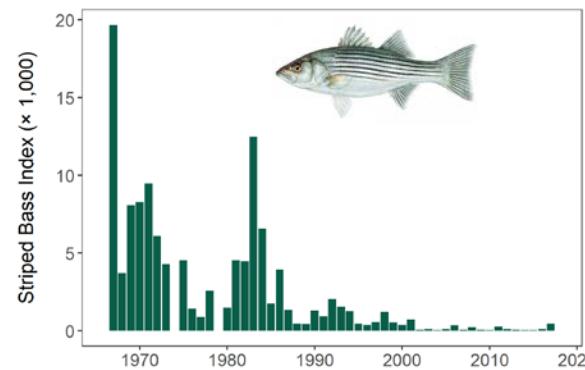
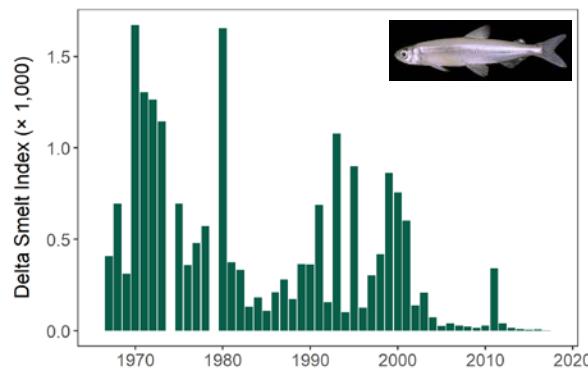
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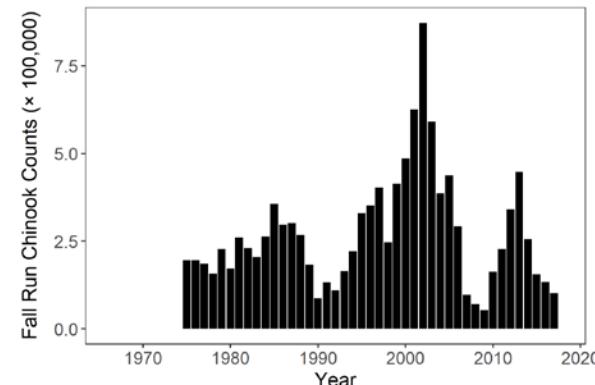
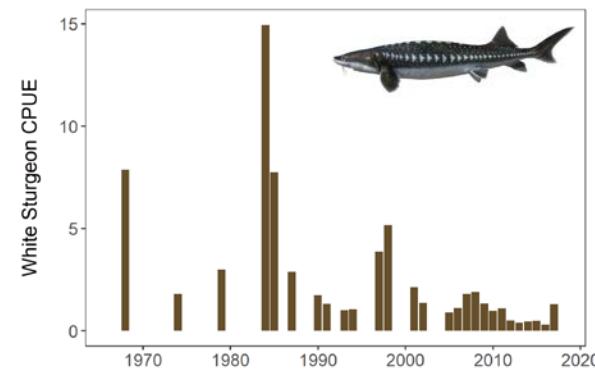
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- White Sturgeon is a species of concern and a popular target of recreational fishing. Catch per unit effort is based on trammel net surveys.
- Fall Run Chinook Salmon, an important species for both the commercial and recreational fishery, is also a species of concern. Population dynamics are driven by hatchery production and a suite of environmental variables. Totals counts of both in-river and hatchery returns are shown here.



### Fall Midwater Trawl



### Other Surveys



**FOR MORE INFORMATION:** Recent articles in the IEP Newsletter summarize trends and abundance index calculations for [pelagic fishes](#). The IEP website provides the [metadata](#) for production of this report.



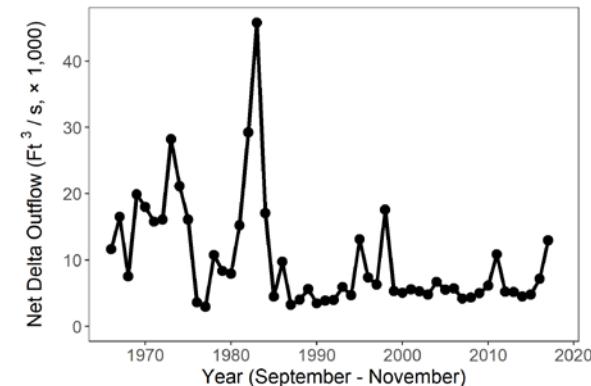
# Interagency Ecological Program Status & Trends

## 2017 Fall Season Report

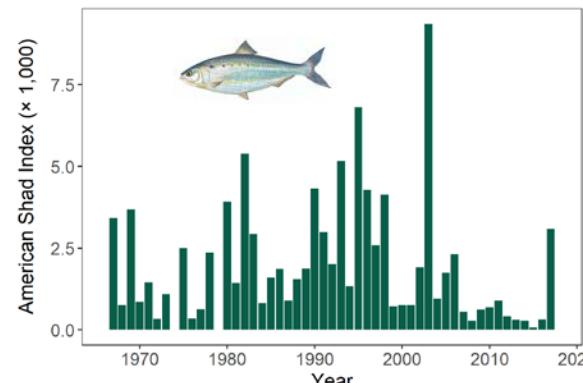
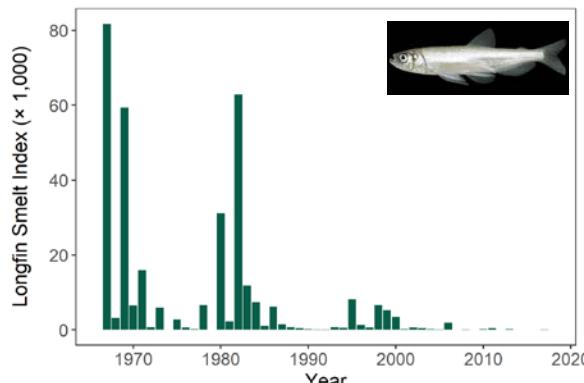
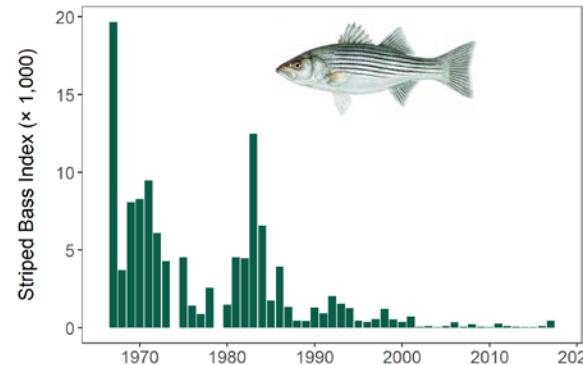
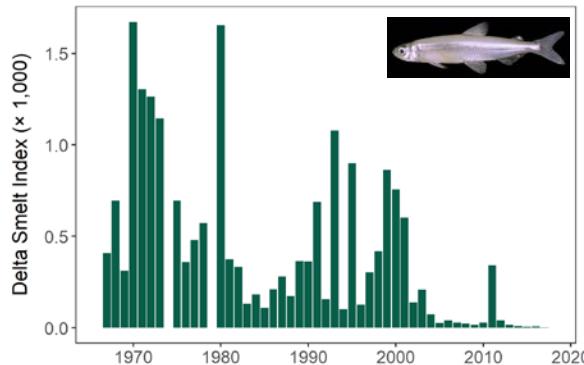
### Fishes: 1967 - 2017



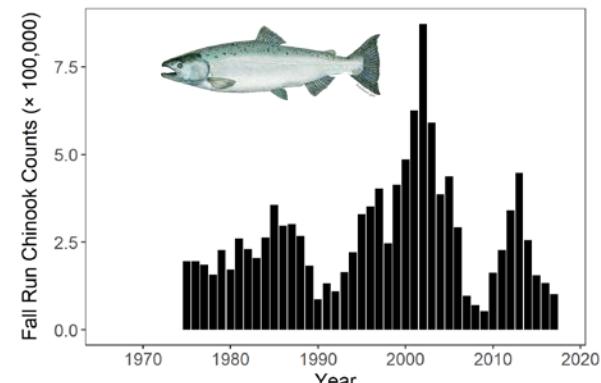
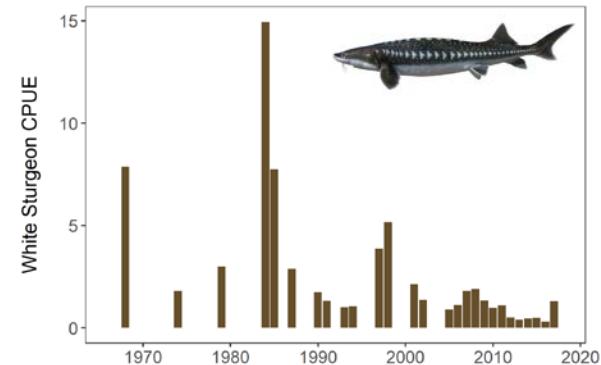
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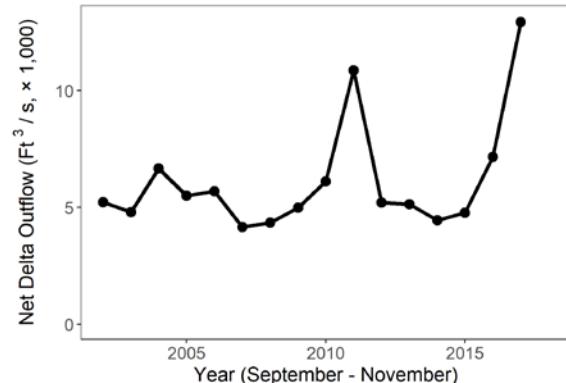
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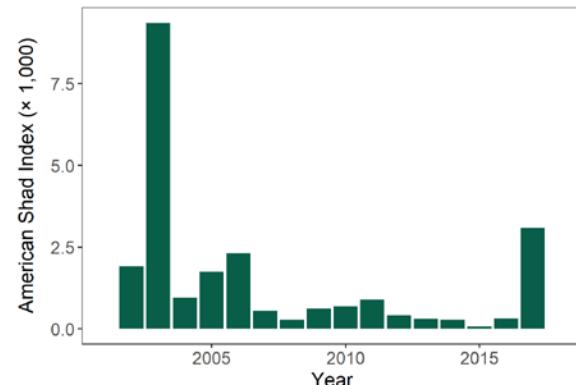
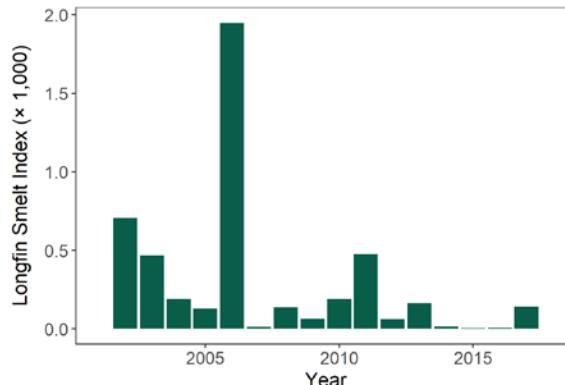
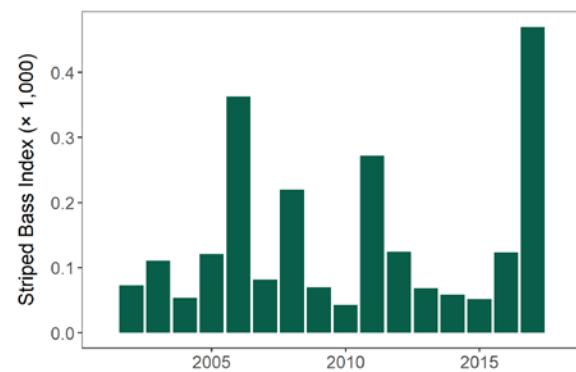
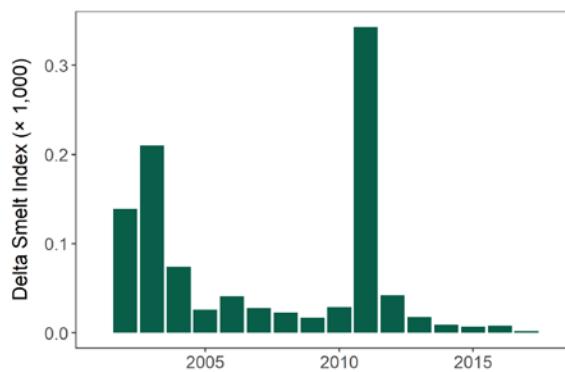
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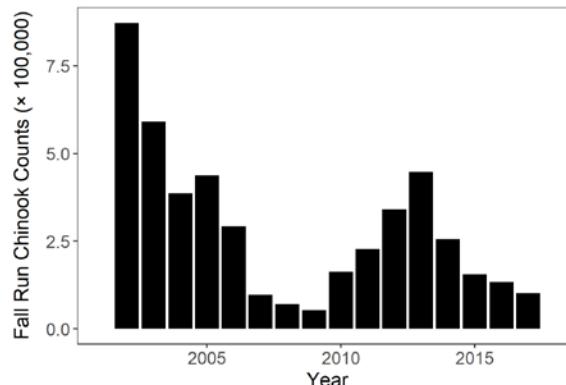
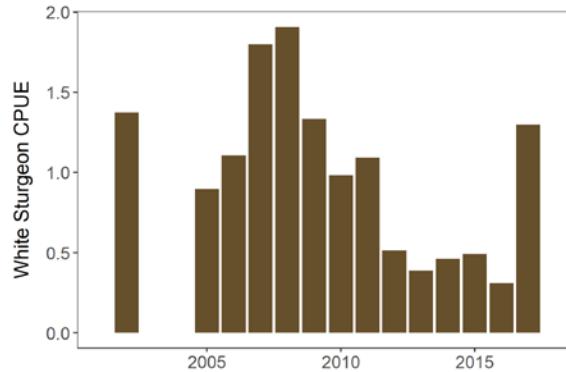
- Many pelagic fishes declined sharply around 2001 in what is known as the Pelagic Organism Decline. Some species have continued to decline over the last 15 years.
- For Delta Smelt, 2017 marked the lowest recorded index in over 50 years (Index = 2).
- Some fish species increased in 2017 relative to recent years. The Striped Bass 2017 index was the highest since 2001. The 2017 Longfin Smelt index was the highest since 2013. American Shad saw its highest index since 2003, and White Sturgeon CPUE was the highest since 2009.
- In 2017, Fall Run Chinook Salmon declined for the fourth year in a row (counts = 101,222).



#### Fall Midwater Trawl



#### Other Surveys

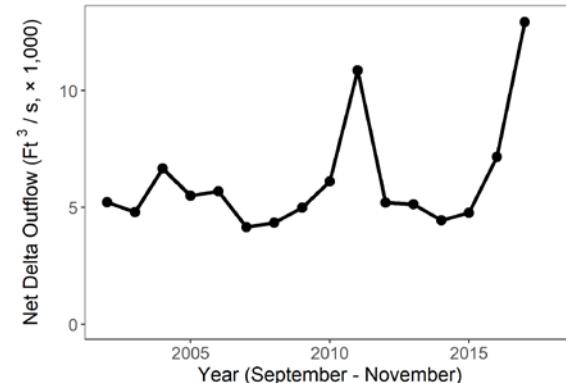


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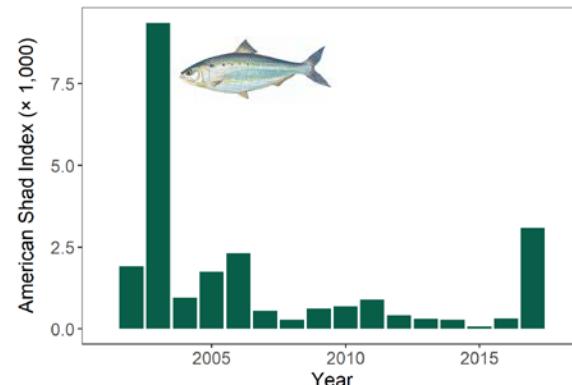
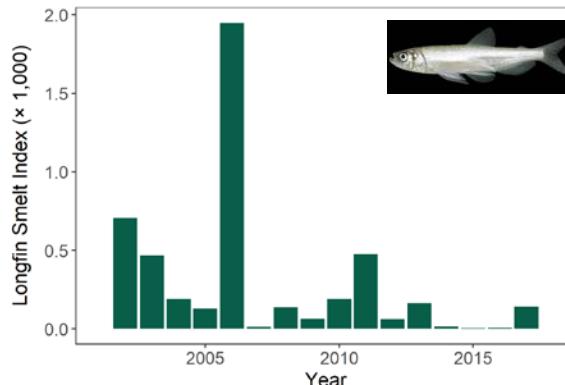
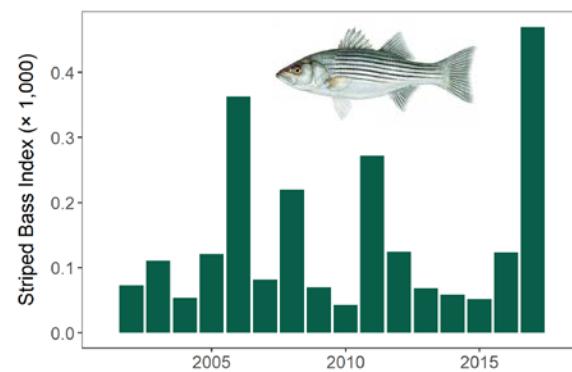
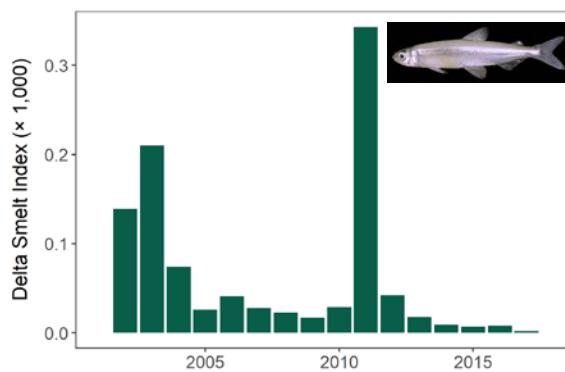
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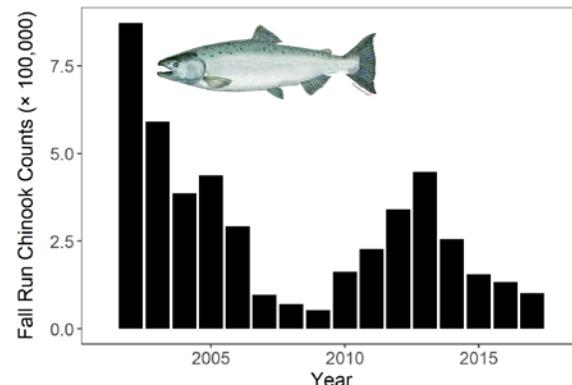
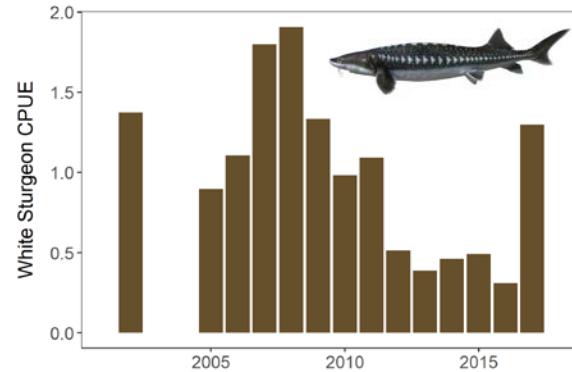
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### Fall Midwater Trawl



### Other Surveys



# Report location online

<https://water.ca.gov/Programs/Environmental-Services/Interagency-Ecological-Program#>

## Interagency Ecological Program (IEP)



Our research vessel, Sentinel, sails on the San Joaquin River near the Antioch bridge. DWR/2016

The Interagency Ecological Program (IEP) is a consortium of State and federal agencies that has been conducting cooperative ecological investigations since the 1970s. They provide and integrate relevant and timely ecological information for management of the Bay-Delta ecosystem and the water that flows through it. IEP believes the highest quality science contributes to achieving a reliable and sustainable water supply and a healthy Bay-Delta ecosystem.

IEP relies upon multidisciplinary teams of agency, academic, nongovernmental organizations, and other scientists to conduct collaborative and scientifically sound monitoring, research, modeling, and synthesis efforts for various aspects of the aquatic ecosystem. IEP also holds an annual workshop, publishes a quarterly newsletter and science highlights, and conducts technical and programmatic reviews of the program and its elements.

For more information about how IEP has evolved and is guided, read:

- [IEP Guiding Principles](#)
- [IEP Strategic Plan](#)

IEP California Coastal Commission

► [Interagency Ecological Program \(IEP\)](#)  
► [IEP Data and Metadata Data](#)

### Events

► [Groundwater Sustainability Agency Forum](#)  
DWR will host a public GSA Forum for GSA members and stakeholders. The Forum will highlight various GSA efforts to facilitate the exchange of ideas, establish professional networks, and foster successful stakeholder engagement.  
Start: Thu 21 Mar 2019, 10:00 AM  
End: Thu 21 Mar 2019, 3:00 PM

► [2019 IEP Annual Workshop](#)  
Lake Natoma Inn, Folsom CA  
Start: Tue 5 Mar 2019, 8:00 AM  
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Archived Newsletters  
IEP Status & Trends Report

### Contact Information

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Interagency Ecological Program  
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Archived Newsletters  
IEP Status & Trends Report

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# Questions?

- Raise your hand or submit via Menti polling

Go to [www.menti.com](http://www.menti.com) and use the code 56 23 0

# Question:

## What is the Most Important Take-Away From Workshop?

1. Circle your job category & write your answer to above question on index card.
2. Randomly pass index cards between tables ... pass as much as possible.  
Everyone should have someone else's index card at end.
3. With a partner, read what is on the cards you're each holding.
  - Come to a consensus to assign points based on how much each statement resonated with you both
    - 7 total up for grabs between the two cards
  - Record your score on the back. **NO half points!**

Examples

Card 1

7 pts

Perfection of statement  
blew us away!

Card 2

0 pts

It was OK, but other  
card really nailed it.

3 pts

Both good, but liked  
other one a little better.

4 pts

Both good, but liked  
this one a little better.

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4. Repeat steps 2-3 with your partner. We will do these two steps 3X total.
5. After third scoring, add up points of whatever index card your holding.

# Thanks for your interest in Open Science & Open Data!

- If you'd like to be notified about future DUWG Open Science efforts, please provide your email address on Menti.com using code: **78 14 01**
- Check out Open Science resources (including this presentation) & upcoming FAQs on Github  
<https://github.com/InteragencyEcologicalProgram/Open-Data-Workshop>