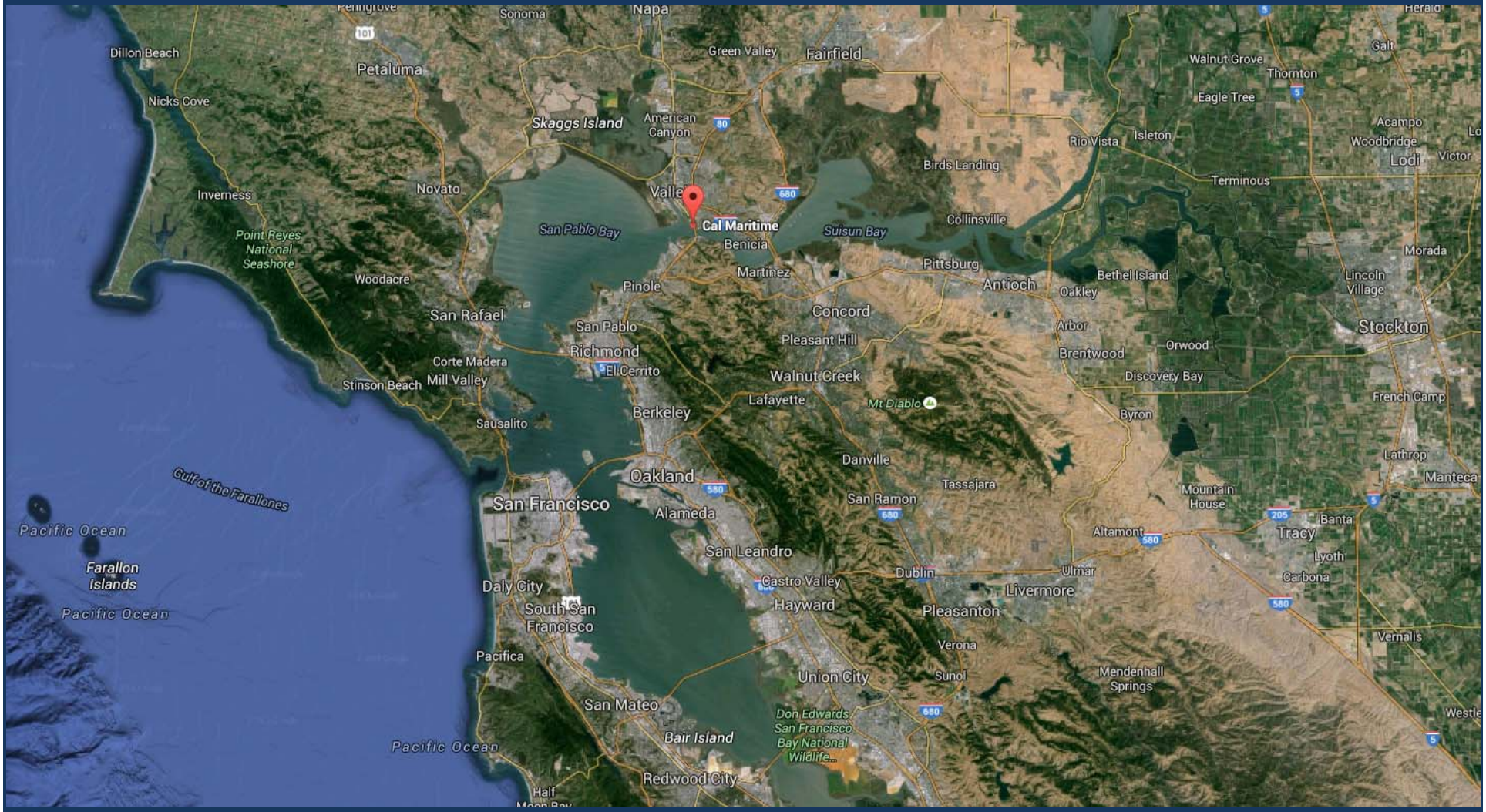
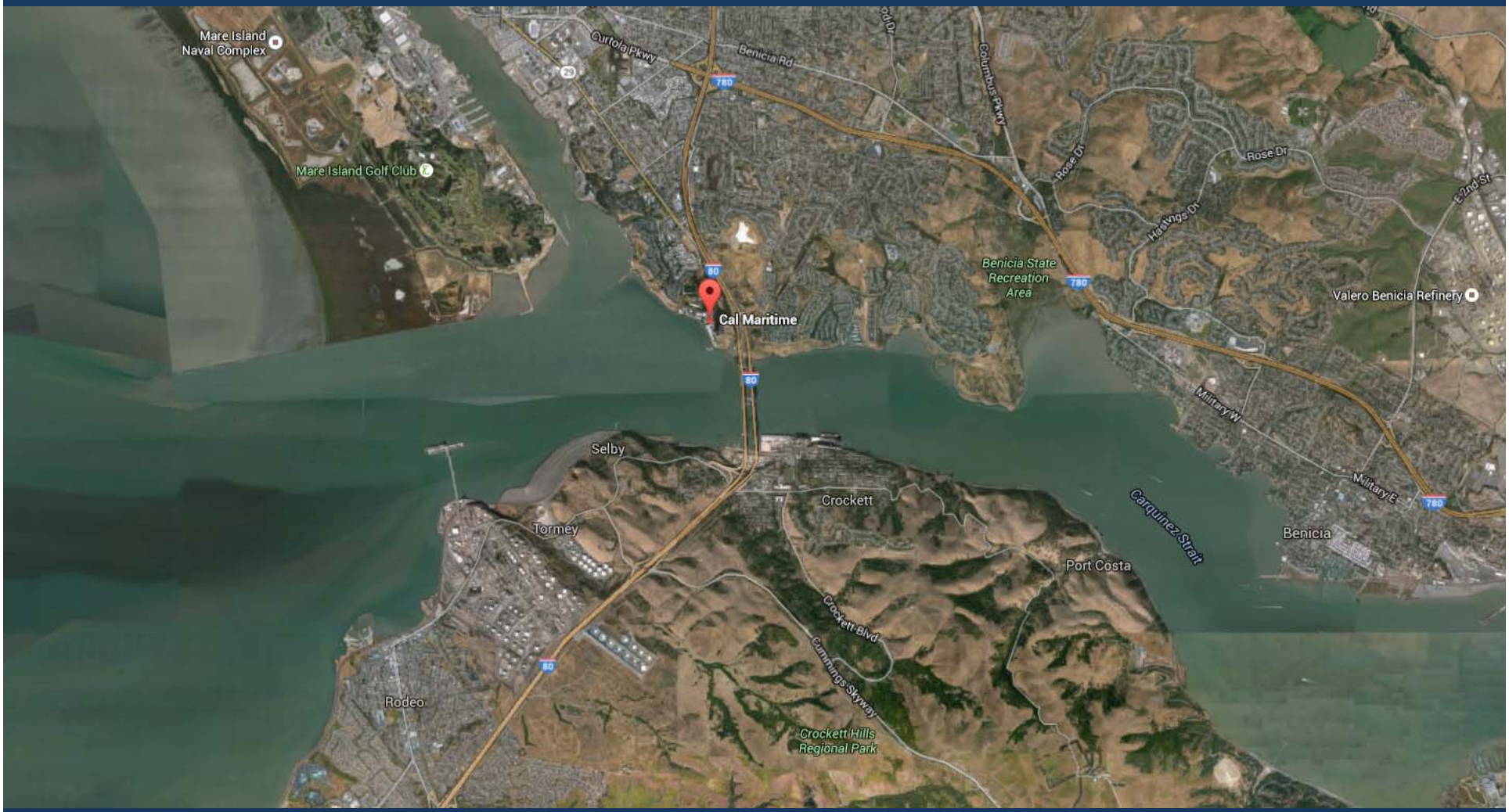
The Challenge of Meeting Challenge

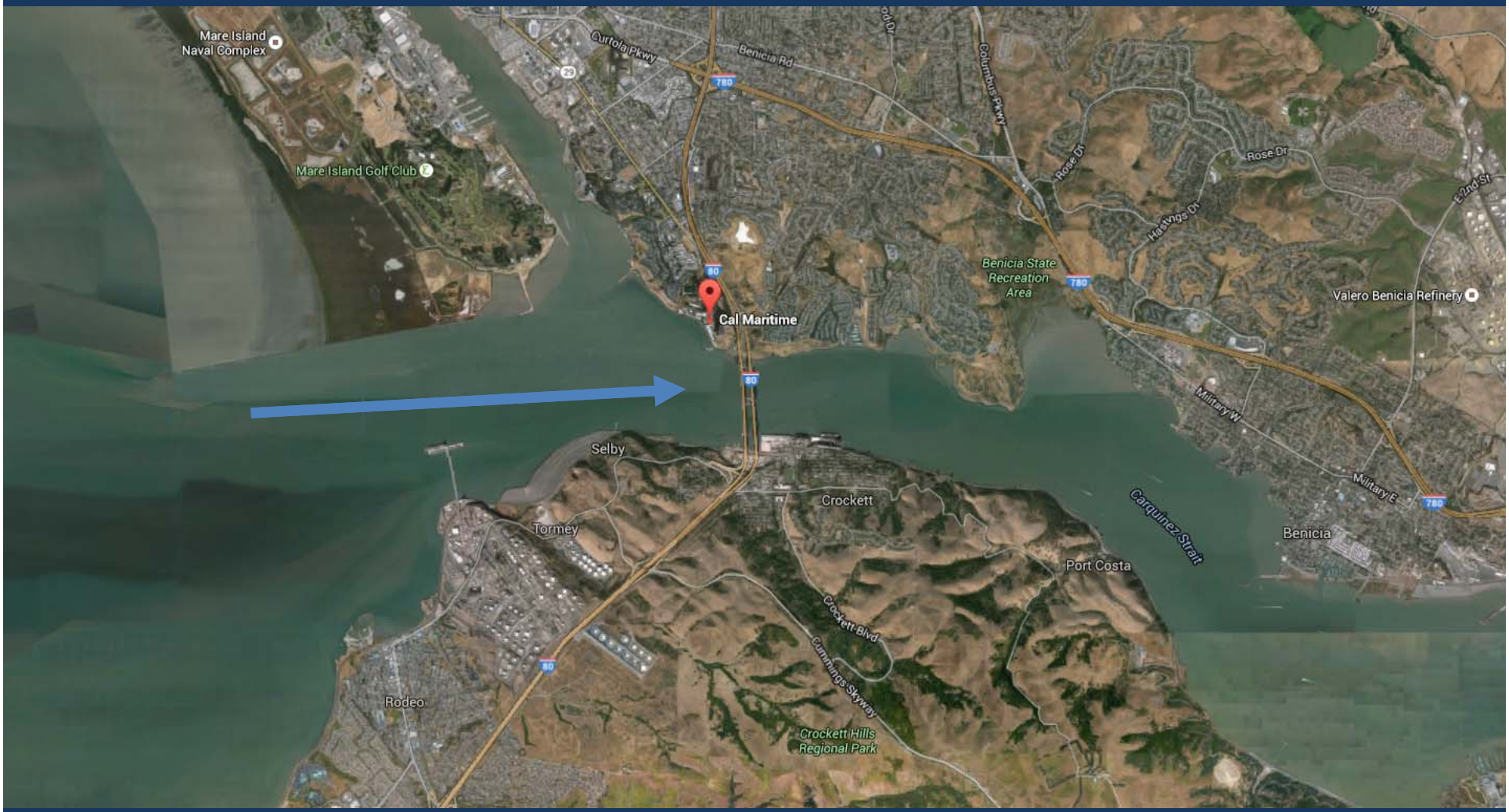
SF Bay


Napa
Sonoma
Petaluma
Dillon Beach
Nicks Cove
Green Valley
Fairfield
Skaggs Island
American Canyon
Walnut Grove
Thornton
Galt
Eagle Tree
Acampo
Woodbridge
Lodi
Victor
Rio Vista
Isleton
Birds Landing
Terminous
Inverness
Novato
Vallejo
Cal Maritime
Benicia
San Pablo Bay
Suisun Bay
Collinsville
Point Reyes National Seashore
Morada
Pittsburg
Antioch
Bethel Island
Oakley
Lincoln Village
Woodacre
Martinez
Pinole
Concord
San Rafael
San Pablo
Arbor
Stockton
Pleasant Hill
Richmond
Brentwood
Orwood
Corte Madera
El Cerrito
Walnut Creek
Discovery Bay
Stinson Beach
Mill Valley
Lafayette
Mt Diablo
French Camp
Berkeley
Byron
Sausalito
Danville
Lathrop
Manteca
Gulf of the Farallones
Oakland
Tassajara
Mountain House
San Francisco
San Ramon
Alameda
Banta
Pacific Ocean
Altamont
Tracy
San Leandro
Lyoth
Farallon Islands
Dublin
Ulmar
Carbona
Daly City
Castro Valley
Livermore
Hayward
South San Francisco
Pleasanton
Pacific Ocean
Verona
Vernalis
Pacifica
Union City
Sunol
Mendenhall Springs
San Mateo
Don Edwards San Francisco Bay National Wildlife...
Bair Island
Pacific Ocean
Redwood City
Half Moon Bay

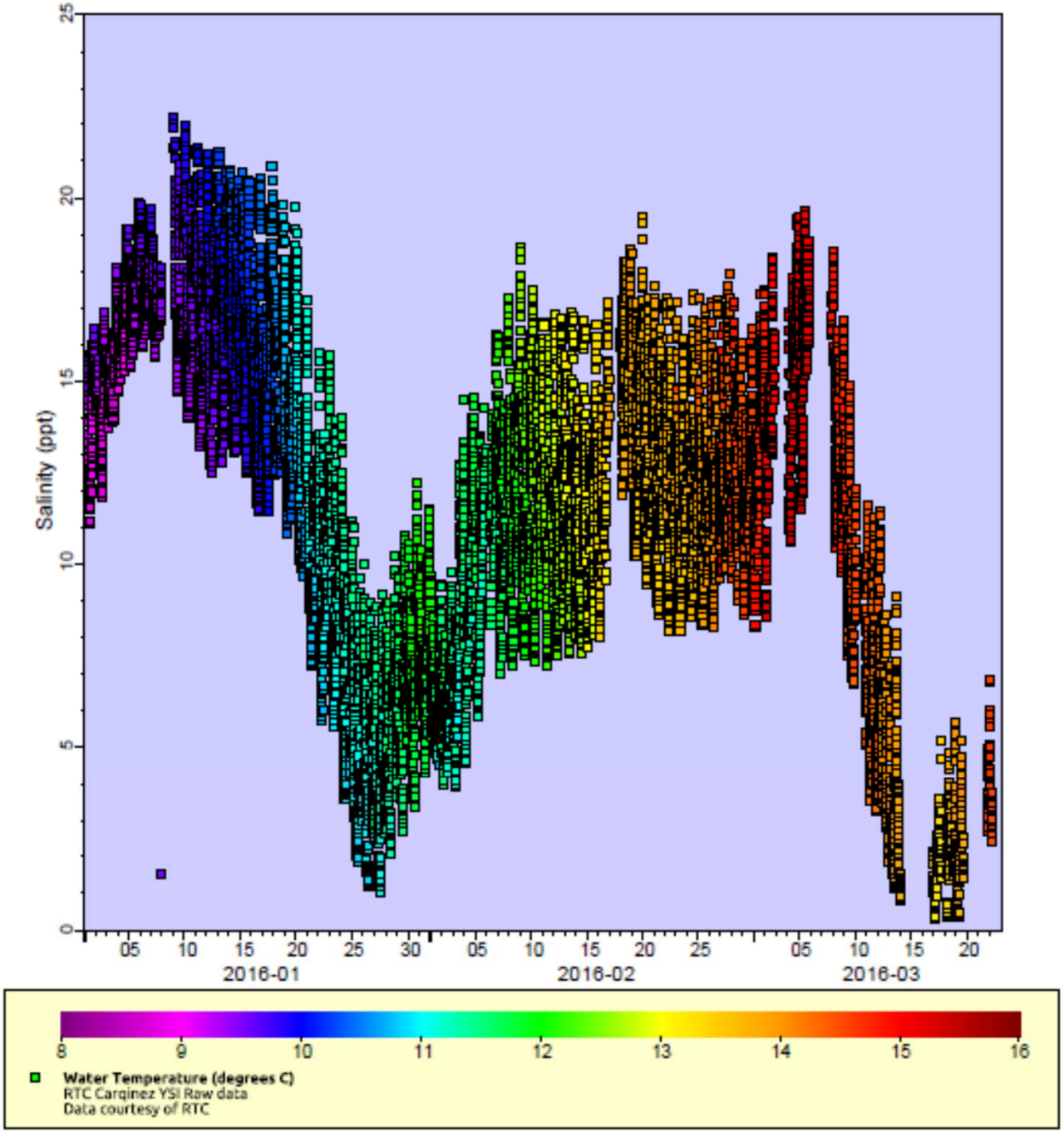
Carquinez Strait



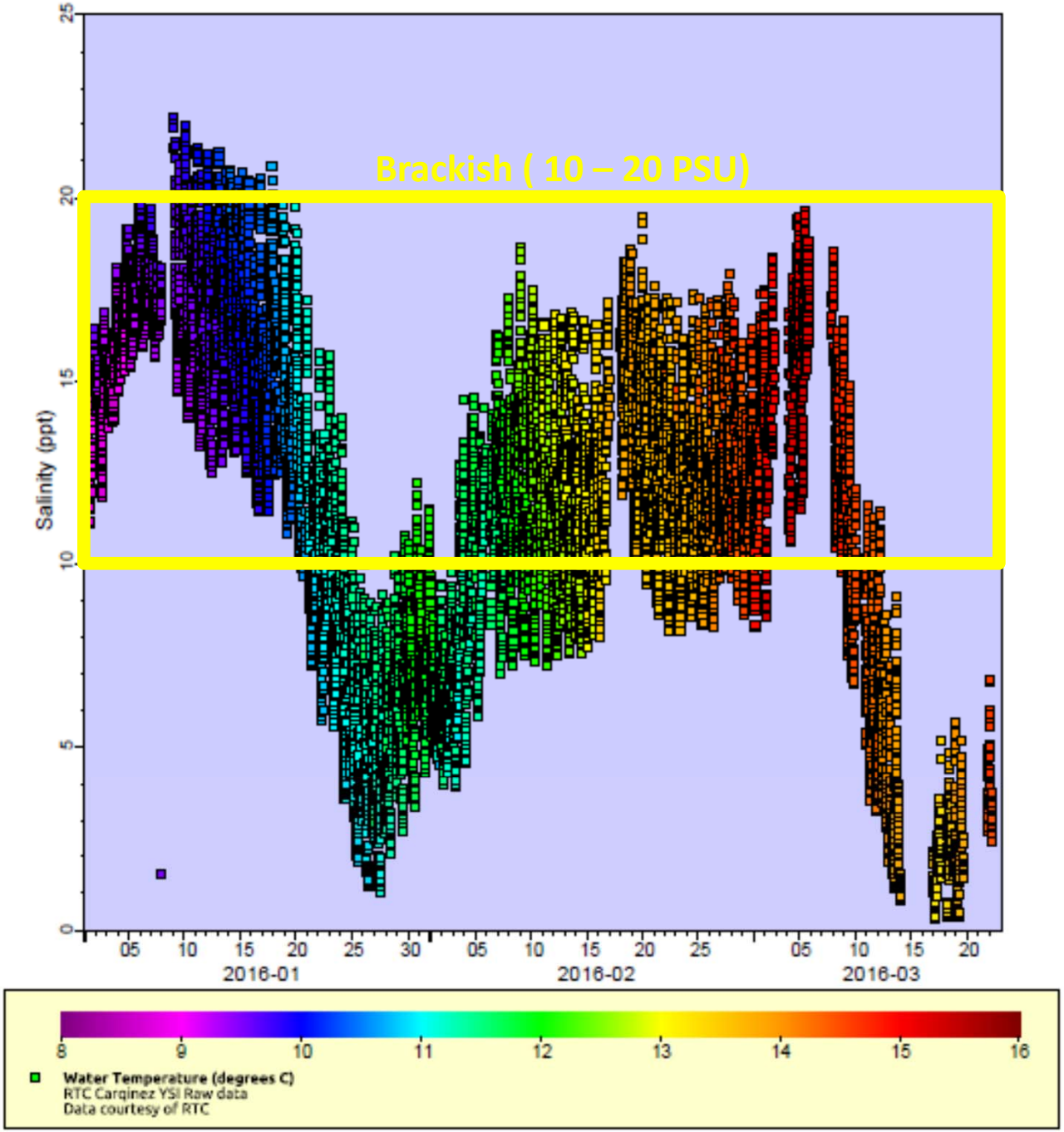
Carquinez Strait



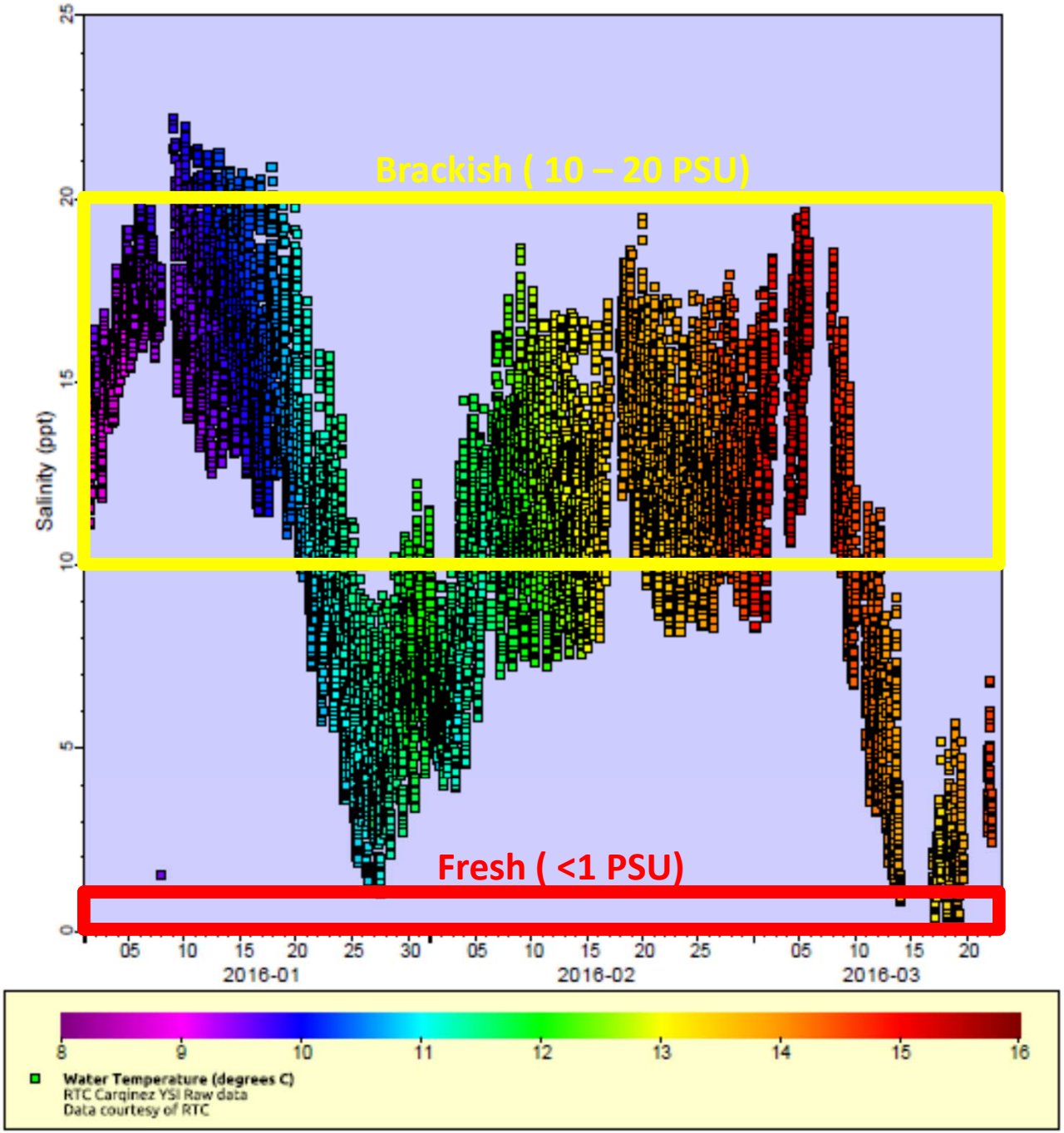
Carquinez Strait


Salinity (ppt)
0
5
10
15
20
25
05
10
15
20
25
30
2016-01
2016-02
2016-03
8
9
10
11
12
13
14
15
16
Water Temperature (degrees C)
RTC Carqinez YSI Raw data
Data courtesy of RTC

ARITIME


Brackish (10 – 20 PSU)
Salinity (ppt)
25
20
15
10
5
0
05
10
15
20
25
30
2016-01
2016-02
2016-03
8
9
10
11
12
13
14
15
16
Water Temperature (degrees C)
RTC Carqinez YSI Raw data
Data courtesy of RTC

ARITIME


Brackish (10 – 20 PSU)
Fresh (<1 PSU)
Salinity (ppt)
0
5
10
15
20
25
05
10
15
20
25
30
2016-01
2016-02
2016-03
8
9
10
11
12
13
14
15
16
Water Temperature (degrees C)
RTC Carqinez YSI Raw data
Data courtesy of RTC

Land-Based Testing Criteria

Land-based Testing Parameters	USCG Criteria & Standards	
	Treatment Uptake	Treatment Discharge
Uptake Location(Latitude / Longitude)		
Date (dd-mm-yy)		
≥50 µm (organisms/m^3)	>100,000	<10
<50 µm & ≥10 µm, MPN (organisms/mL)	>1000	<10
<50 µm & ≥10 µm, Epifluorescent Microscopy (organisms/mL)[a, c]	>1000	<10
<50 µm & ≥10 µm, Flow Cytometry (organisms/mL)[a]	>1000	<10
<50 µm & ≥10 µm, Variable Fluorescence (PAM) (Fv/Fm)[a]	-	-
<50 µm & ≥10 µm, ATP (ng/L)[a]	-	-
Indicator Microbes, *E. coli* (CFU/100 mL)	-	<250
Indicator Microbes, *Enterococci* (CFU/100 mL)	-	<100
Indicator Microbes, *Vibrio cholerae* (01/0139) (CFU/100 mL)	-	<1
Indicator Microbes, Heterotrophic Plate Counts (CFU/mL)[a]	1000	-
Engineering Parameters and Water Quality		
BWMS Effluent Flow Rate (m^3/hr)[b]	-	-
Temperature (°C) (in-line)	4-35	-
Salinity (PSU) (in-situ)	F/B/M	-
Dissolved Oxygen (mg/L)	-	-
POC (mg/L)	4	-
DOC (mg/L)	6	-
TSS (mg/L)	25	-
Turbidity (NTU)	-	-
Chlorophyll α[a] (µg/L)	-	-
pH	-	-
UV Transmittance (%/cm) (if applicable)		
UV Intensity (mW/Cm2 (if applicable)		
BWMS Energy Consumption (kW)	-	-

Phytoplankton

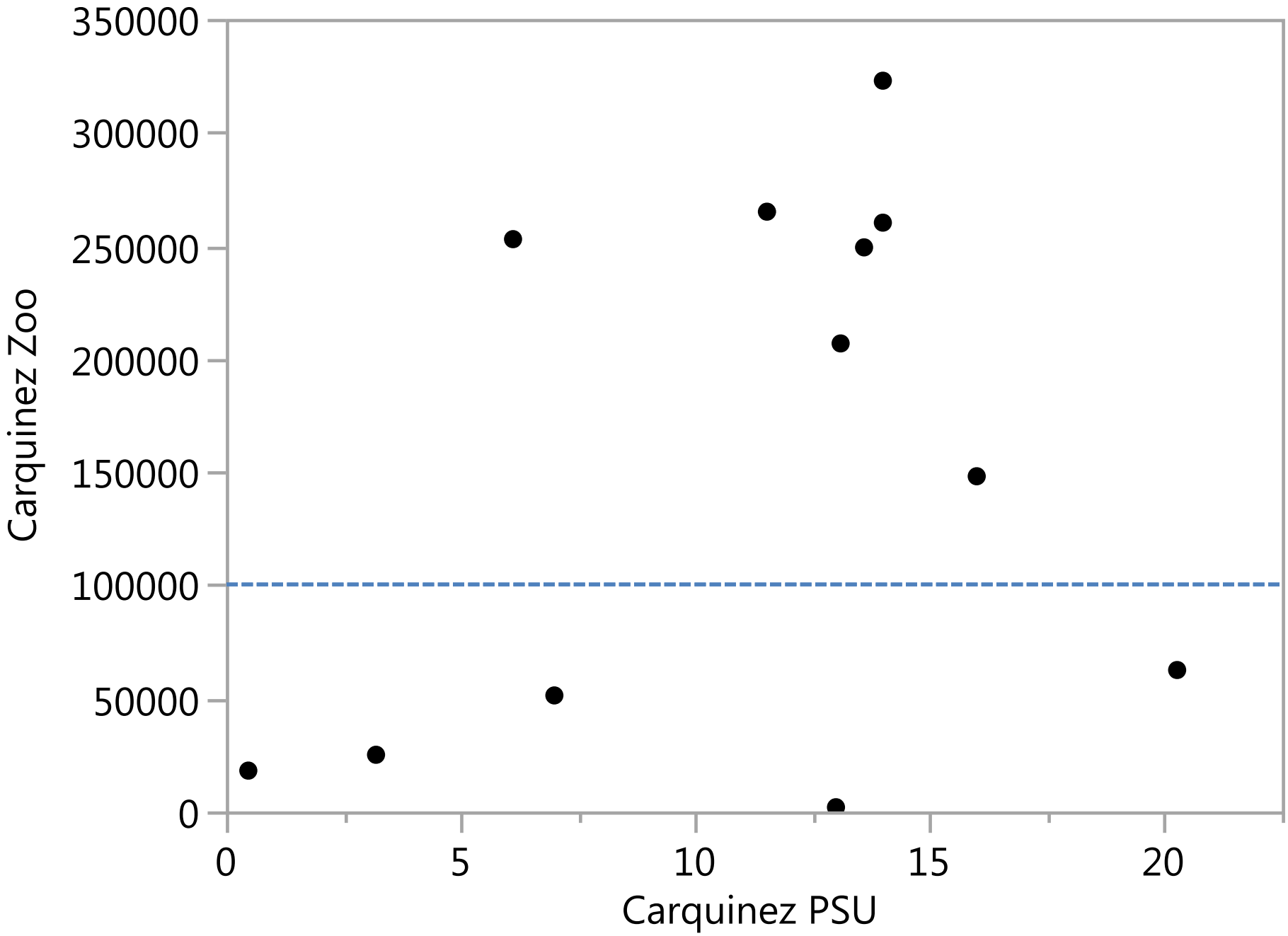
Salinity of grow-out tubs can not be higher than 10.0 PSU to keep salinity < 1.0 PSU and meet challenge.

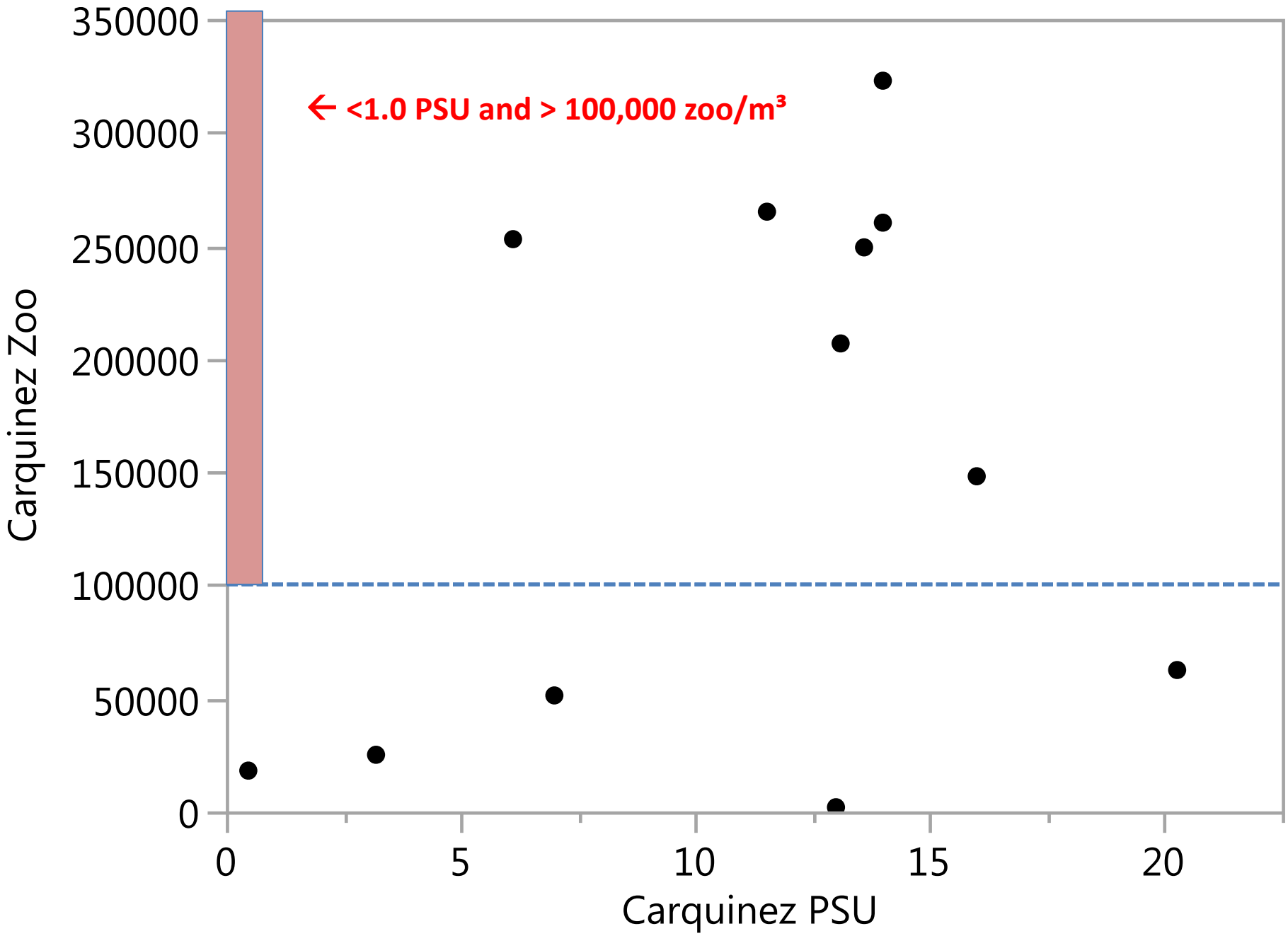
Land-Based Testing Criteria

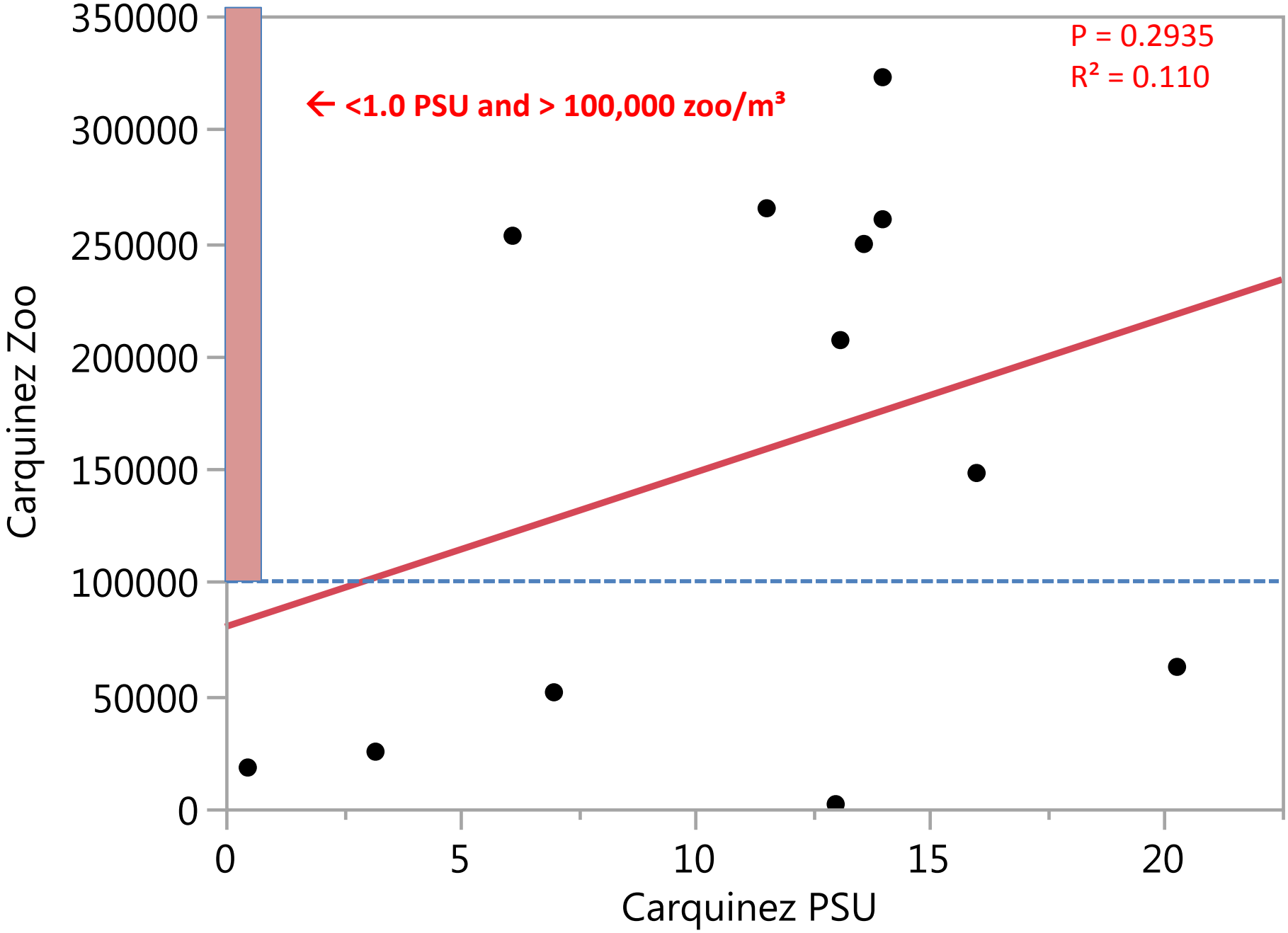
Land-based Testing Parameters	USCG Criteria & Standards	
	Treatment Uptake	Treatment Discharge
Uptake Location(Latitude / Longitude)		
Date (dd-mm-yy)		
>50 µm (organisms/m^3)	>100,000	<10
<50 µm & ≥10 µm, MPN (organisms/mL)	>1000	<10
<50 µm & ≥10 µm, Epifluorescent Microscopy (organisms/mL)[a, c]	>1000	<10
<50 µm & ≥10 µm, Flow Cytometry (organisms/mL)[a]	>1000	<10
<50 µm & ≥10 µm, Variable Fluorescence (PAM) (Fv/Fm)[a]	-	-
<50 µm & ≥10 µm, ATP (ng/L)[a]	-	-
Indicator Microbes, *E. coli* (CFU/100 mL)	-	<250
Indicator Microbes, *Enterococci* (CFU/100 mL)	-	<100
Indicator Microbes, *Vibrio cholerae* (01/0139) (CFU/100 mL)	-	<1
Indicator Microbes, Heterotrophic Plate Counts (CFU/mL)[a]	1000	-
Engineering Parameters and Water Quality		
BWMS Effluent Flow Rate (m^3/hr)[b]	-	-
Temperature (°C) (in-line)	4-35	-
Salinity (PSU) (in-situ)	F/B/M	-
Dissolved Oxygen (mg/L)	-	-
POC (mg/L)	4	-
DOC (mg/L)	6	-
TSS (mg/L)	25	-
Turbidity (NTU)	-	-
Chlorophyll α[a] (µg/L)	-	-
pH	-	-
UV Transmittance (%/cm) (if applicable)		
UV Intensity (mW/Cm2 (if applicable)		
BWMS Energy Consumption (kW)	-	-

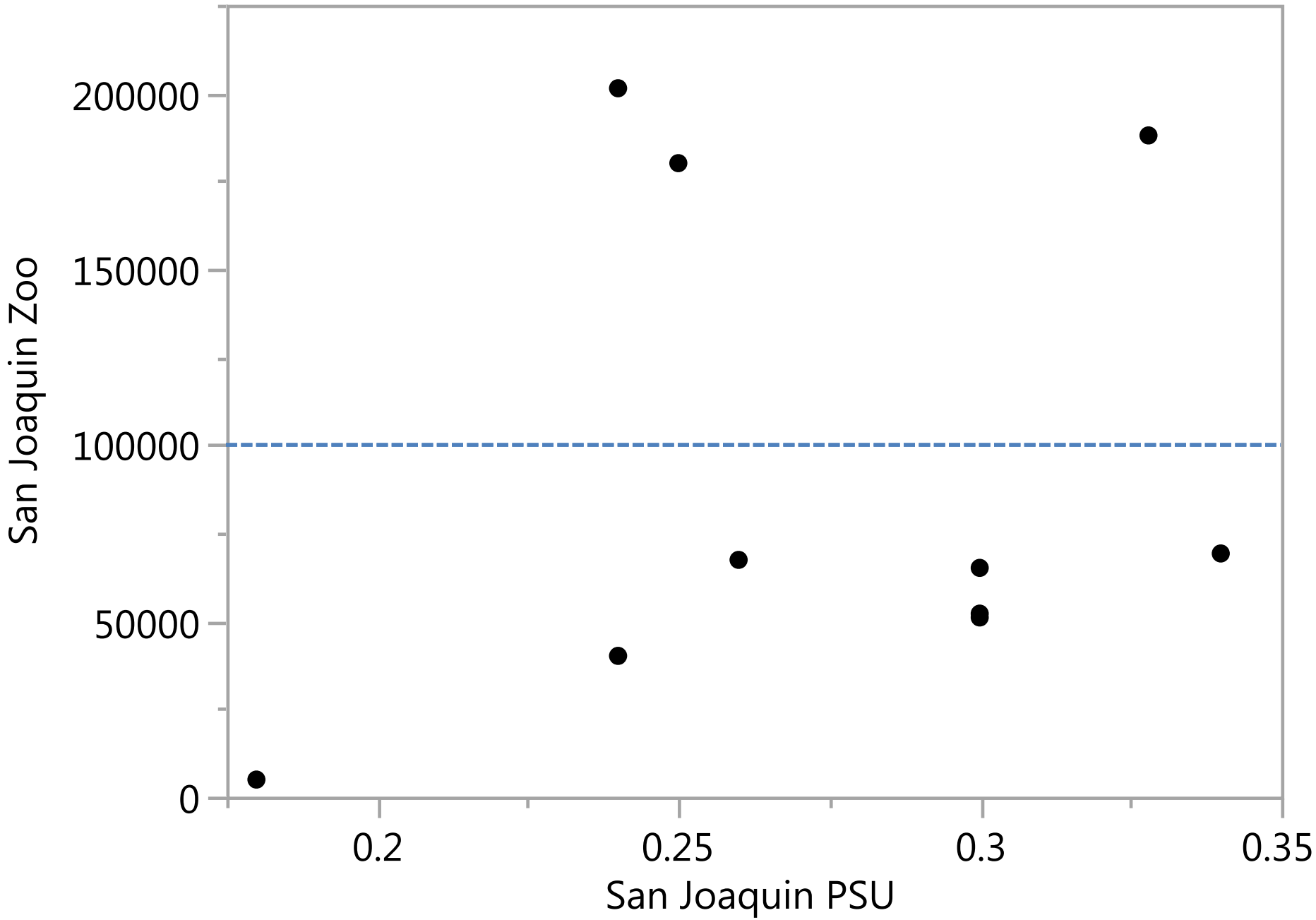
Land-Based Testing Criteria

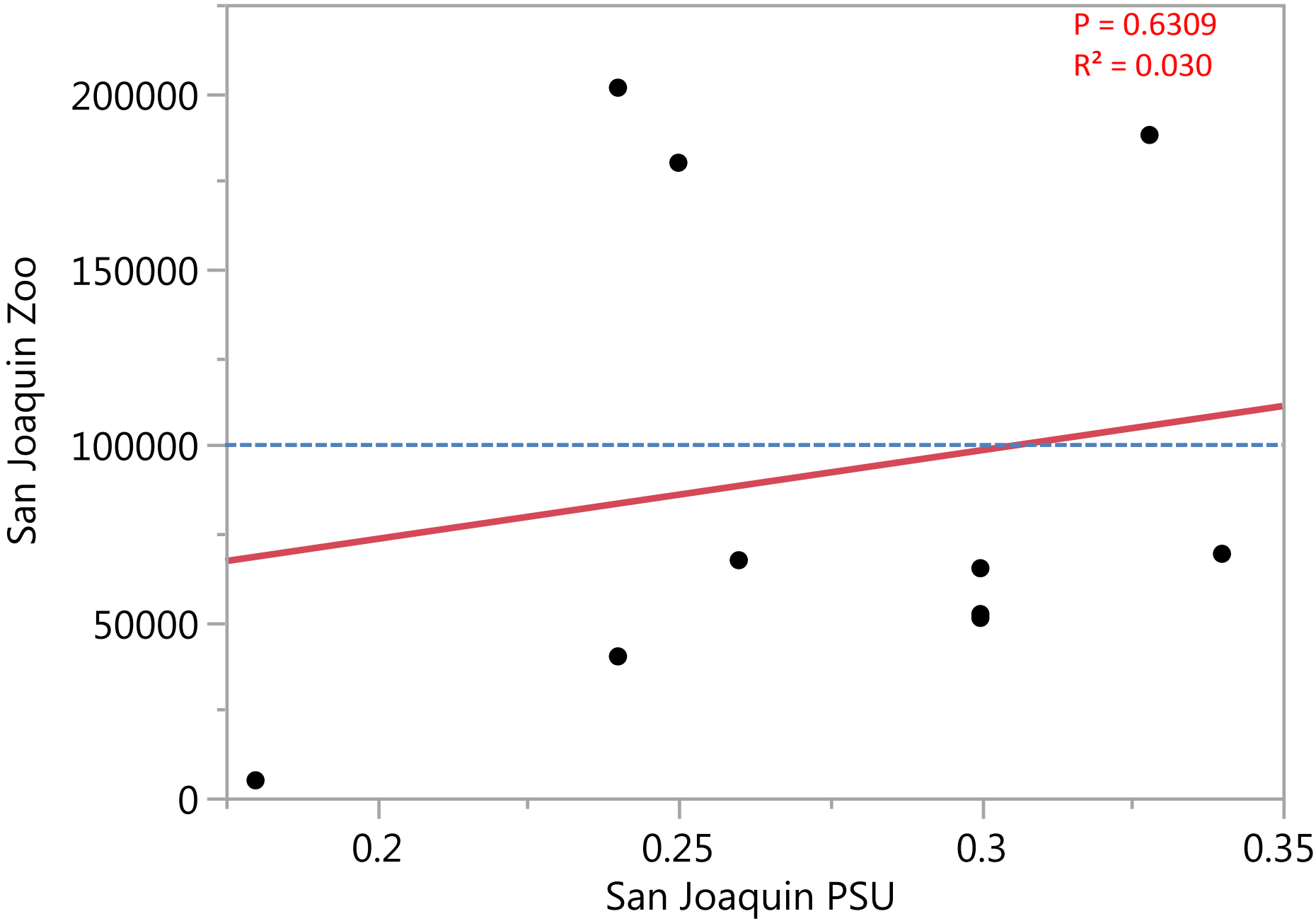
Land-based Testing Parameters	USCG Criteria & Standards	
	Treatment	Treatment
UV Intensity (mW/Cm2 (if applicable)		
BWMS Energy Consumption (kW)	-	-

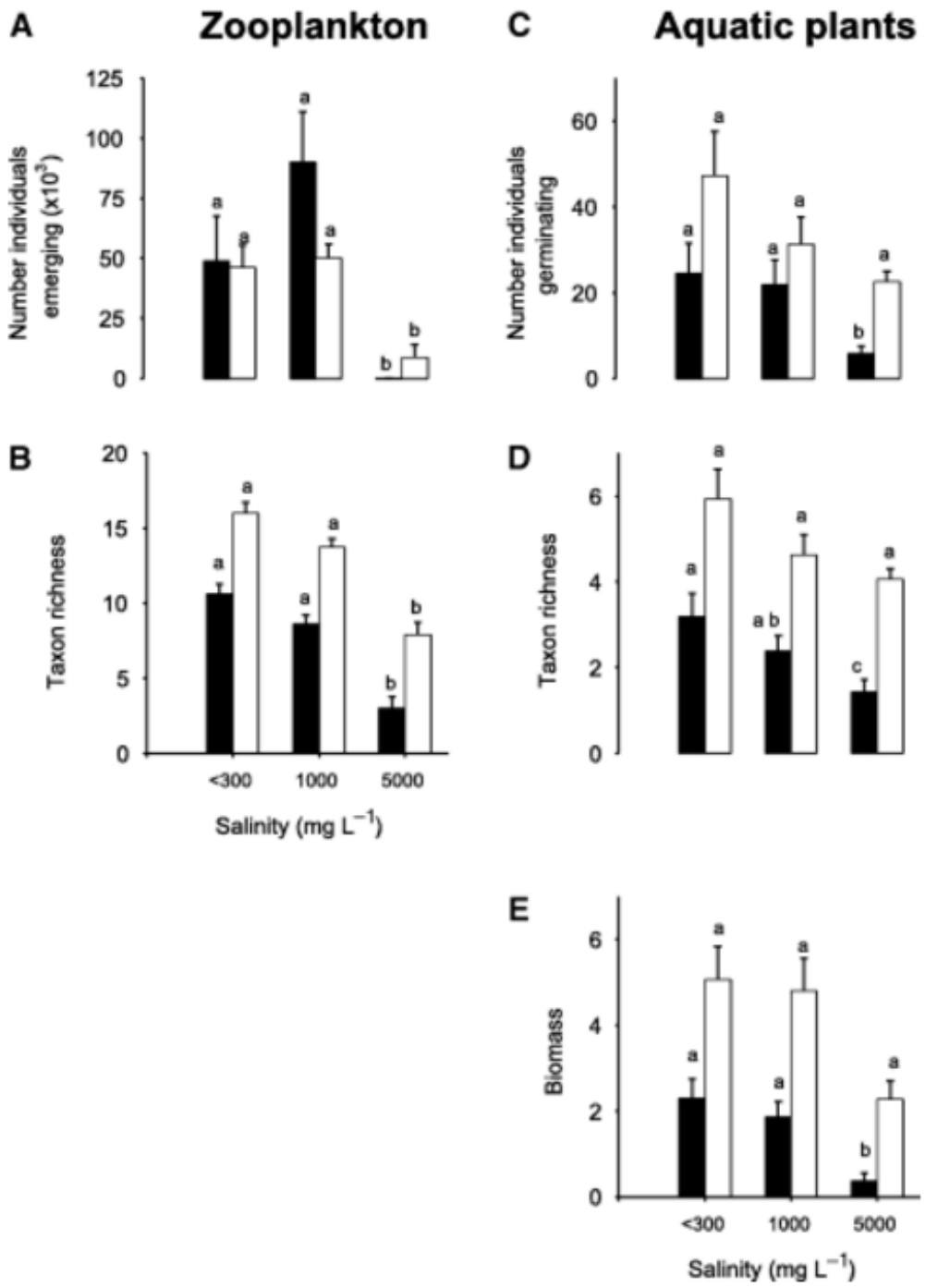

350000
300000
250000
200000
150000
100000
50000
0
Carquinez Zoo
0
5
10
15
20
Carquinez PSU

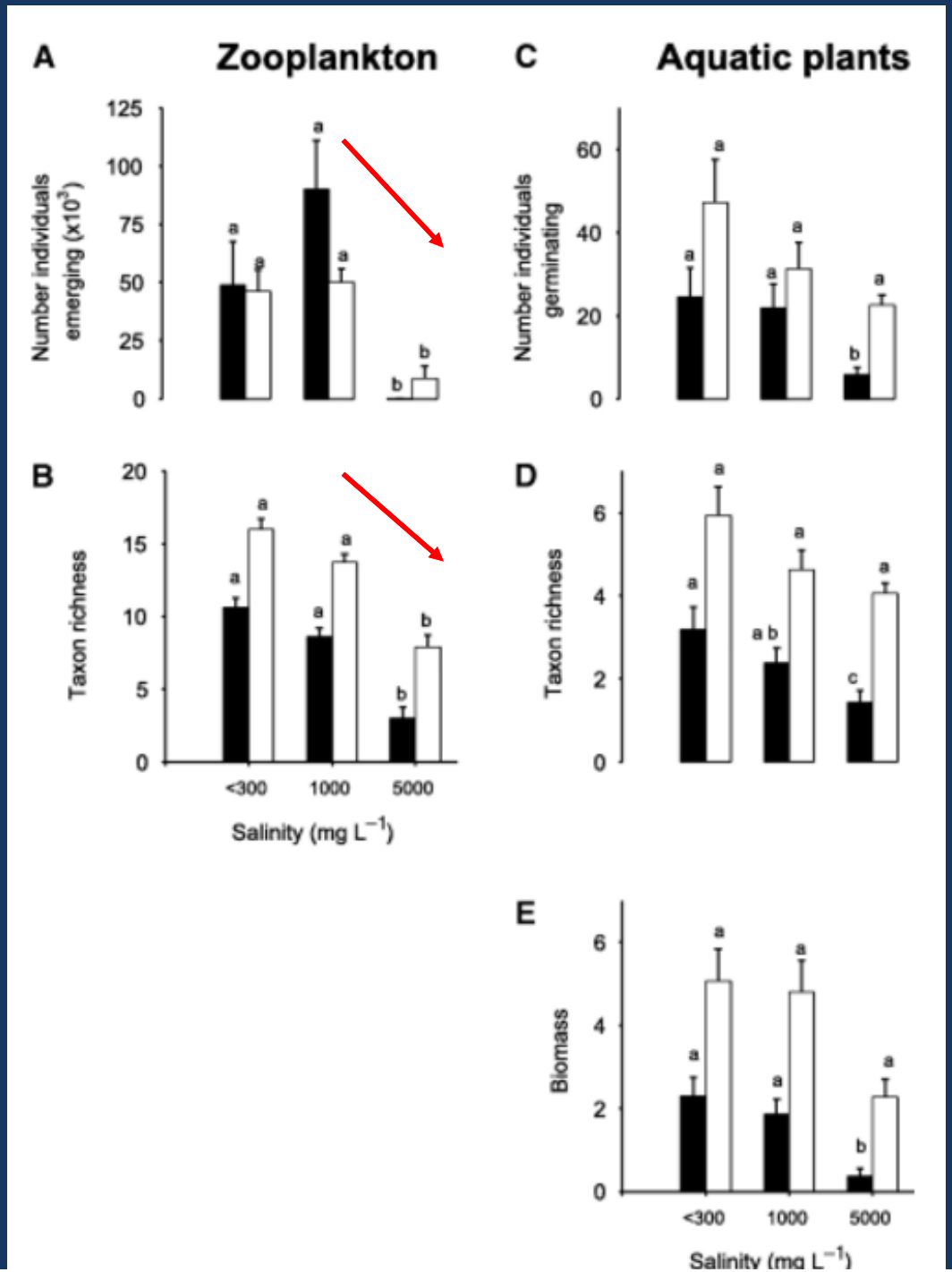

← <1.0 PSU and > 100,000 zoo/m³
Carquinez Zoo
350000
300000
250000
200000
150000
100000
50000
0
0
5
10
15
20
Carquinez PSU


P = 0.2935
R² = 0.110
← <1.0 PSU and > 100,000 zoo/m³
Carquinez Zoo
350000
300000
250000
200000
150000
100000
50000
0
0
5
10
15
20
Carquinez PSU


200000
150000
100000
50000
0
San Joaquin Zoo
0.2
0.25
0.3
0.35
San Joaquin PSU


P = 0.6309
R² = 0.030
200000
150000
100000
50000
0
San Joaquin Zoo
0.2
0.25
0.3
0.35
San Joaquin PSU


A
Zooplankton
Number individuals emerging (x10^3)
125
100
75
50
25
0
B
Taxon richness
20
15
10
5
0
<300
1000
5000
Salinity (mg L^{-1})
C
Aquatic plants
Number individuals germinating
60
40
20
0
D
Taxon richness
6
4
2
0
E
Biomass
6
4
2
0
<300
1000
5000
Salinity (mg L^{-1})


A
Zooplankton
C
Aquatic plants
Number individuals emerging (x10^3)
Number individuals germinating
B
Taxon richness
D
Taxon richness
E
Biomass
<300
1000
5000
Salinity (mg L^{-1})

Results/ Discussion

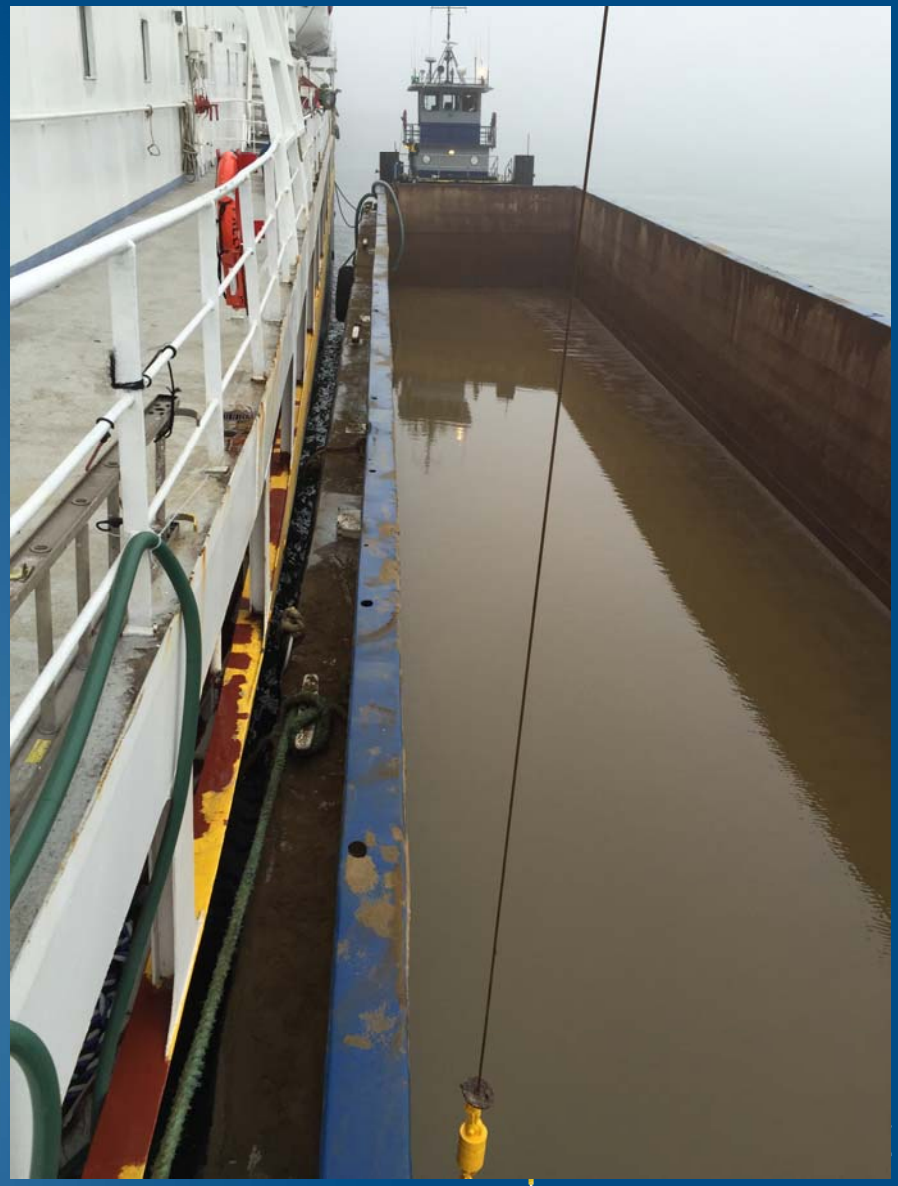
Carquinez: (0.48 - 20.27 PSU)
San Joaquin: (0.18 – 0.34 PSU)

No correlation between salinity and zooplankton abundance.

These are single samples taken mid-day, there could be high variability in a 24 hr period.

Not identifying down to species level.

CAL MARITIME



Questions?