

Resource Selection Function Analyses:

**Assessing habitat use relative to
behavior and resource characteristics/availability
for five common marine mammal species
in the Southern California Bight**

Trent McDonald¹, **Mari A. Smultea**^{2,3}, Shay Howlin¹, and Cathy Bacon^{2,4}

¹Western EcoSystems Technology, Inc., Laramie, WY;

²Marine Biology Department, Marine Mammal Behavioral Ecology Group, Texas A&M University at Galveston, Pelican Island, Galveston, TX 77553

³Smultea Environmental Sciences (SES), P.O. Box 256, Preston, WA 98050;

⁴Marine Science Department, Texas A&M University at Galveston, Pelican Island, Galveston, TX 77553



What is an RSF (Resource Selection Function)?

Manly et al. 1993, 2002

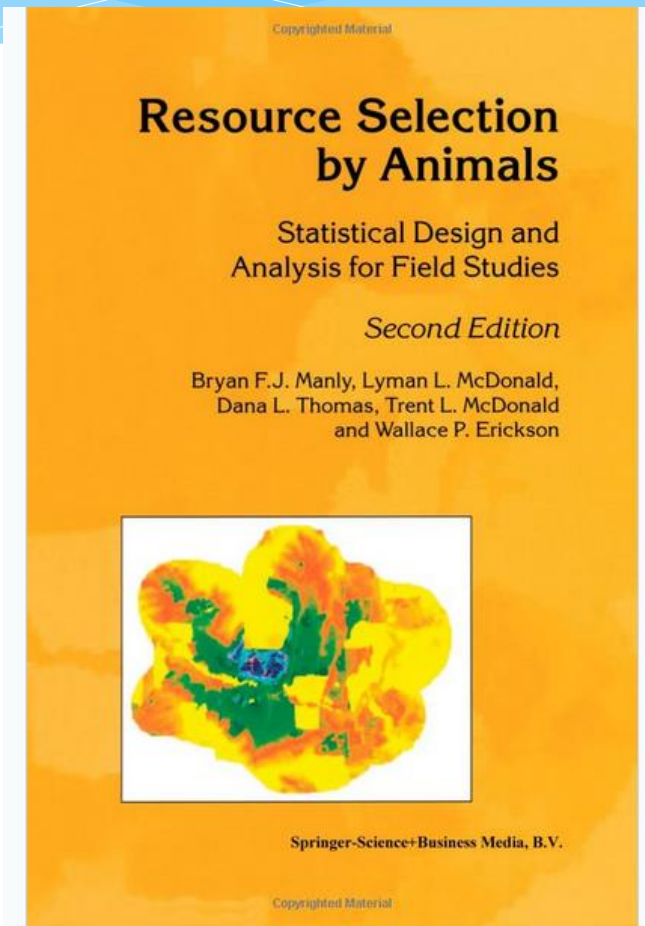
1. Animals make choices re: resources
2. Resources **used disproportionately to availability**

Models choice using quantifiable habitat characteristics

Habitat use & impacts

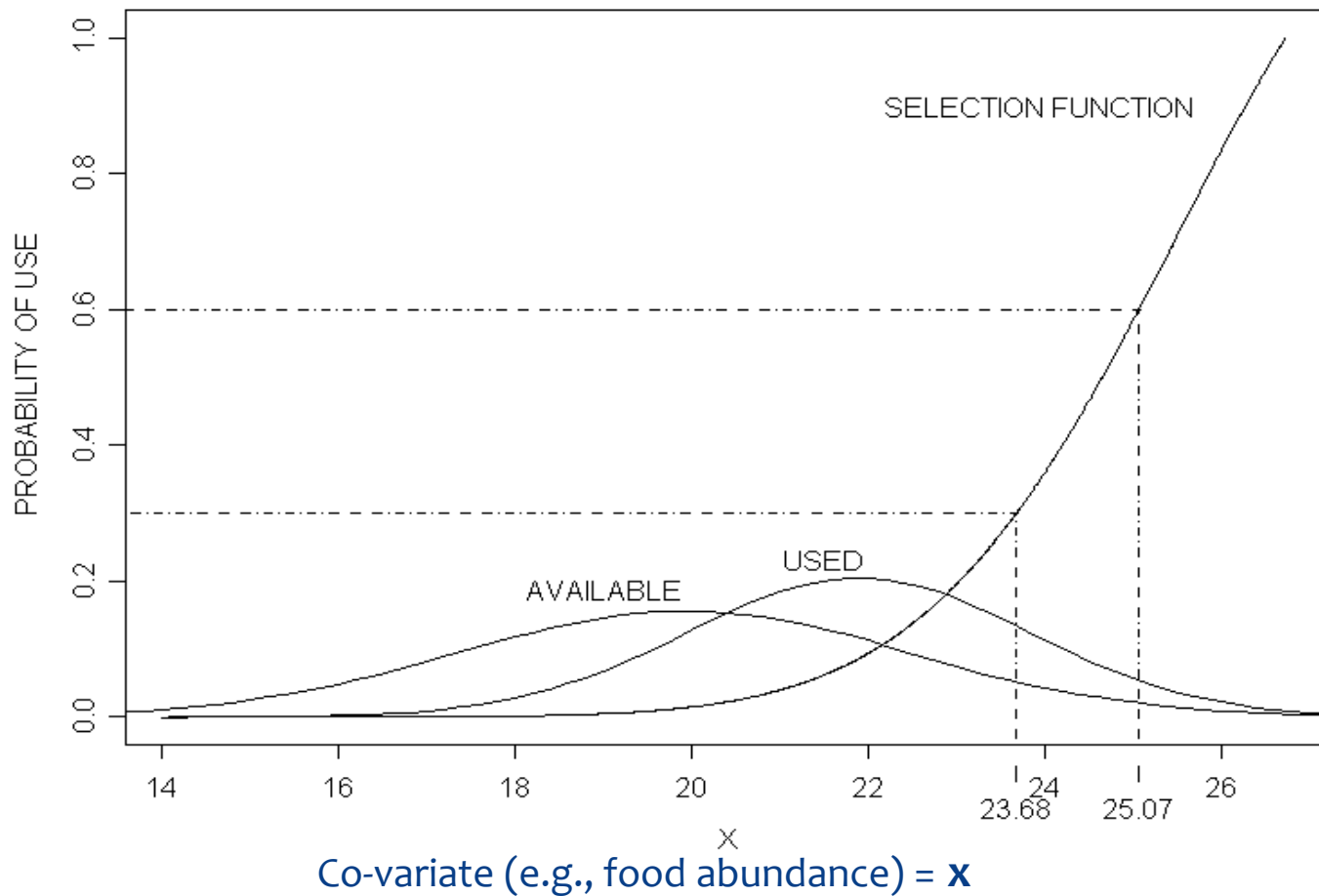
fish, birds, mammals, polar bears

- oil / gas exploration
- global warming



How apply RSF?

1. Randomly select “available” locations & attributes
2. Compare to sighting locations



How do RSFs differ from density mapping?

- * Density mapping estimates the *used* distribution only -
- Not what's *available*.
- * Ignoring *availability* can bias estimates of preference --
- *especially rare habitats*

Questions & Goals

Do marine mammals in U.S. Navy SOCAL Range Complex

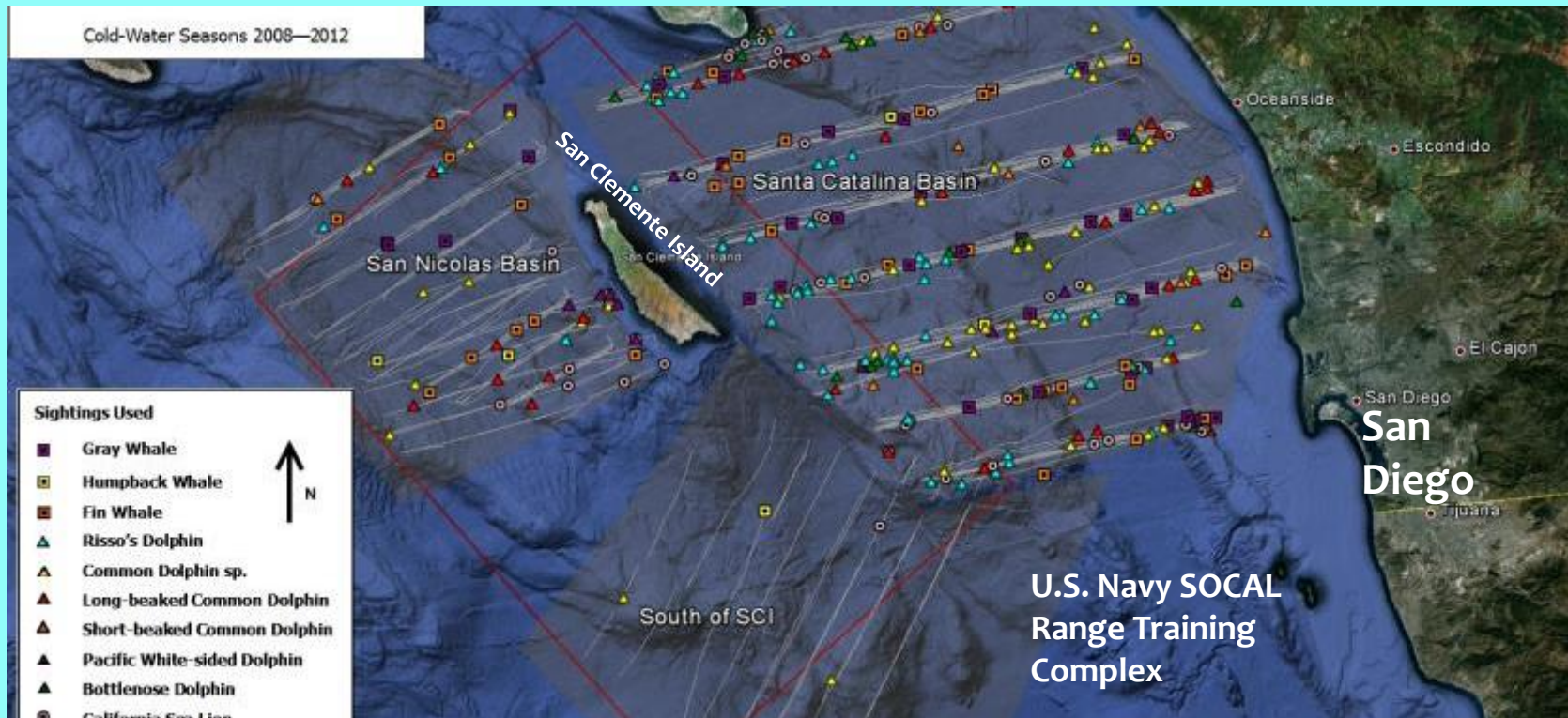
- * prefer certain habitat?
- * *behave* differently in different habitats?

GOAL:

1. Establish “baseline”
 - * future changes?
 - * anthropogenic activities?

Approach

- * 15 aerial surveys 2008-2012
- * Systematic line-transect
- * “First-observed” **behavior state**
 - * **Slow** = rest, mill, slow travel
 - * **Travel**



Statistics

- * Standard logistic regression
- * AIC ranking – 127 models

- * *Randomly Selected* 35,167 points

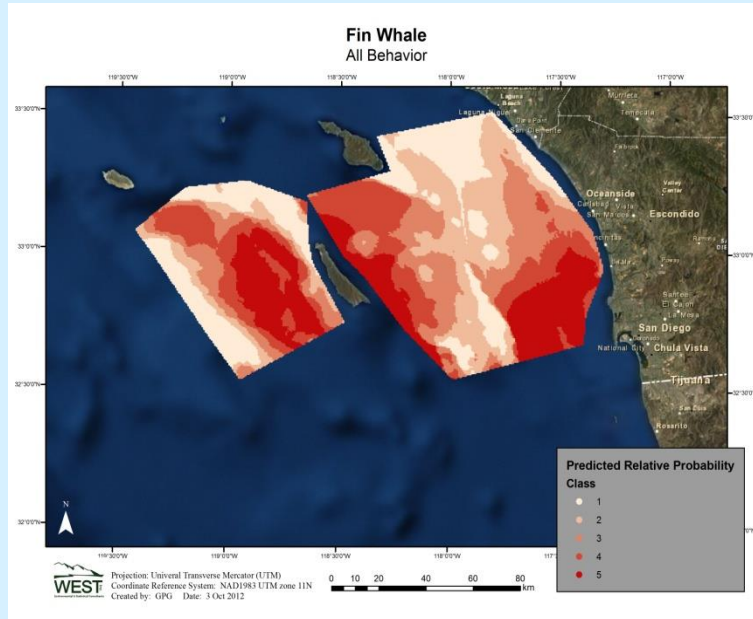
- * **7 habitat variables**
 1. *Depth*
 2. *Distance to shore*
 3. *Slope*
 4. “Northness”
 5. “Eastness”
 6. Latitude
 7. Longitude

5 Common Species

	# Sightings
California sea lion	157
Risso's dolphin	135
Fin whale	60
Gray whale	40
Bottlenose dolphin	31

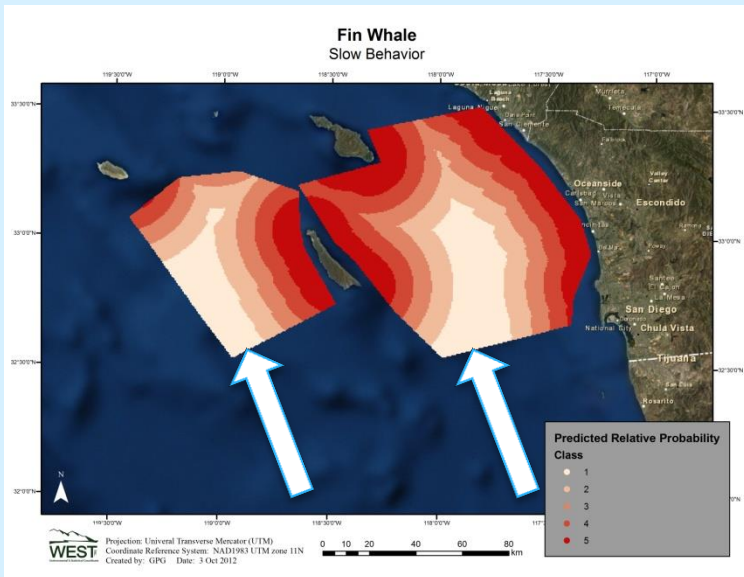
Fin Whale

Overall Use

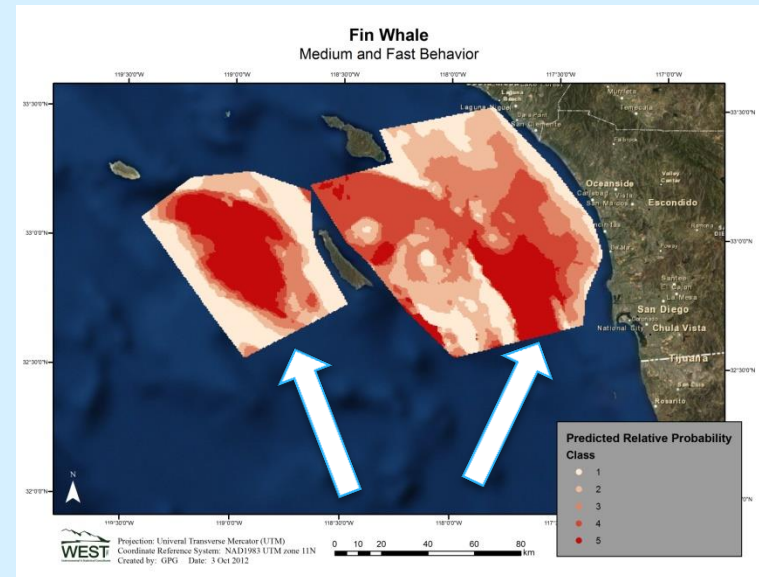


M. Smultea/NMFS permit 14451

SLOW

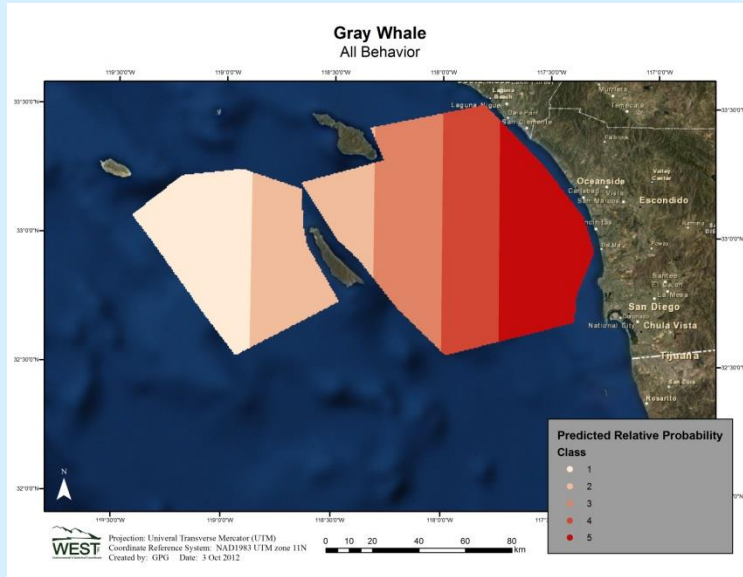


TRAVEL



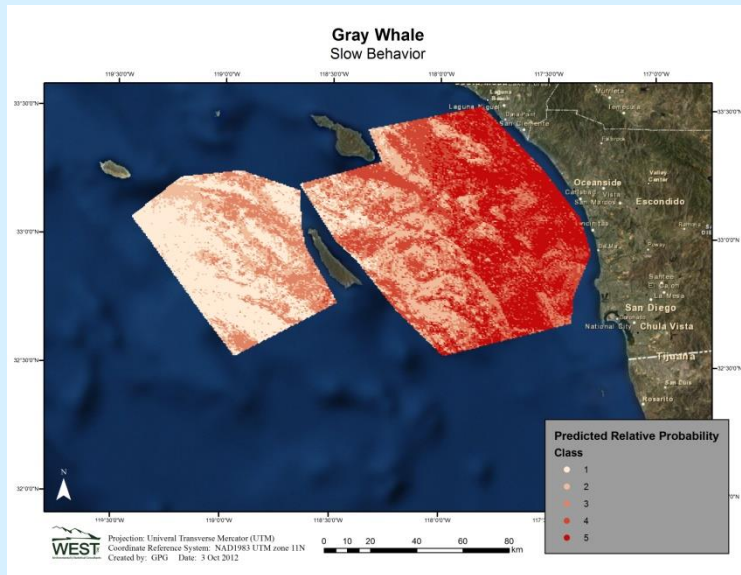
Gray whale

Overall Use

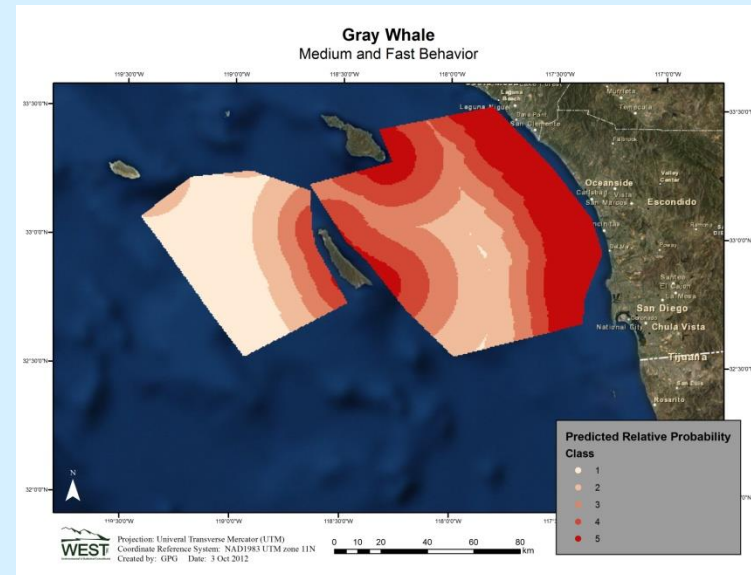


B. Würsig/NMFS permit 14451

SLOW

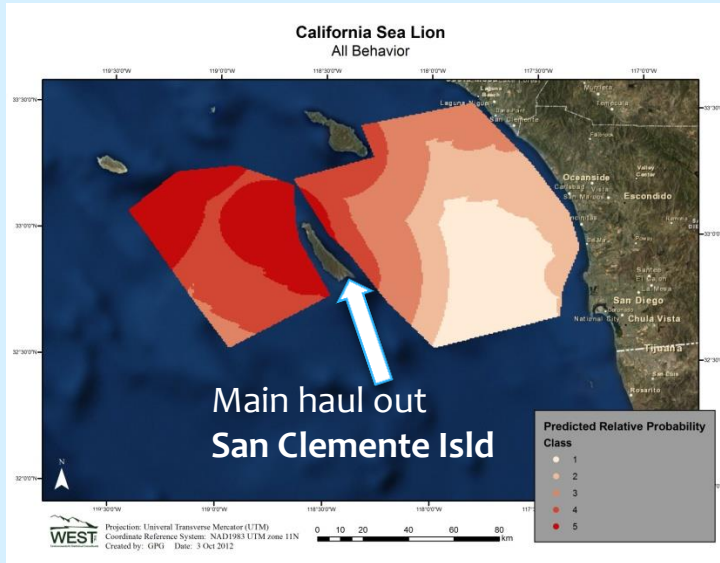


TRAVEL



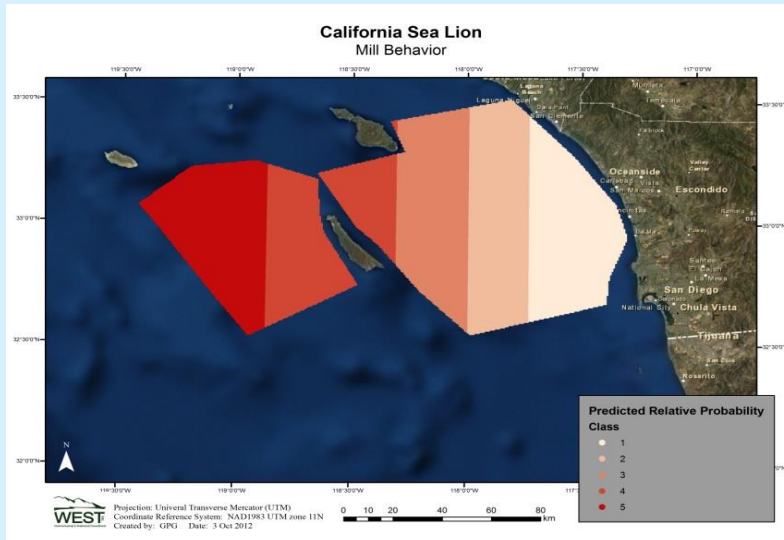
California sea lion

Overall Use

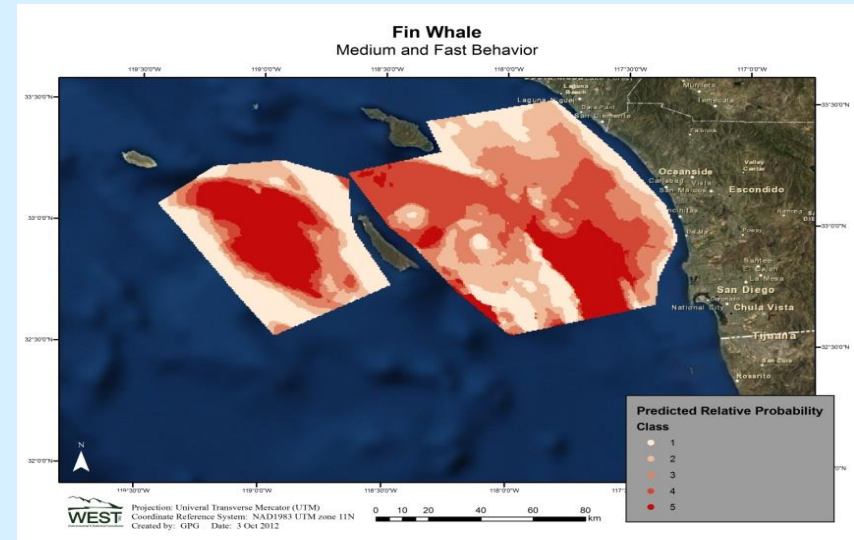


M. Smultea/NMFS permit 14451

SLOW

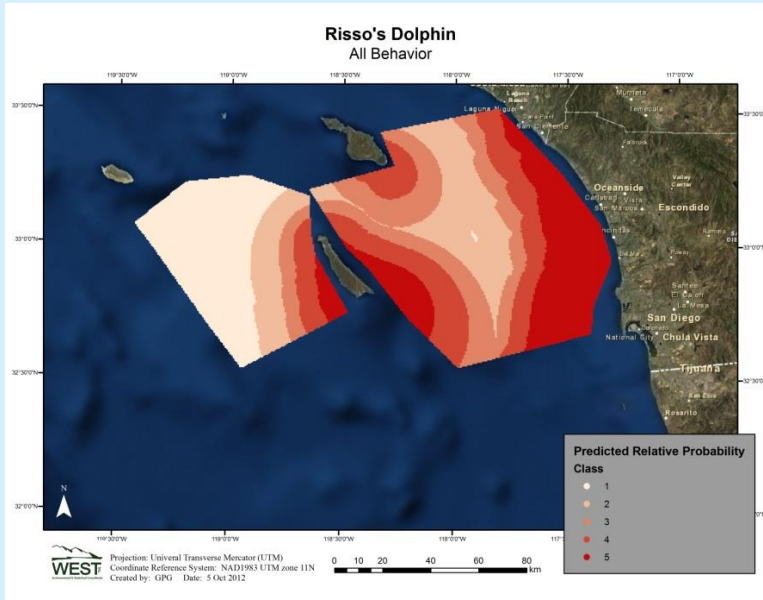


TRAVEL



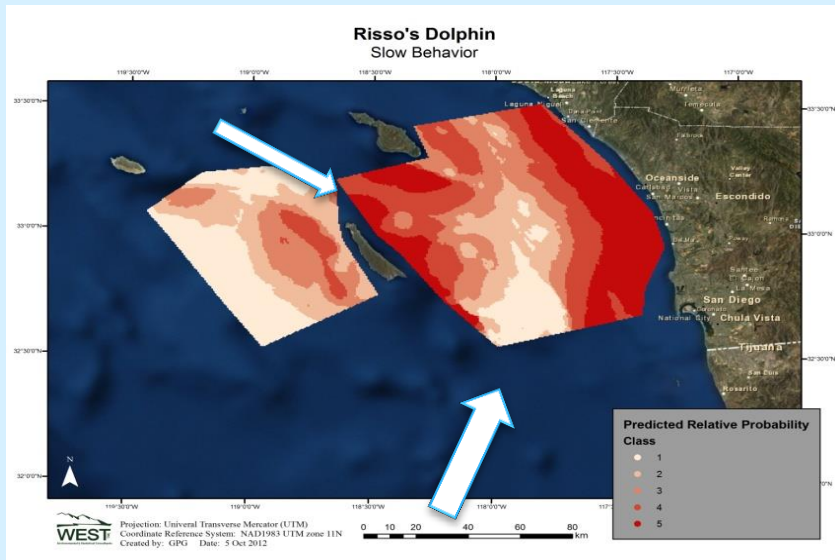
Risso's dolphin

Overall Use

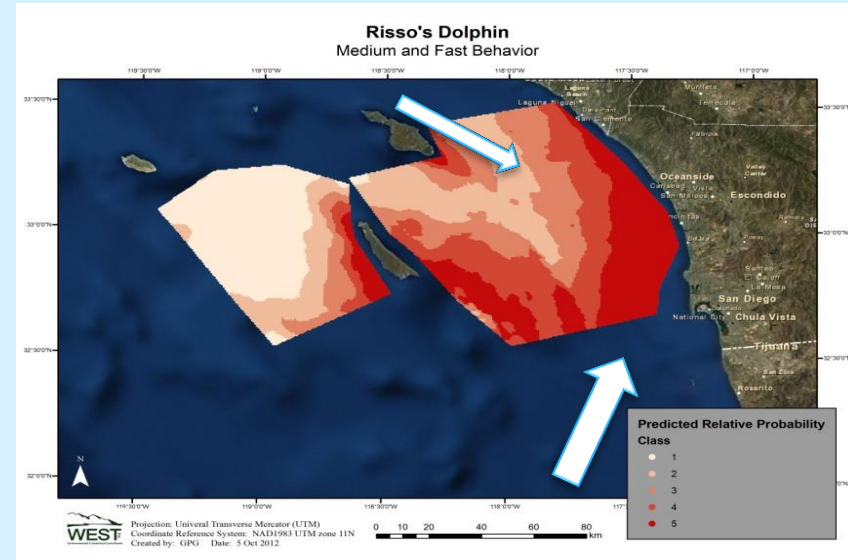


B. Würsig/NMFS permit 14451

SLOW

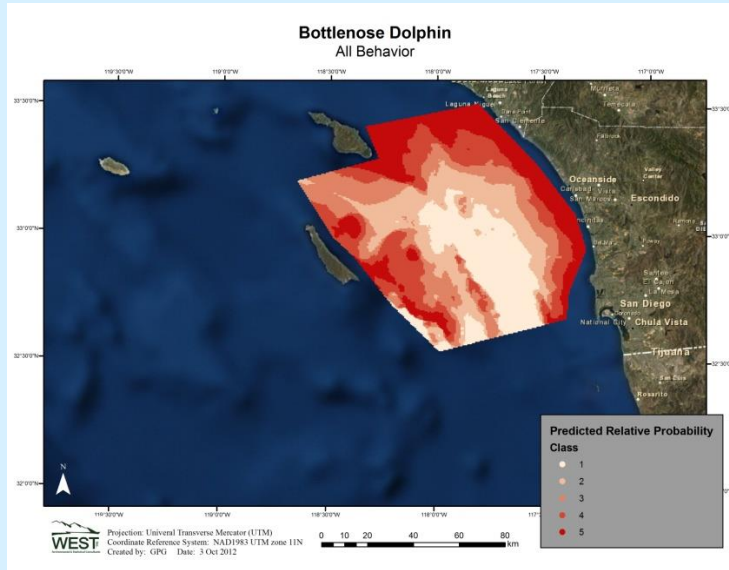


TRAVEL

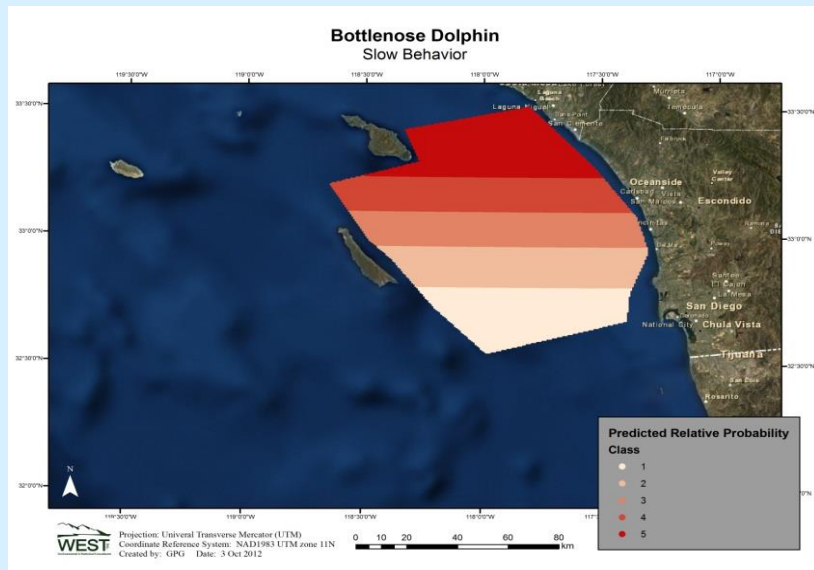


Bottlenose dolphin

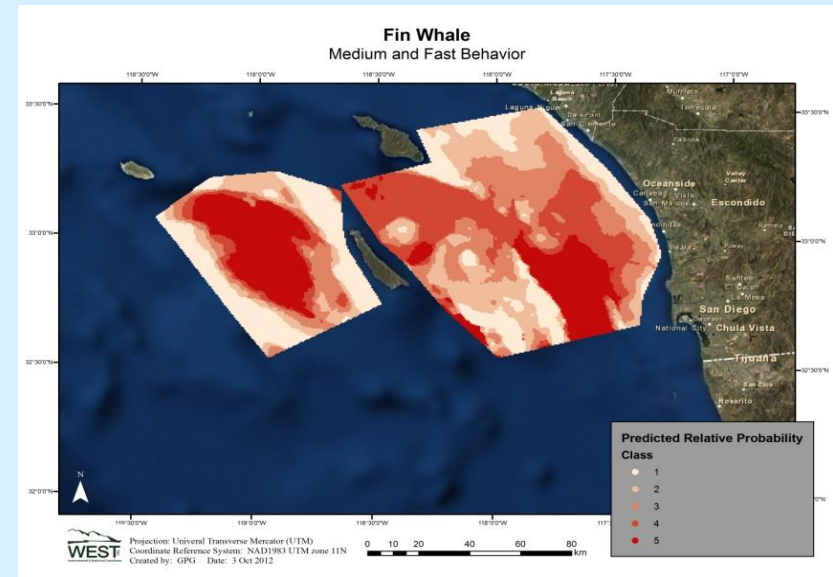
Overall Use



SLOW



TRAVEL



Interpretations

- * **Slow** \approx rest, social, feed, mill
- * **Travel** \approx point - to - point movement

Conclusions / Hypotheses

Habitat by behavior --- Differences

	FIN WHALE	GRAY WHALE
<i>Occurrence</i>	Year-round, migrate, feed	Seasonal migrant
<i>Food</i>	Krill, small fish	<i>Migrating</i>
<i>Distribution</i>	Prefer offshore	Prefer mainland coast
SLOW	Near shore/slopes = <i>upwelling</i> = MORE food, protection?	Prefer mainland coast
TRAVEL	Across flat basins = LESS food	Along coast & islands – follow contours? Protection?

Conclusions / Hypotheses

Habitat by behavior --- Differences

	RISSO'S DOLPHIN	BOTTLENOSE DOLPHIN
<i>Occurrence</i>	Resident, seasonal fluctuation	Resident
<i>Food</i>	Crepuscular or nocturnal forage - SQUID	Opportunistic forage - FISH
<i>Distribution</i>	Prefer slopes	Prefer island shorelines
SLOW	Near both islands	Near Santa Catalina Island
TRAVEL	More offshore along slope – foraging?	Flat basins – transiting? foraging?

Conclusions / Hypotheses

Habitat by behavior --- Differences

	CALIFORNIA SEA LION
<i>Occurrence</i>	Year-round, seasonally abundant, migrate
<i>Food</i>	Fish, squid
<i>Distribution</i>	Prefer waters near island haul-outs
SLOW	<i>Rest-social</i> Near haul outs / slope waters = <i>upwelling</i> = MORE food, protection, proximity?
TRAVEL	Across flat basins = LESS food, vulnerable? Going somewhere

Take Home Message

- * **Consider behavior when assessing habitat use**
 - * *Selection related to function*

More?

- * SST, CHL, currents?
- * Season, time of day?

- * *Common dolphins*

- * *Focal behavior follows*
 - * Detail
 - * Video