Juvenile Salmonid Outmigration Studies in the San Francisco Estuary

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Outline

US Army Corps of Engineers

- Goal and Objectives
- Background Information
- Methods

Allison Bremner

- Results
- Analysis
- Conclusions

Pete LaCivita

Bay Planning Coalition:

- Methods
- Results

Tom Keegan

- Summary
- Future

Allison Bremner

Goal

Increase our knowledge of juvenile salmonid migratory behavior to refine the scientific underpinnings of the spatial and temporal dredging work windows.

Objectives

Determine:

- **transit rates**
- **residence times**
- **pathways**
- **discrete locations**

…of tagged fish during outmigration.

“Best Available” Science

Protected by the Endangered Species Act:

Late Fall-run Chinook Salmon
(*Oncorhynchus tshawytscha*)

SPECIES OF CONCERN

Steelhead Trout
(*Oncorhynchus mykiss*)

THREATENED

Collaboration:
LTMS Science Group

Collaboration:

Bay Planning Coalition

Ellen Johnk, Executive Director

ECORP Consulting, Inc. was hired to work with the USACE, specifically at:

-Port of Oakland
-Port of San Francisco
-Paradise Cay
-Mare Island

Collaboration: CALFED-funded group

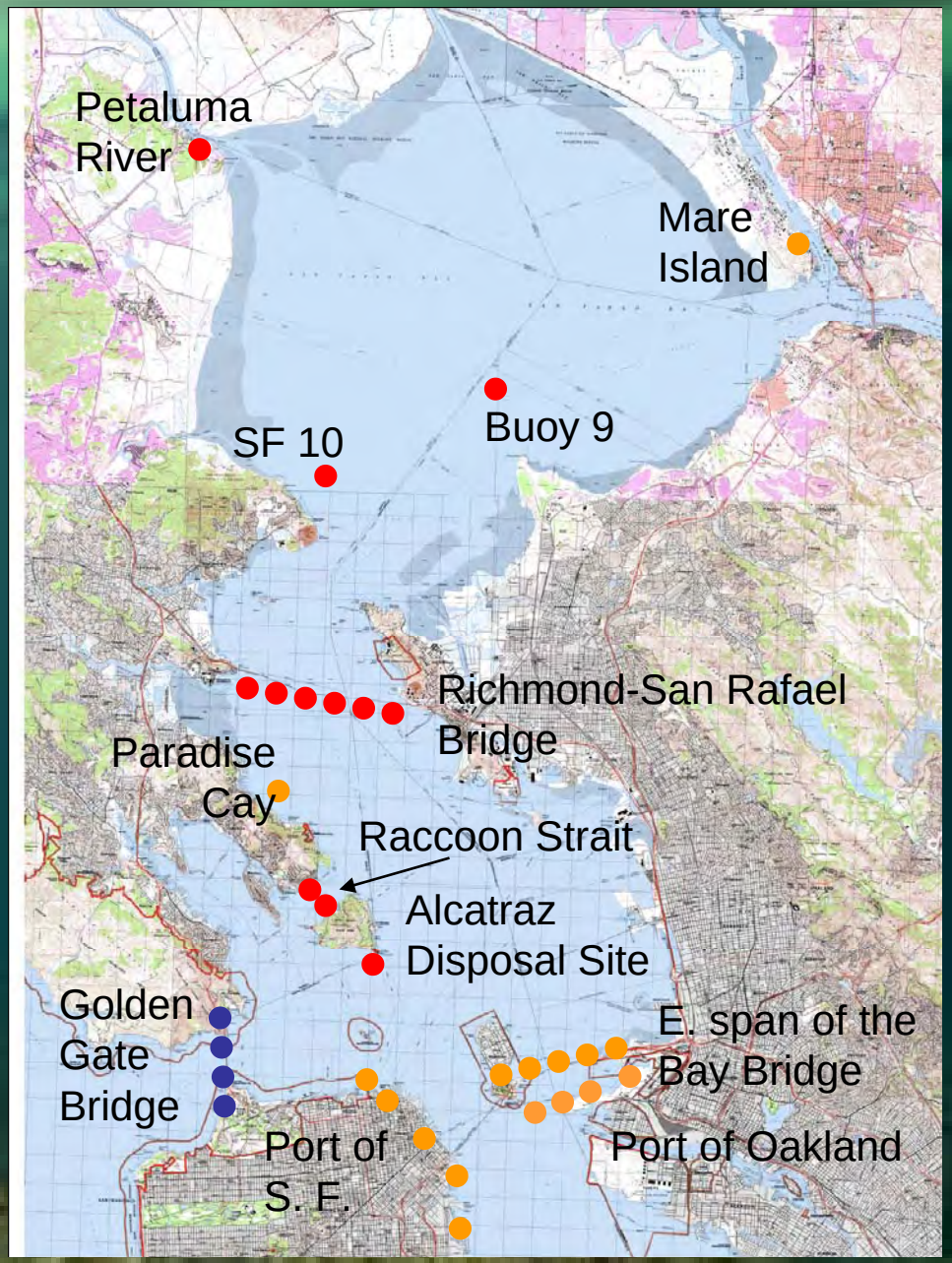
Many contributors = many tagged fish

EBMUD	120 Steelhead
NOAA	200 Chinook
UC DAVIS UNIVERSITY OF CALIFORNIA	200 Steelhead
	49 Chinook, 49 Steelhead
U.S. FISH & WILDLIFE SERVICE	147 Chinook, 65 Steelhead

Total = 396 Chinook, 434 Steelhead

Many contributors, many monitor sites

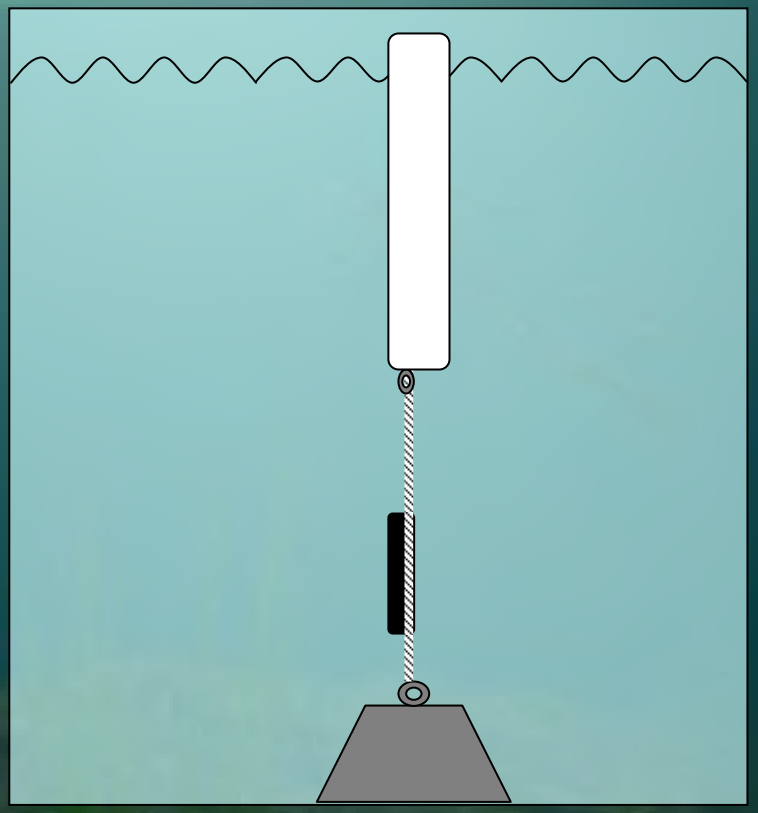
Agency	Site Location	# Monitors
	●	39
BPC, ECorp	●	13
NOAA	●	20



Passive acoustic monitoring

- Manufacturers = Vemco Ltd.
- Coded ultrasonic tags, V7 and V9
- Ultrasonic monitor, VR2, or “electronic listening stations”

Monitor Configuration



Monitor Deployment

Monitor Arrays


COLEMAN NATIONAL
FISH HATCHERY
Sacramento
River
CalFed release at Battle Creek
USACE release at Rio Vista

Fish selection

- Minimum of 140mm total length (TL)
- Healthy

Transport from the truck to the holding tanks at CABA

UCDAVIS
CENTER FOR AQUATIC BIOLOGY & AQUACULTURE

Putah Creek Facility, UC Davis

Outdoor tanks

Laboratory

Surgery Preparation

Surgery procedure- anesethization

Surgery procedure, cont.-

-measure total length
-weigh the fish
-record health conditions (scales, fins and eyes)
-photograph

Surgery procedure, cont.-

10mm incision anterior to the pelvic fins

Ta Dah! The tag is now inserted into the fish.

Suturing the incision

Suturing the incision, cont.

Voila! salmon a la transmitter tag.

Release into the Sacramento river at Rio Vista, CA

THE FIRST GLANCE:

ACOUSTICALLY TAGGED FISH DETECTIONS AT THE RICHMOND SAN RAFAEL BRIDGE

PETER LaCIVITA
FISHERY BIOLOGIST
U.S.ARMY CORPS OF ENGINEERS
SAN FRANCISCO DISTRICT

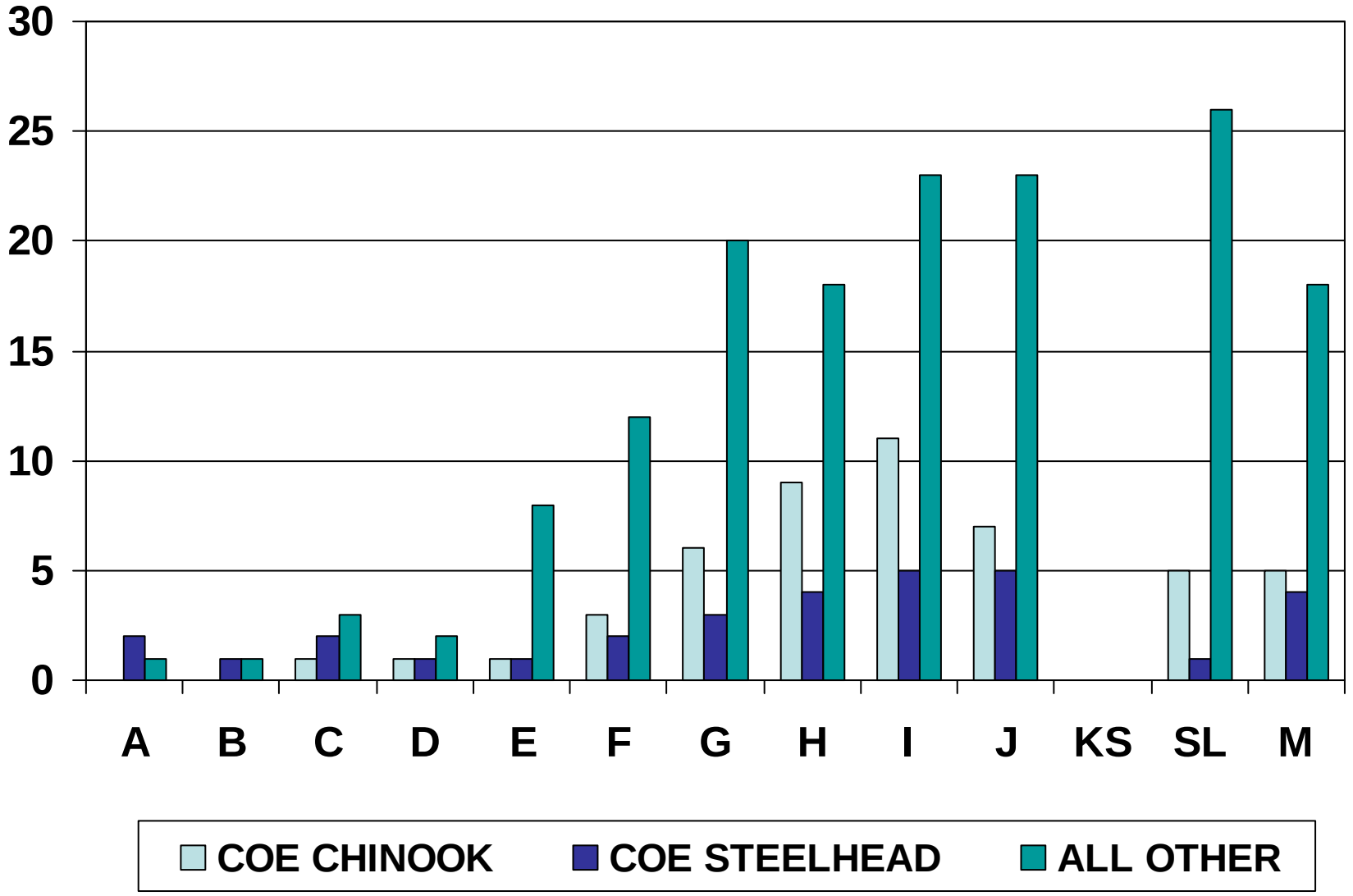
LTMS SCIENCE SYMPOSIUM JUNE 22, 2007 OAKLAND, CALIFORNIA

COE TAGGED FISH DETECTED AT THE RICHMOND SAN RAFAEL BRIDGE

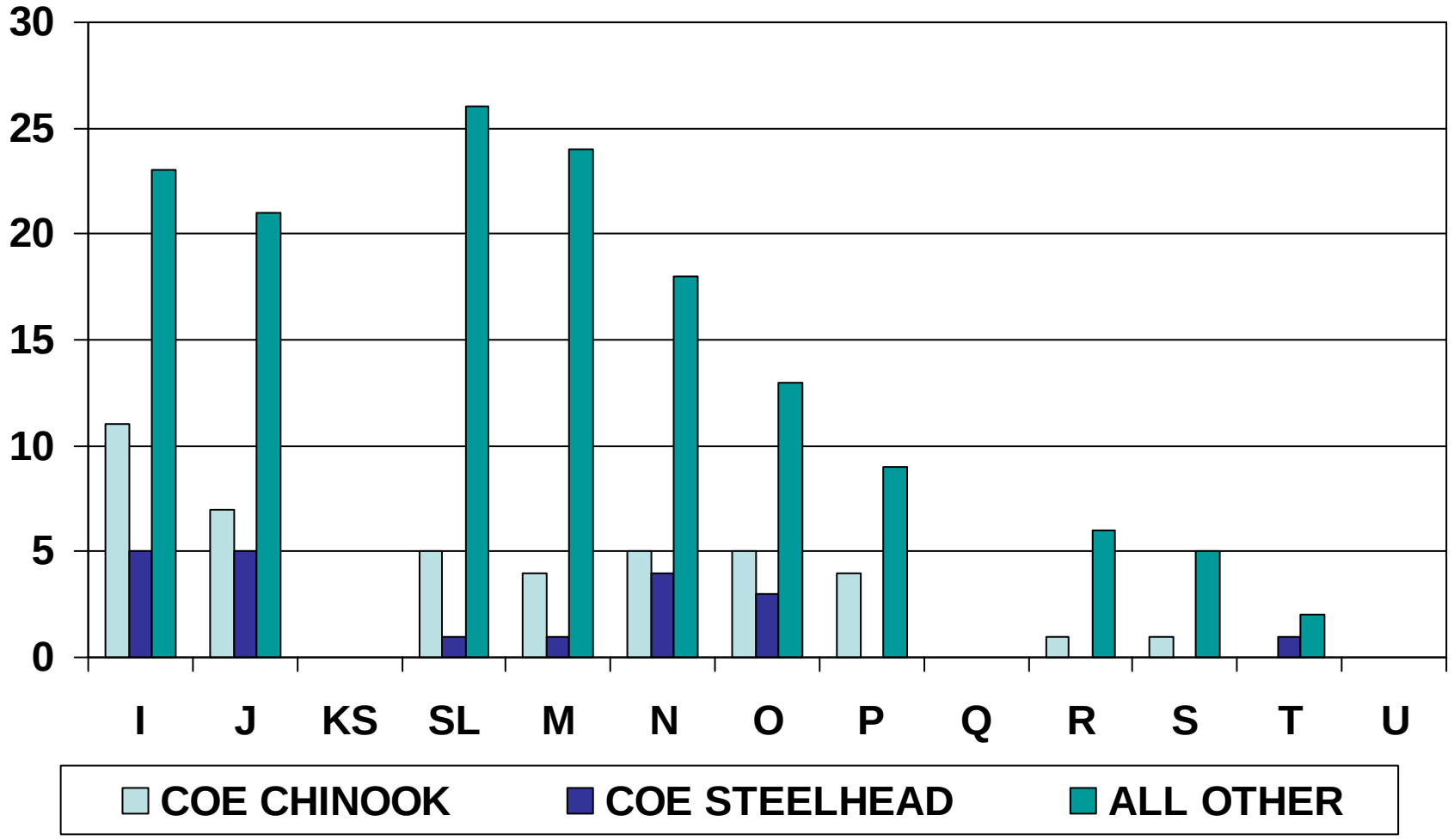
DETECTIONS BY RELEASE DATE AND SPECIES

	CHINOOK			STEELHEAD		
DATE	RELEASE	DETECT	%	RELEASE	DETECT	%
1/22	10	3	30	9	5	55
1/26	10	4	40	10	2	20
1/31	10	4	40	10	3	30
2/5	10	1	10	10	1	10
2/9	9	5	55	10	1	10
TOTALS	49	17	35	49	12	25

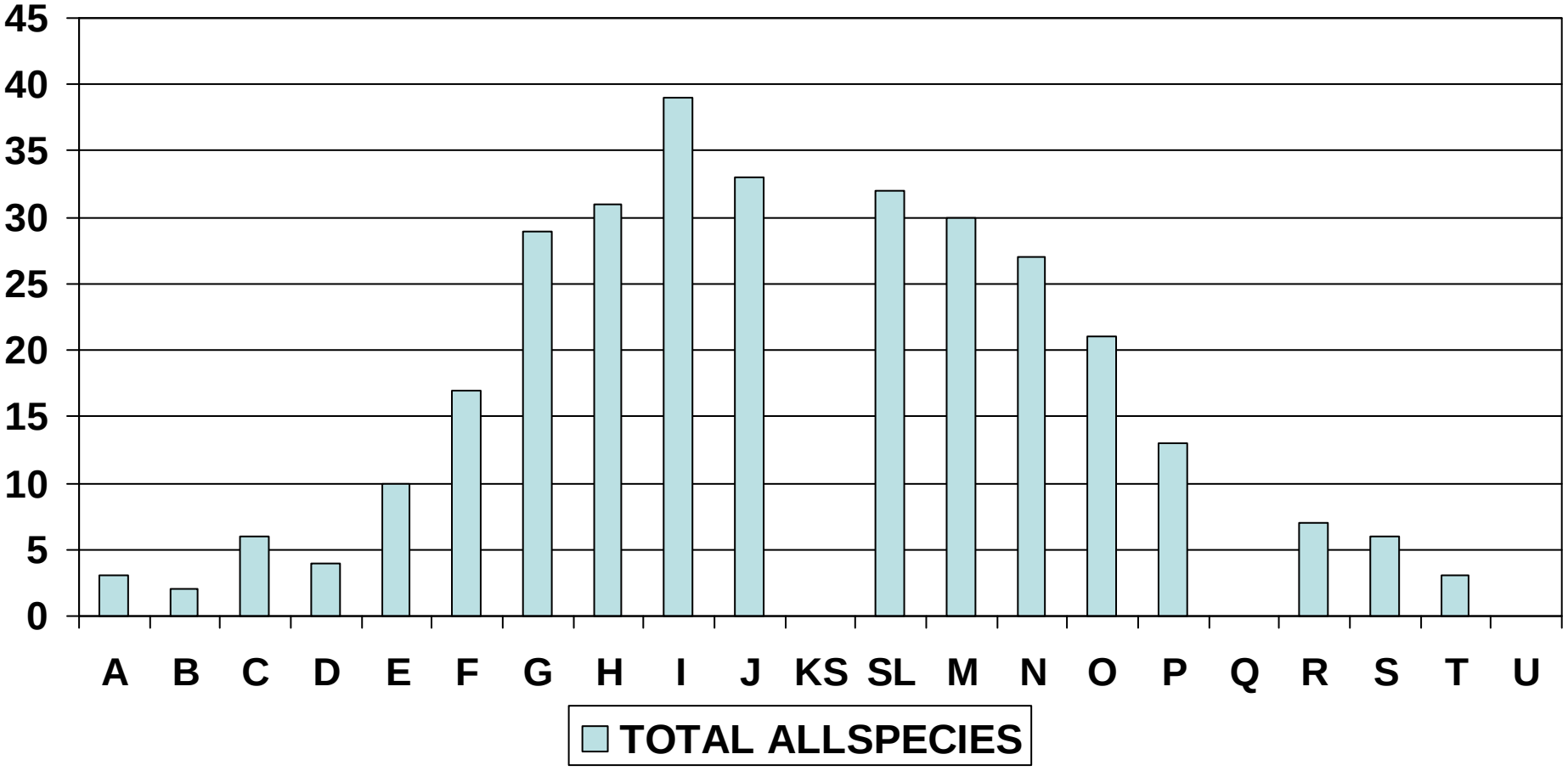
TAGGED FISH DETECTIONS WEST SPAN
RICHMOND SAN RAFAEL BRIDGE
KS – SL = SHIP CHANNEL



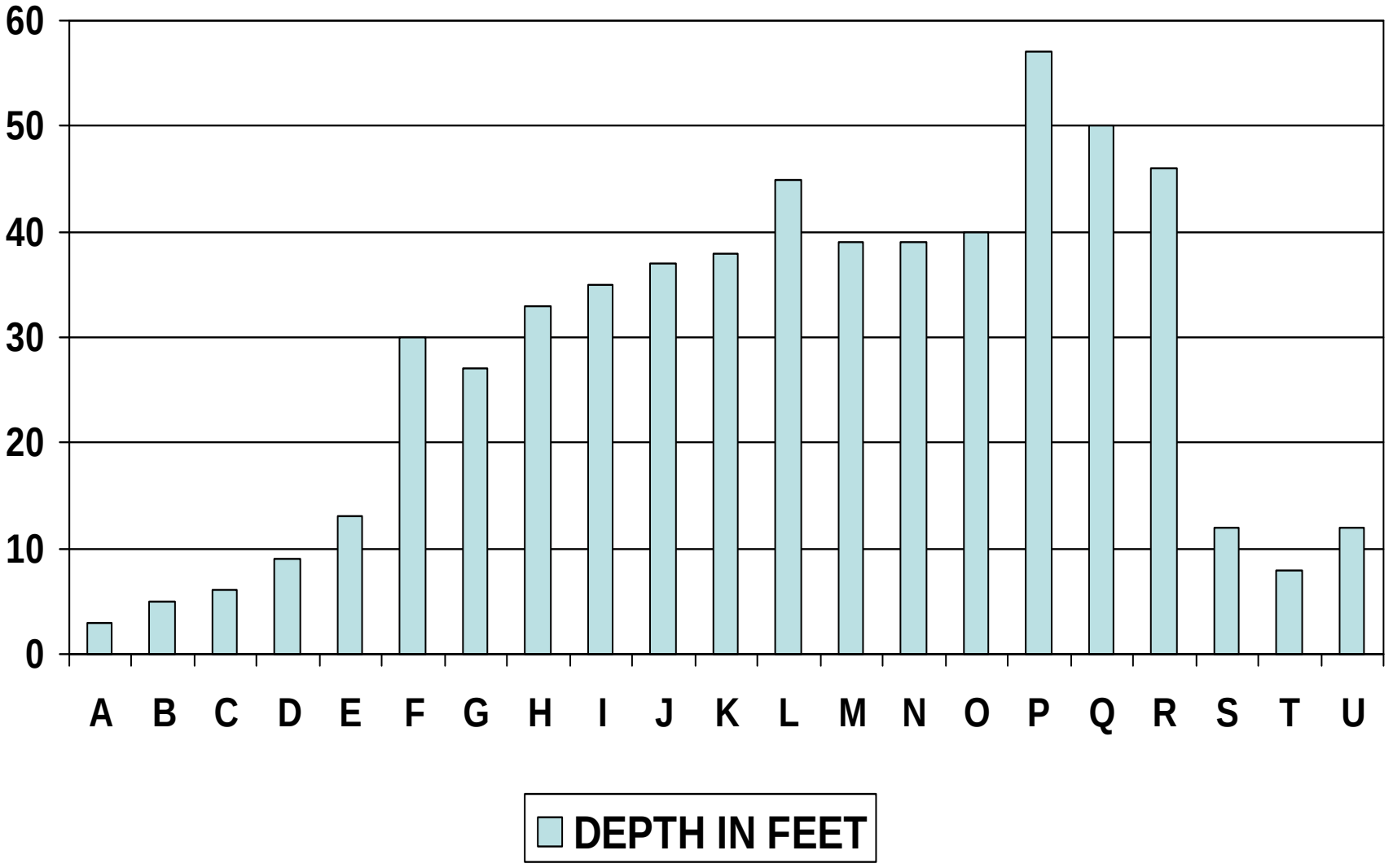
TAGGED FISH DETECTIONS EAST SPAN
RICHMOND SAN RAFAEL BRIDGE
KS –SL=SHIP CHANNEL



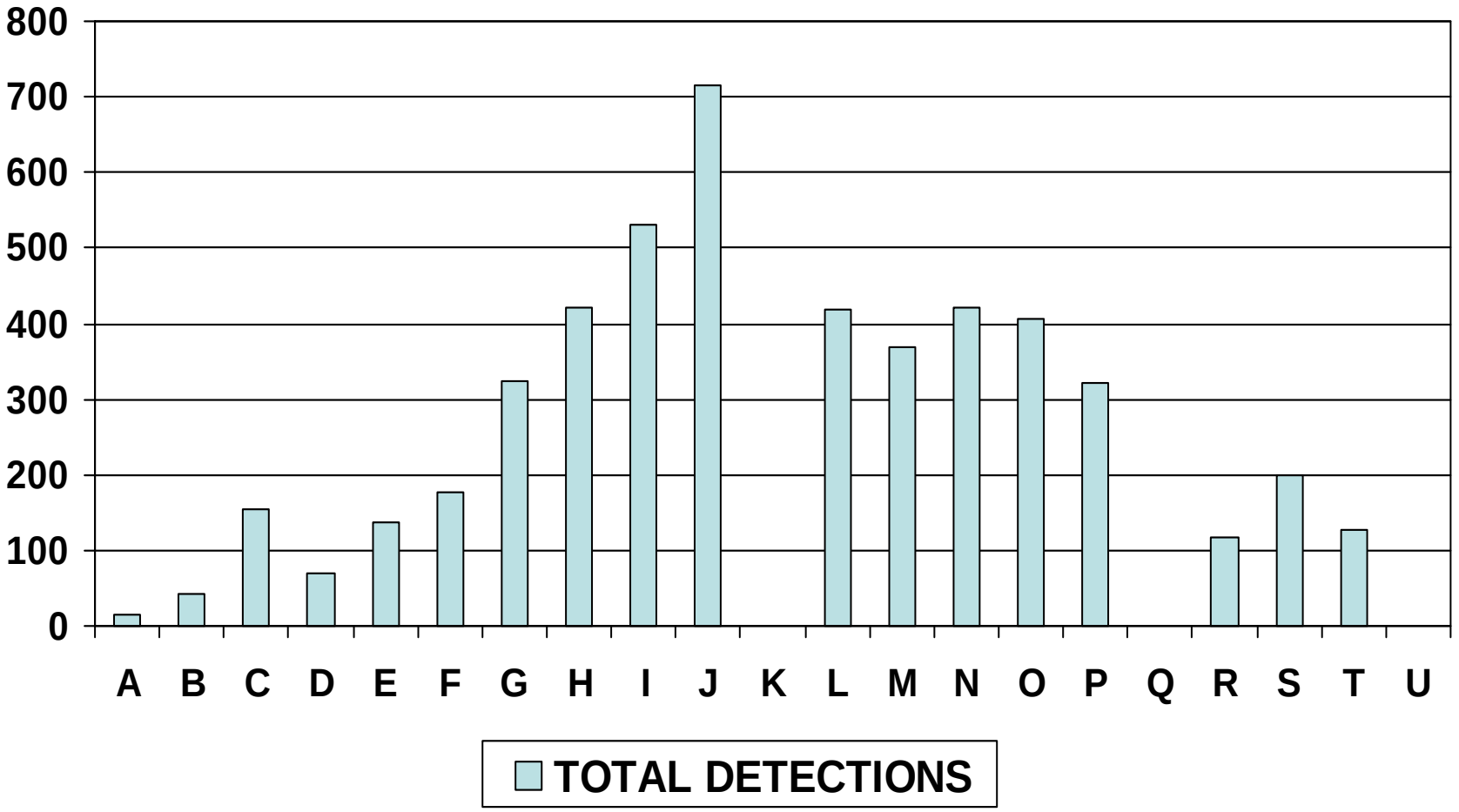
TOTAL FISH TAGS DETECTED
RICHMOND SAN RAFAEL BRIDGE
KS – SL = SHIP CHANNEL



DEPTH IN FEET AT THE SAN RAFAEL BRIDGE STATIONS



TOTAL OF ALL ACOUSTIC SIGNALS DETECTED AT THE RICHMOND SAN RAFAEL BRIDGE



SUMMARY

WE CAN TAG AND RELEASE FISH

WE CAN DETECT THEIR PASSAGE

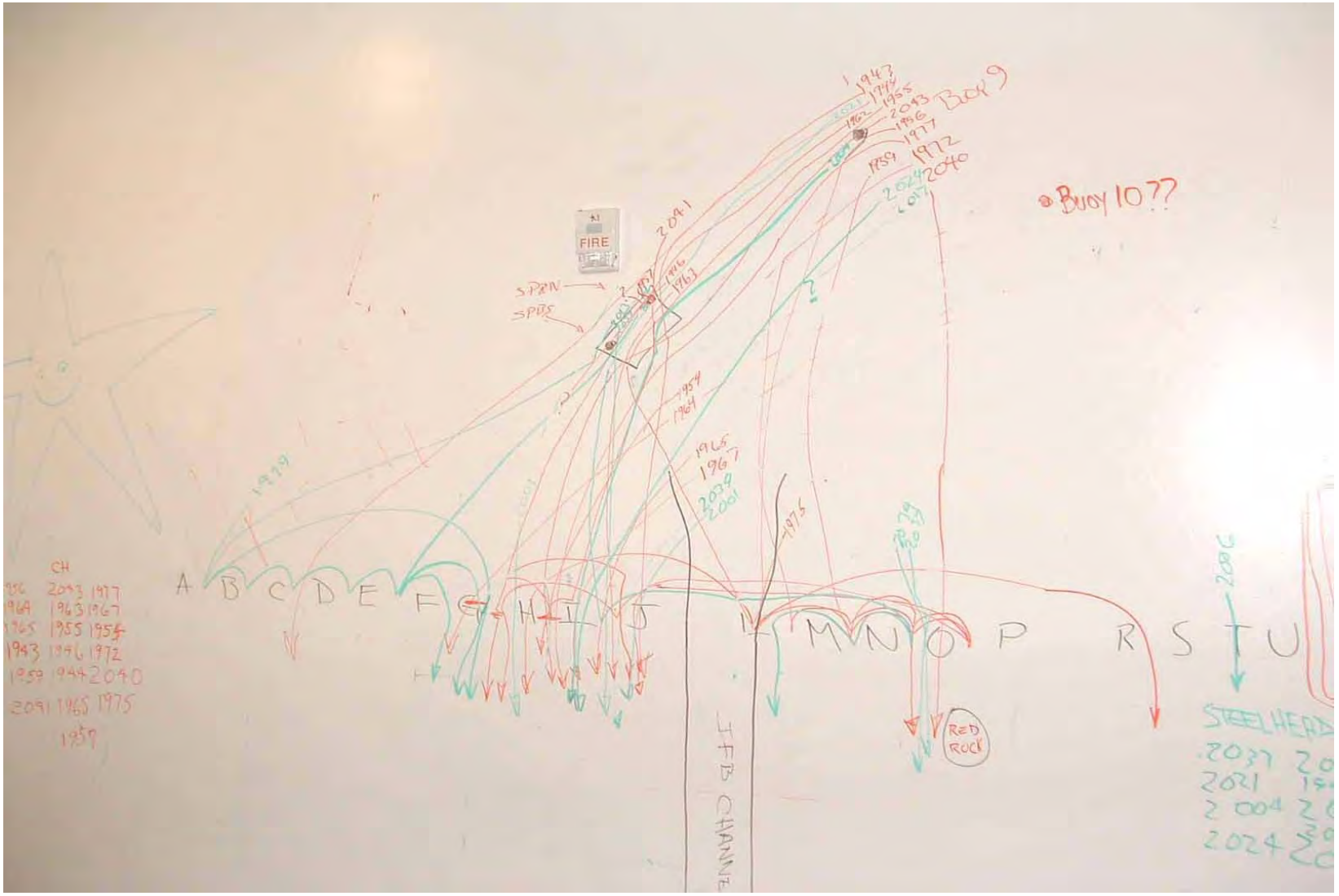
AT THE RS BRIDGE:

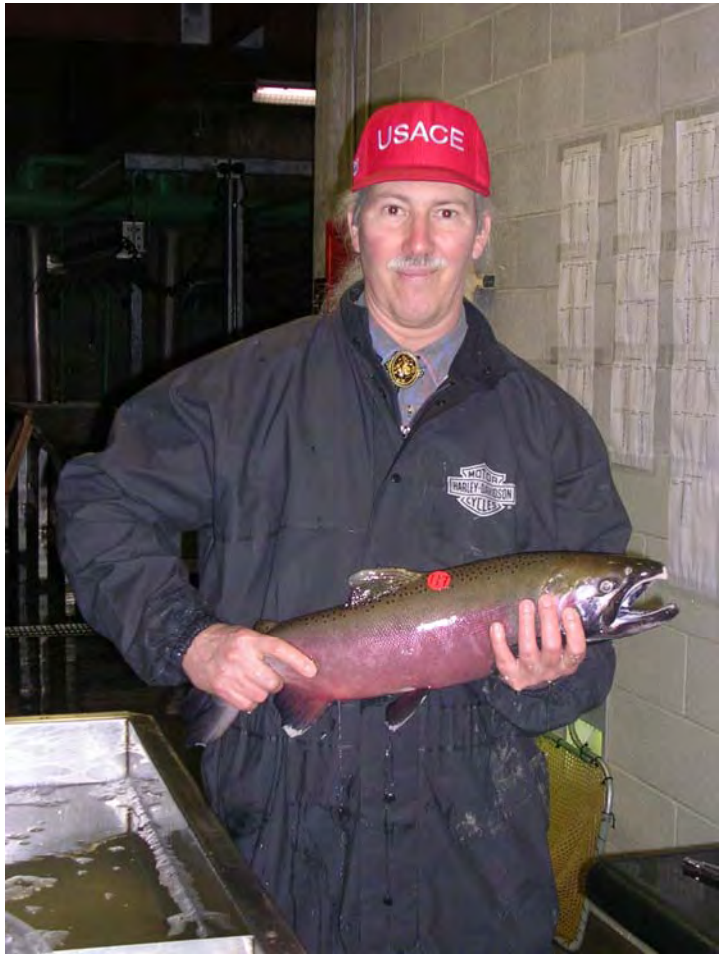
DETECT TIMES SHOW ~ 99% COVERAGE

ALL SPECIES TEND TO USE DEEPER WATER

RESIDENCE TIME VARIABLE

THE SPAGHETTI DIAGRAM

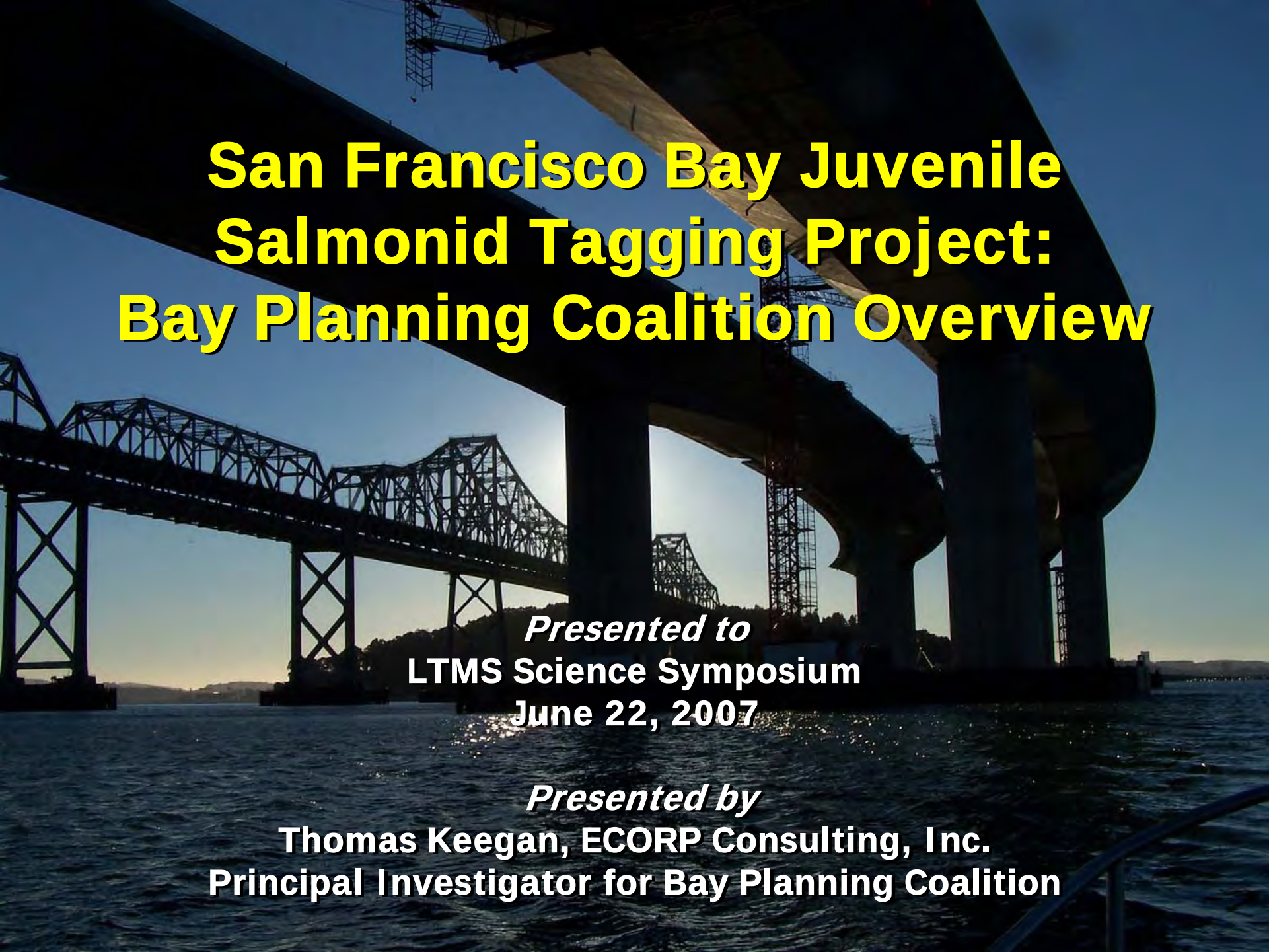




THAT’S

ALL

FOLKS!



San Francisco Bay Juvenile Salmonid Tagging Project: Bay Planning Coalition Overview

Presented to
LTMS Science Symposium
June 22, 2007

Presented by
Thomas Keegan, ECORP Consulting, Inc.
Principal Investigator for Bay Planning Coalition

BPC Receiver Deployment

- 25 receivers installed by BPC/ECORP
  - 5 Port of Oakland
  - 9 East Span Bay Bridge
  - 5 Port of San Francisco
  - 2 Mare Island
  - 1 Paradise Cay
  - 3 Port of Stockton

BPC/ECORP's Receiver Deployment

- Schedule 80 PVC deployment bracket
- Attached to pier pilings with large SS hose clamps
- Safety ropes through PVC and tied to pier pilings
- Study identification placard

Receiver Deployment Bracket

Mare Island Receiver Locations

SF Bay Receiver Locations

East Span
Bay Bridge
9 receivers

Port of SF Piers
45, 35, 27, 30-32,
and 80

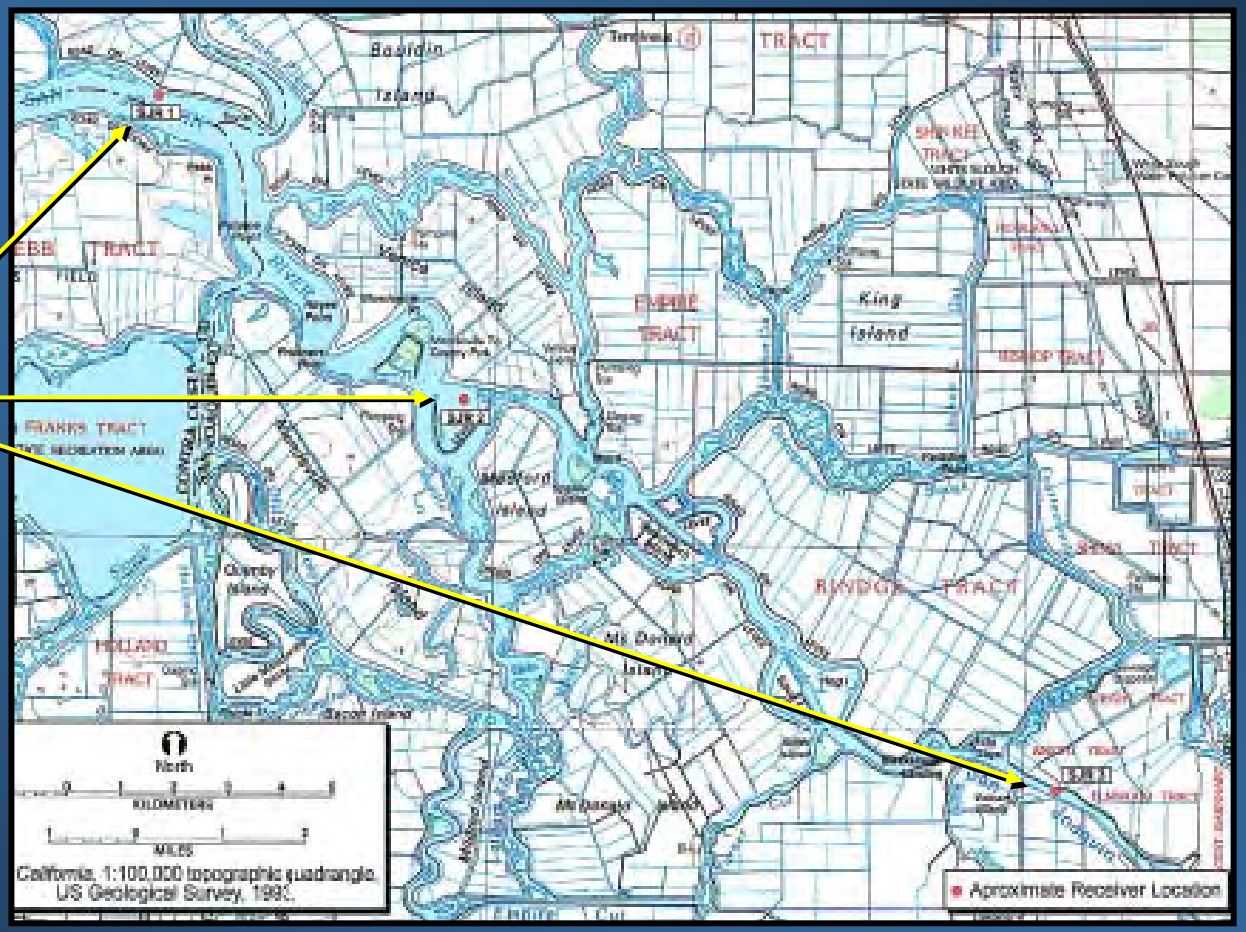
Port of
Oakland
5 receivers

Paradise Cay Receiver Location

Paradise Cay North Dock

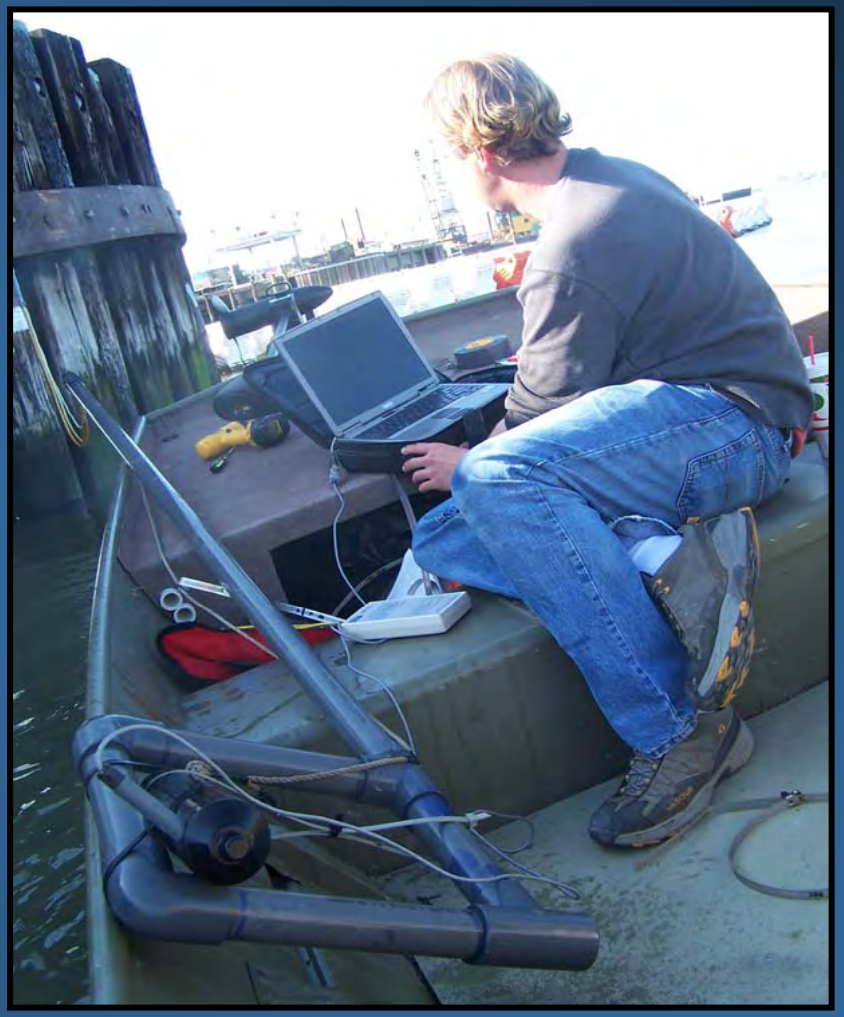
Port of Stockton
Receiver Locations

3 receivers

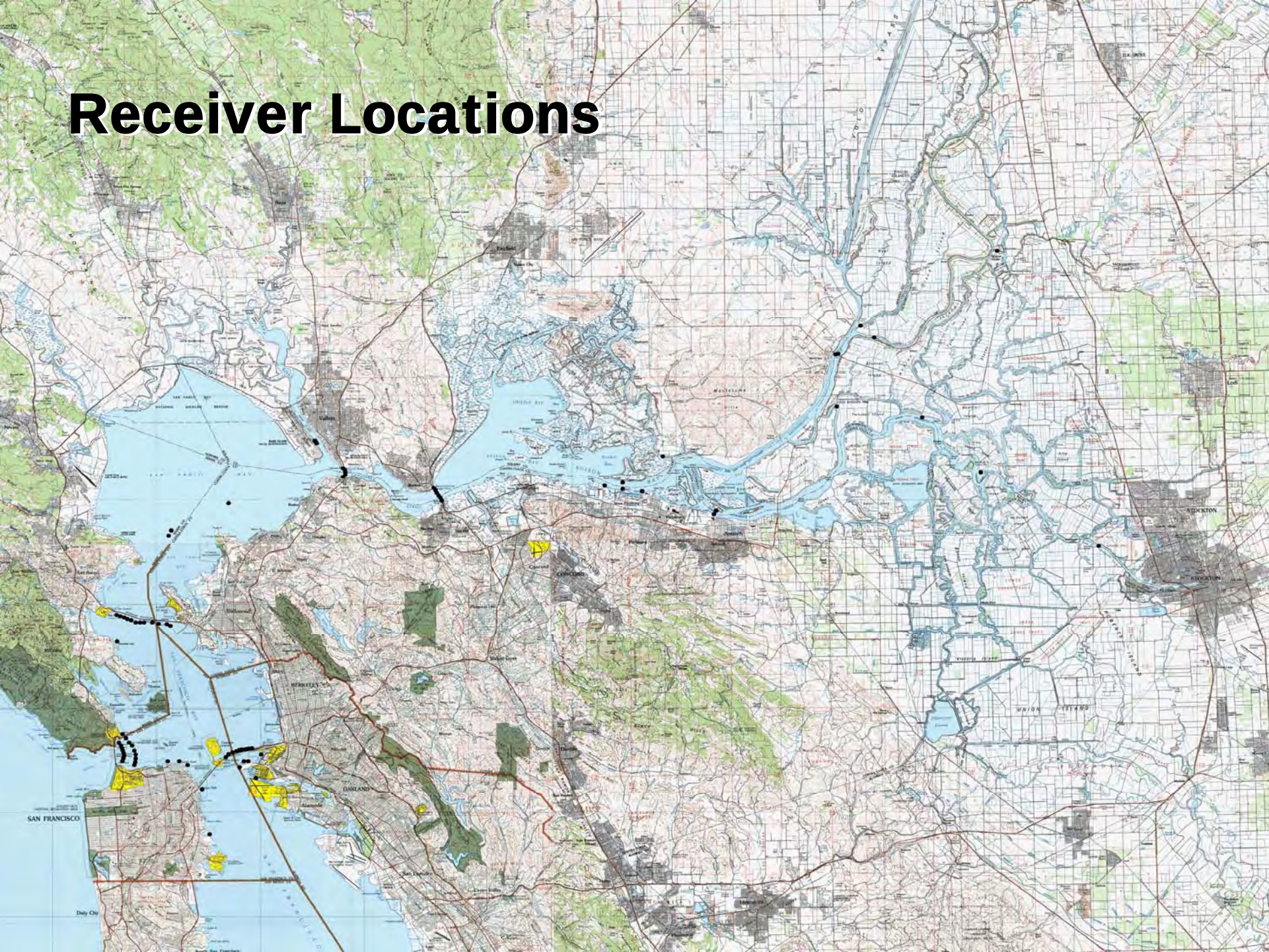


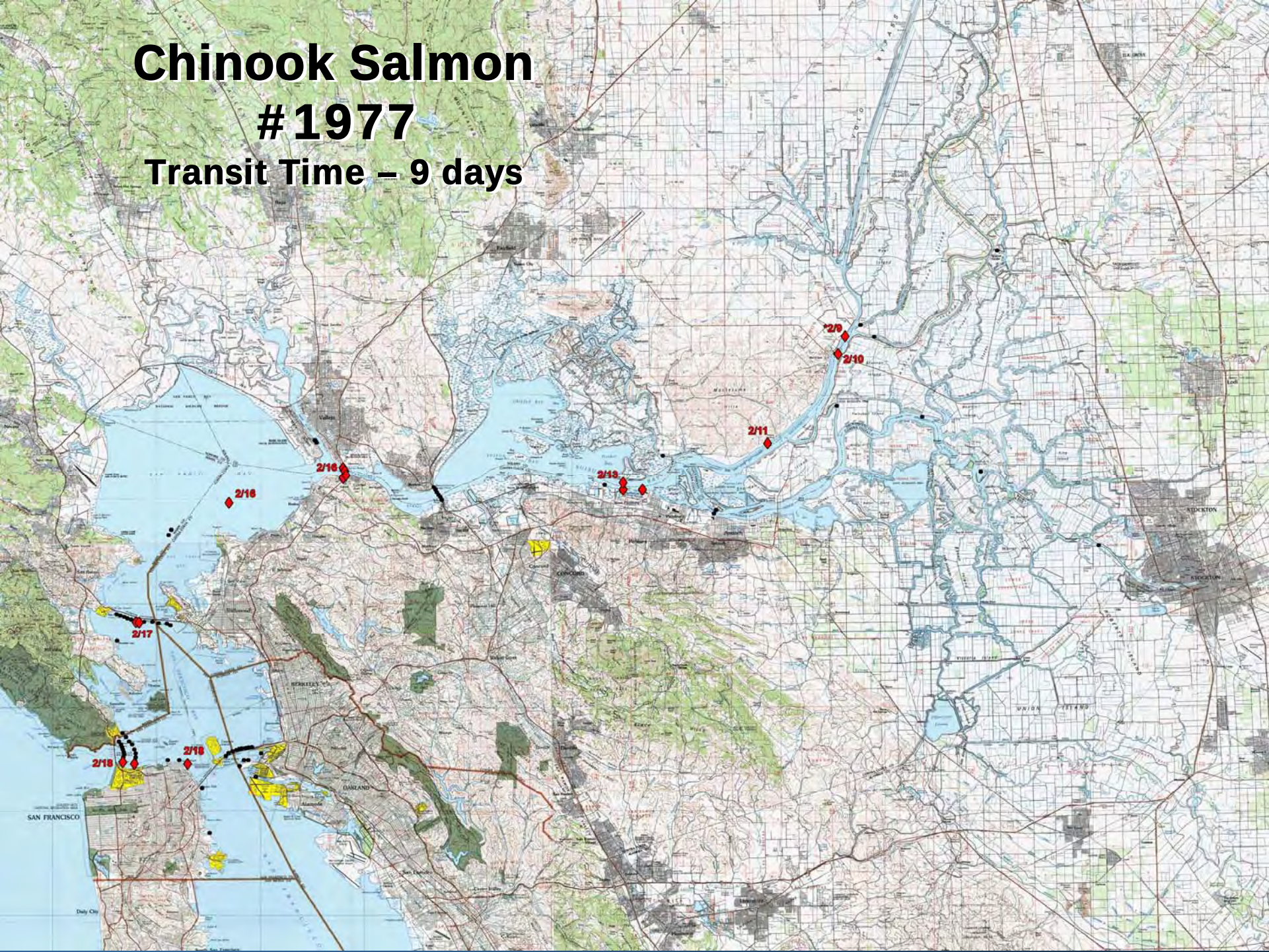
Preliminary BPC Project Results

- BPC/ECORP has detected 100 unique tag ID's; including steelhead, Chinook salmon, striped bass, and green sturgeon, spread over 25 receivers
- Tags have been detected from all agencies involved in study



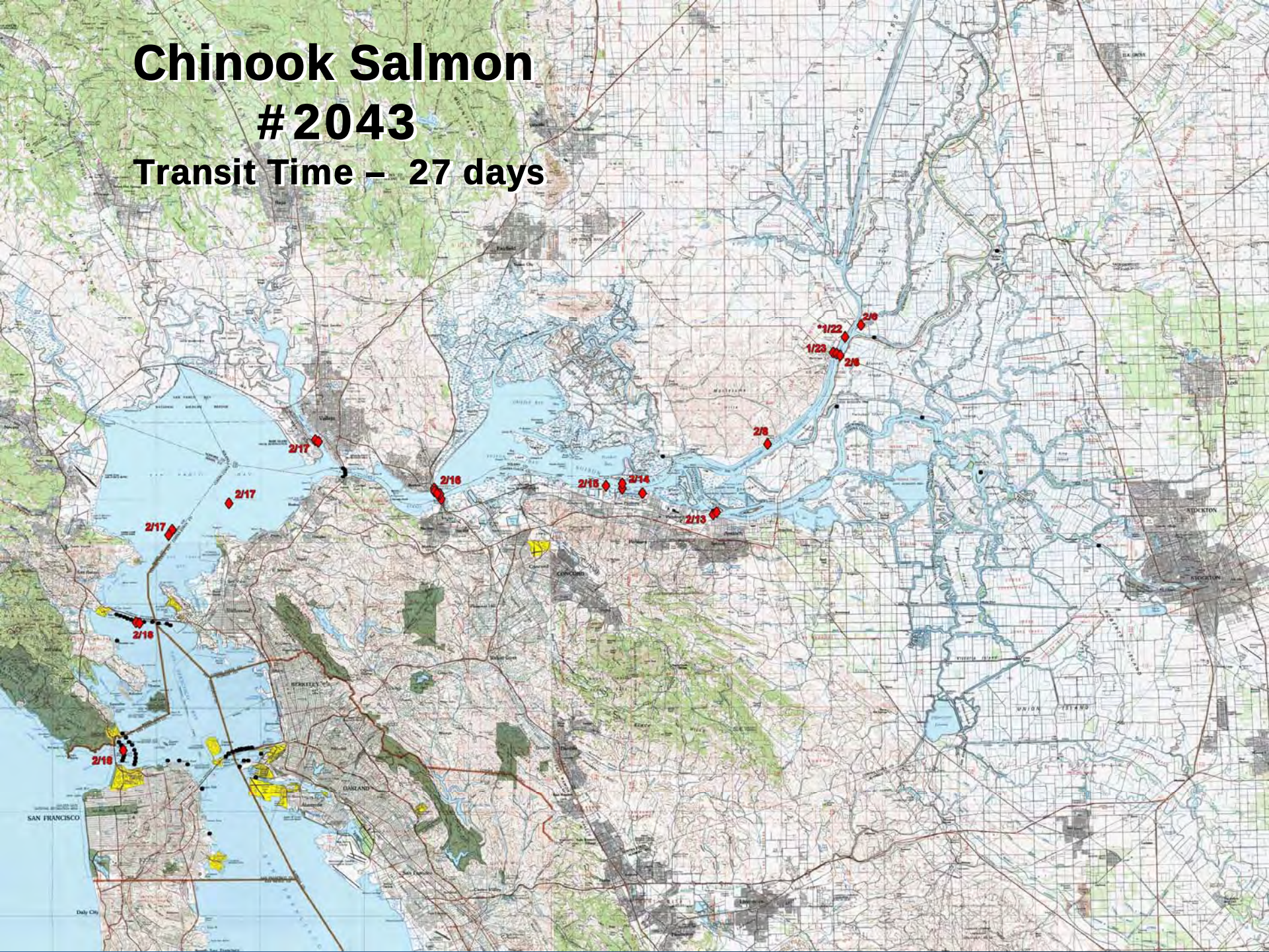
Receiver Locations




Chinook Salmon
#1977
Transit Time – 9 days
*2/9
2/10
2/11
2/13
2/16
2/16
2/17
2/18
2/18
SAN FRANCISCO
OAKLAND
BERKELEY
STOCKTON
UNION ISLAND

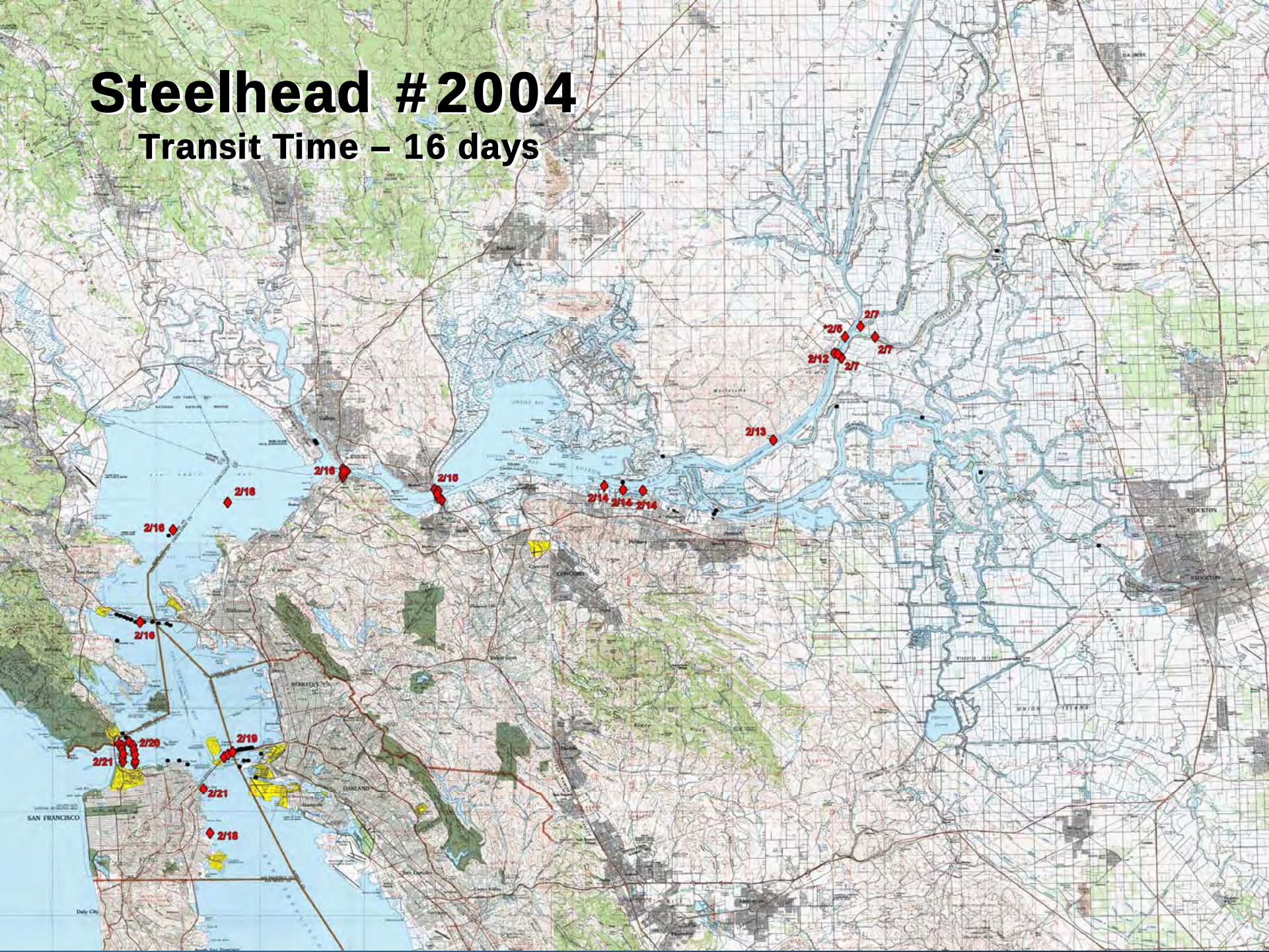
Chinook Salmon #2043

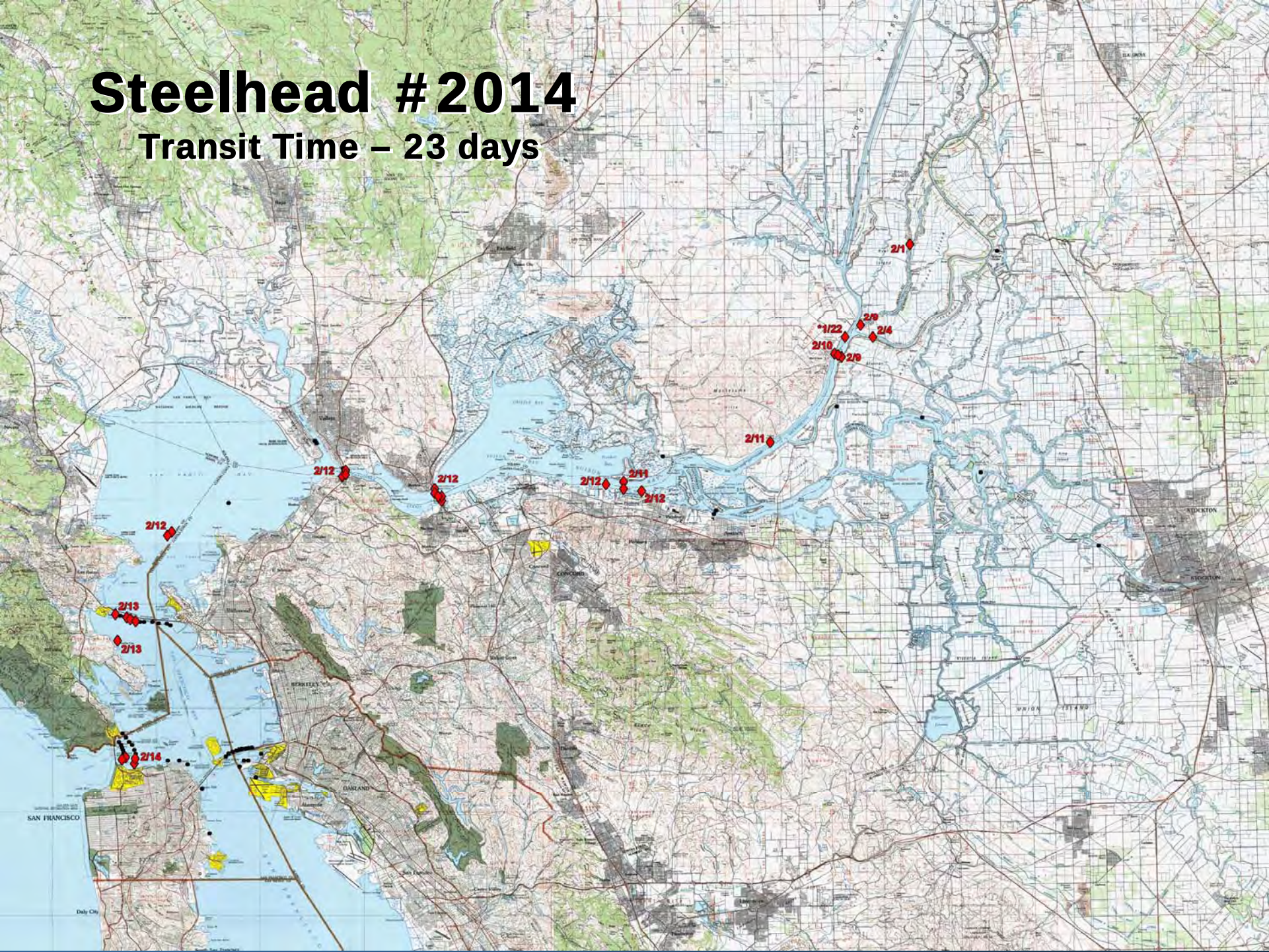
Transit Time – 27 days



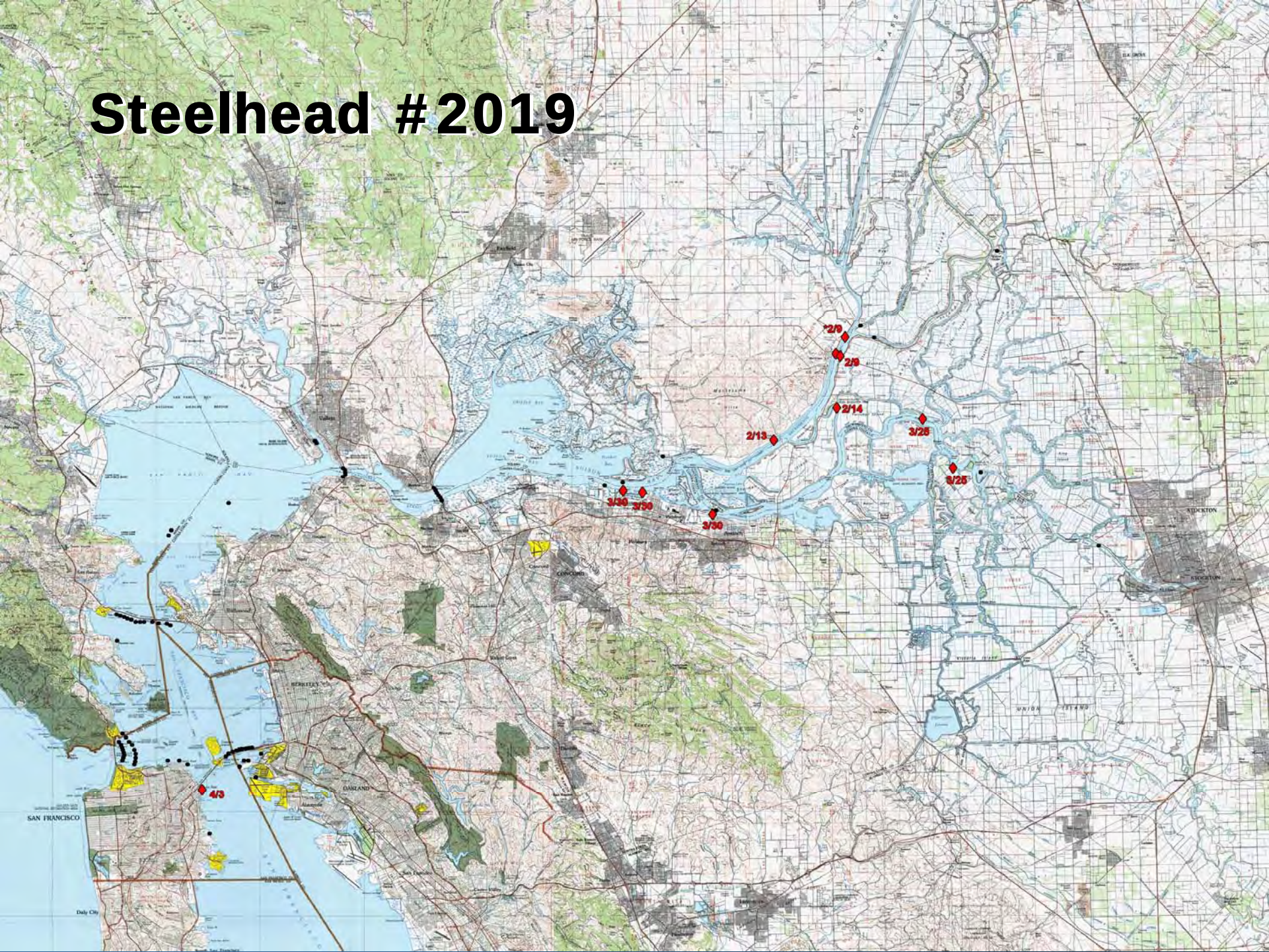
Steelhead #2004

Transit Time – 16 days

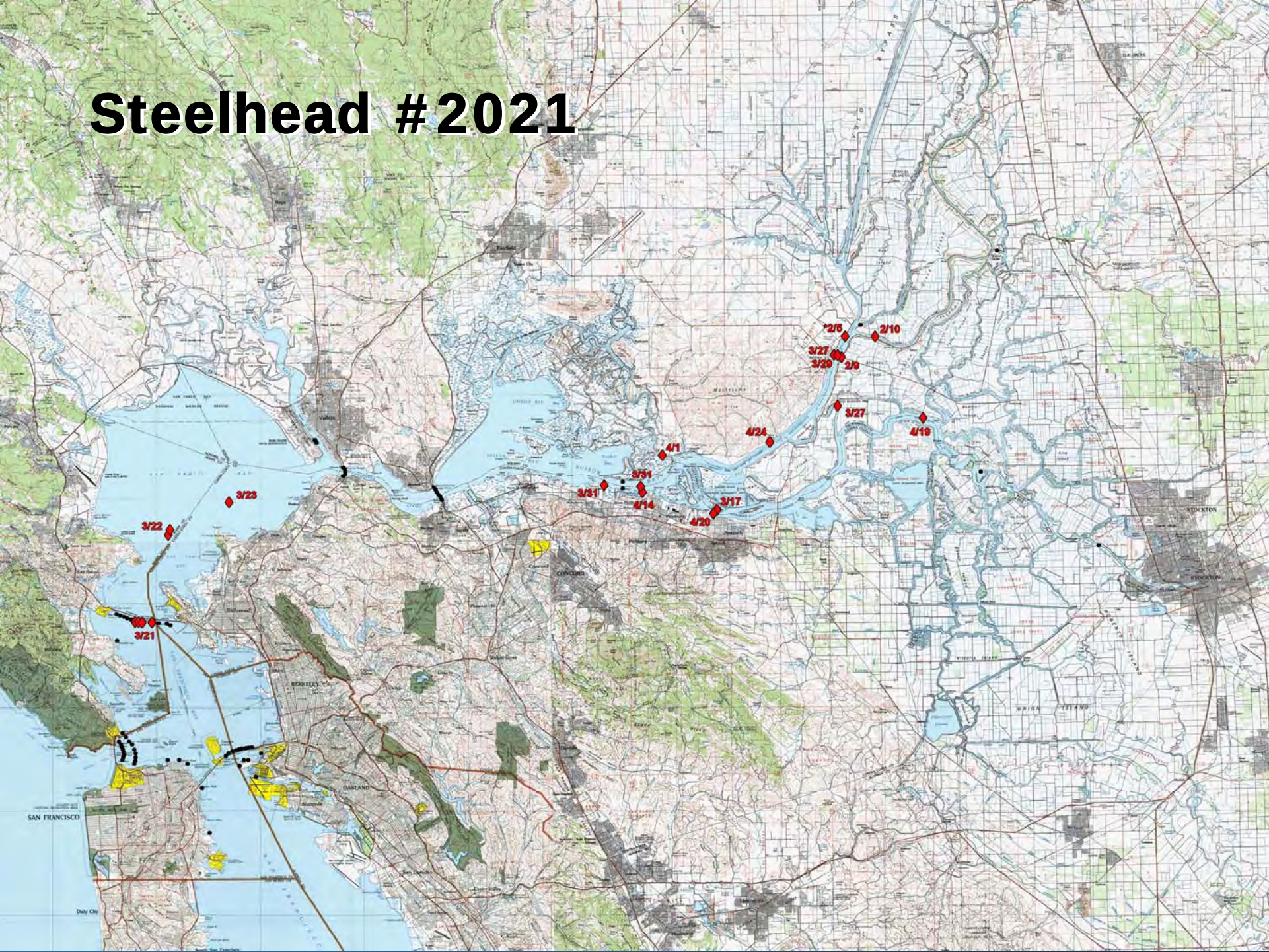



Steelhead #2014
Transit Time – 23 days
2/1
2/9
*1/22
2/4
2/10
2/9
2/11
2/12
2/12
2/12
2/11
2/12
2/12
2/13
2/13
2/14
SAN FRANCISCO
OAKLAND
BERKELEY
CONCORD
STOCKTON
UNION ISLAND

Steelhead #2019

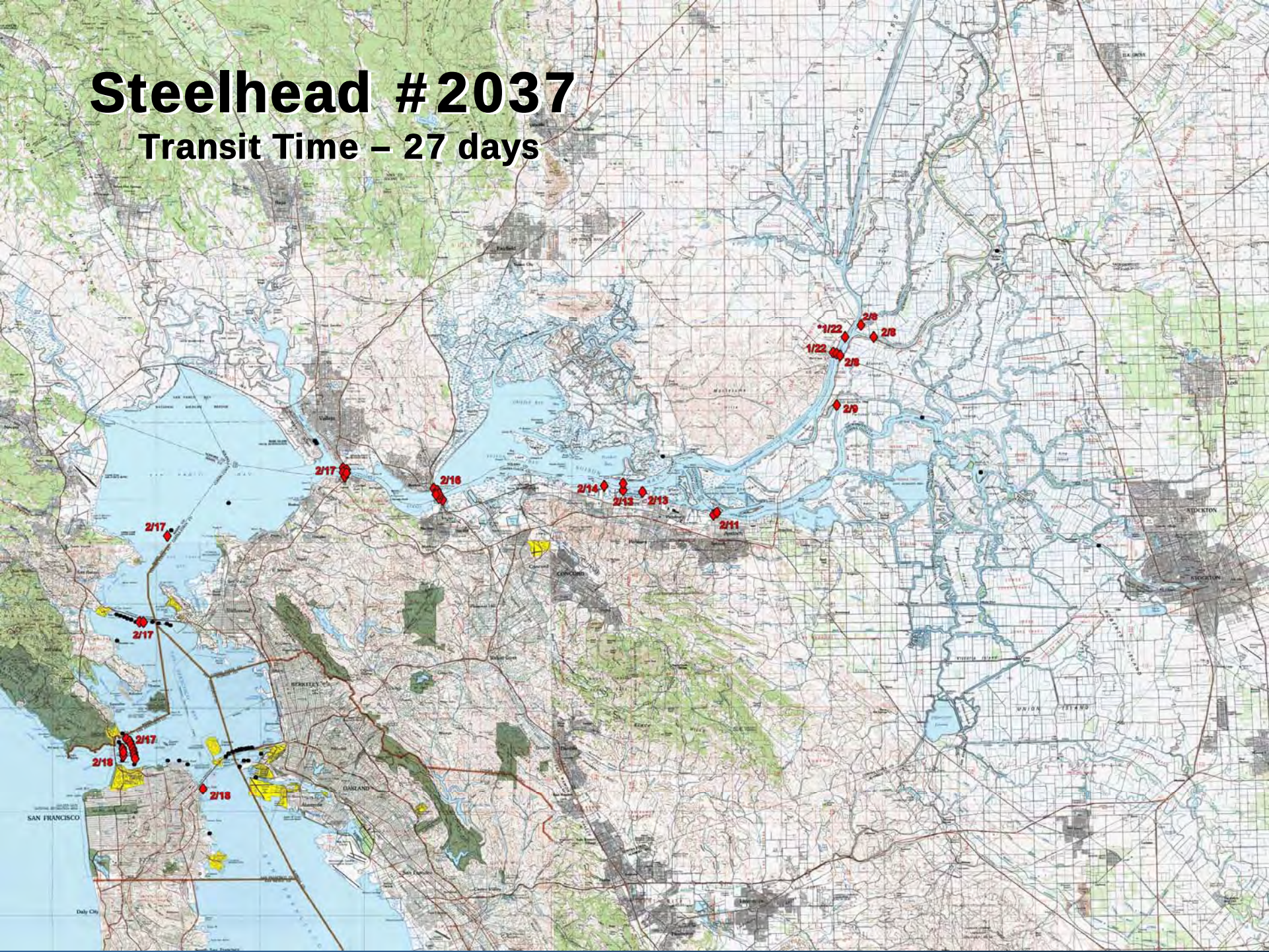


Steelhead #2021



Steelhead #2037

Transit Time – 27 days



Bay Planning Coalition Member Interests

- Contribute to the collection of sound, scientifically based information
- NOAA/NMFS is a study participant and has indicated that fish distribution data are necessary for our understanding of how these fish species use the bay
- Enable NOAA/NMFS, and other regulatory agencies to make well-informed decisions regarding potential impacts that proposed dredging activities and other marine construction activities, may or may not have on special-status species and habitats

Summary

- A successful collaboration
- Monitors and tags performed to expectation
- Fish survival:
  - post surgery 100%
  - post release 98%
  - beyond R-S Bridge ~30%
  - beyond GG Bridge ~23%
- Data analysis:
  - at “Spaghetti Diagram” stage
  - further analysis dependent on final data collection
- Interim data use:
  - ??? More tagged fish go around SF10 than through???

Future

- Success adequate to warrant continuing with planned 3-year study
- Minor modifications will be made to enhance monitor deployment and retrieval
- Monitors will be placed at other locations of interest
- Green Sturgeon?

Acknowledgements

BPC: Ellen Johnk
NOAA Fisheries: Dr. Bruce MacFarlane, Arnold Ammann, Cyril Michel, Steve Lindley,
UC Davis: Dr. Pete Klimley, Phil Sandstrom, Eric Chapman, Eric Hallen, Paul Lutes
BCDC: Brenda Goeden, Jessica Hamburger
USACE: Susan Ma, Mike Dillabough, Cynthia Jo Fowler, Fari Tabatabai, Al Paniccia, Hillary Wolfe, Capt. Bill Brazil, Hank Macner, crew of the Grizzly
LTMS Science Groupies, esp. Rob Lawrence, Phil Lebednik, Jason Richards, Jody Zaitlin, Melissa Escaron
Vemco, ltd.,
USFWS: Pat Brandes, staff at the Coleman National Fish Hatchery
EBMUD