Puget Sound Seabird Survey

Science by citizens, not just citizen science

Determining seabird presence, abundance, and distribution for planning, response, and natural resource damage assessment

Jerry Joyce

Seattle Audubon Society

for birds and nature

Moon Joyce Resources

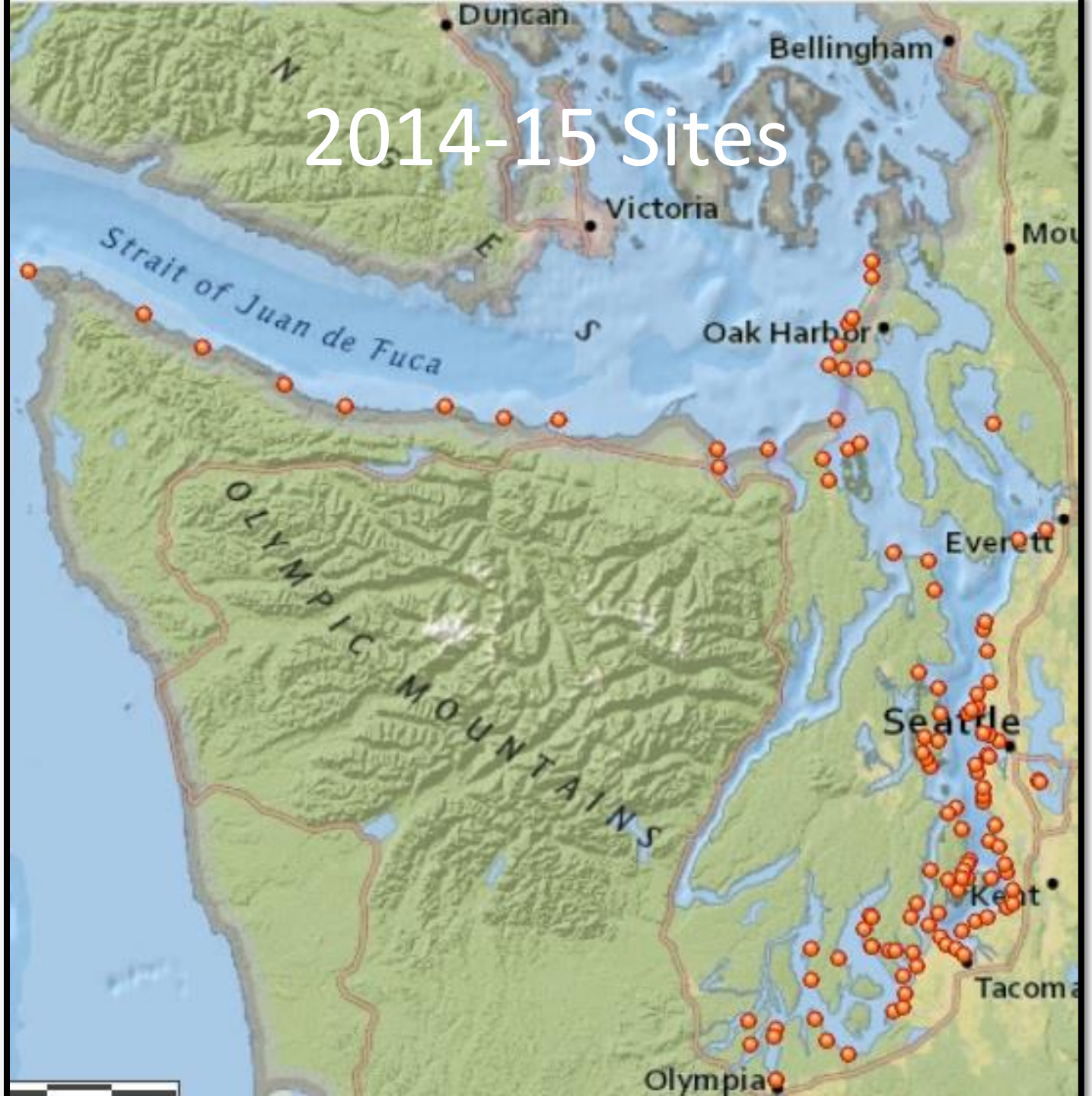
Consulting on Science and Technology for the Environment

- A citizen-science, land-based seabird survey
- 115 survey sites throughout Puget Sound
- Surveyed monthly October-April
- All sites surveyed nearly simultaneously
- Over 41K sighting records and 216K birds
- Protocol enabling distance-sampling analysis

Why Birds?

Photo: Bob Dang, Cal. Fish & Game Office of Spill Prevention & Response

2014-15 Sites



SURVEY CONDITIONS:
please circle the appropriate conditions

WEATHER	CLEAR	PARTLY-CLOUDLY	OVERCAST	FOG	
PRECIPITATION	RAIN	SNOW	NONE		
SEA STATE	CALM	RIPPLED	CHOPPY	WAVY	ROUGH
TIDE MOVEMENT	RISING	FALLING	UNKNOWN		

OILING RATES:
how many male Buffleheads were visibly oiled? (please circle)

N/A	NONE	_____ (count)

notes: _____

VISIBILITY CONDITIONS:
how far away did you have VERY GOOD visibility of the birds?

< 100m 100m 250m 500m 1km

if visibility was poor, due to what conditions?

GLARE SEA CONDITIONS WEATHER OTHER: _____

HUMAN ACTIVITY:
indicate NUMBER of shoreline users in the following categories

_____ Walkers _____ Dogs
_____ Power Boats _____ Unpowered Boats
_____ Other: _____

RAPTOR ACTIVITY:
record the COUNT of which SPECIES of raptors observed during survey.

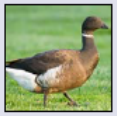
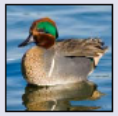
#	species	notes on how it affected the birds on the water
#	species	notes on how it affected the birds on the water
#	species	notes on how it affected the birds on the water

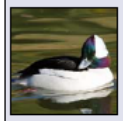
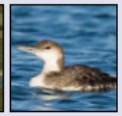
SURVEY EQUIPMENT:
circle equipment type and magnification (e.g. "8x" or "20-60x")

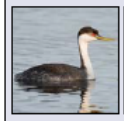
BINOCULARS _____ *mag. power* SPOTTING SCOPE _____ *mag. power*

NOTES AND COMMENTS:

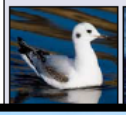
Bird Families included in the *Puget Sound Seabird Survey*



Geese/Swans Dabbling Ducks



Diving Ducks Loons



Grebes Cormorants



Puget Sound Seabird Survey **Recording Form**

Date: ____/____/_____
(MM / DD / YYYY)

____° = 0° reference point

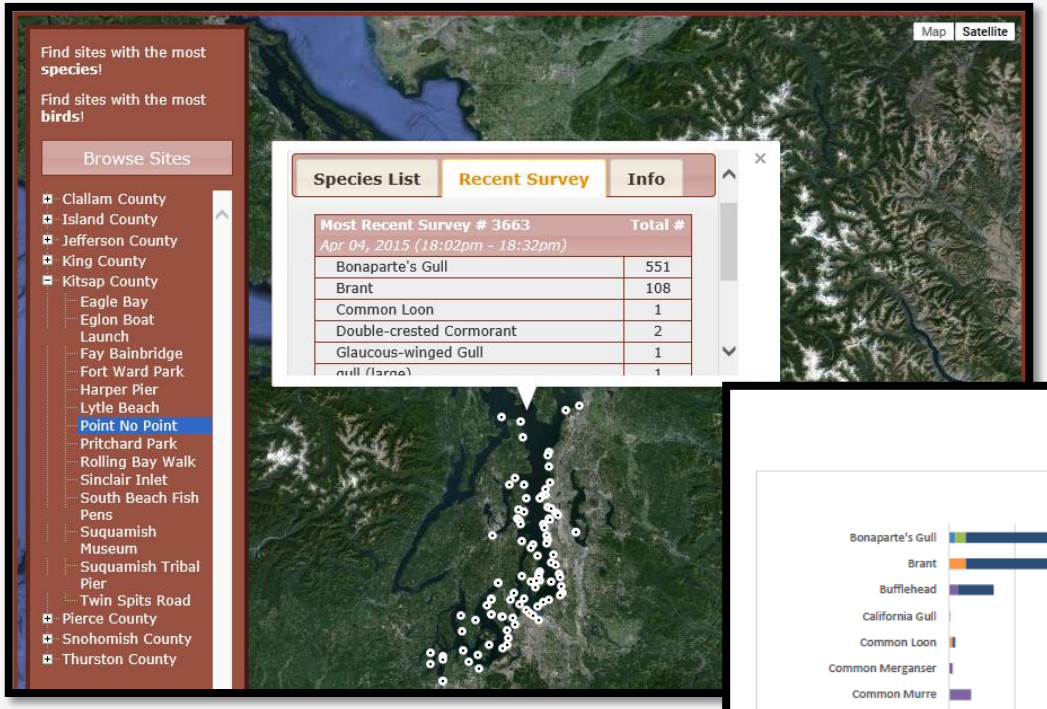
Survey Site Code:_____ Survey Site Name: _____
Start Time (e.g. 1500) : _____ Finish Time (e.g. 1517): _____

Name (1): _____ *(does distance measurement)* Name (2): _____
Name (3): _____ Name (4): _____

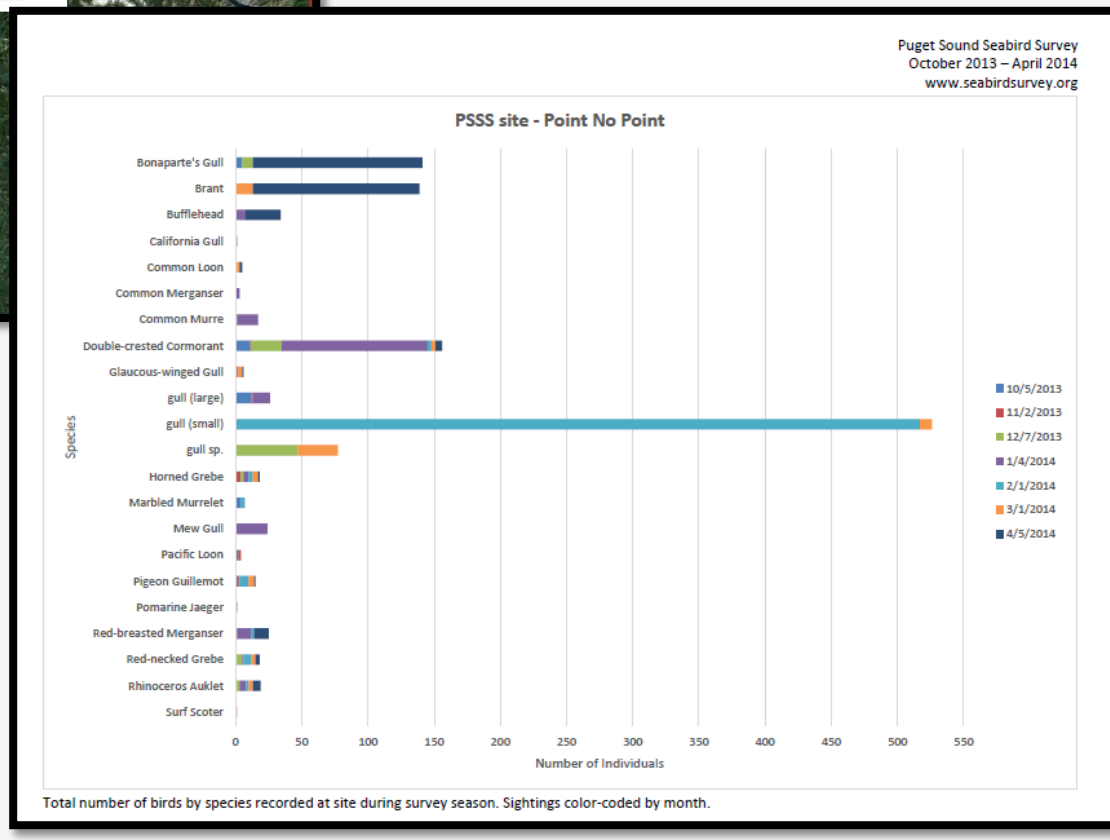
	SPECIES	SURVEY (w/in 300m) #	bearing	dist(mm)	SEX RATIO M	F	?	Horizon Obscured?	LARGE FLOCK? min.	max.	best	Optional Column (in flight / beyond 300m / after survey) notes	
examples	D.C. Cormorant	2						☒ YES				☐	examples
	SUSC (or *"Surf Scoter"*)	43	125	25	20	15	8	☐ YES	35	50	43	☐	
	Pigeon Guillemot							☐ YES				☒ *4, flying far offshore*	
								☐ YES				☐	
								☐ YES				☐	
								☐ YES				☐	
								☐ YES				☐	
								☐ YES				☐	
								☐ YES				☐	
								☐ YES				☐	
								☐ YES				☐	
								☐ YES				☐	

Photo: Toby Ross©

Interactive Data Access

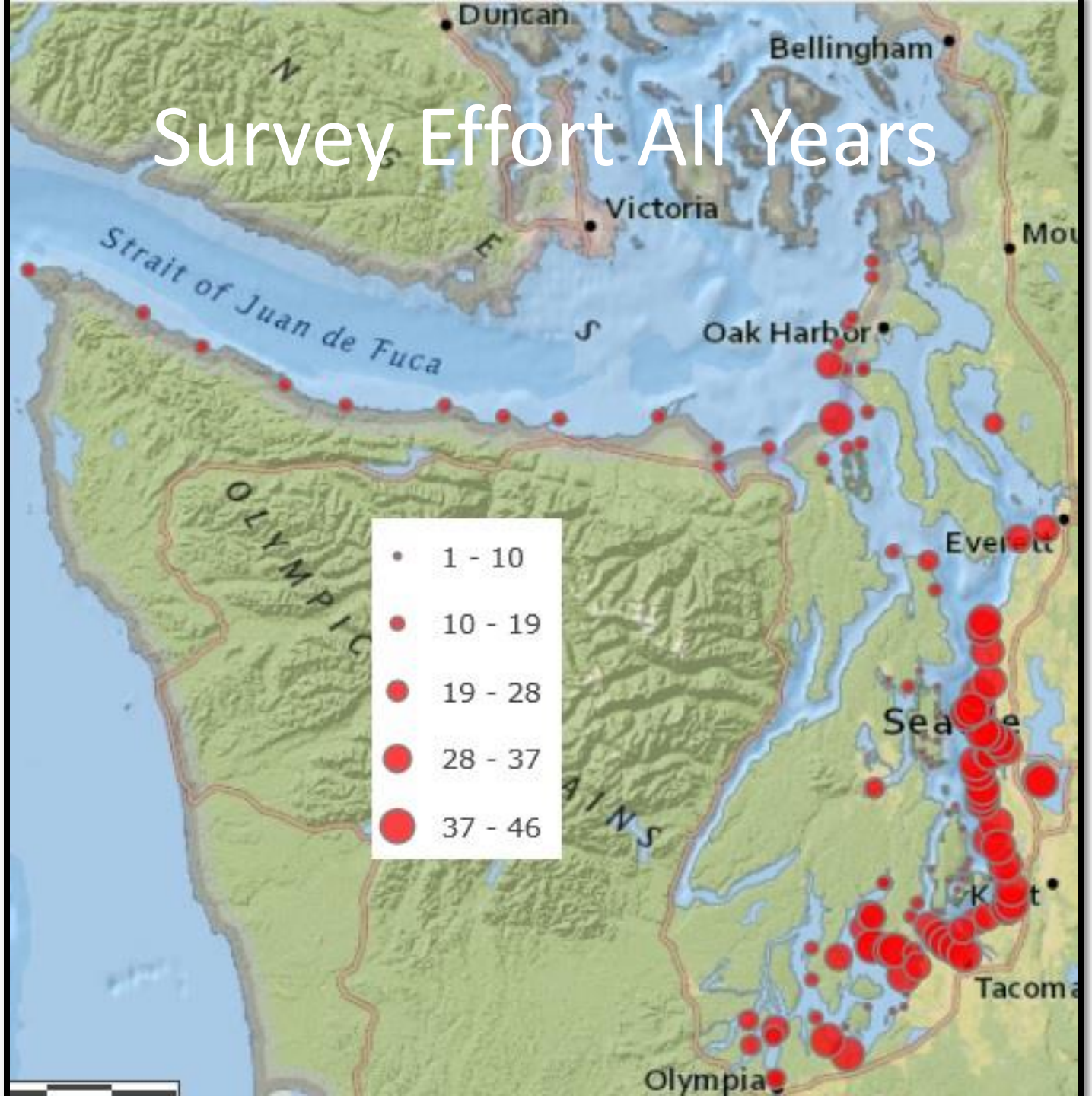


http://www.seabirdsurvey.org



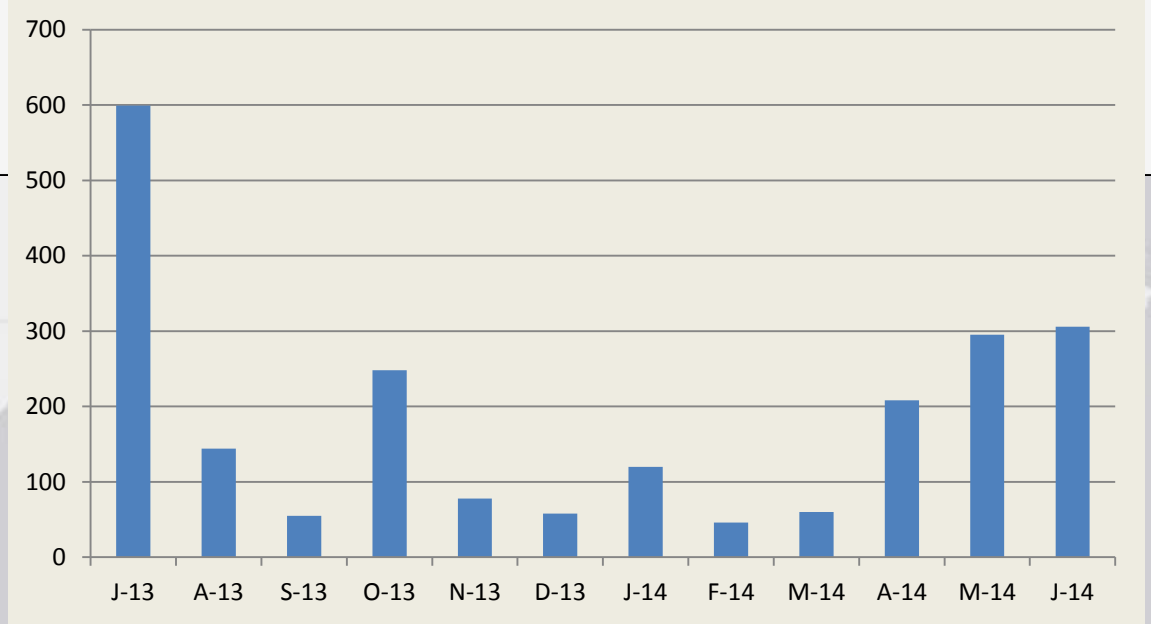
Total number of birds by species recorded at site during survey season. Sightings color-coded by month.

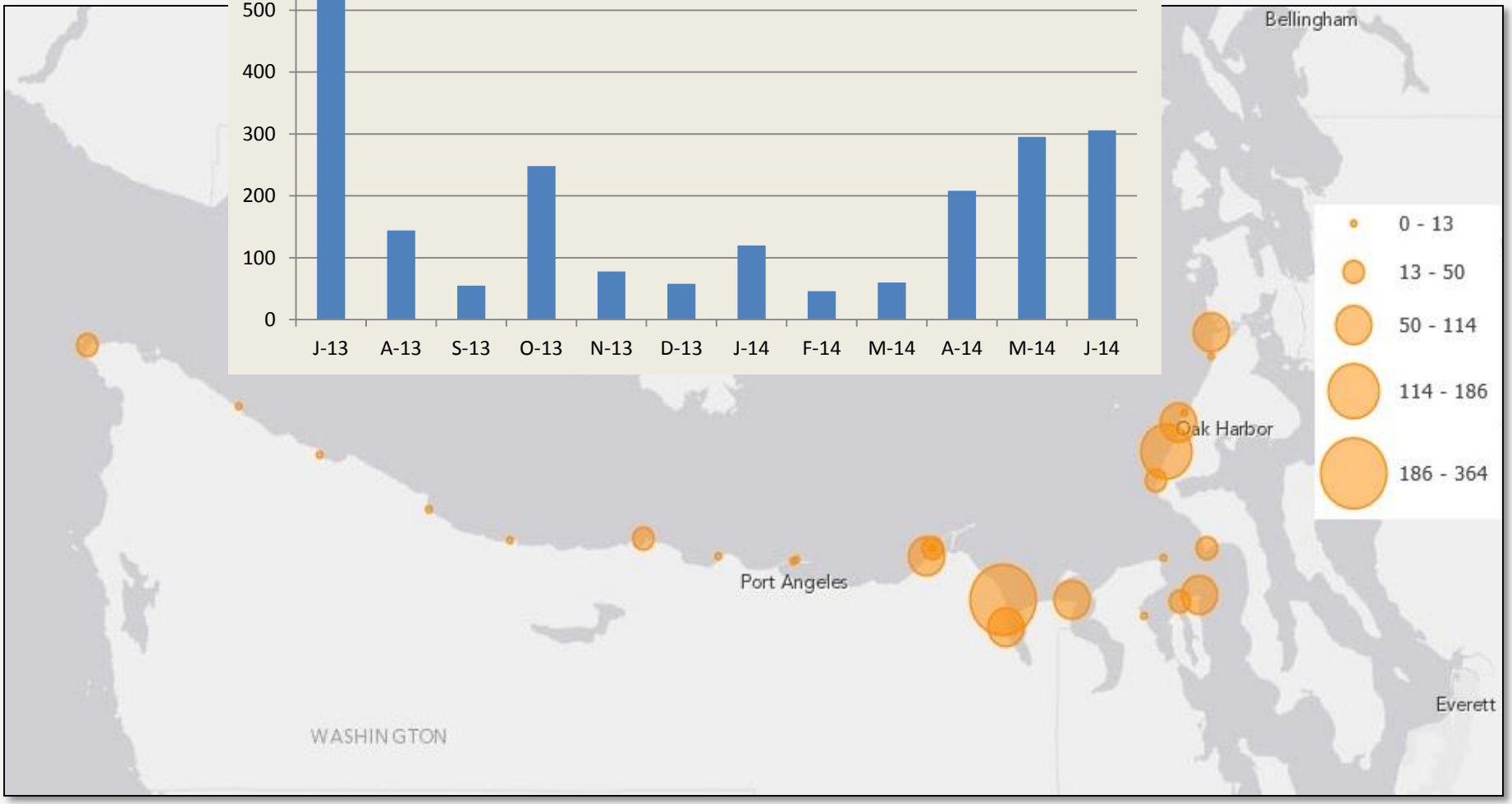
Survey Effort All Years



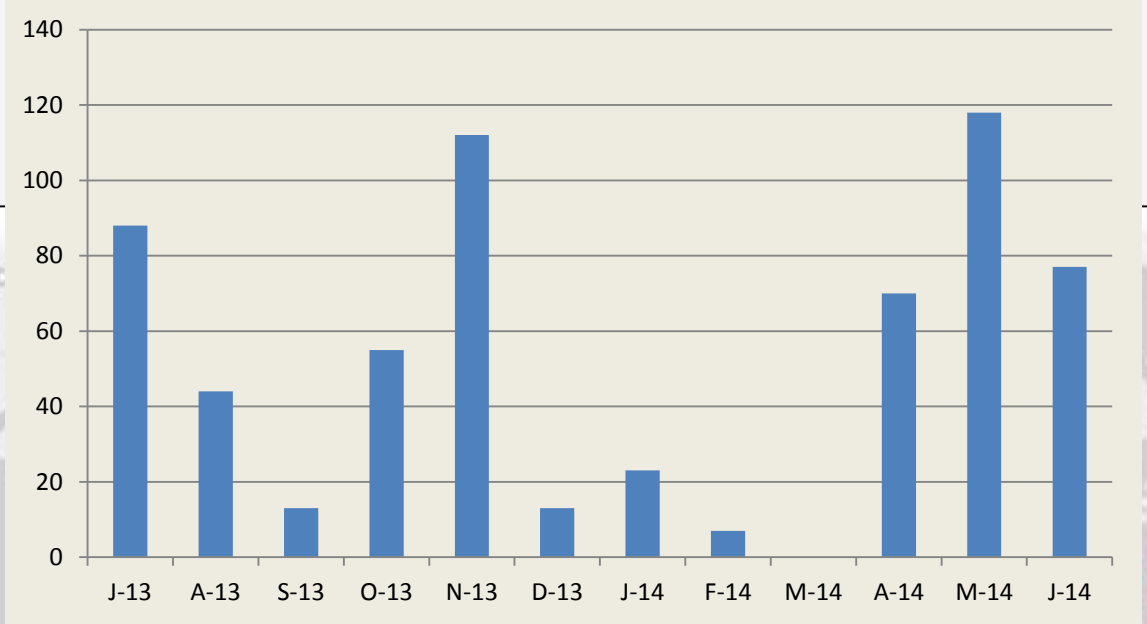
2013/2014 Sites with 11 or 12 Surveys

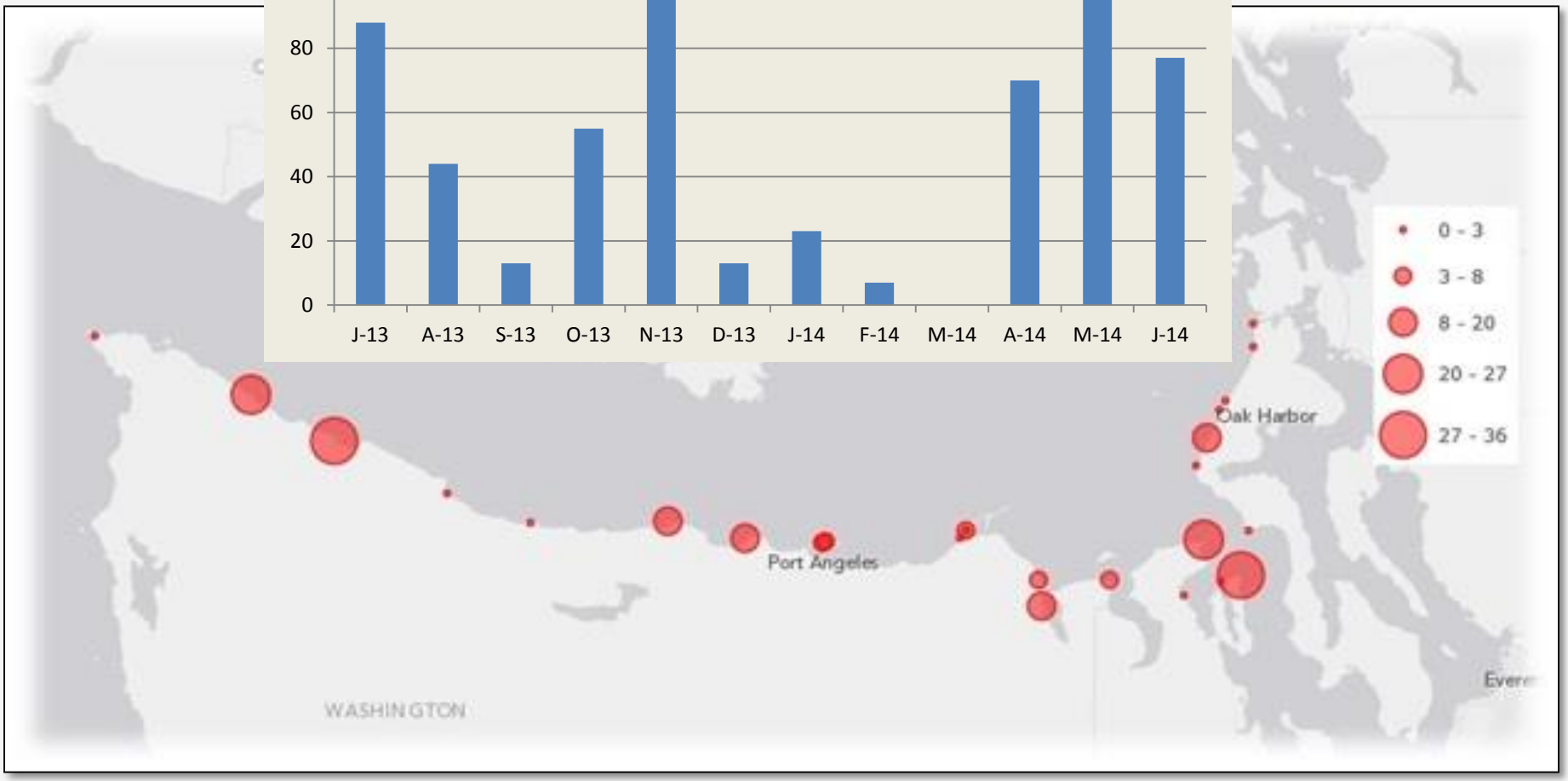
Pigeon Guillemot



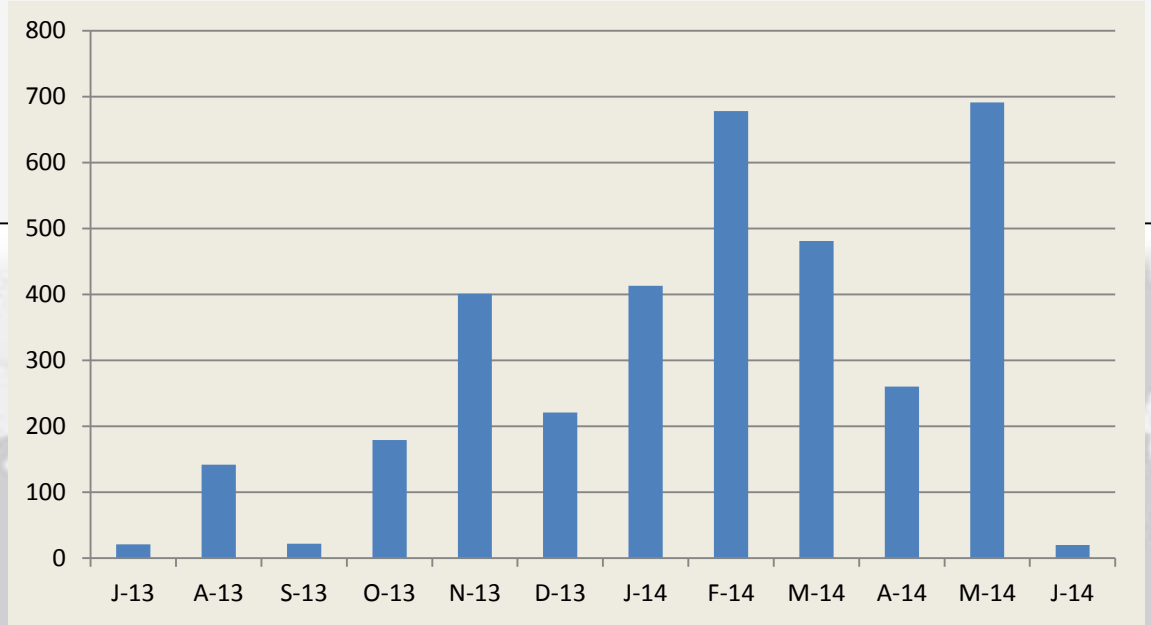


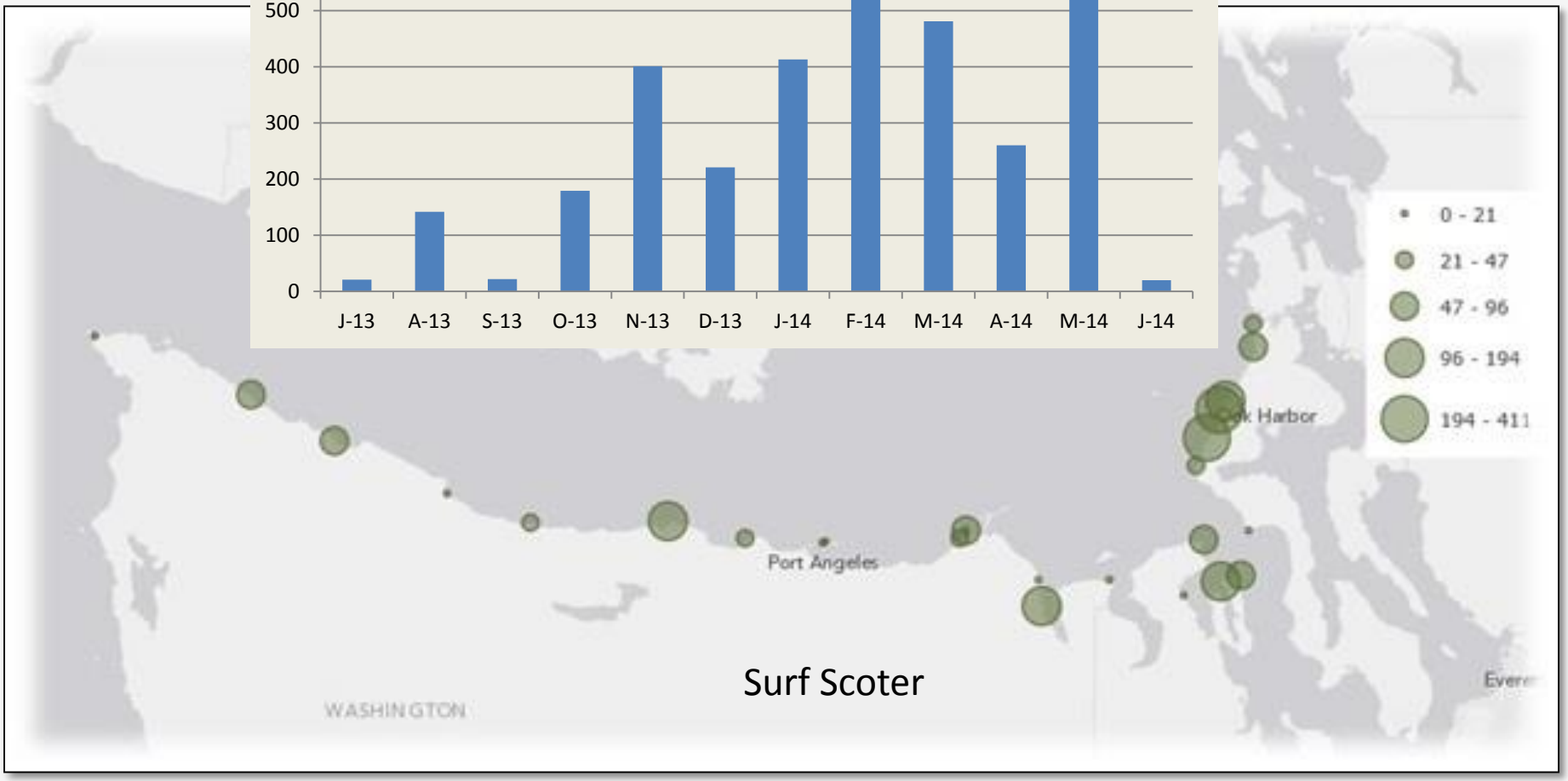
Marbled Murrelets





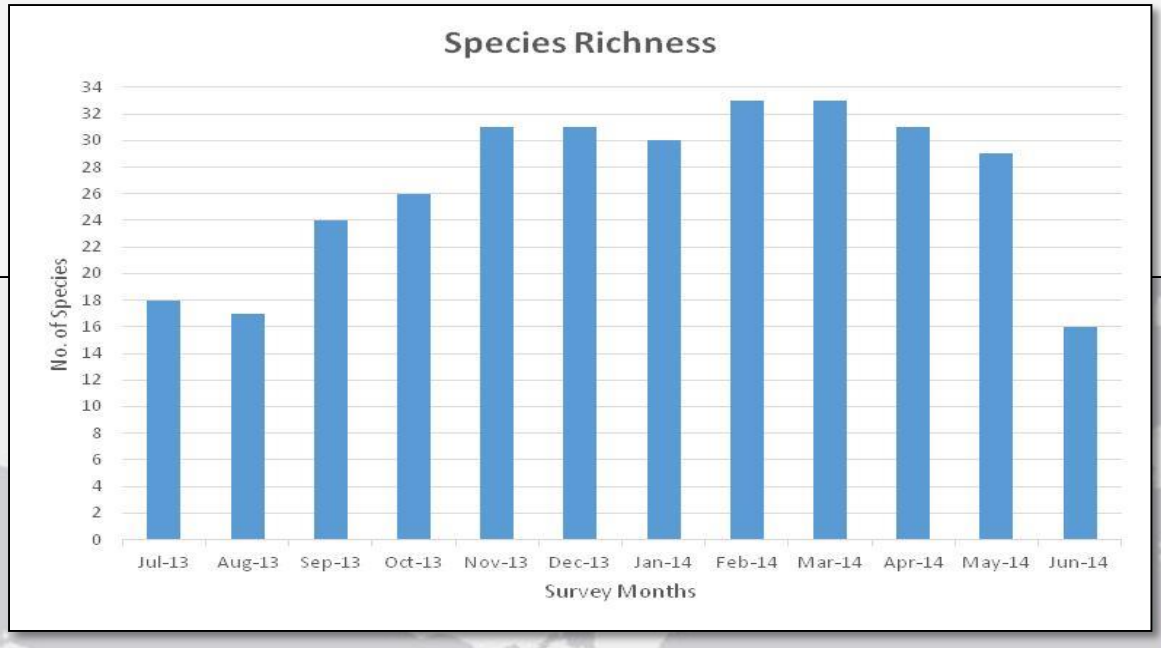
Scoters sp.



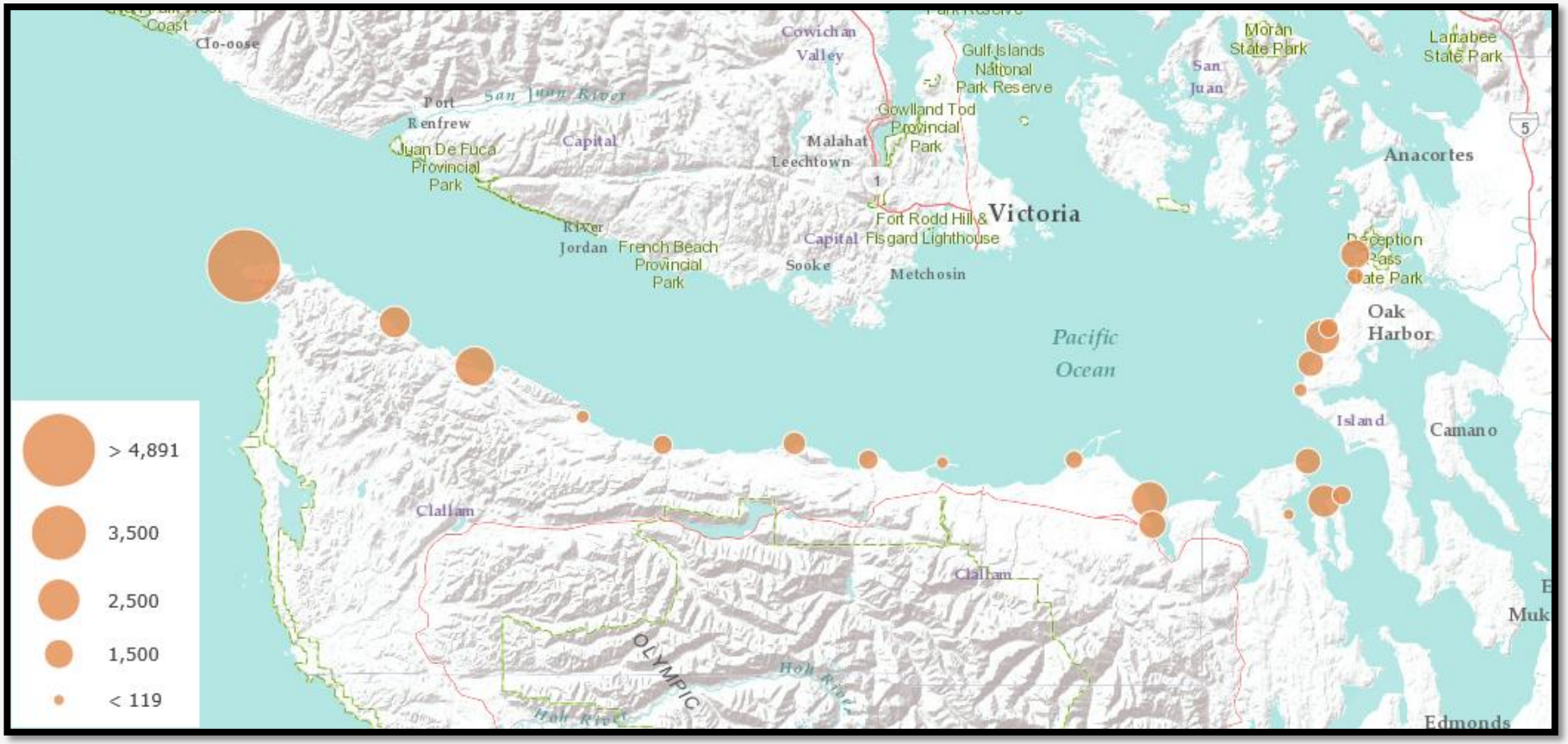


Surf Scoter

Number of Species Recorded



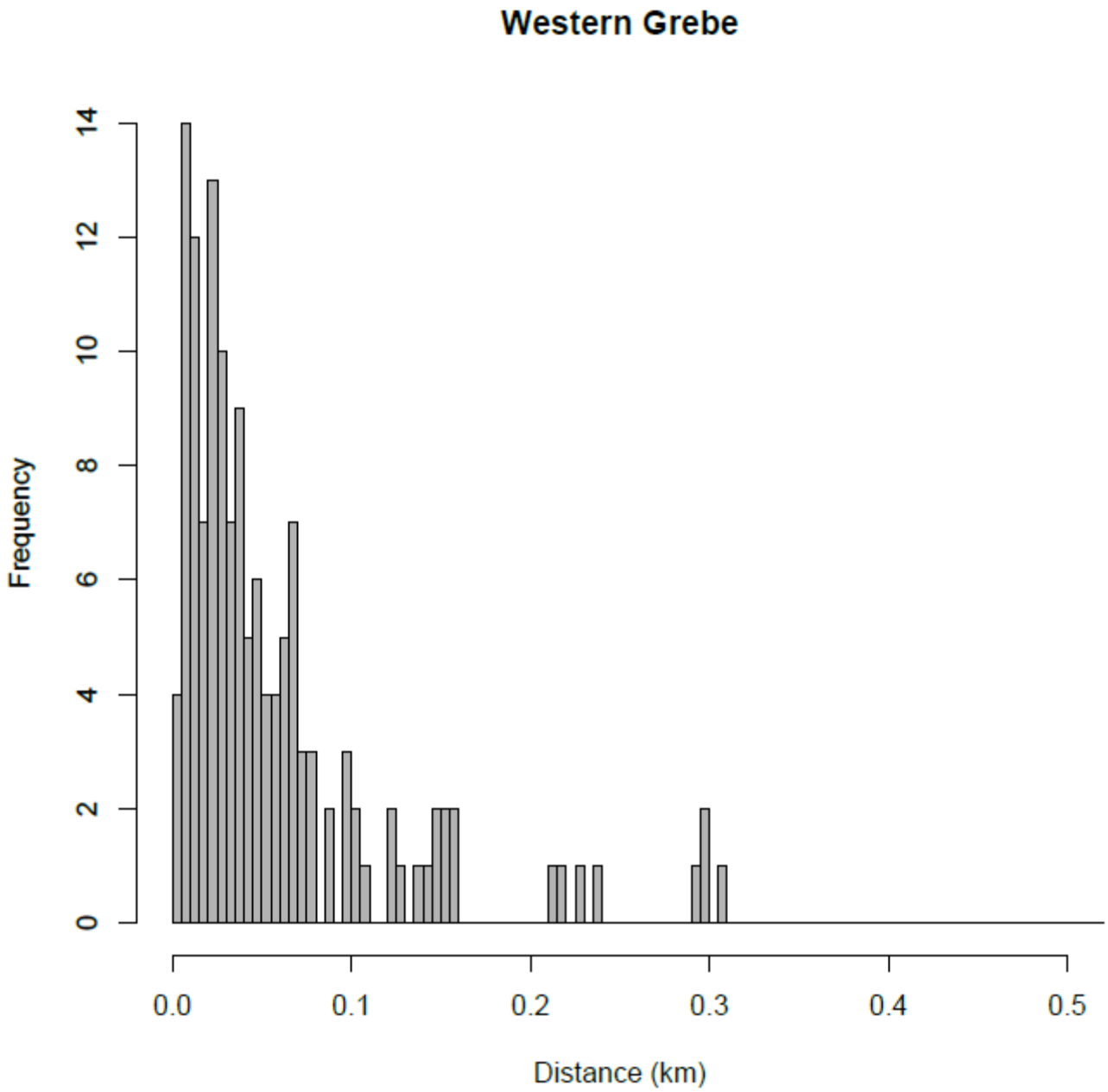
Total Number of Birds

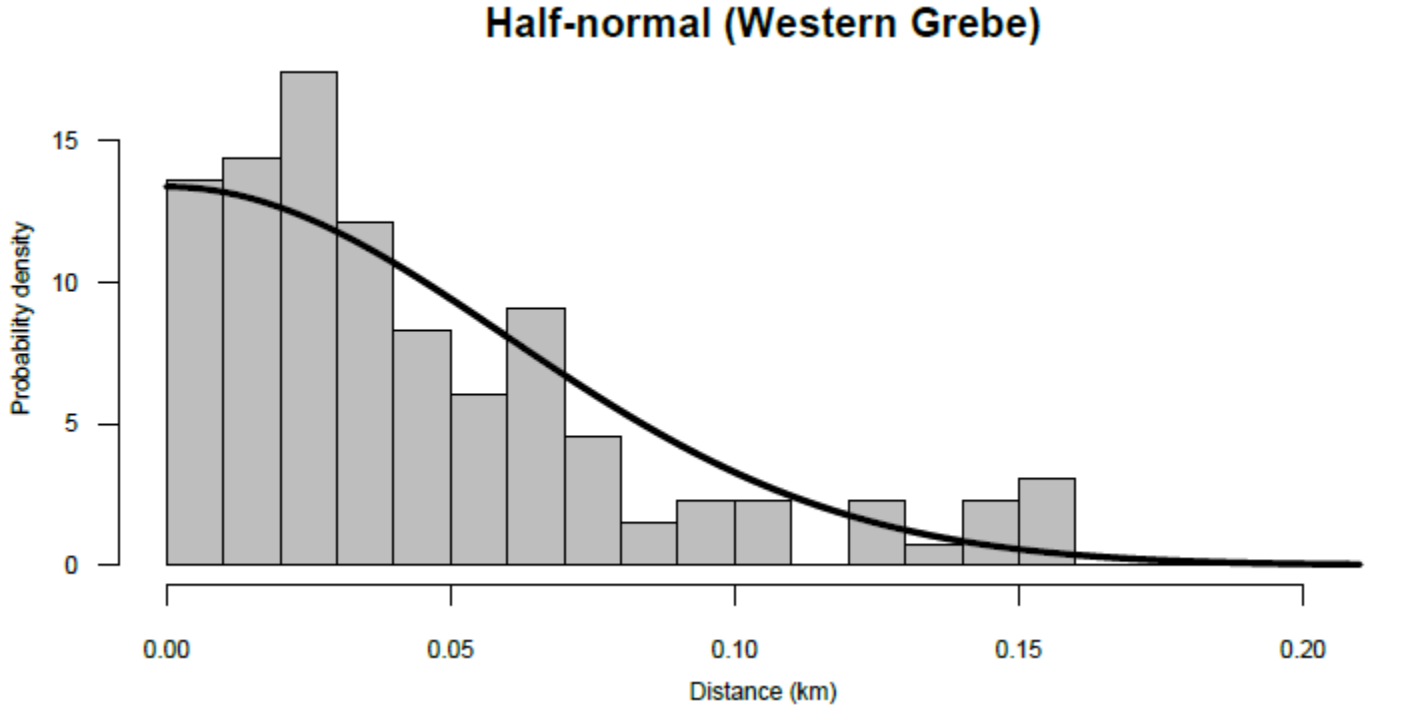


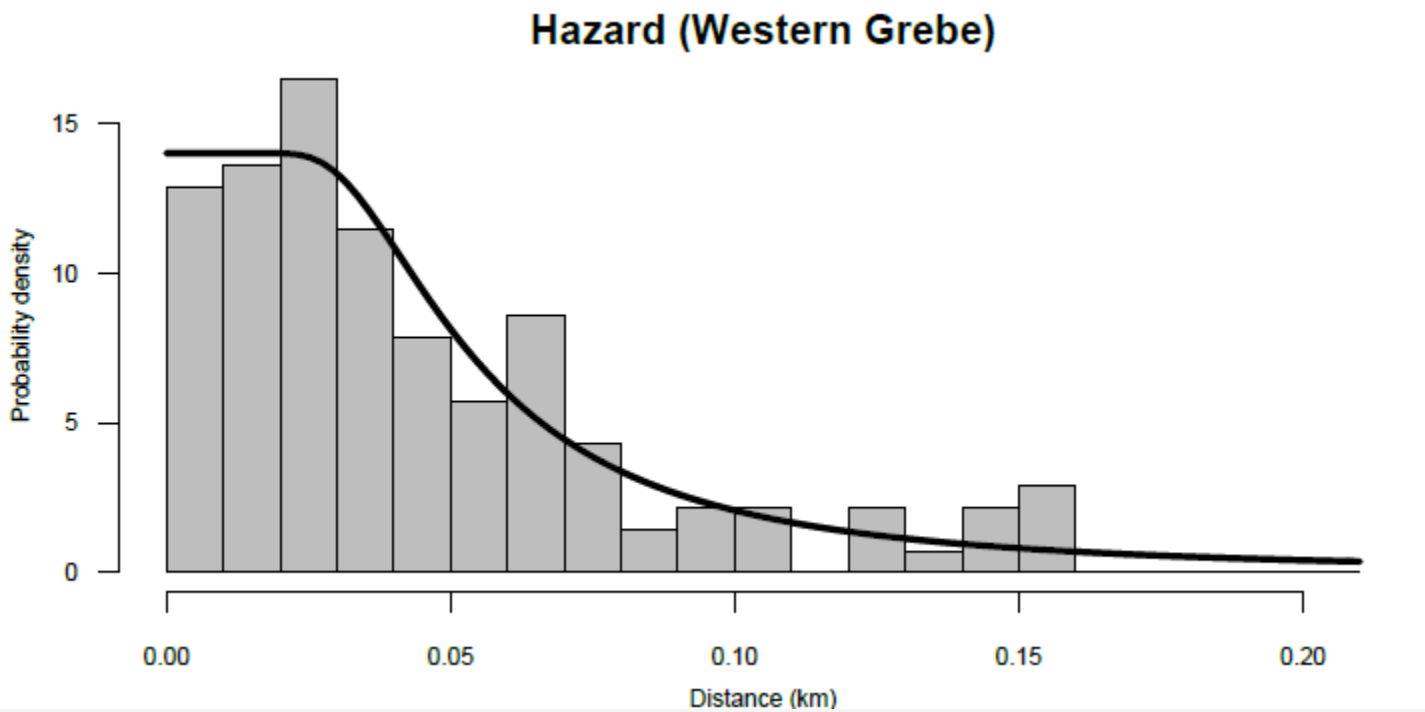
Distance Sampling Analysis

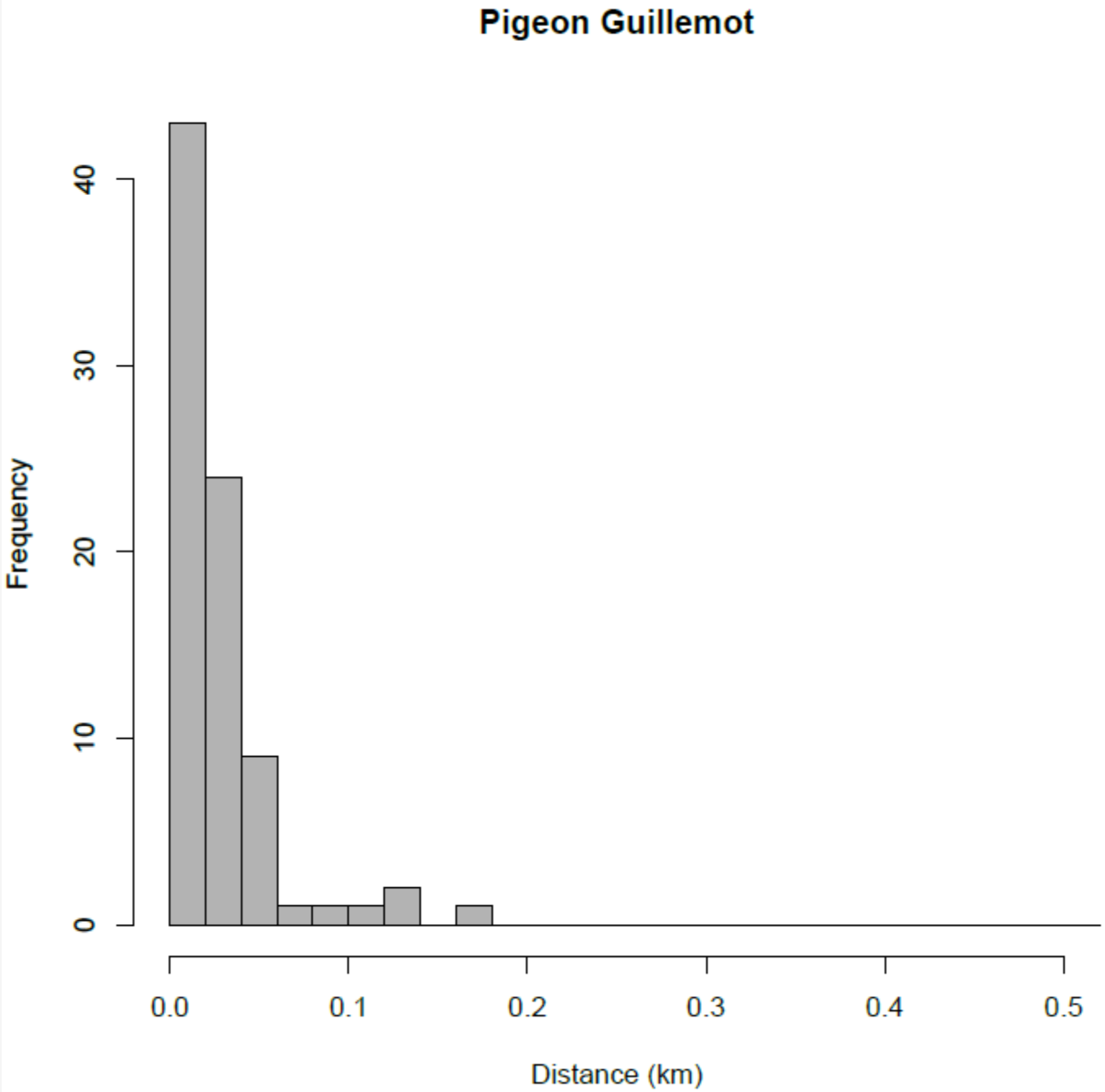
- Distance sampling allows for calculation of density estimates and determination of variation
- Incorporates the effects of change in detection of each species due to:
  - Changes in distance from the observer
  - Sighting conditions
  - Quality of observing equipment
  - Observer experience

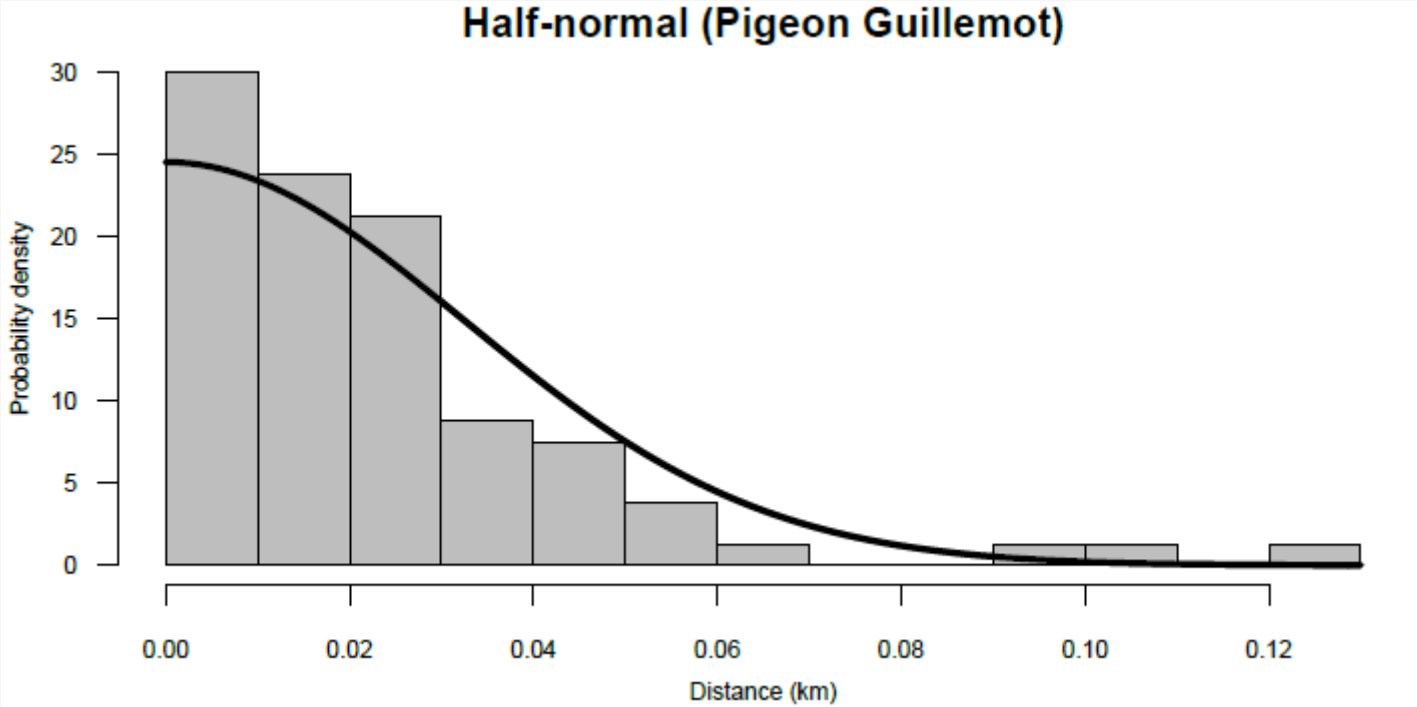
(Buckland et al., 2008).

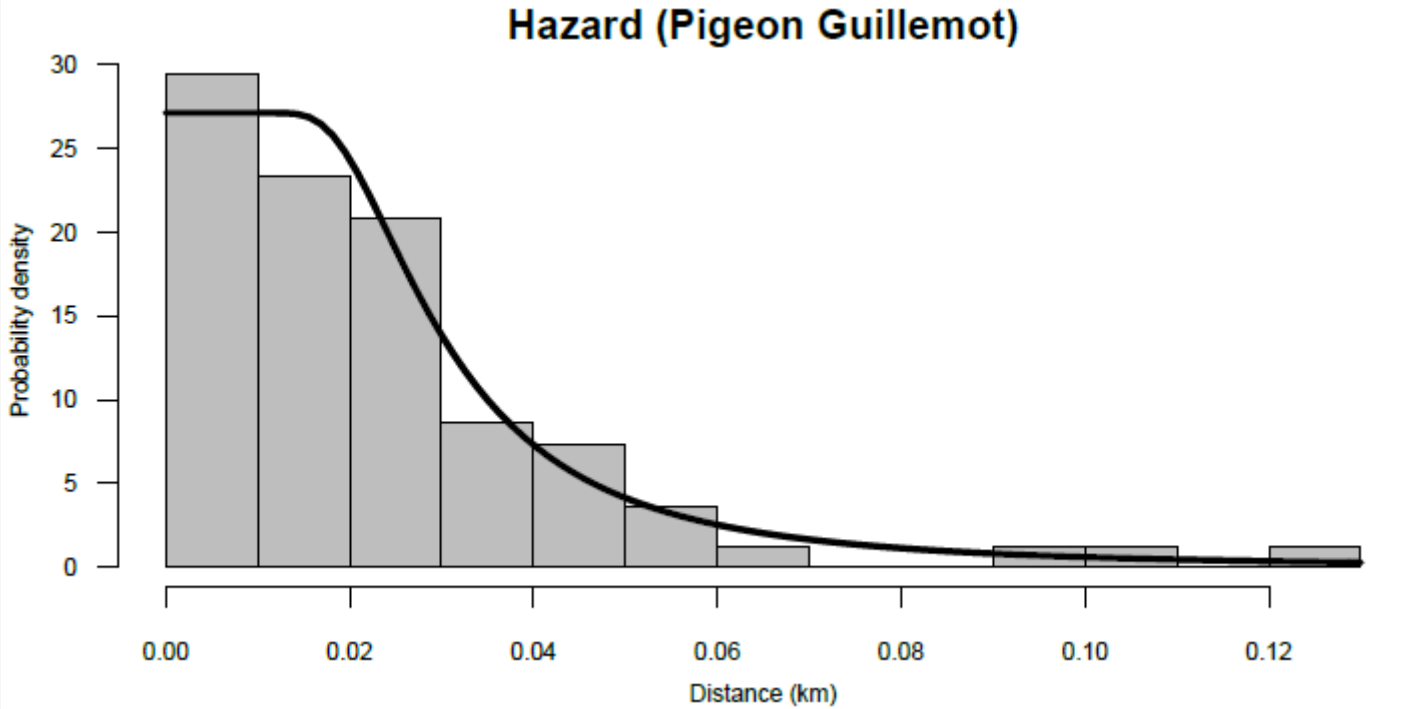

Western Grebe
Frequency
0
2
4
6
8
10
12
14
0.0
0.1
0.2
0.3
0.4
0.5
Distance (km)


Half-normal (Western Grebe)
Probability density
15
10
5
0
0.00
0.05
0.10
0.15
0.20
Distance (km)


Hazard (Western Grebe)
Probability density
15
10
5
0
0.00
0.05
0.10
0.15
0.20
Distance (km)


Pigeon Guillemot
Frequency
0
10
20
30
40
0.0
0.1
0.2
0.3
0.4
0.5
Distance (km)


Half-normal (Pigeon Guillemot)
Probability density
30
25
20
15
10
5
0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
Distance (km)

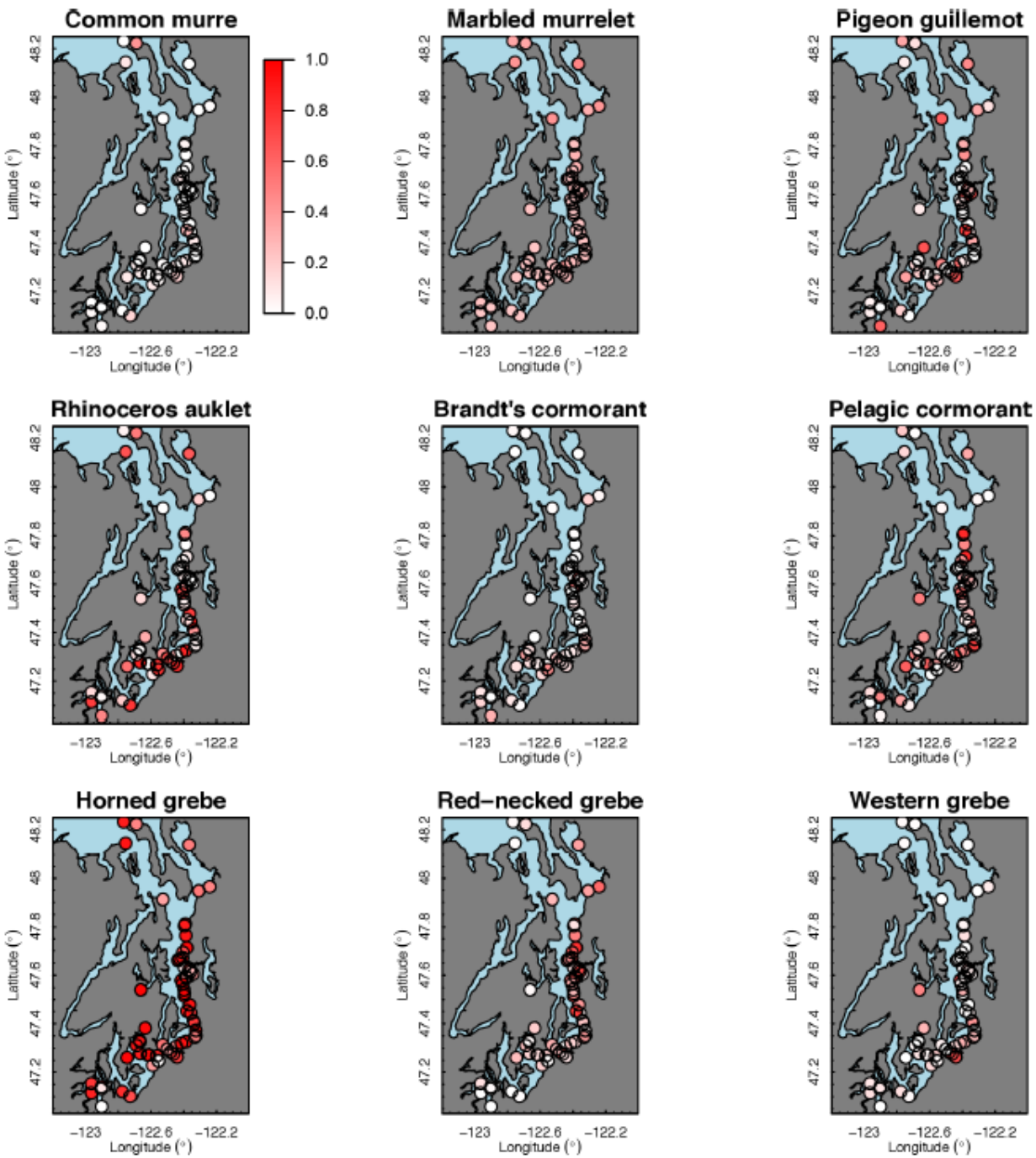

Hazard (Pigeon Guillemot)
Probability density
30
25
20
15
10
5
0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
Distance (km)

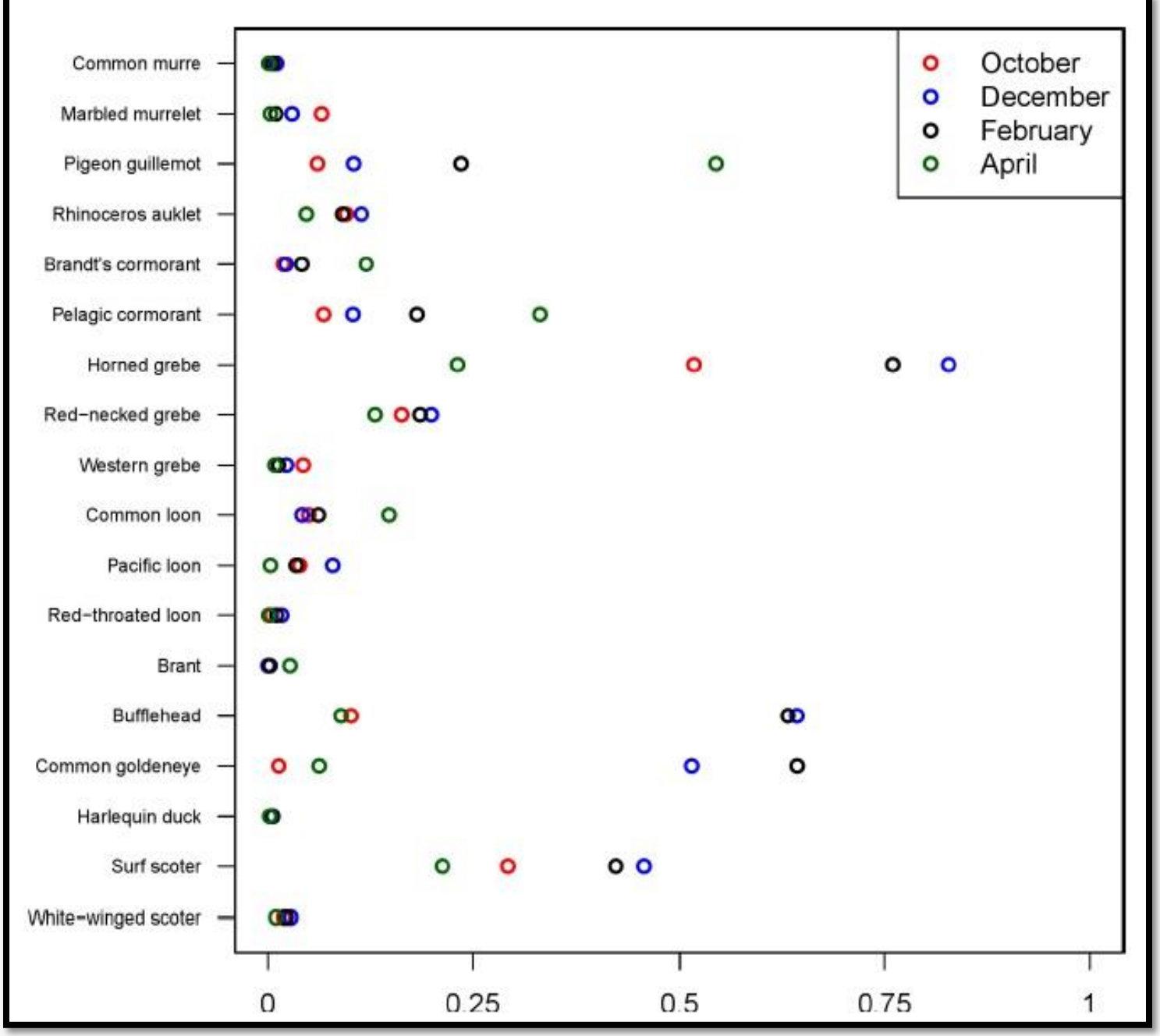
Using citizen-science data to identify local hotspots of seabird occurrence

Eric J. Ward, Kristin N. Marshall, Toby Ross, Adam Sedgley, Todd Hass, Scott F. Pearson, Gerald Joyce, Nathalie J. Hamel, Peter J. Hodum, and Rob Faucett

https://peerj.com/articles/704/

Data from 62 sites that had at least 15 visits.


Common murre
Marbled murrelet
Pigeon guillemot
Rhinoceros auklet
Brandt's cormorant
Pelagic cormorant
Horned grebe
Red−necked grebe
Western grebe
1.0
0.8
0.6
0.4
0.2
0.0
Latitude (°)
48.2
48
47.8
47.6
47.4
47.2
−123
−122.6
−122.2
Longitude (°)



Estimated median probabilities of occurrence by month. Estimates are shown for the most recent year (October 2013–April 2014). Estimates for November, January, and March are not shown.

Oil Spill Response

The 2013 expansion to the Strait and Admiralty Inlet included protocols for additional observations in the event of a spill.

This included:

- Make observations of oiled shorelines and marine animals (without entering contaminated areas)
- Conduct an additional seabird survey

We conducted an unannounced Call-out drill to test the feasibility of these protocols.

Drill Response—Oil Observations

Twelve of 26 sites could conduct observations within four hours.

Drill Response—Oil Observations

Twenty-two of 26 sites could make observations within 24 hours.

Drill Response—Seabird Survey

Twenty-three out of 26 sites had at least one observer for the seabird survey during the next daylight high-tide window.

Takeaways-1

- A properly designed citizen-science program can produce highly reliable data
- Data summaries provide local and regional information on distribution and relative abundance of species
- Advanced analysis techniques are available to produce powerful density estimates and probability of occurrence for each species

Takeaways-2

- Only a citizen-science program can provide the resources for this comprehensive study
- Properly trained volunteers can provide valuable early reconnaissance for presence of oil, oiled wildlife, and occurrence of wildlife
- Full coverage of areas most at risk requires the expansion into the San Juan Islands region
- A little money goes a very long way in a citizen-science program

Thanks to the 190 primary observers and the hundreds of assistants

Abby Larson, Adam Crutcher, Adam Sedgley, Amber Carver, Amber Hearsley, Amy Huggins, Ann Root, Anne Bell, Anne Blair, Anne Thomson, Barb Lutzewitz, Barbara Blackie, Barbara Guthrie, Becca Stombaugh, Bernice Tannenbaum, Beth Stimson, Bill Horder, Bill Vogt, Bob Boekelheide, Bob Iddins, Bob Martin, Bob Sextro, Bob Stallcop, Bob Whitney, Brenda Dewey, Brynn McIntyre, Carl Haynie, Carlyn Roedell, Carol Hartung, Carol Smith, Carole Elder, Cathie Conolly, Charlie Crow, Charlie Shoaf, Charlie Wright, Chris Anderson, Chris Millow, Chris Rennick, Cinda Langjhar, Cindy Horning, Coleman Byrnes, Dan Christian, Dan Evans, Dan Roscoe, Dana Kovac, Danae Presler, Danielle Shorts, Dasha Gudalewicz, Dave Frazer, Dave Hays, Dave Jackson, David Beatty, David Garcia, David Gluckman, David Jamison, David Richardson, Deb Campbell, Debbie Campbell, Debbie Dain, Denny Van Horn, Diane Nason, Don Duprey, Donna LaCasse, Dow Lambert, Ed Swan, Emily Neal, Emily Runnells, Eric Kraig, Ezra Parker, Fiona Cohen, Frank Snow, Gabriel Newton, Gail Storrs, Gary Shugart, Gary Smith, Geoff Snyder, George Horning, George Ritchotte, Govinda Rosling, Guy McWethy, Heidi Pedersen, Ian Maunsell, Ilon Logan, Ingrid Hansen, Jack Gossett, Jamie Montague, Jane Dolliver, Janet Carroll, Janet Shonk, Jason Vassallo, Jean Olson, Jean Trent, Jean Walat, Jen Mckeirnan, Jennifer May, Jill Hein, Jim Fiero, Jim Gift, Jim Owens, Jo Reeves, Jo Smith, Joe Buchanan, Johanna King, John Blair, John Cragin, John Riegsecker, John White, John Williams, Jon Houghton, Joseph Evenson, Joyce Murray, Jud Scoville, Judy Mullally, Julie Monahan, Kathie Stork, Kathleen Morley, Kathy West, Kay Norton, Ken Brunner, Ken Rauscher, Ken Wiersema, Kimberle Stark, Kris Lightner, Krissy Mazur, Larry Goldstein, Larry Jensen, Laura Feuerborn, Laura Saunders, Lee Robinson, Linda Wilkinson, Lisa Harkins, Lynne Smith, Mark Salvadalena, Mark Sullivan, Martha Hollis, Mary Russell, Matthew Pike, Maureen Ellis, Maureen Thompson, Max Czapanskiy, Michael Hobbs, Michael Roedell, Michael Schrimpf, Mike Freund, Monica Fletcher, Nate Johnson, Nathalie Hamel, Pam Stewart, Paula Larson, Peter Hodum, Phyllis Kind, Port Townsend Marine Science Center, Randy Smith, Rebecca Evans, Rebecca Galloway, Rebekah Graham, Rick Huey, Rob Britschgi, Rod Brown, Roland Kilcher, Ron Leamon, Ron Martin, Ron Sikes, Rosemary Sikes, Sarah Peden, Sarah Schmidt, Scott Markowitz, Scott Pearson, Seth Hildebrand, Shannon Kawamura, Sharon Sneddon, Stan Rullman, Stephen Elston, Steve Dang, Steve Grayson, Steve Johnson, Sue Nattinger, Sue Yates, Susan Ehler, Susie Stillman, Terry Mace, Terry Sullivan, Toby Ross, Tonnie Casey, Tracey Scalici, Tristan Nunez, Vera Cragin, Virginia Bound, Wendy Feltham, Woody Franzen.

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