



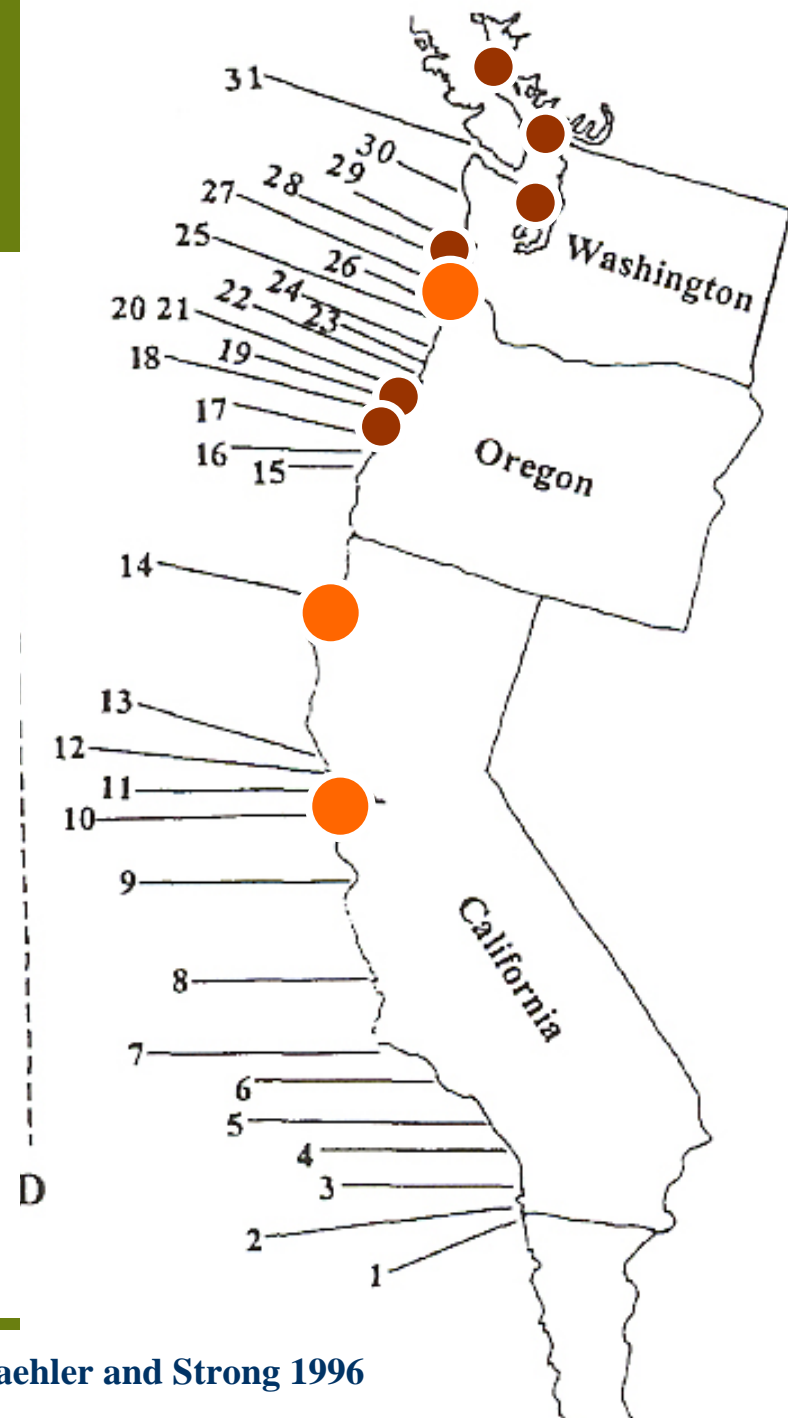
The threat of Humboldt County's *Spartina* population to other west coast estuaries

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Center for Lakes & Reservoirs

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Spartina Summit - Eureka, California

Known West Coast Infestations

- San Francisco Bay, CA (*alterniflora*, *patens*, *densiflora*, *anglica*)
- Humboldt Bay, CA (*densiflora*)
- Siuslaw River, OR (2) (*patens*, *alterniflora*)
- Coos Bay, OR (*alterniflora*)
- Gray's Harbor, WA (*alterniflora*, *densiflora*)
- Willapa Bay, WA (*alterniflora*)
- Puget Sound, WA (*anglica*, *patens*, *densiflora*)
- Comox Harbor, BC (*patens*)
- Fanny Bay, BC (*densiflora*)
- Boundary Bay, BC (*anglica*)



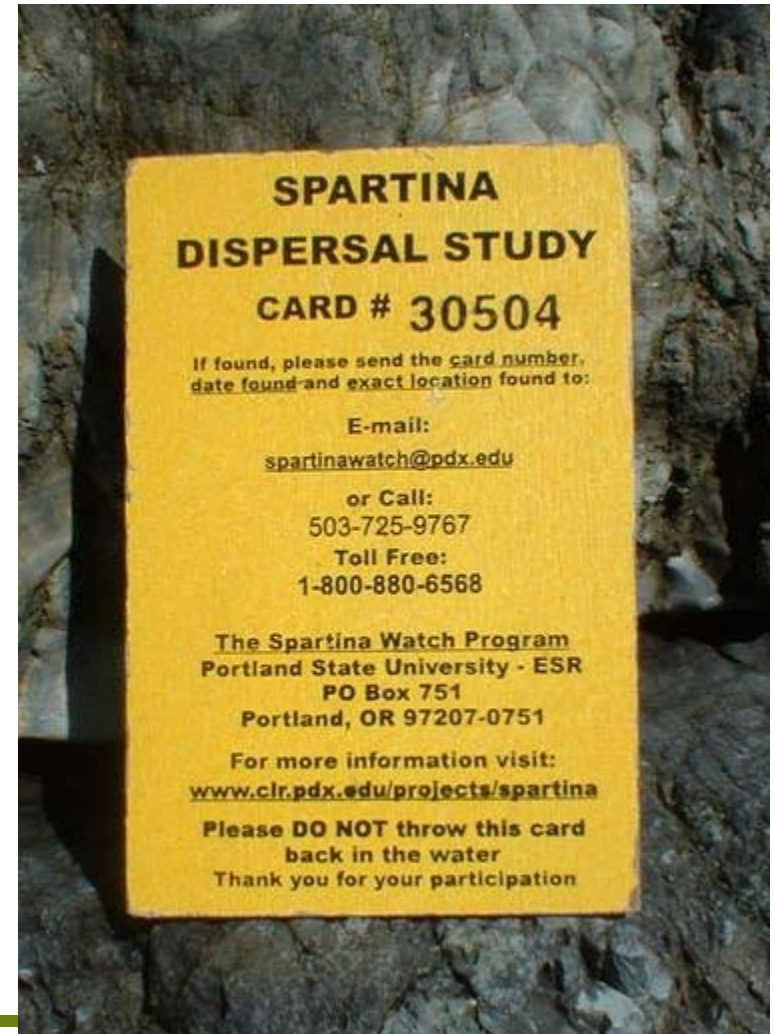
Drift Card Dispersal Study Objectives

- Seasonal & spatial dispersal of *Spartina* propagules via ocean currents from heavily infested bays
- Relative risk posed by different populations/species
- Identify common debris collection zones
- Education & outreach



Methods – Card Design

- Buoyant plywood cards (10 cm x 15 cm)
- Biodegradable - designed to persist 3-6 months
- Coded for release date and location
- NOAA specifications (Oahu, Hawaii Drift Card Study 2002-2004)



Methods – Releases

- Three release locations
- September 2005 through August 2006
- 200 cards/bay/month
- Within two hours of high tide

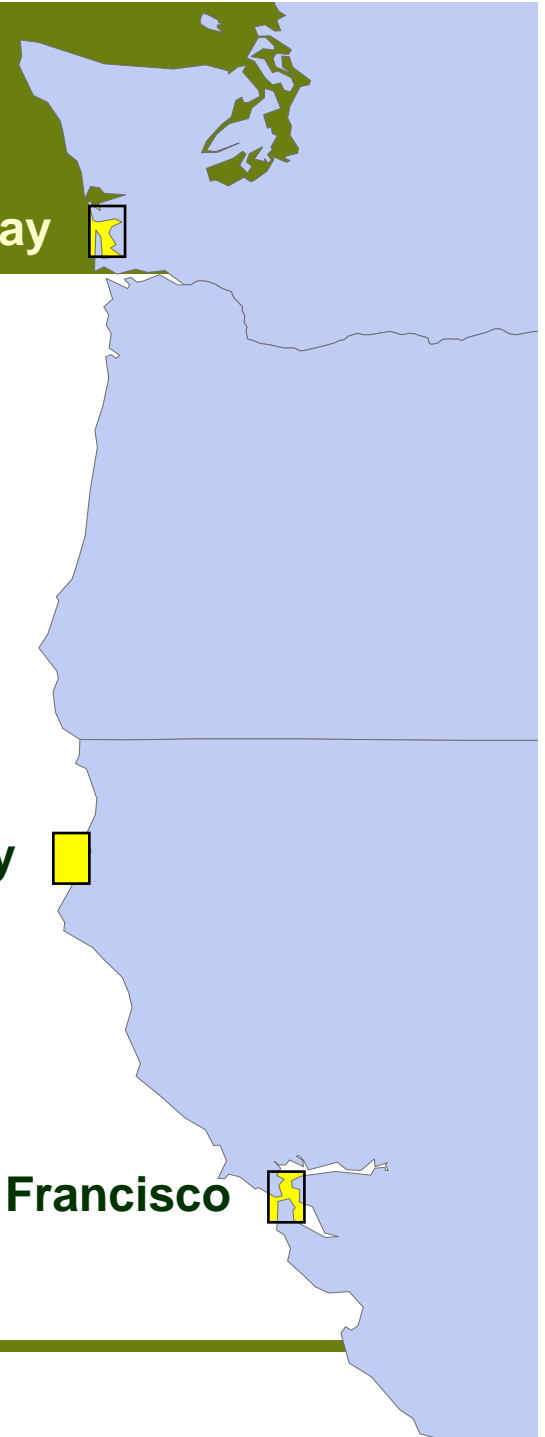
Willapa Bay



Humboldt Bay



San Francisco



Application of drift cards to *Spartina* dispersal

- *Spartina* seeds float and can be dispersed by currents
- Wrack mats observed offshore by local fishermen
- Isolated stem fragments repeatedly found along Northern Oregon and Washington coastlines



Application of drift cards to *Spartina* dispersal



- Drift cards previously used to model floating pollutants, circulation patterns, sewage outfall & lost cargo
- Persistence in environment
 - *Spartina* seeds viable ~ 4-7 months
(Callaway & Josselyn 1992, Kittelson & Boyd 1997)
 - Wrack capable of floating over two months
(Sayce et al 1997)
 - Wooden drift cards designed to persist 3-6 months depending on conditions

Drift card

Limitations:

- Simulates surface transport only
- May underestimate velocities
- Requires someone to find and report (correlation of recovery location with human use)

Applications:

- Study of near-shore, coast-wise transport on surface currents
- Identify potential collection zones and high priority early detection sites
- Low tech + strong outreach component

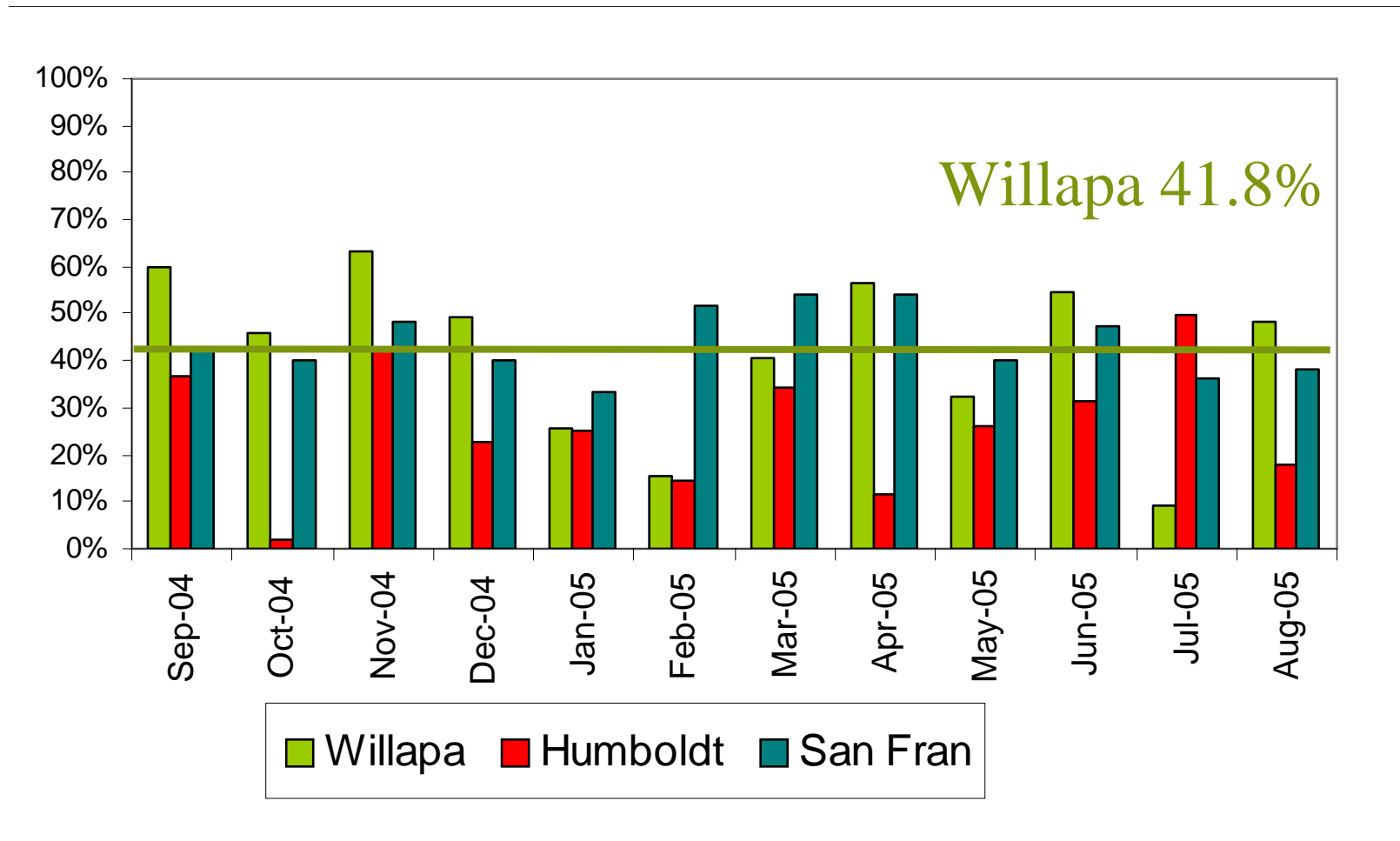


Methods – releases

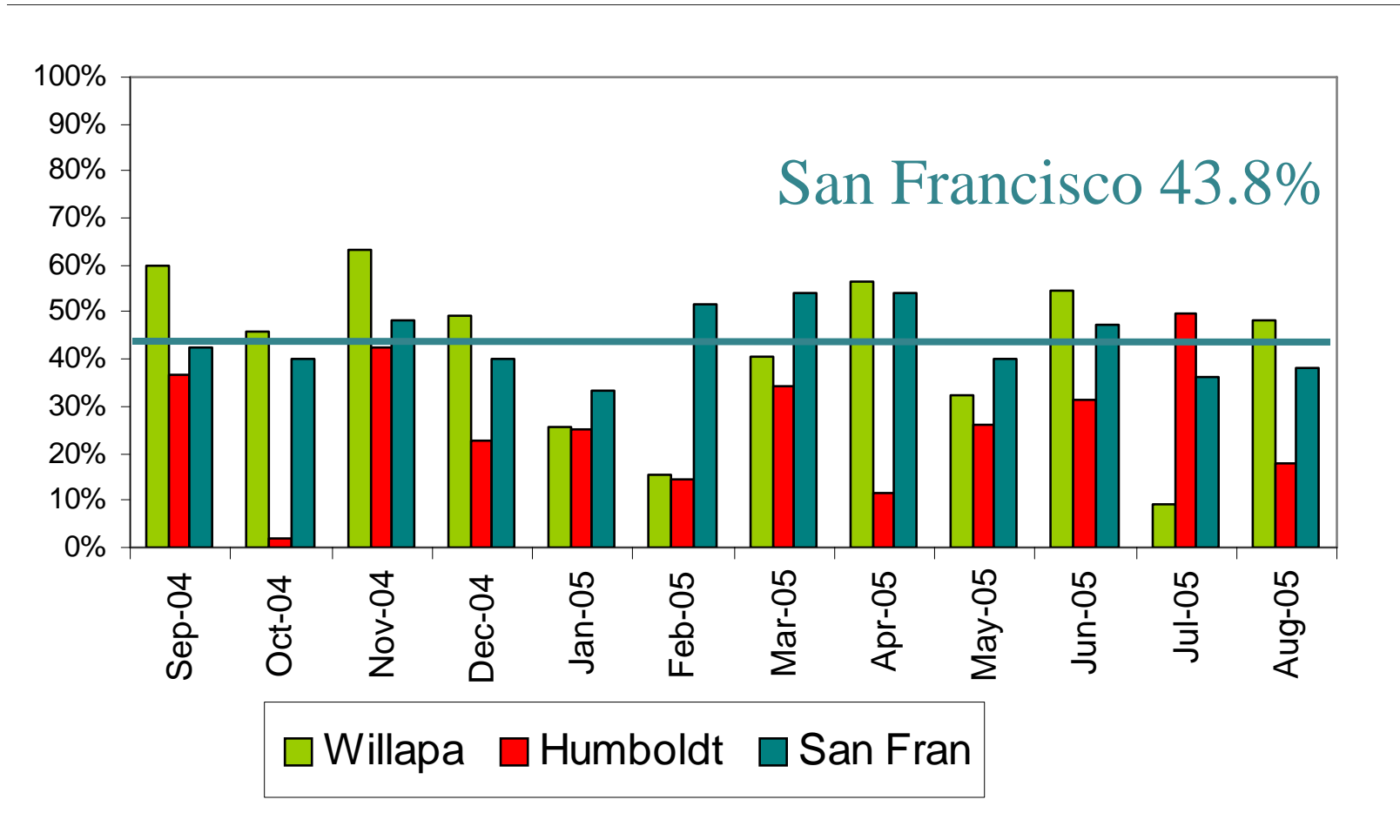
- One-year commitment from local agency staff
 - (WDFW) David Heimer, Travis Haring, Russell Nunez, Les Holcomb
 - (GGNRA, NPS) Kristen Ward
 - (USDFW - Arcata office) Bill Pinnix



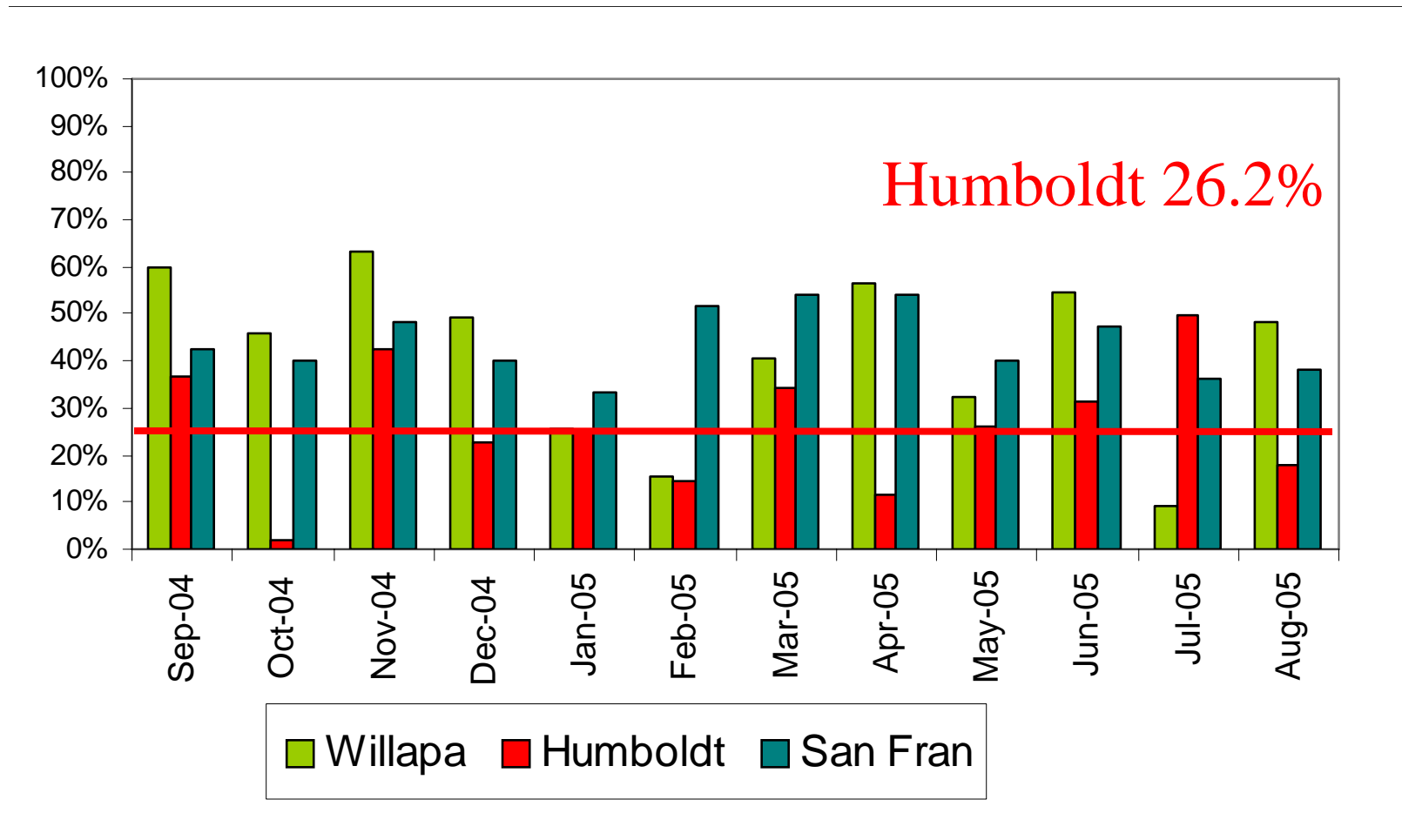
Results – return rates



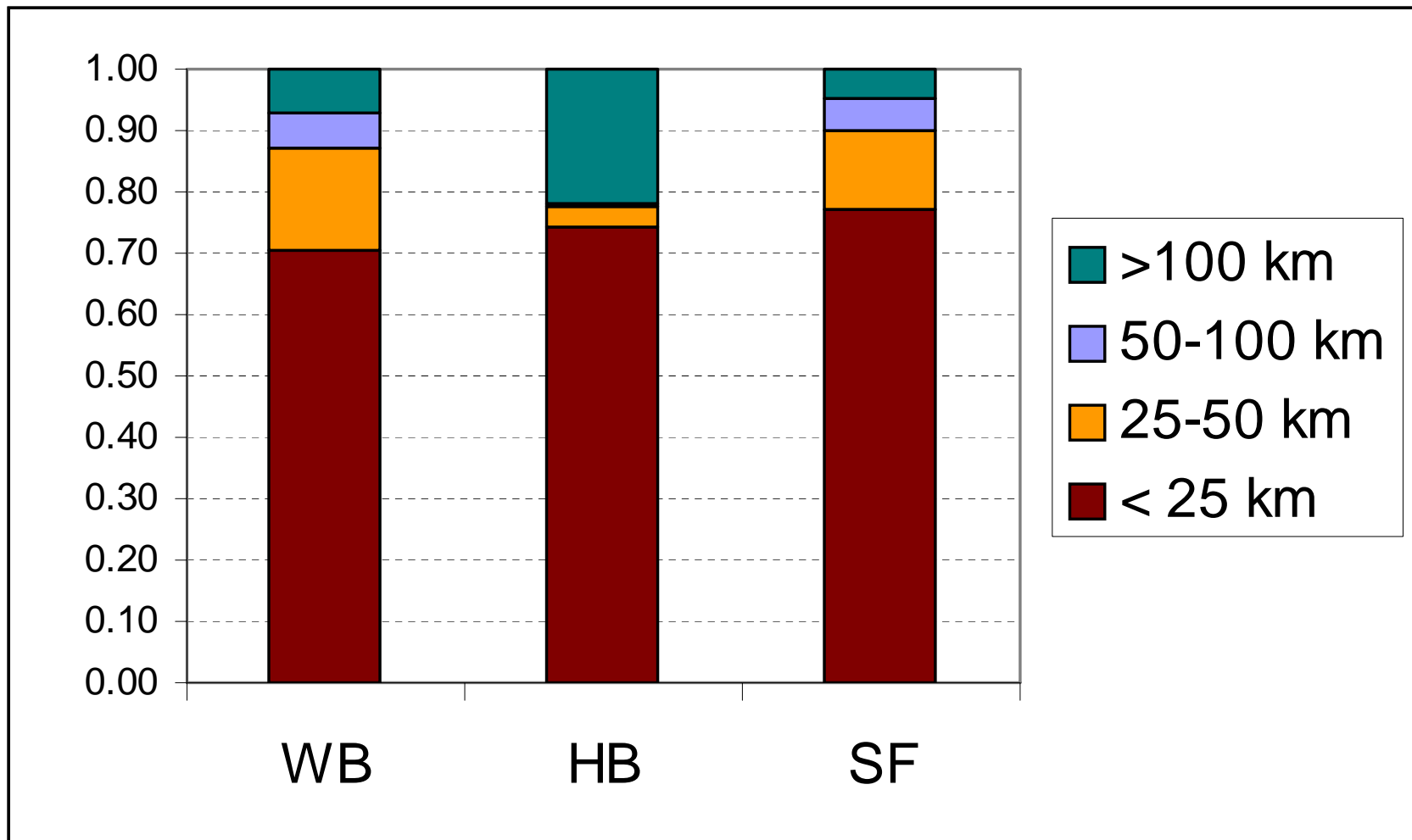
Results – return rates



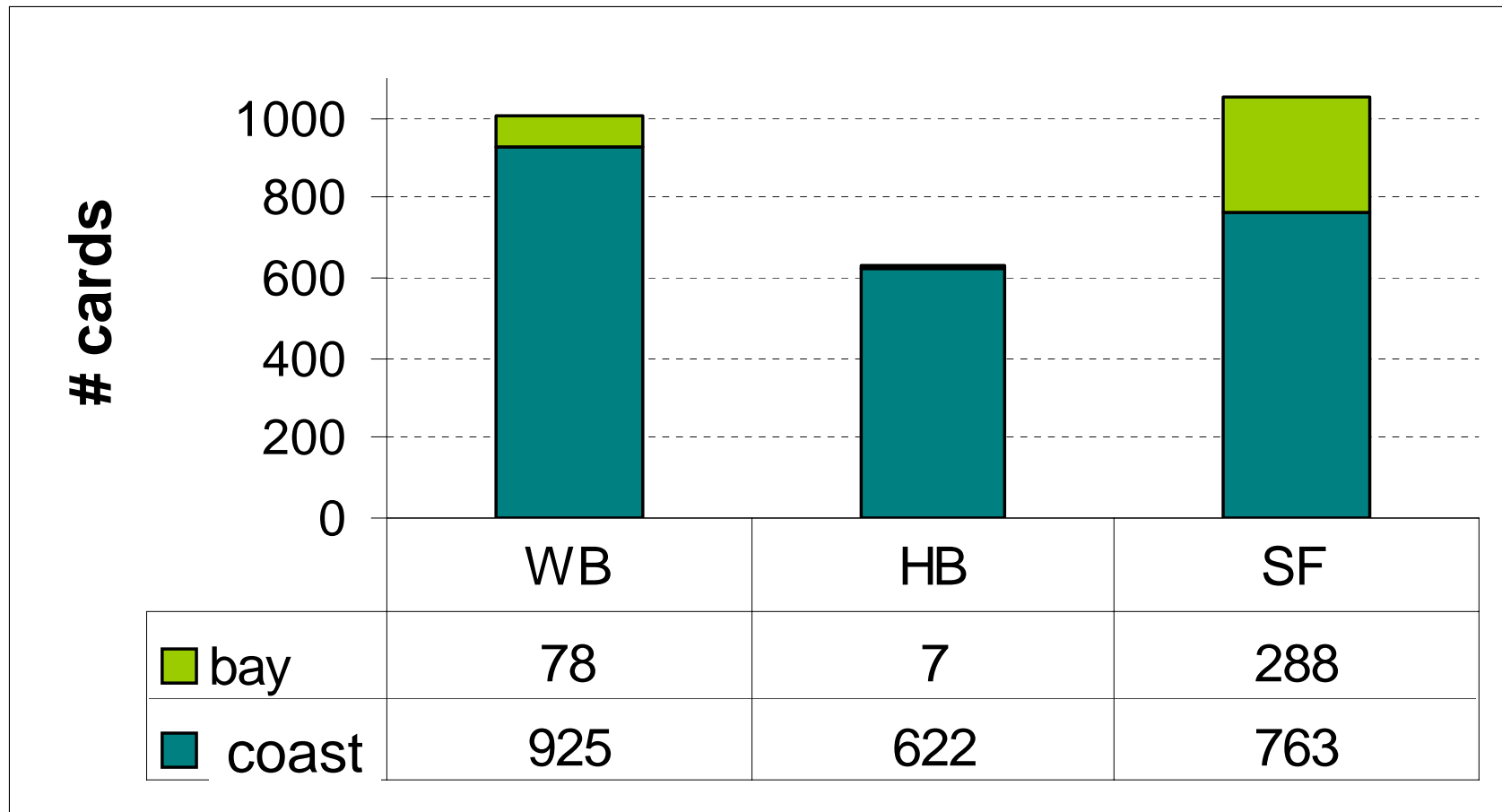
Results – return rates



Results – near vs. long distance

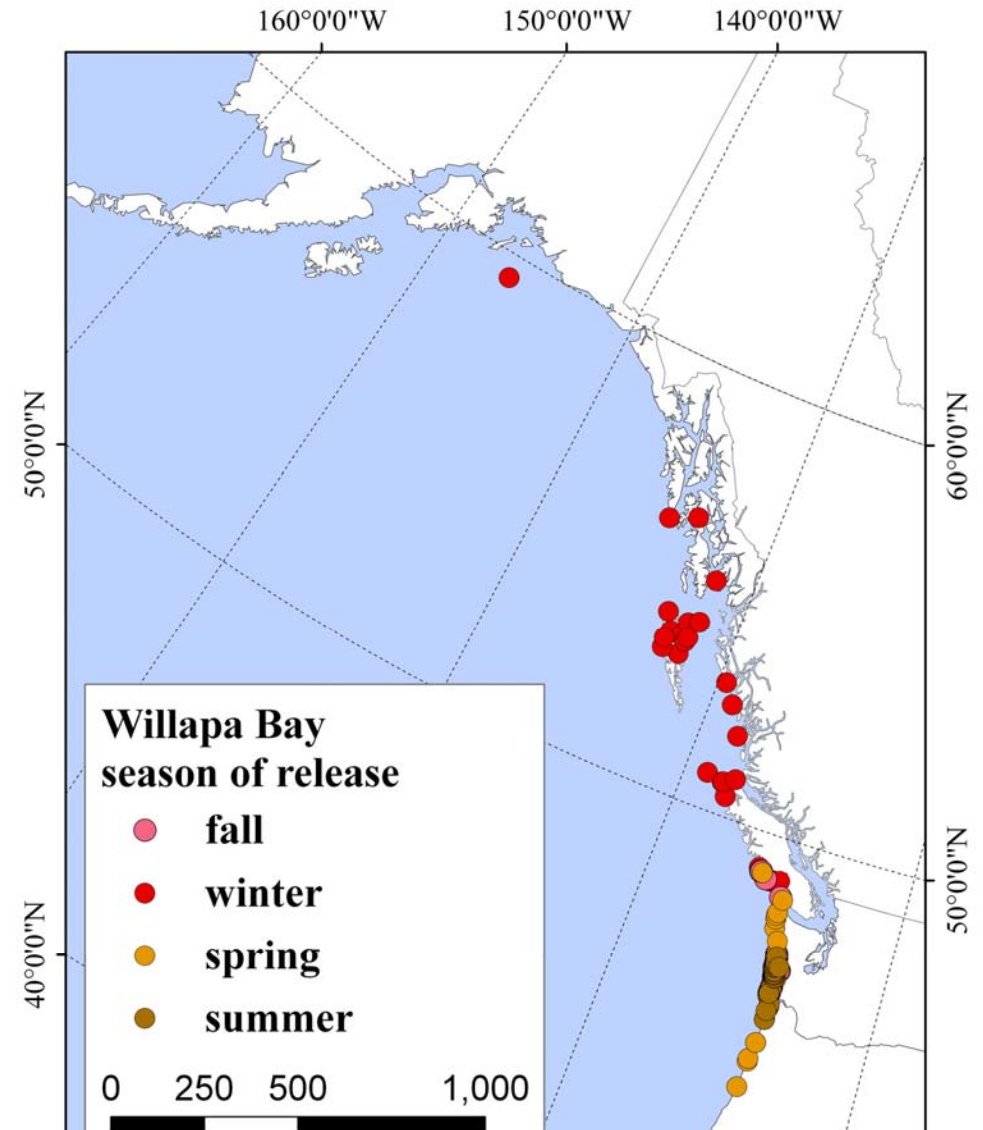


Cards retained in release bay



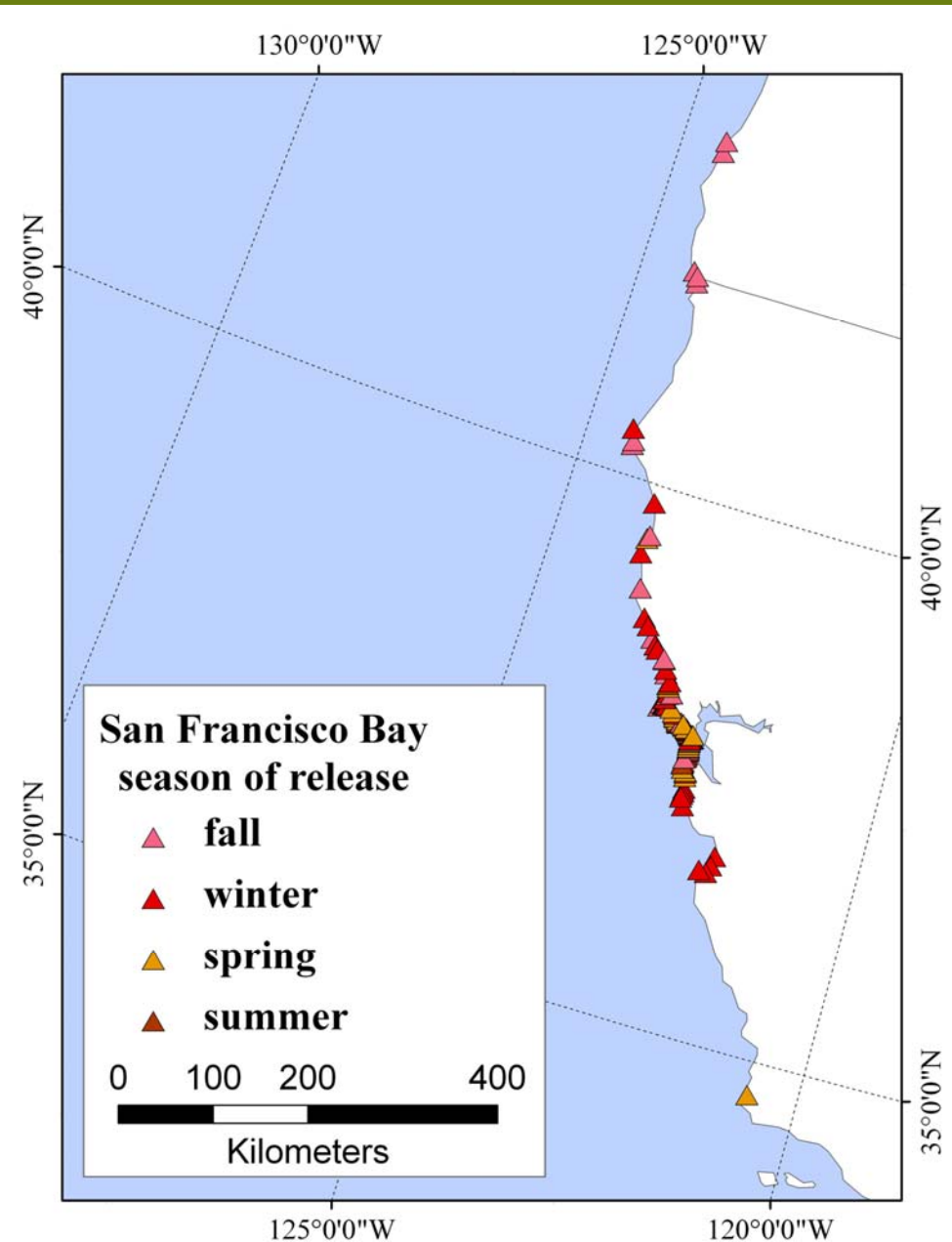
Willapa Releases

	Max distance (km)	Max Velocity (km/day)
North	2,000	36.9
South	300	13.0



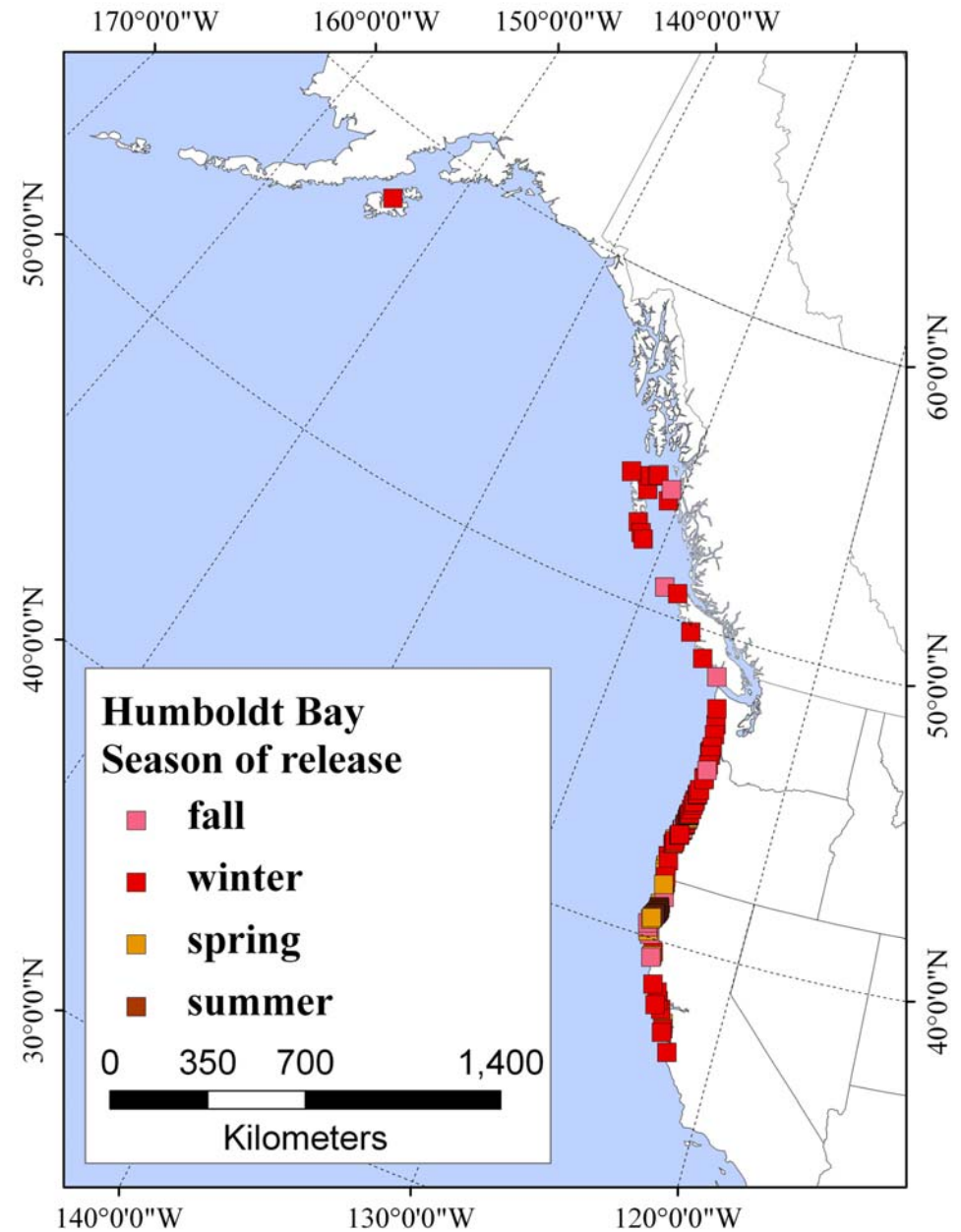
San Francisco Releases

	Max distance (km)	Max Velocity (km/day)
North	630	16.1
South	400	14.0



Humboldt Releases

	Max distance (km)	Max Velocity (km/day)
North	2,800	24.5
South	530	11.1



Debris zones from Willapa releases



- BC: Queen Charlotte Islands (13), Pacific Rim National Park (20), Barkley Sound (4)
- WA: Olympic National Park (6), Moclips(10), Pacific Beach (17), Roosevelt Beach (4), Copalis Beach (8), Ocean City (10), Oyhut (3), Grays Harbor (8), Ocean Shores (61), Westhaven (6), Long Beach (21), Seaview (5)
- OR: Sunset Beach (4), Seaside (3), Neskowin (3)
- CA: none

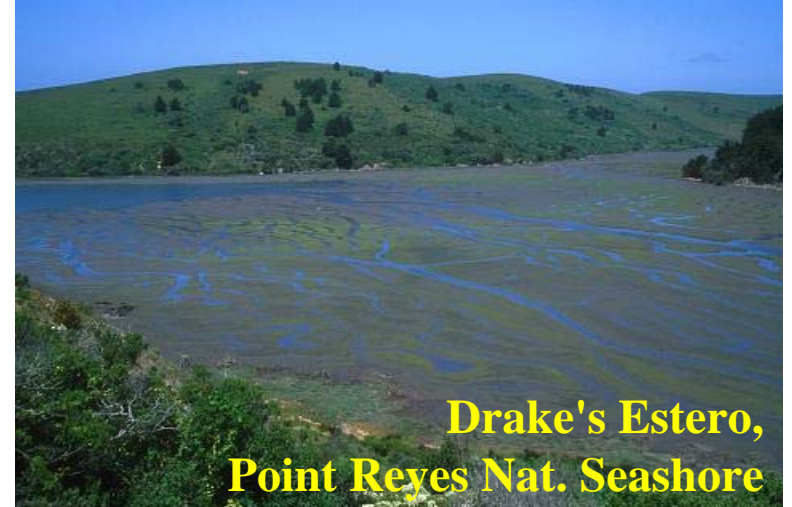
Debris zones from Humboldt releases



- BC: Queen Charlotte Islands (10)
- WA: Ft. Canby State Park Beach (8)
- OR: Beachside State Park (3), Florence area (7), Umpqua River area (6), Pistol River Beach (8)
- CA: Crescent City (10), Trinidad (3), Clam Beach (10), Lost Coast (3), Fort Bragg (4)

Debris zones from San Francisco releases

- BC: none
- WA: none
- OR: none
- CA: Cape Mendocino (3), Fort Bragg (3), Gualala (3), Fort Ross (5), Jenner (5), Bodega Bay (4), Point Reyes National Seashore (97), Montara (5), Half Moon Bay (9), Pescadero area (6), Monterey Bay (6)



Summary

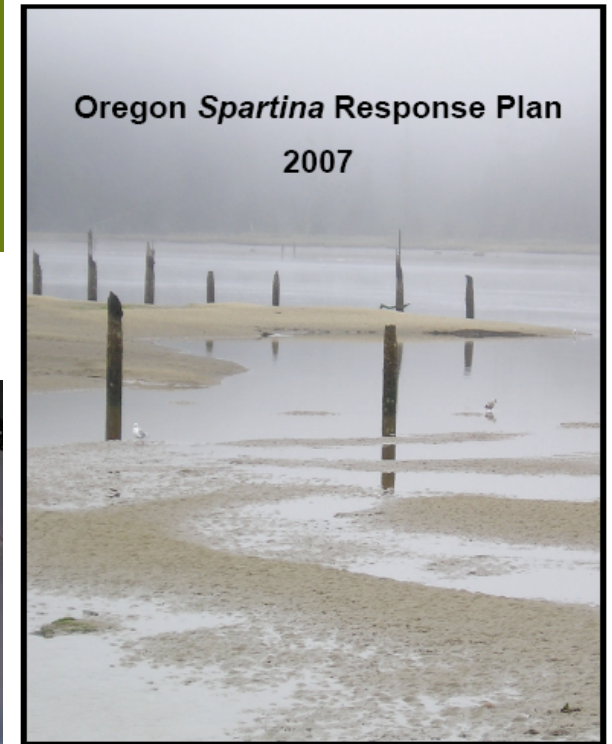
- Local deposition more likely than distant
- Rapid long-distance transport demonstrated
- Large seasonal component, generally following known patterns of ocean currents
 - Highest northward velocities & transport seen in WB & HB winter releases
 - Releases from Humboldt Bay demonstrated greatest range both N & S
 - Lower velocities & transport from SF

Additional Questions

- Additional releases to help identify collection zones and account for inter-annual variability
- Importance of transport into estuaries (HB to Eel River and WB to Grays Harbor)

Oregon Spartina Response Plan

- EDRR effort
- Goal of eradication
- Modified our search image for early detection surveys in Oregon – winter surveys for *S. densiflora*
- On-going discussion & collaboration with neighboring states
 - Coast-wide management plan needed



Acknowledgements

➤ Funding

- San Francisco Estuary Institute
- Oregon Department of Agriculture
- Washington Department of Fish & Wildlife

➤ Collaborators performing releases

- Golden Gate National Recreation Area (NPS)
- WDFW
- USDFW - Arcata office

➤ Volunteers

- Beachwatch (CA)
- COOAST (WA & OR)
- SOLV (OR)
- Beachcombers, tourists, children & many others!

