Risk Analysis Based on Reported Data

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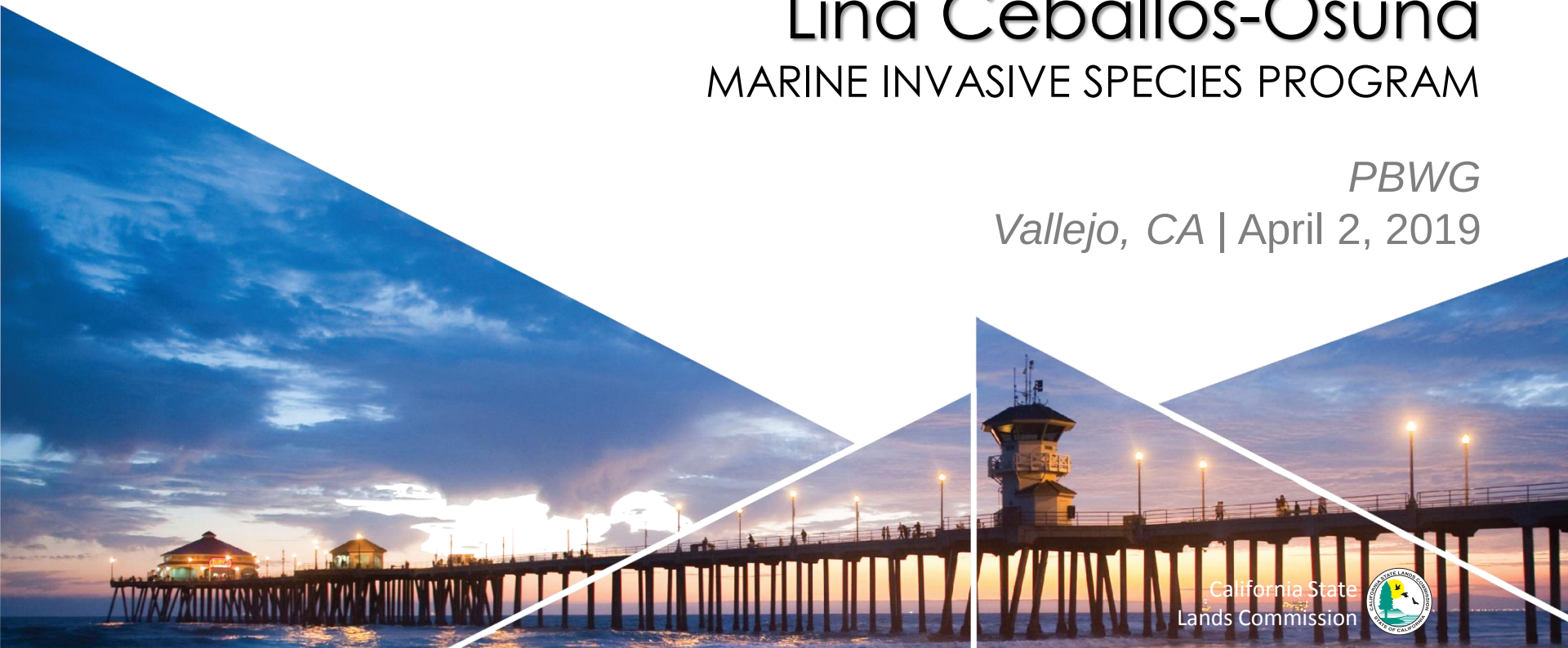
MARINE INVASIVE SPECIES PROGRAM

PBWG
Vallejo, CA | April 2, 2019

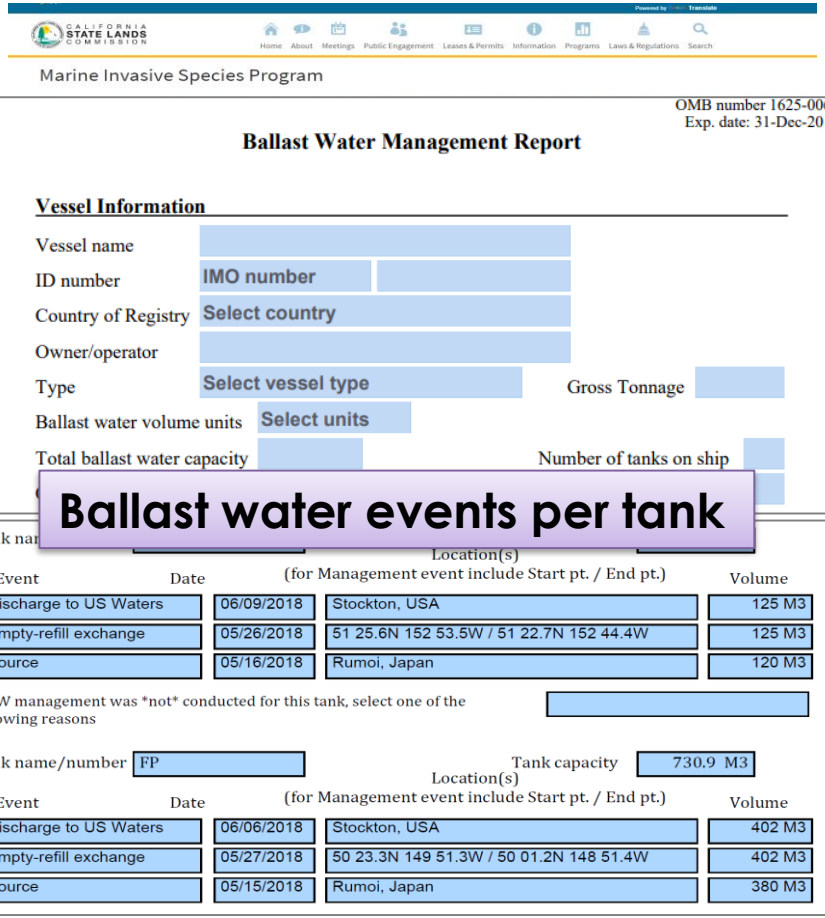


California State
Lands Commission

Outline

1. **Reported Data**
2. **Propagule Pressure**
3. **Ballast Water Discharged**
4. **Wetted Surface Area**
5. **Risk Assessment -PPP**
    - Different levels of risk assessment
    - Risk scores
6. **Questions**

1. Data from reported forms



CALIFORNIA STATE LANDS COMMISSION

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Marine Invasive Species Program

OMB number 1625-0069
Exp. date: 31-Dec-2018

Ballast Water Management Report

Vessel Information

Vessel name
ID number — IMO number
Country of Registry — Select country
Owner/operator
Type — Select vessel type — Gross Tonnage
Ballast water volume units — Select units
Total ballast water capacity — Number of tanks on ship

Ballast water events per tank

Tank nar

Event	Date	Location(s) (for Management event include Start pt. / End pt.)	Volume
Discharge to US Waters	06/09/2018	Stockton, USA	125 M3
Empty-refill exchange	05/26/2018	51 25.6N 152 53.5W / 51 22.7N 152 44.4W	125 M3
Source	05/16/2018	Rumoi, Japan	120 M3

If BW management was *not* conducted for this tank, select one of the following reasons

Tank name/number: FP — Tank capacity: 730.9 M3

Event	Date	Location(s) (for Management event include Start pt. / End pt.)	Volume
Discharge to US Waters	06/06/2018	Stockton, USA	402 M3
Empty-refill exchange	05/27/2018	50 23.3N 149 51.3W / 50 01.2N 148 51.4W	402 M3
Source	05/15/2018	Rumoi, Japan	380 M3

STATE OF CALIFORNIA – STATE LANDS COMMISSION
MARINE INVASIVE SPECIES PROGRAM ANNUAL VESSEL REPORTING FORM
SLC 600.12 (Revised 08/17)
Public Resources Code Sections 71201.7, 71205

Vessel Name:
Official / IMO Number:
Responsible Officer's Name and Title:
Date Submitted (Day/Month/Year):

- **Last dry dock date**
- **Antifouling coatings**
- **Speed**
- **Freshwater transits**
- **Extended residency times**

b. If No, enter the delivery date and location where the vessel was built:

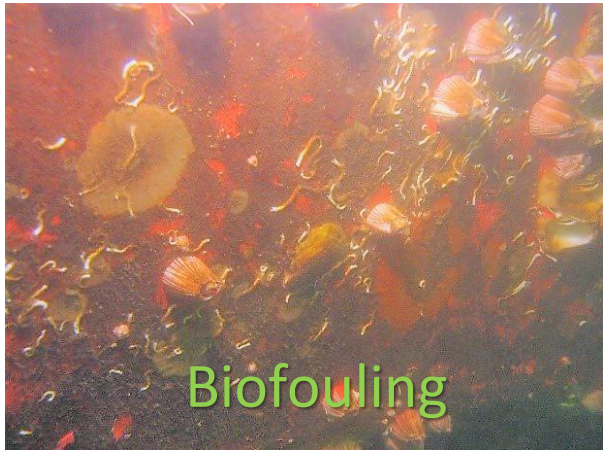
Delivery Date (**Day/Month/Year**):	
Port or Position:	Country:

3. Were the submerged portions of the vessel coated with an anti-fouling treatment or coating during the **out-of-water** maintenance or shipbuilding process listed above?

Yes, full coat applied	☐	
Yes, partial coat	☐	Date last full coat applied (**Day/Month/Year**)
No coat applied	☐	Date last full coat applied (**Day/Month/Year**)

2. Propagule Pressure

Frequency
Diversity
Abundance
} of organisms

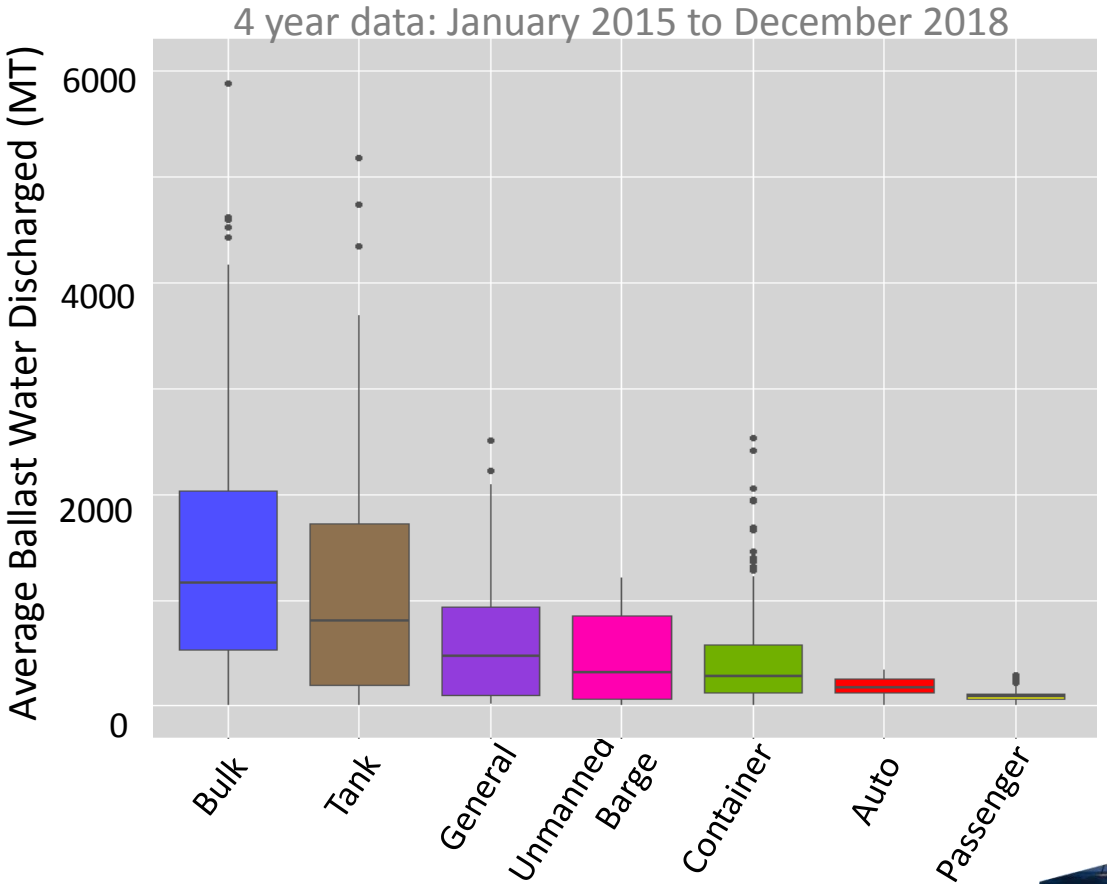


Non-native region

Outline

1. Reported Data
2. Propagule Pressure
3. **Ballast Water Discharges**
4. **Wetted Surface Area (Biofouling proxy)**
5. Risk Assessment -PPP
   - Different levels of risk assessment
   - BWD +WSA
6. Questions?

3. Ballast Water-Potential Risk



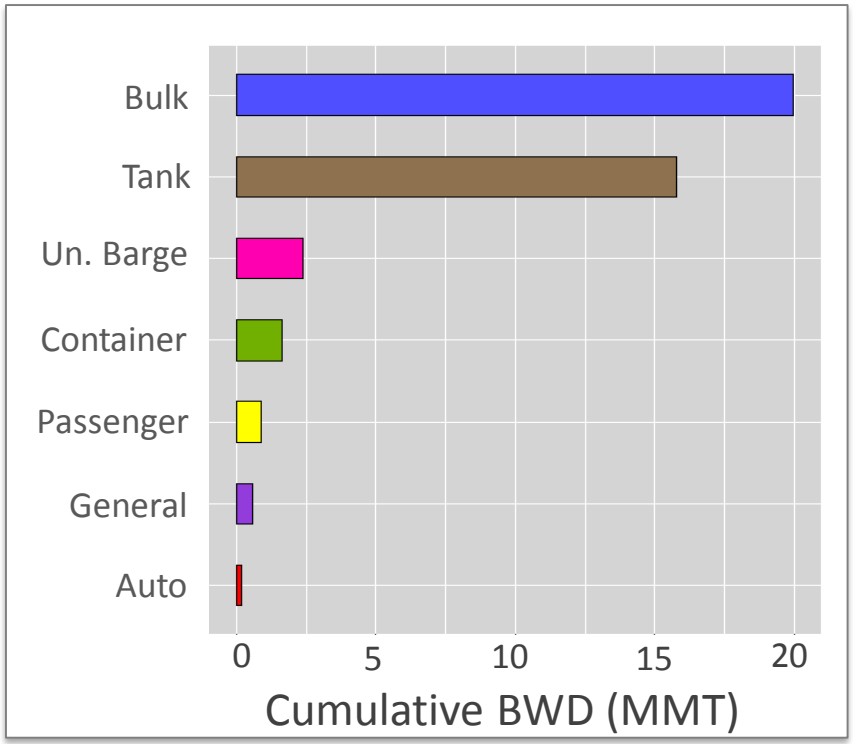
California receives ~11 MMT/year of BW

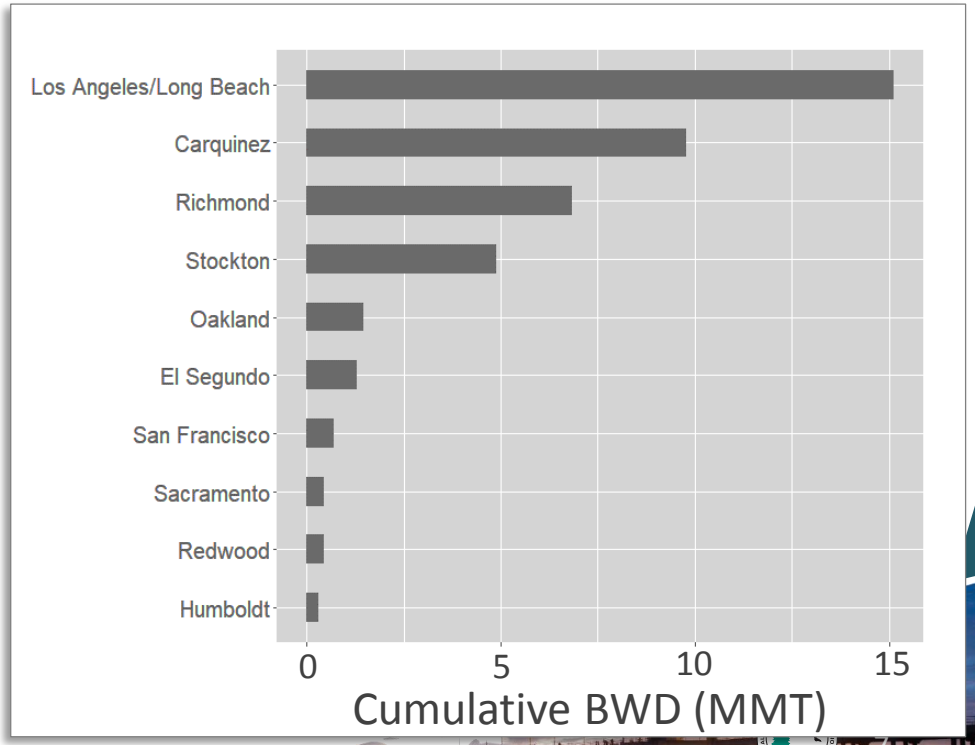
Each ballast water discharge event has the POTENTIAL to release over **~21 million individual organisms**

(Minton et al. 2005)

3. Ballast Water-Potential Risk

4 year data: January 2015 to December 2018





4. Wetted Surface Area-Potential Risk

but ALL vessels present a Biofouling risk

Photos by L Penland SERC

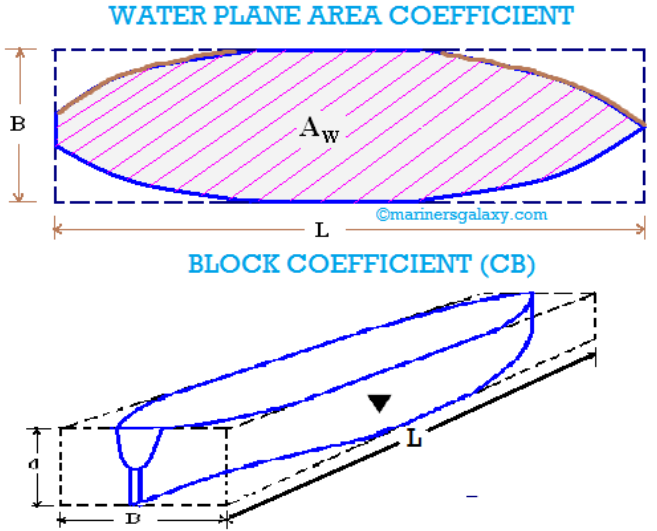
~85% of vessels do not discharge BW in CA

4. Wetted Surface Area

$$WSA = L(2T + B)C_M^{0.5}(0.4530 + 0.4425C_B - 0.2862C_M - 0.003467\frac{B}{T} + 0.3696C_{WP}) + 2.38\frac{A_{BT}}{C_B}$$

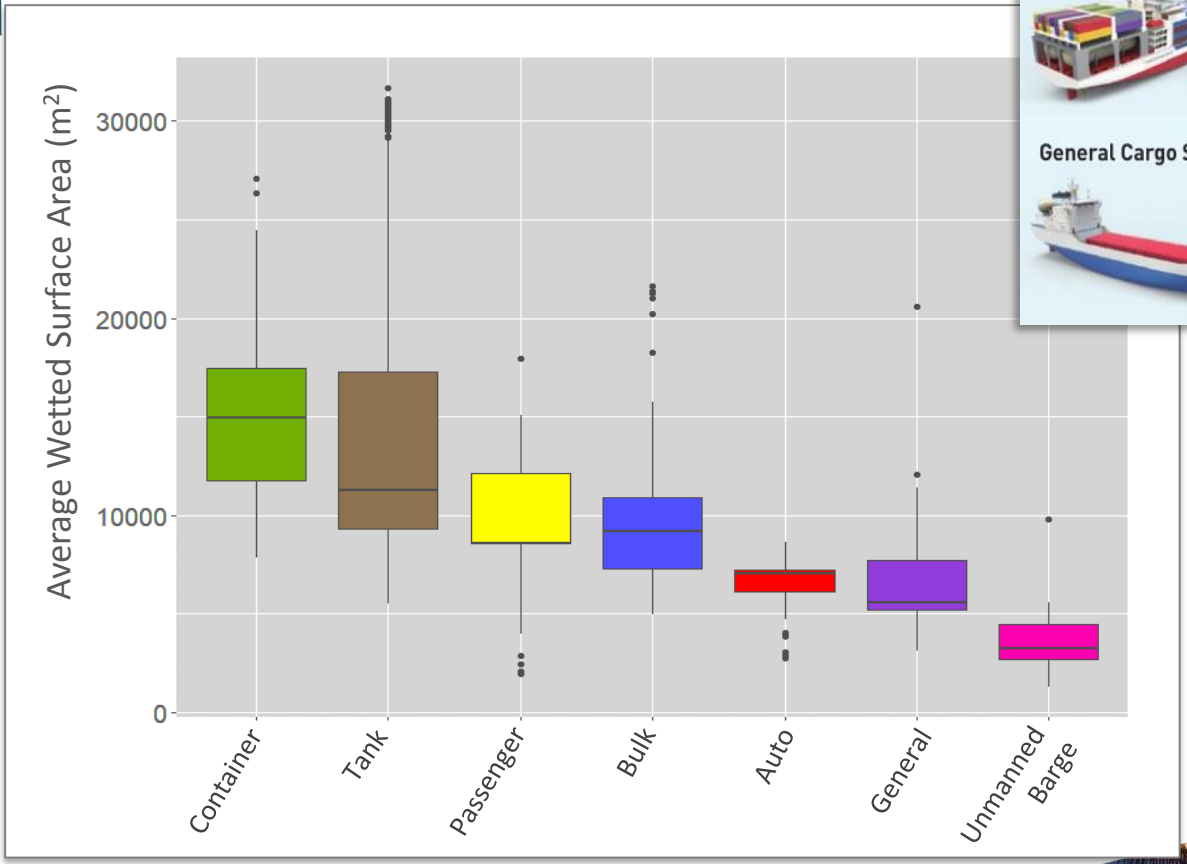
(Van Maanen and Van Oossanen, 1988 and Miller *et al.*, 2018)

- Length
- Draft
- Beam
- Bulbous bow
- Vessel type coefficients
- Correlated to Gross ton



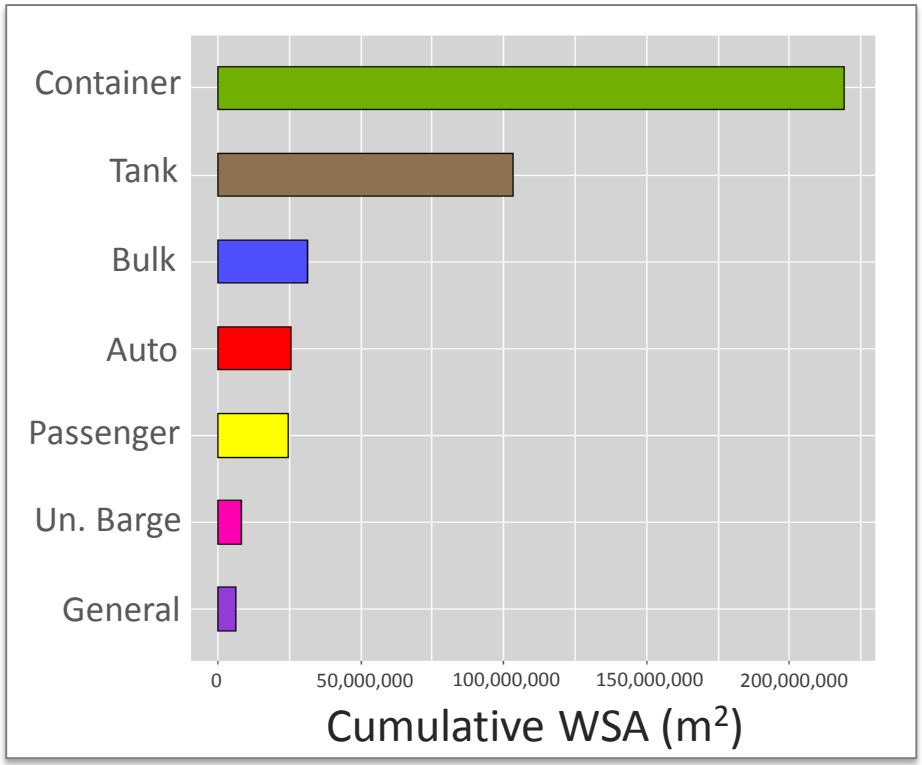
4. Wetted Surface Area

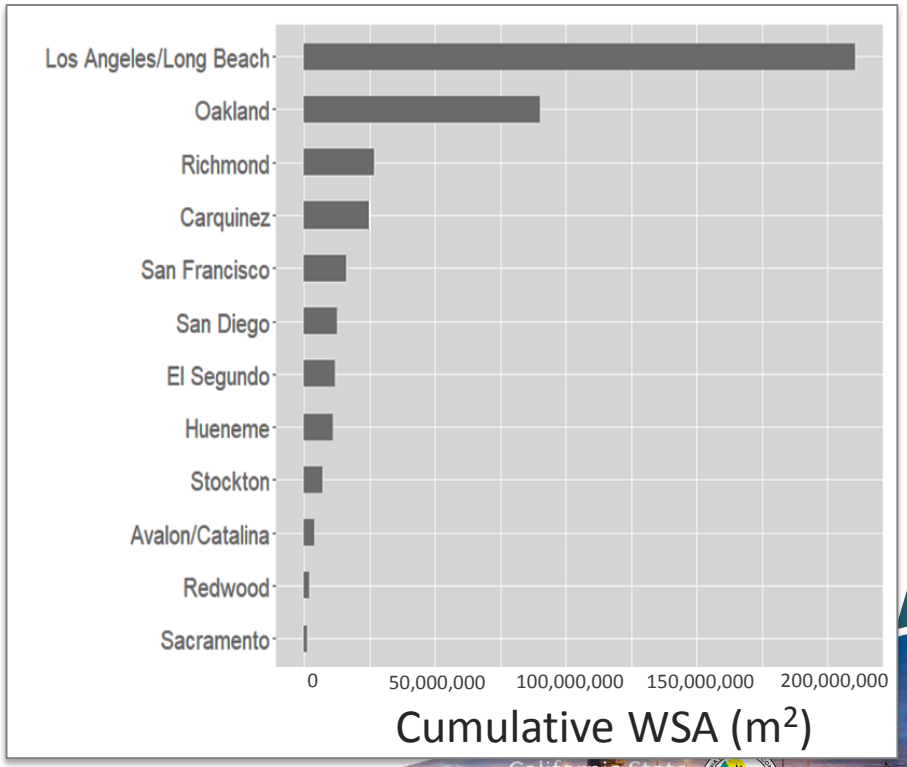
4 year data: January 2015 to December 2018



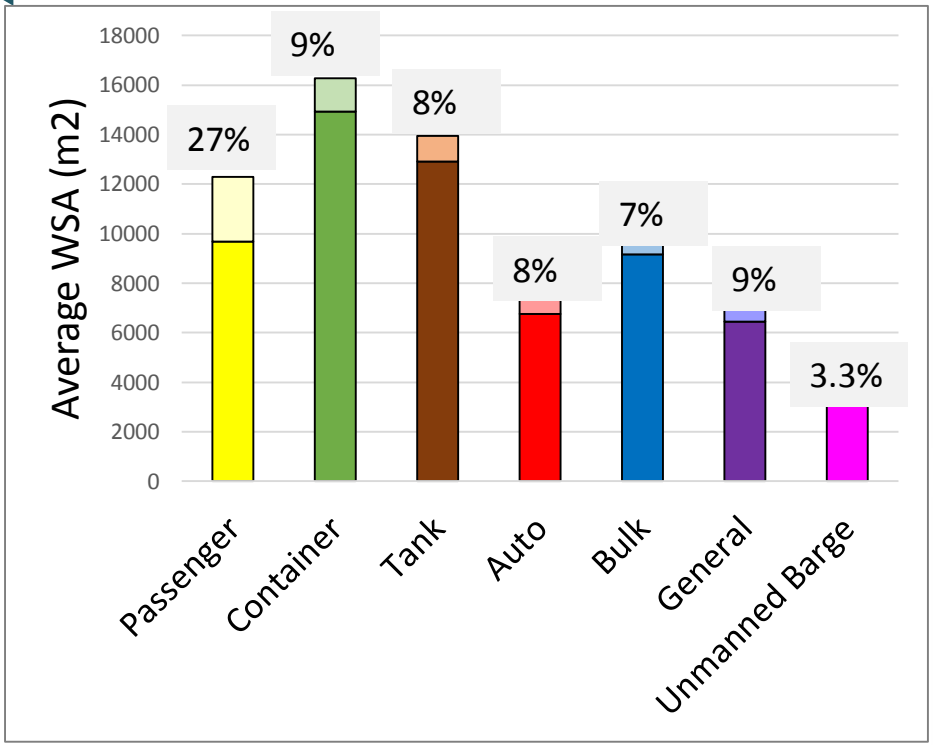
4. Wetted Surface Area in California

4 year data: January 2015 to December 2018

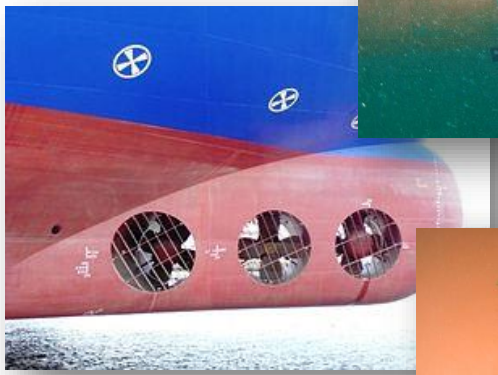




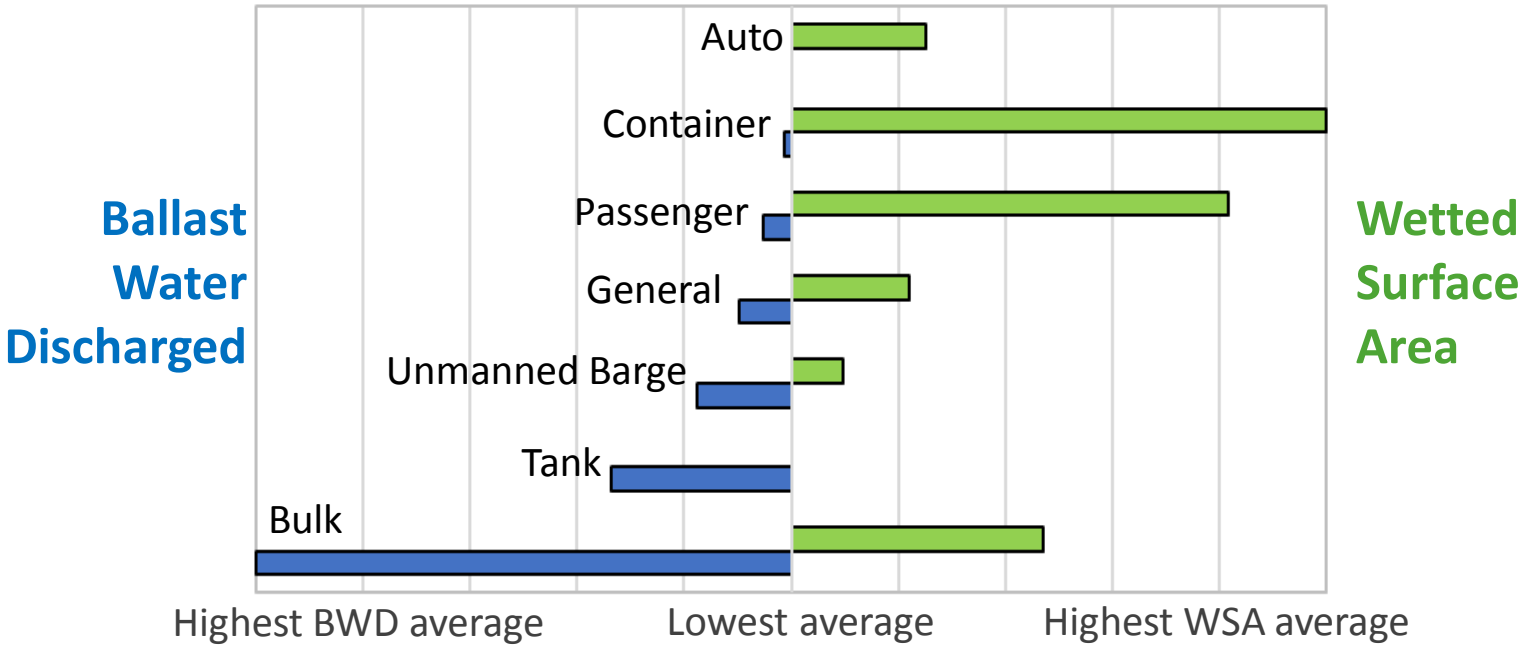
Niche Area- Hot spots



(Niche area percentages based on Moser *et al.*, 2017)



Relative Potential Risk



(Standardized data to compare relative pressure)

5. Potential Propagule Pressure (PPP)

Different Levels of Risk Assessment

Direct Assessment

- Water samples
- Hull surveys

Weighted Risk Assessment

Multiple factors:

- Ballast water source
- Management strategy
- Vessel profile (speed)
- Anti-fouling coatings
- Residency time

Pre-Arrival Assessment

- Using best available proxies (BW and BF)
- Observed patterns (Vessel type)
- Efficient use of resources

More details, increase precision: more effort and resources

Different Levels of Risk Assessment

Direct Assessment

- Water samples
- Hull surveys

Weighted Risk Assessment

Multiple factors:

- Ballast Water source
- Management strategy
- Vessel profile
- Anti-fouling Coatings matching profile
- dency time

Pre-Arrival Assessment

- Observed patterns
- Using best available proxies (BWD and WSA)

More details, increase precision: more efforts and resources

Pre-Arrival Risk Assessment

Relative combined risk based on observed vessel type patterns

Vessel Type	Average BWD (MMT)	Relative BWD rank
Bulk	0.00580	7
Tank	0.00197	6
Unmanned Barge	0.00105	5
General	0.00060	4
Passenger	0.00035	3
Container	0.00011	2
Auto	0.00004	1

Pre-Arrival Risk Assessment

Relative combined risk based on observed vessel type patterns

Vessel Type	Average BWD (MMT)	Relative BWD rank
Bulk	0.00580	7
Tank	0.00197	6
Unmanned Barge	0.00105	5
General	0.00060	4
Passenger	0.00035	3
Container	0.00011	2
Auto	0.00004	1

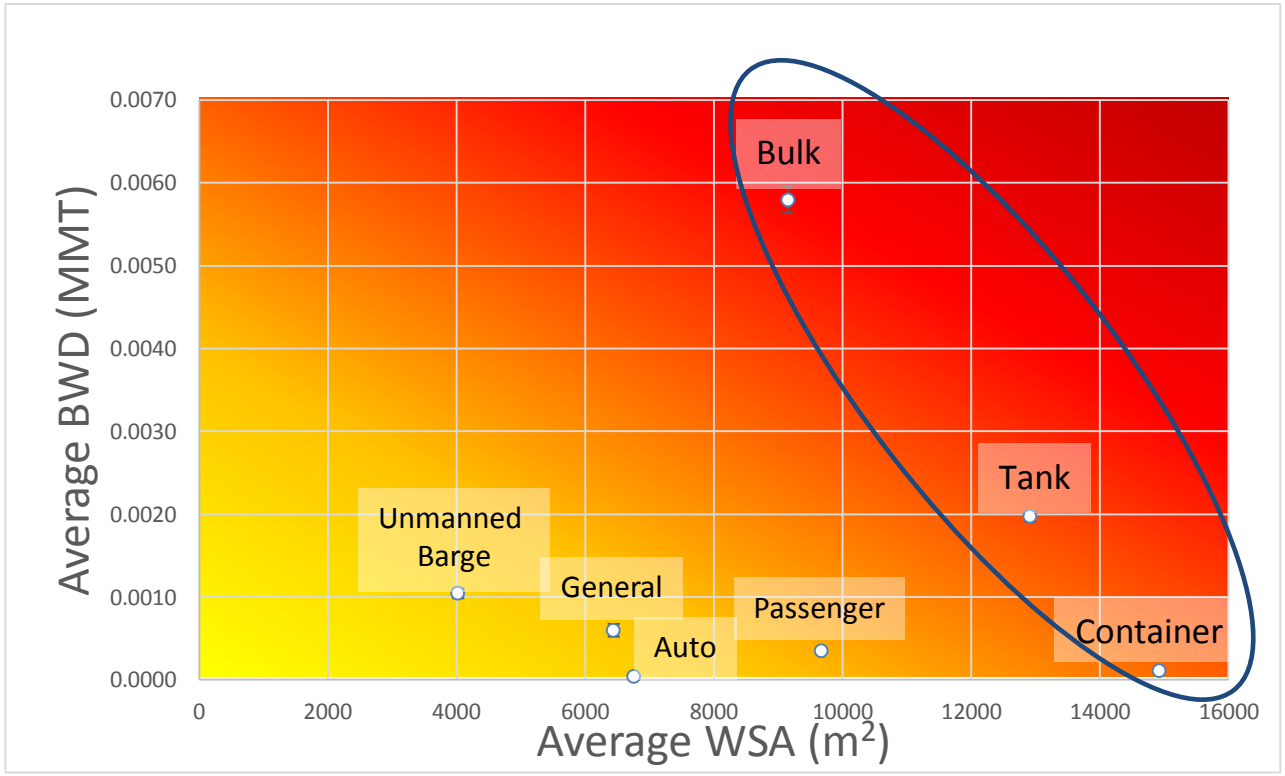
Vessel Type	Average WSA (m^2)	Relative WSA rank
Container	14929.02	7
Tank	12919.97	6
Passenger	9671.39	5
Bulk	9152.14	4
Auto	6762.18	3
General	6441.68	2
Unmanned Barge	4027.59	1

Pre-Arrival Risk Assessment

Relative combined risk based on observed vessel type patterns

Vessel Type	Average WSA (m^2)	Relative WSA rank	Average BWD (MMT)	Relative BWD rank	Risk score
Tank	12919.97	6	0.00197	6	**12**
Bulk	9152.14	4	0.00580	7	**11**
Container	14929.02	7	0.00011	2	**9**
Passenger	9671.39	5	0.00035	3	**8**
Unm. Barge	4027.59	1	0.00105	5	**6**
General	6441.68	2	0.00060	4	**6**
Auto	6762.18	3	0.00004	1	**4**

Combined Pre-Arrival Risk Assessment



Potential Propagule Pressure (PPP)

Different Levels of Risk Assessment

Direct Assessment
- Water samples
- Hull surveys
- Data analysis

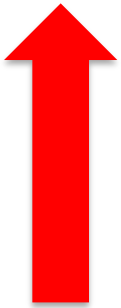
Weighted Risk Assessment
- Multiple factors

Pre-Arrival Assessment
- Observed patterns (BWD and WSA)

More details, increase precision: more effort and resources

Biofouling Weighted Risk Score (fixed / annual)

- Long residency times
- Age of coatings
- Low speed



- Freshwater transits
- Cleaning
- MGPS
- *Antifouling coatings matching profile

BW Weighted Risk? (different each arrival)

- **Volume**
- BW source
- Environmental match
- Management strategy

Best available parameter, represents PPP

Potential Risk Score

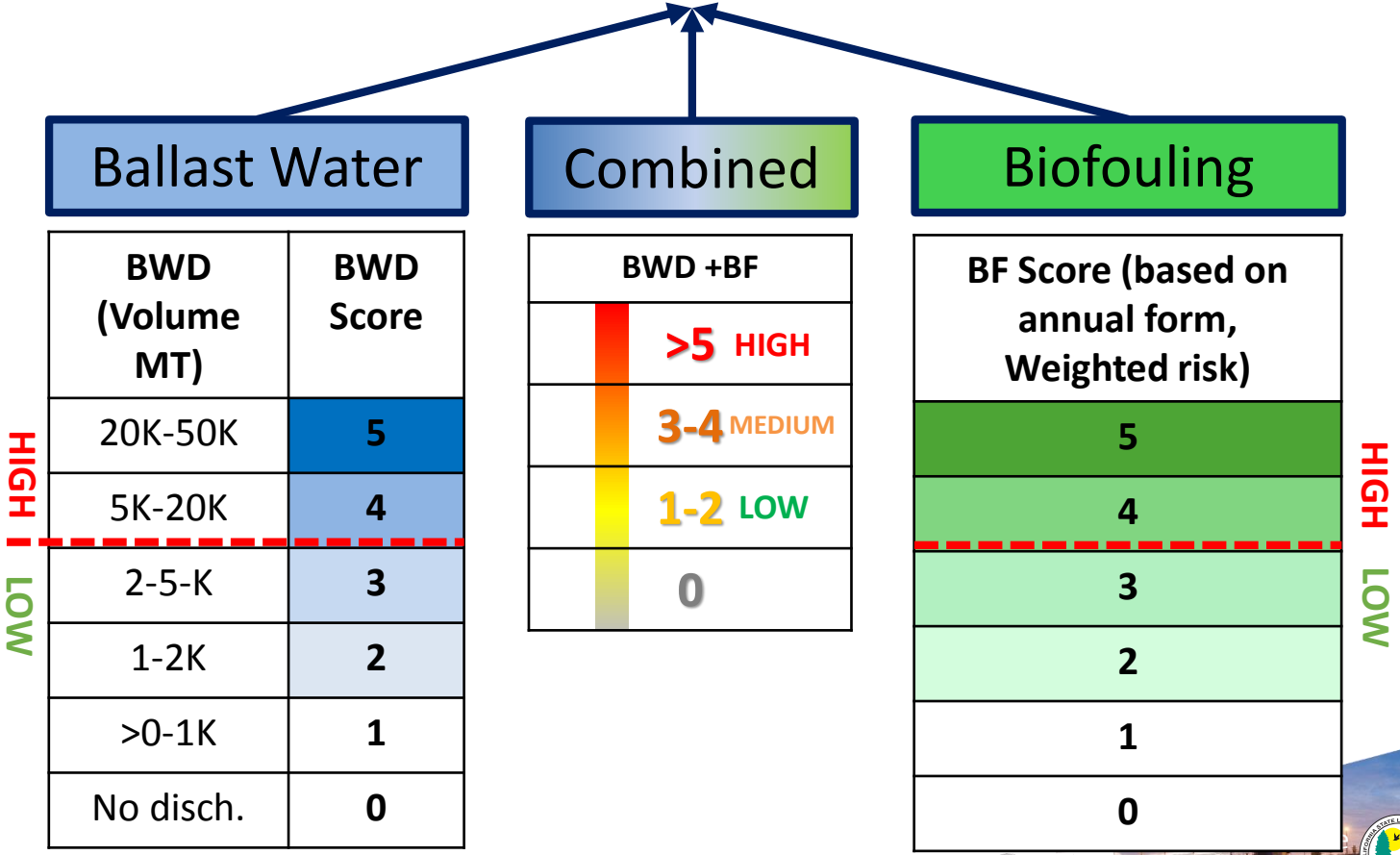
Ballast Water

BWD (Volume MT)	BWD Score
20K-50K	5
5K-20K	4
2-5-K	3
1-2K	2
>0-1K	1
No disch.	0

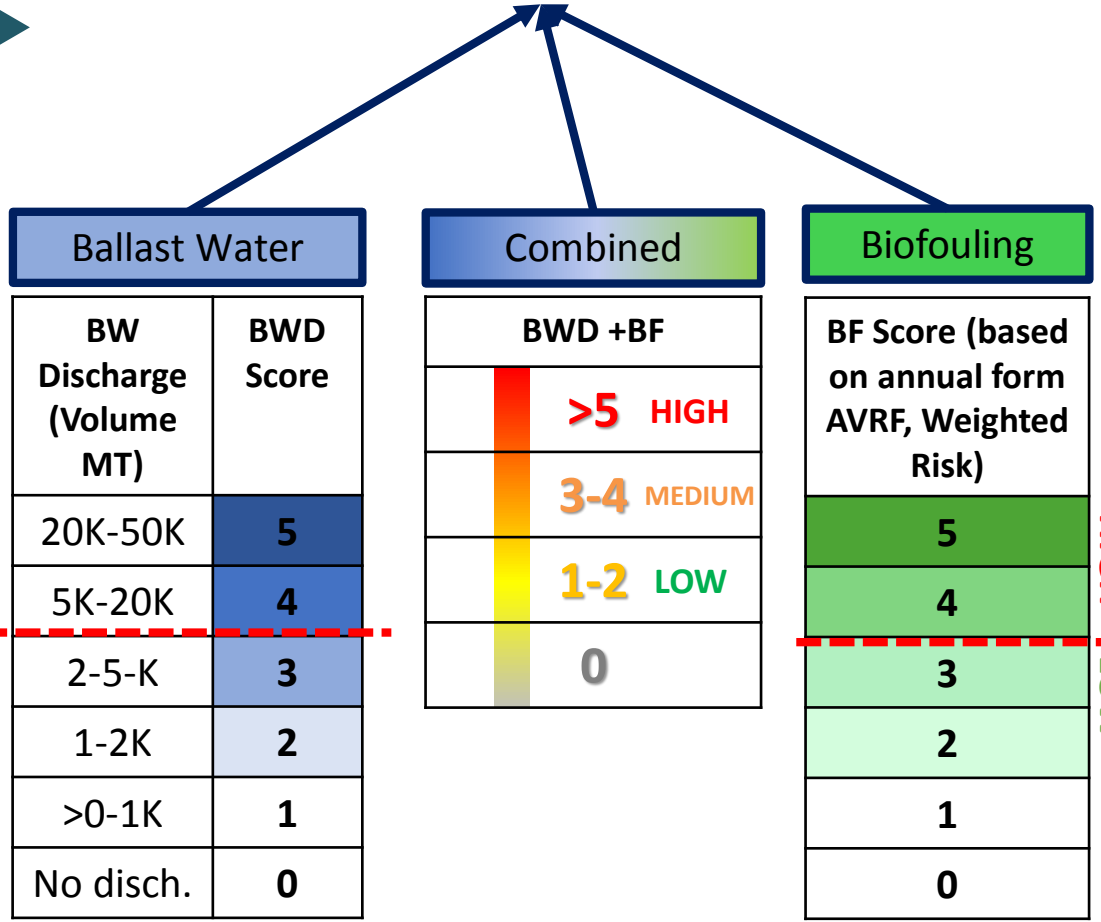
Biofouling

BF Score (based on annual form, Weighted risk)
5
4
3
2
1
0

Potential Risk Score



Potential Risk Score



Example 1:
- BWD= 1.5K= 2 Low
- AVRF= 4 High
- Combined: 6 High

→ HIGH

Example 2:
- BWD= 5K = 4 High
- AVRF= 1 Low
- Combined: 5 High

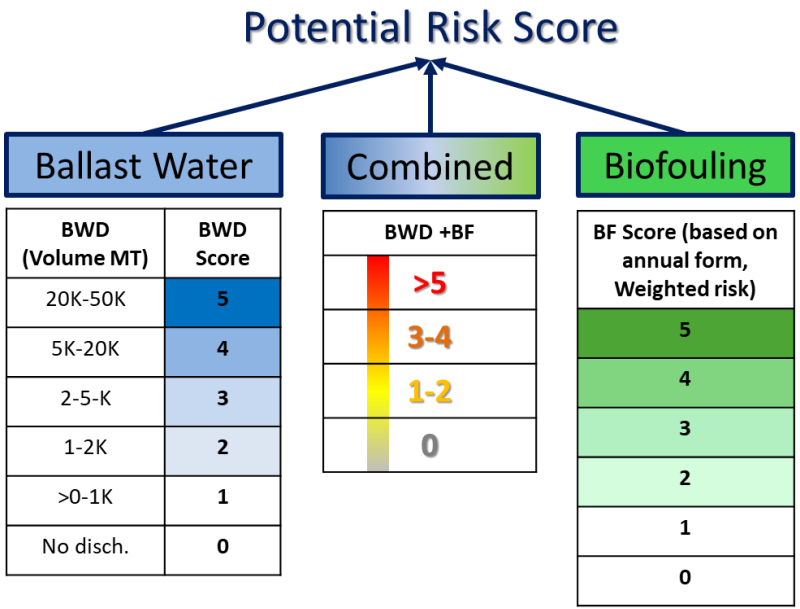
→ HIGH

Example 3:
- BWD= <1K = 1 Low
- AVRF= 3 Low
- Combined: 4 Medium

→ MEDIUM

Example 4:
- BWD= 3K = 1 Low
- AVRF= 1 Low
- Combined: 2 Low

→ LOW



INSPECTION - HIGH PRIORITY

OUTREACH

- New to CA
- >5 years without inspection
- 1st BF arrival: vessel newly subject to 4.8 (Biofouling regulations)

COMPLIANCE

- Potential Violations: Early detection of noncompliant discharges (e.g. Exchange in the wrong location)

Potential Propagule Pressure (PPP)

Different Levels of Risk Assessment

Direct Assessment

- Water samples – Compliance testing
- Hull surveys – ROV surveys
- Data analysis/Research/ Regulations

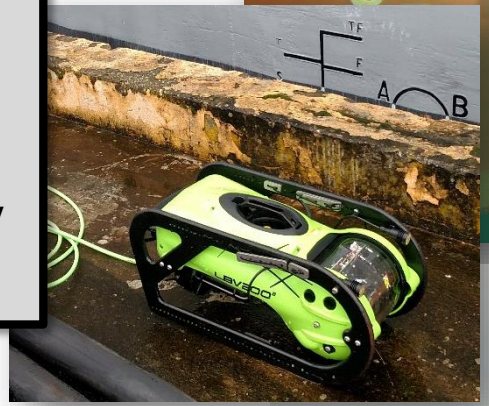


Photo by L Penland-SERC

Weighted Risk Assessment

- Multiple factors

Pre-Arrival Assessment

- BWD and WSA

Photo by K. Holzer-SERC

Prevention is the most effective method to prevent introductions

www.slc.ca.gov

THANK YOU & QUESTIONS

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