

Brightwater Marine Outfall Eelgrass Restoration: an 11 Year Odyssey

Kimberle Stark

DNRP, WLRD

Jeff Lundt

DNRP, WTD

Matthew Boyle

Grette Associates

Dana Woodruff

Pacific Northwest National Laboratory/Battelle

Cindy Rathbone

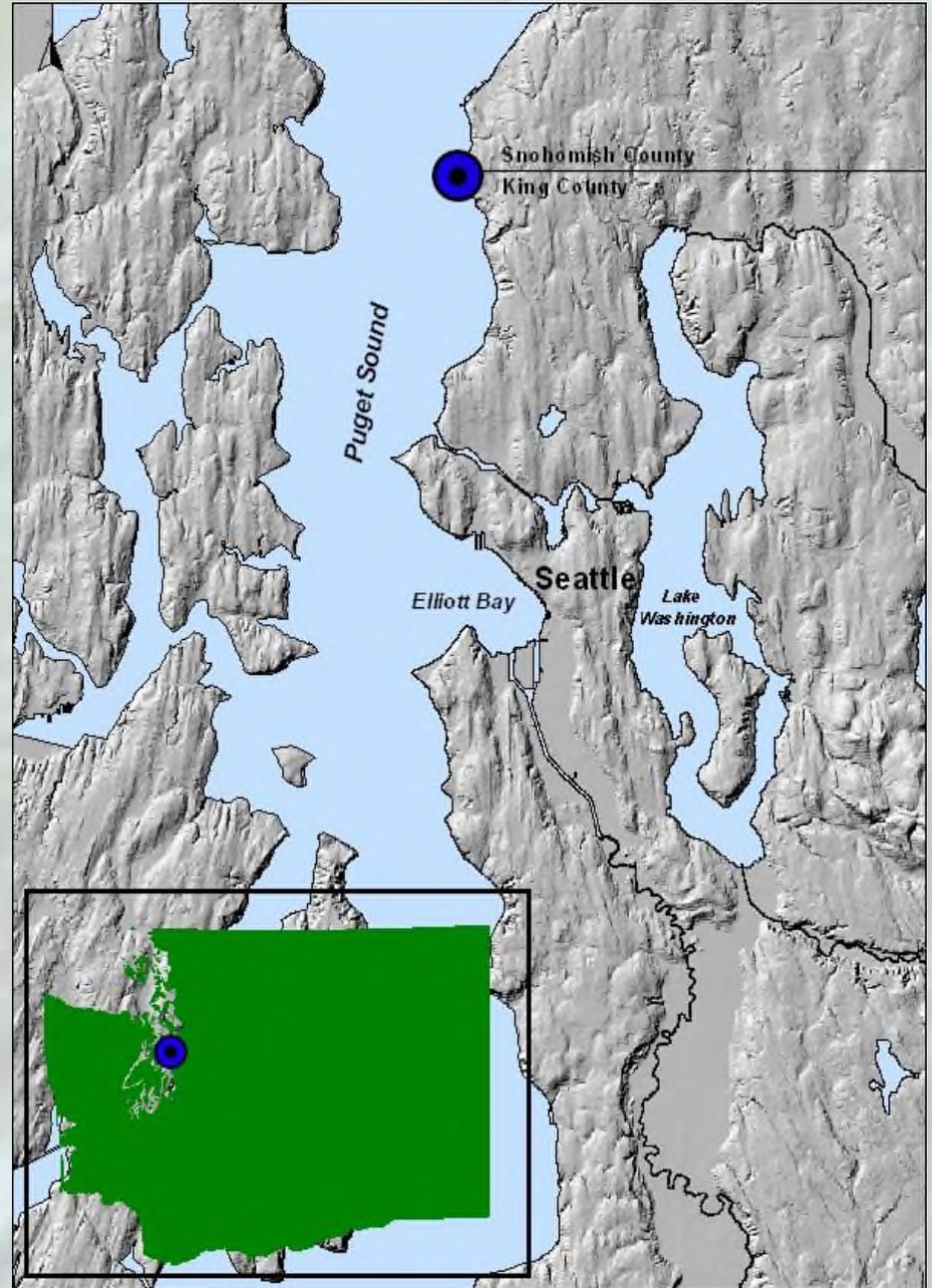
Washington State Dept. of Natural Resources

Laura Arber

Washington State Dept. of Fish and Wildlife



Why?



Why Care?

- Native perennial plant (*Zostera marina*) that forms meadows
- Nursery area for fish and shellfish
- Provides food & spawning habitat



Restoration Goal

To restore intertidal and shallow subtidal eelgrass habitat to pre-construction conditions

Performance Standards

-  Short-term (1-yr) survival of transplanted eelgrass constitutes no more than 50% loss in cover (area), or no greater than 75% loss in density.
-  Long-term (5-yr) survival of transplanted eelgrass is statistically equivalent to pre-construction abundance in the same area.

 King County

Brightwater
TREATMENT SYSTEM

**Eelgrass Restoration and
Biological Resources
Implementation Workplan**

Revised April 2008

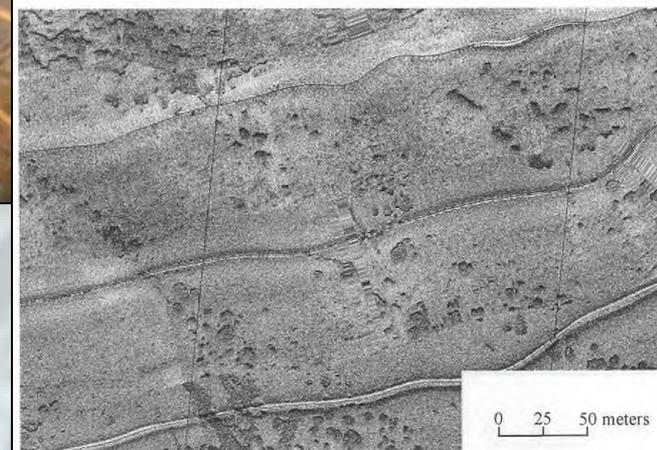
Prepared by
Grette Associates
Tacoma, WA
Battelle Marine Sciences Laboratory
Sequim, WA
King County Dept. of Nat. Resources & Parks
Seattle, WA

Restoration Plan Elements

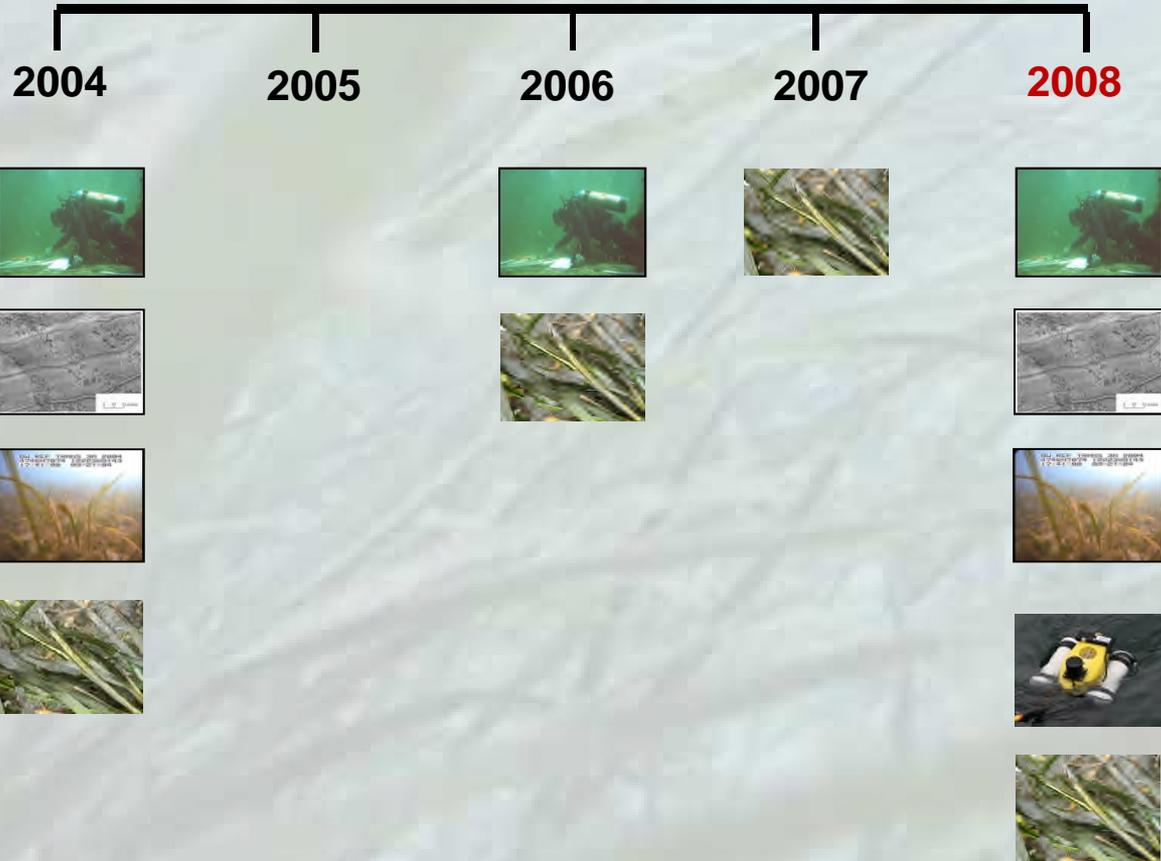
-  Pre-construction surveys
-  Pre-construction harvesting & propagation
-  Experimental harvest plots
-  Transplant
-  Post-construction surveys
-  Contingency plan

Pre-construction Surveys

- Document extent & mean densities of eelgrass
- Assess inter-annual variation
- Combination of methods: SCUBA divers, underwater video & side-scan sonar

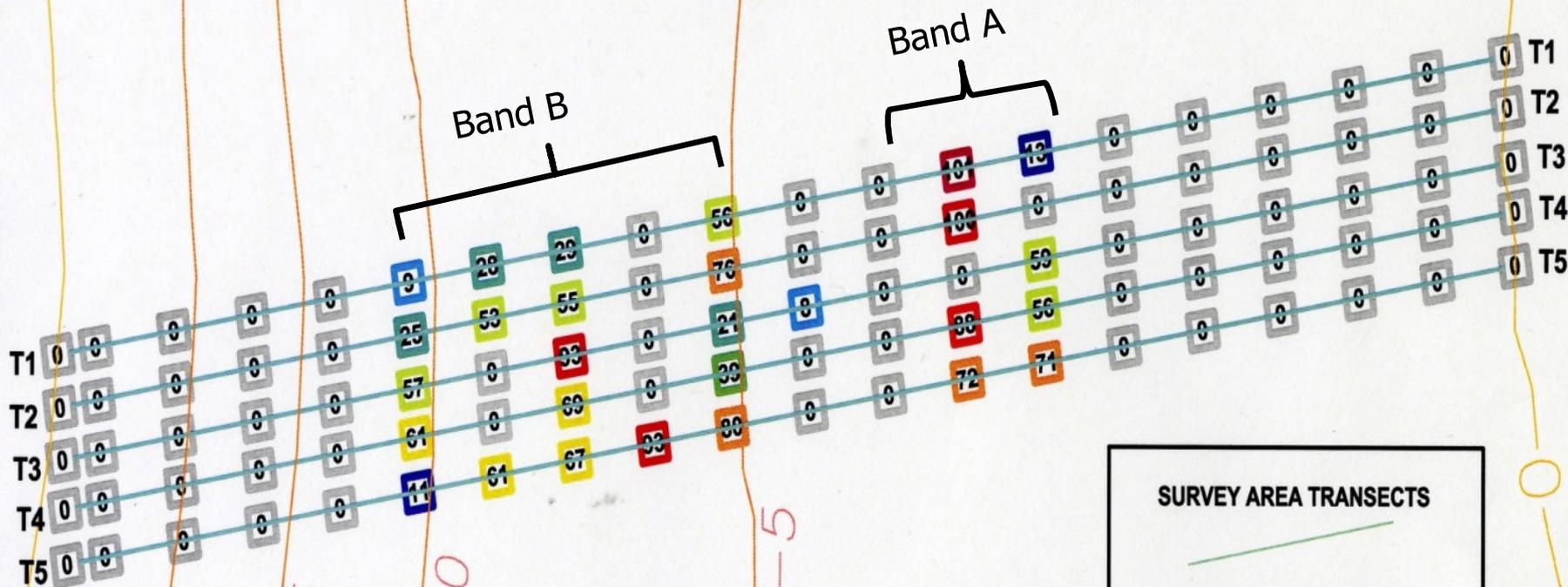


Pre-construction



divers	sonar	video	harvest	ROV
				

2008



Band B

Band A

-25

-20

-15

-10

-5

80 shoots/m²
26 shoots/m²

Grette Assoc.

SURVEY AREA TRANSECTS

MEAN EELGRASS DENSITY PER SQUARE METER

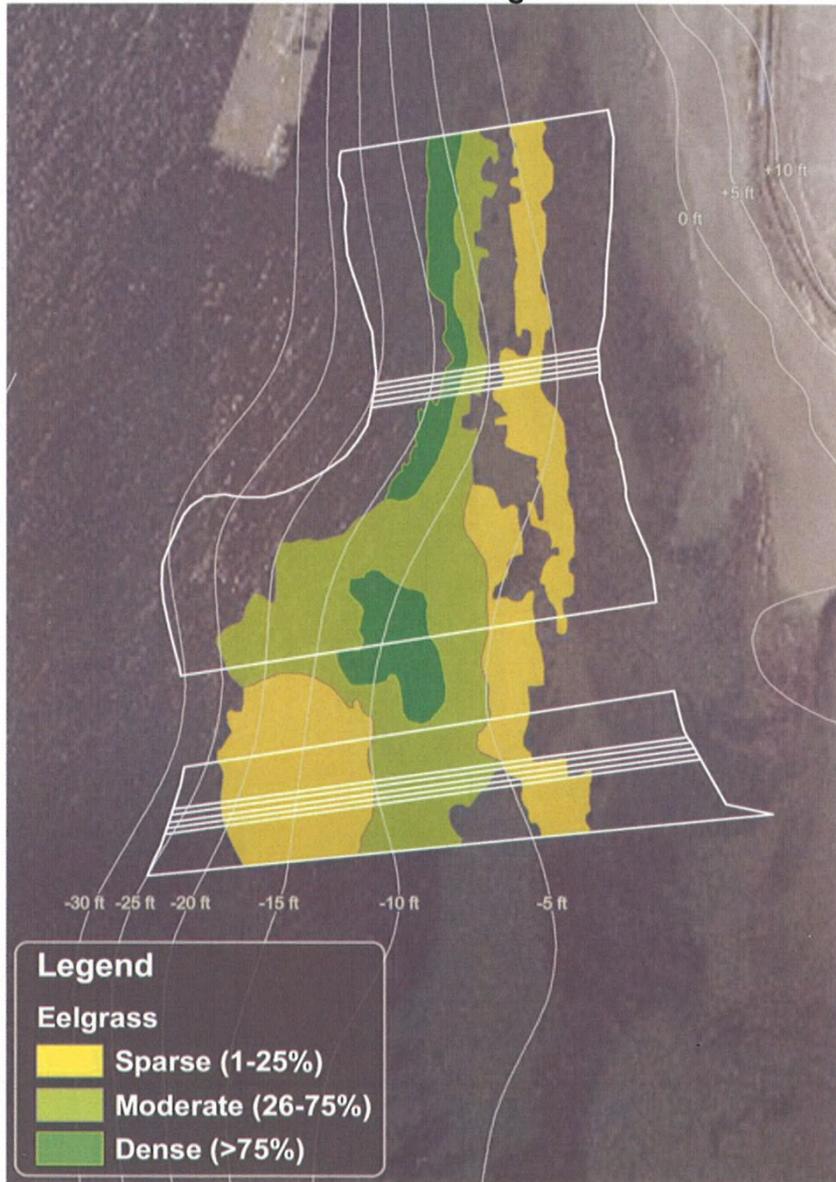
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SCALE IN FEET

DEPTH IN FEET MLLW

SEPTEMBER 2006

Brightwater Outfall Study Area and Reference Area Eelgrass - 2008

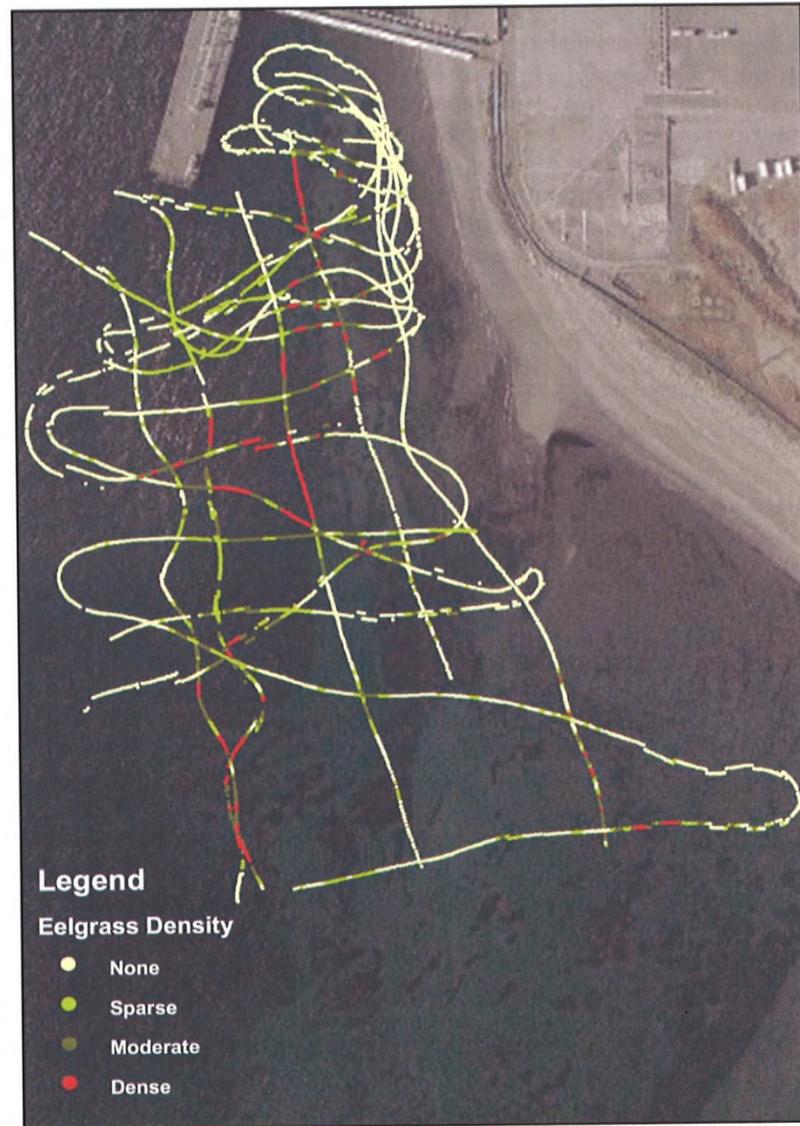


10 0 10 20 Meters

Eelgrass Coverage 2008
Aerial photo from USGS, June 2002



Brightwater Outfall Survey Area - 2008 Underwater Video Transects



25 0 25 Meters

Eelgrass Density 2008



Harvest



PNNL

304 shoots in 2004
1,500 shoots in 2006
490 shoots in 2007

Grette

12,240 shoots in 2008





Post-construction

2009 2010 2011 2012 2013 2014



<p>sonar</p> 	<p>video</p> 	<p>transplant</p> 	<p>divers</p> 	<p>ROV</p> 
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May 2009









Transplant

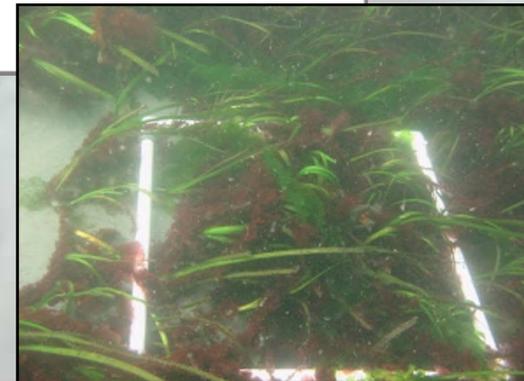
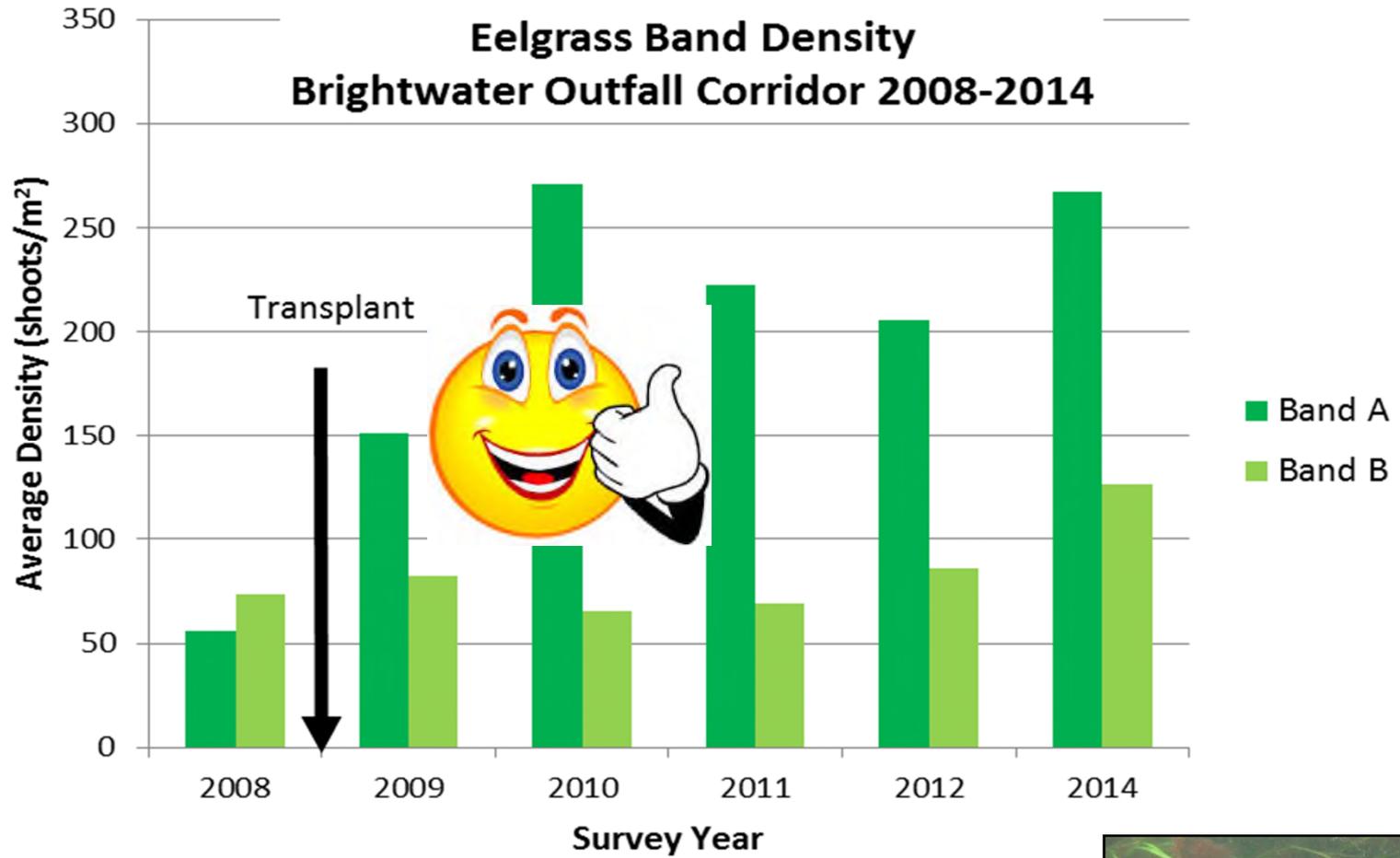




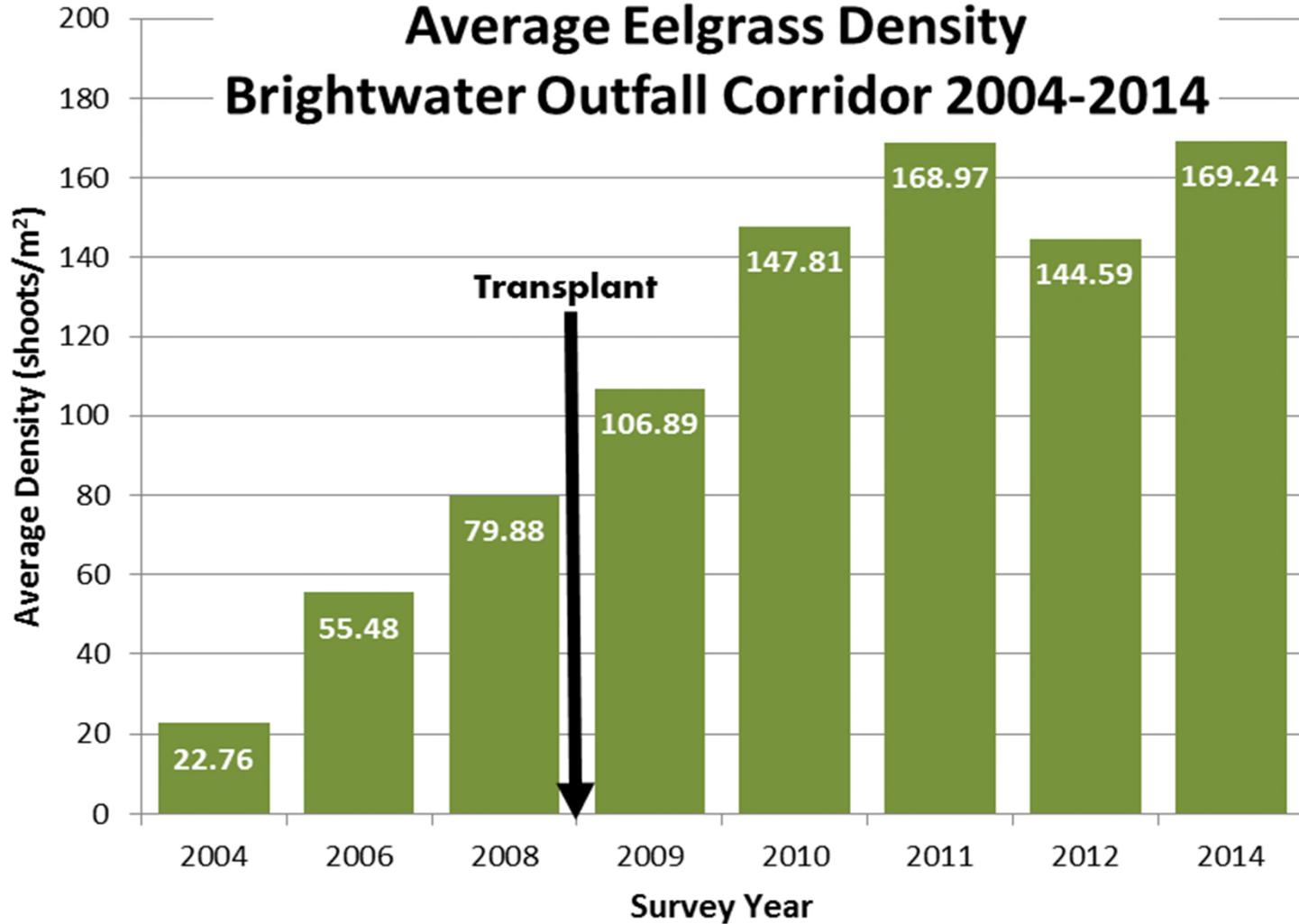
Post-construction



Eelgrass Band Density Brightwater Outfall Corridor 2008-2014



Average Eelgrass Density Brightwater Outfall Corridor 2004-2014



71%

So.....

- Met the 2010 short-term performance standard for both aerial coverage & density.
- Met the long-term survival performance standard. The 2014 density is statistically higher than pre-construction abundance in the same area.
- Were able to restore the site without having to harvest from a donor site.



Acknowledgments

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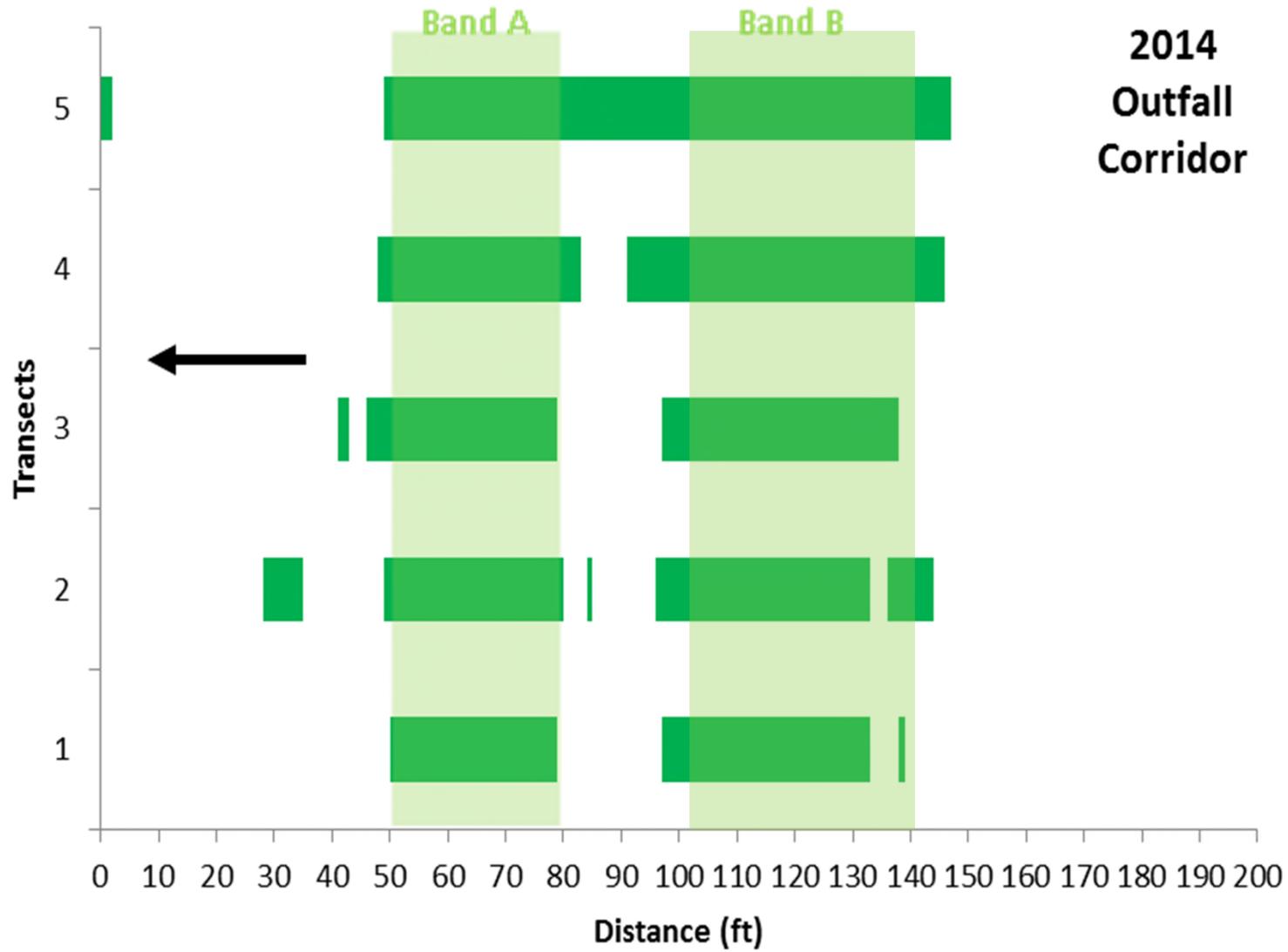
Jim Devereaux & ROV team—KC Env. Lab.

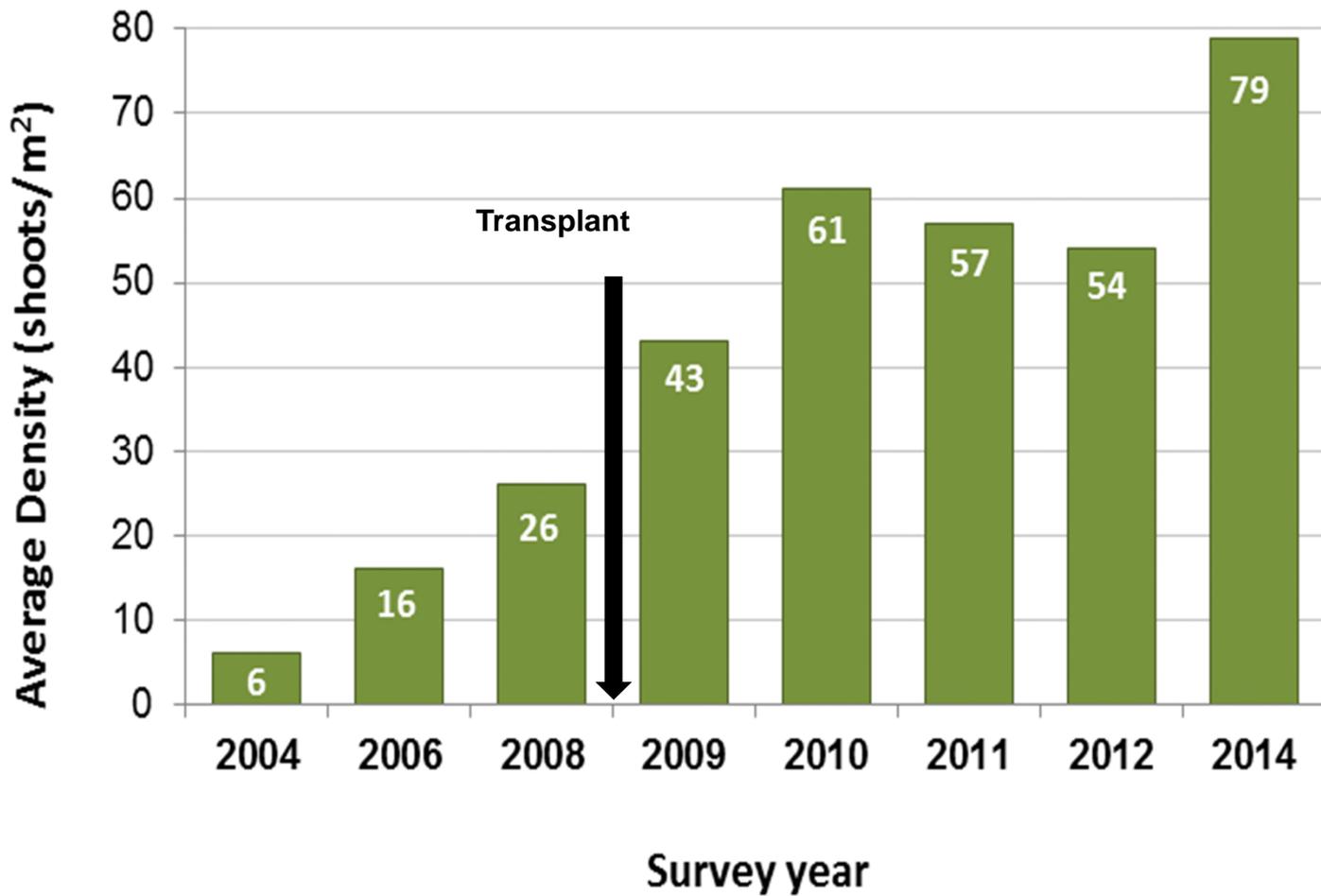
Grette Associates

PNNL (Pacific Northwest National Lab.)

<http://green2.kingcounty.gov/marine/Publications>

**2014
Outfall
Corridor**





101%