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Investigating Coastal Recreation and Climate in the Coastal Lagoons of Rhode Island, USA: A Multi-Methods Approach

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Outline

- Introduction
- Part A: Observational Data
  - Methods
  - Analysis
  - Results
- Part B: Interview Data
  - Methods
  - Analysis
  - Results
- Discussion: Comparing Results
- Conclusion

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Introduction:
Coastal Lagoons in the Ocean State

- Also known as “Salt Ponds”
- Unique, shallow, productive marine embayments
- Separated from the open ocean by a permanent, engineered “breachway”
- Tidal
- Popular for lounging, boating, swimming, fishing, and recreational and commercial shellfishing

Sailing on Quonochontaug

(Source: Kayla Nitzberg)

Motoring on Ninigret

(Source: Meredith Haas, RI Sea Gr

“Chilling” on Ninigret

(Source: Meredith Haas, RI Sea Gr

Commercial activity on Pt. Judith

(Source: Meredith Haas, RI Sea Gr

Quonochontaug Pond

1:20,000

(Source: Google Earth)

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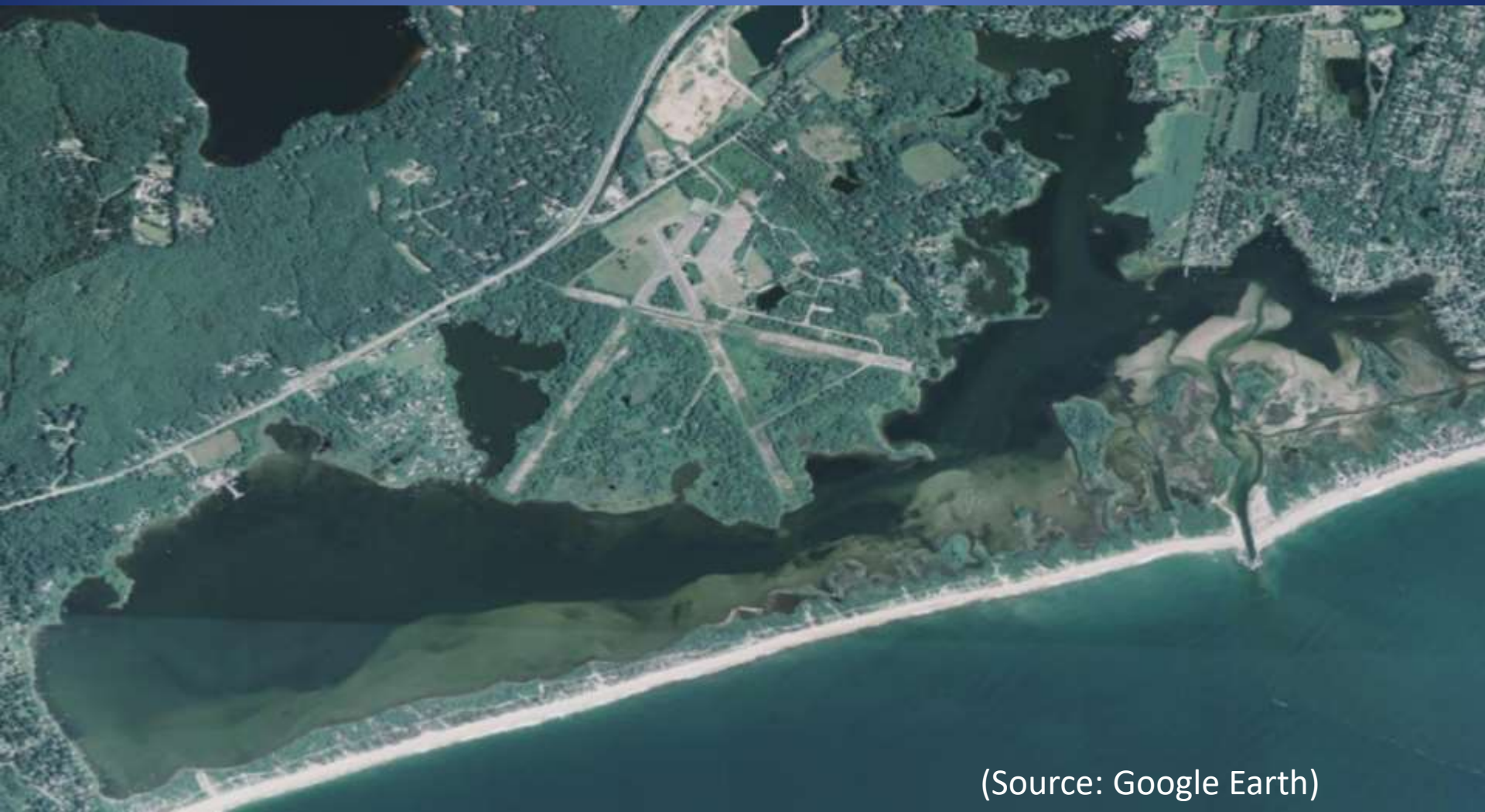
Ninigret Pond

1:25,000



(Source: Google Earth)

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Pt Judith Pond

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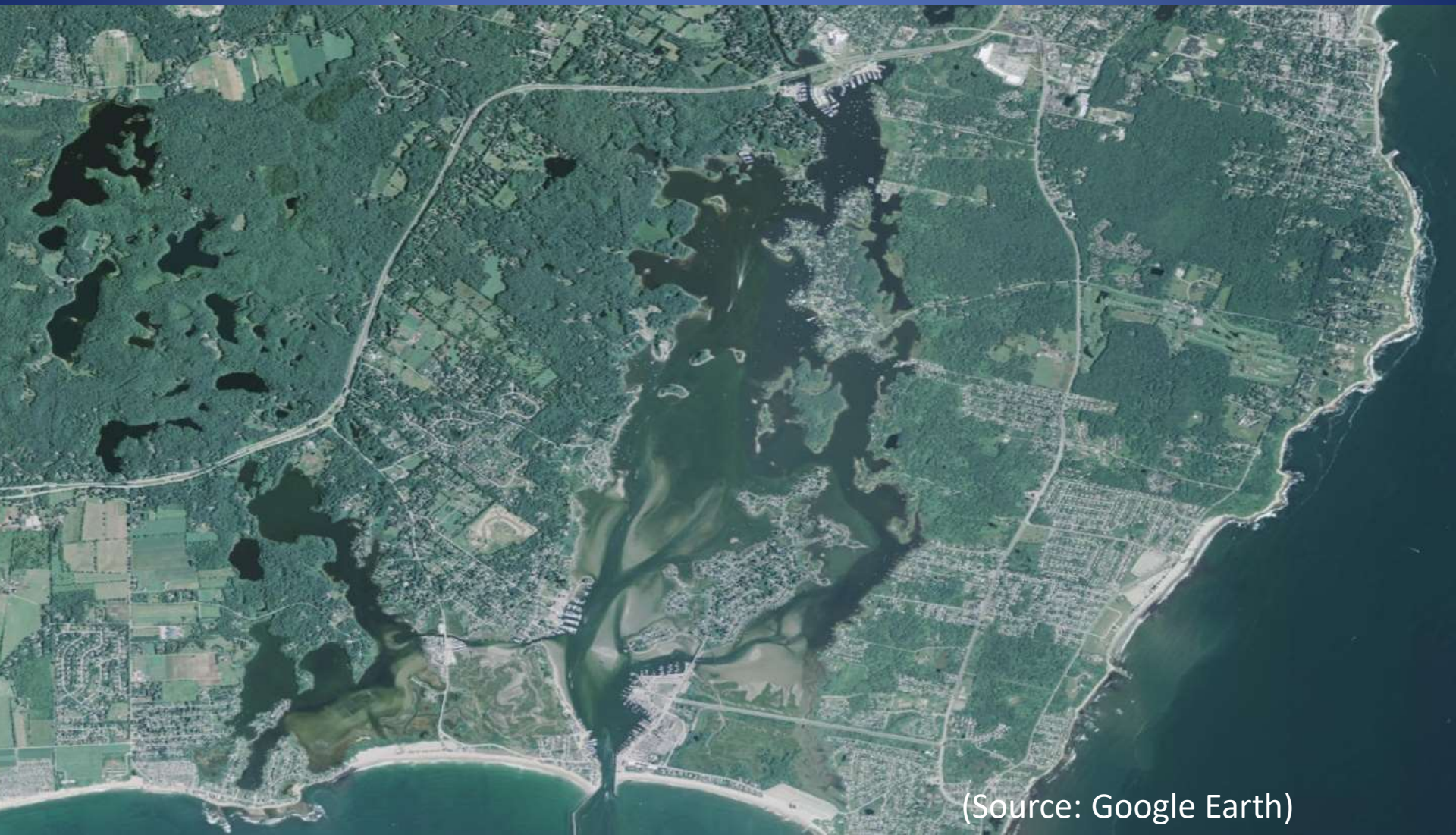

(Source: Google Earth)

Introduction: Recreation and Tourism

- Recreational use of the coastal lagoons in Rhode Island is economically important
  - Tourism-dependent part of the state
- Lagoons highly valued for range of activities
  - Fishing, clamming, boating, beach-going, etc.
- Weather considerably affects an individual's decision to recreate
  - Ease of paddling for kayakers, comfort level for beach-goers, etc.

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Introduction: Weather and Recreation

- Weather and weather expectation may serve as important motivators for outdoor recreation
  - 72% of U.S. public usually or always checks the weather for the purpose of simply knowing what the weather will be like (Lazo, Morss, and Demuth 2009)
- Outdoor recreation is related to weather factors
  - Weather-related activities (e.g. sailing requires wind)
  - Physiological factors such as thermal comfort
  - Psychological factors such as expectation, thermal history and memory (Nikolopoulou, Baker, and Steemers 2001)

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Introduction: Climate Change in RI

- Climate change will affect the summer weather in Rhode Island
  - Warming between 3-10 degrees by 2080
  - Increased intensity of wind, rain, drought and storm events in the summer (Horton et. al. 2014)
- Planning for future coastal recreation/tourism requires understanding how it might change with climate change.
  - Demand for tourism infrastructure
  - Impact on environmental resources

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Research Questions

1. How do different weather conditions affect levels of different types of recreational use on the coastal lagoons?
2. What factors affect an individual's decision to recreate, how important are they to the users, and are they different among different types of user groups?
3. Can stated importance of weather factors explain observed effects of weather factors?
4. What other factors besides weather can explain changes in amount of use?

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Why It Matters

- To the community:
  - Understanding what and how much weather conditions affect recreation can help managers and business owners prepare for day-to-day fluctuations.
  - Understanding which user groups might be affected by climate change and why will help managers, business owners and the state prepare for long-term fluctuations in coastal recreation and tourism.
- To science:
  - Utilizes BOTH stated importance and observed use on the same population
  - Compares DIFFERENT COASTAL uses (not just beach-going)

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4 Coastal Uses Investigated

Chilling

Kayaking

Motoring

Fishing (hook and line and clamming)

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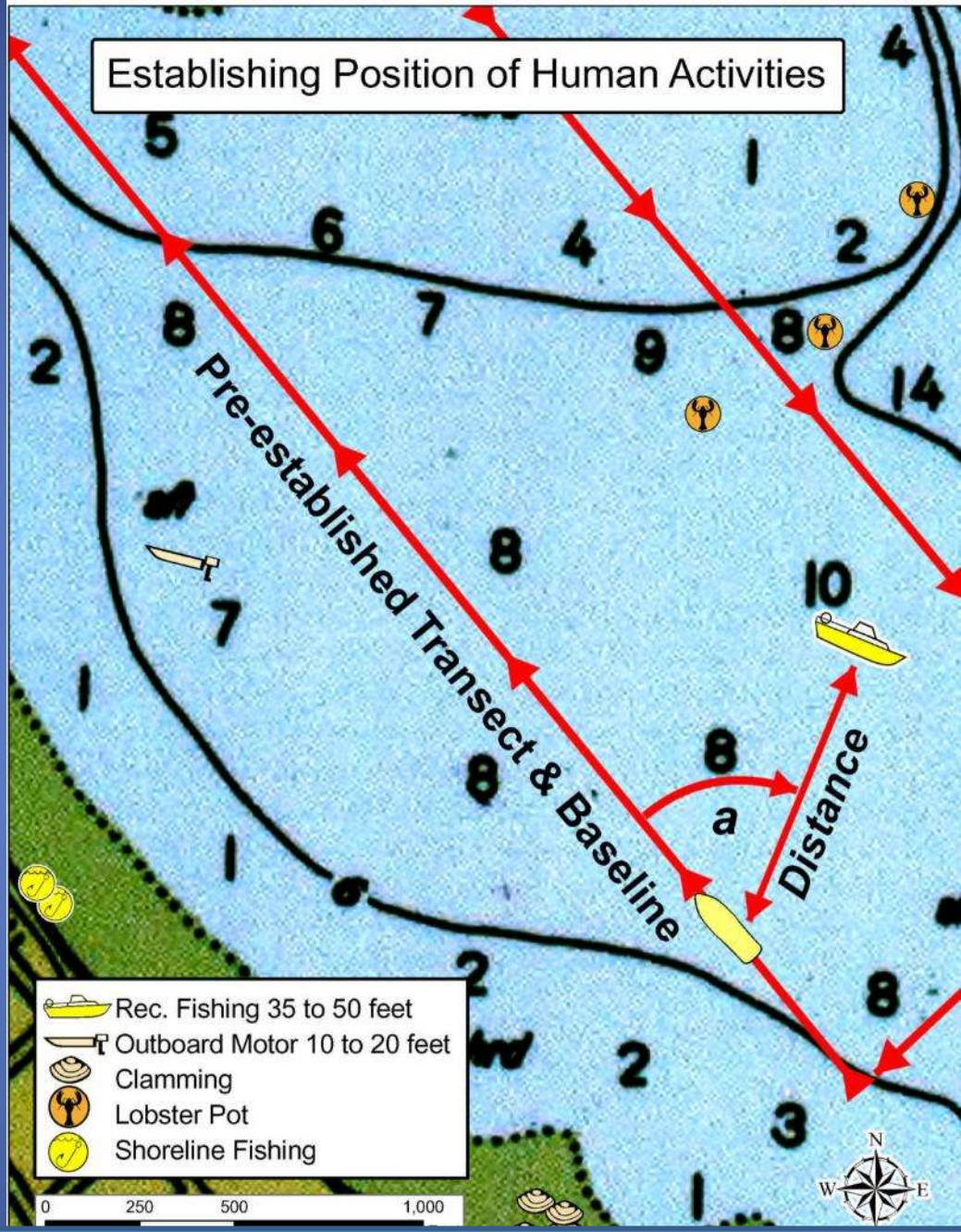
Part A: Observational Data Counting Use

- Transect lines established on lagoons
- Randomly selected days and transect order
- Equipment:
  - Trimble Handheld running ArcPad
  - Trupulse rangefinding binoculars



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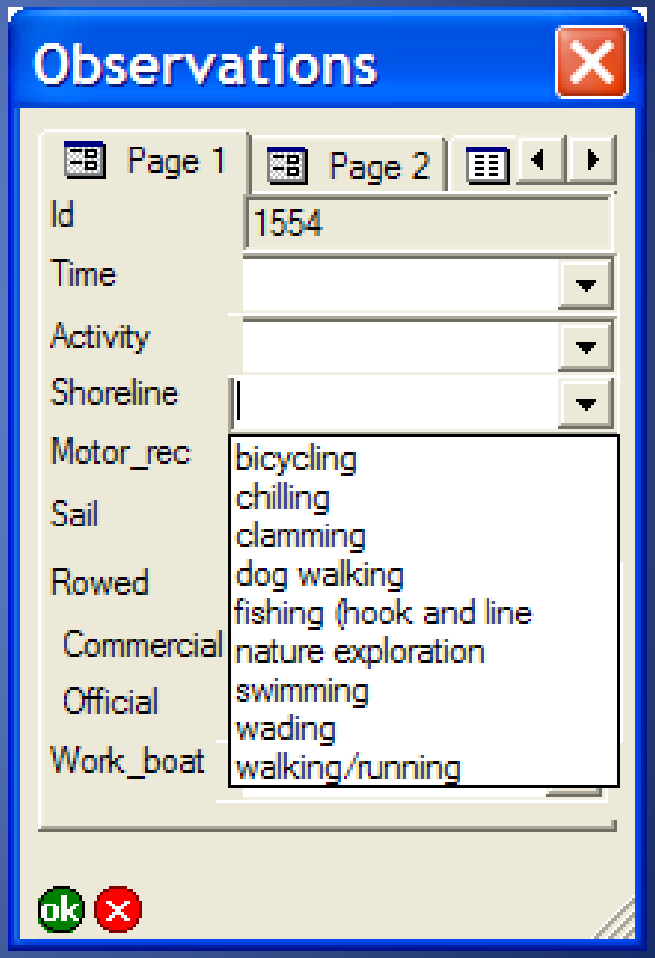
Recording Attributes in ArcPad

- Binoculars used to “tag” user
- Series of drop down choice menus immediately appears on Trimble when a record is created
- Recorder enters attributes of use by tapping the touch screen on the Trimble



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Observational Data Results

- 63 sample days over 2 summers (2014-15)
- 43,892 total recorded points
- Conducted regression analysis of daily tallies of each use (dependent) and weather factors (independent)

Example of observations on Pt. Judith

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Observations Results

1. How do different weather conditions affect levels of different types of recreational use on the coastal lagoons?

Relationships between daily tallies of observed activity (LN) and weather factors

	Weekend	Avg. Hum.	Precip. (in.)	Avg. Wind (mph)	Prov. Avg. Temp. (°F)	Prov. Cooling Degree Days (CDD)	Local Low Temp. (°F) (LLT)
All (R^2 .759)	+ 60.4% **	-2.6%**	- 42.7% **	- 6.5% *	+ 9% **		- 4.9% *
Chilling (R^2 . 906)	+ 97.4%*	-4.5%*	-106.4%**		+105.5%**	-100.4%**	
Rowed (R^2 . 817)			-88.7%**	-19.6%**	+74.6%**	-63%**	-13.8%**
Motor (R^2 . 799)	+117%**	-2.4%*	-42.5%**	-8.1%*	+11%*		
Fishing (R^2 .690)	+55.8%*	-2.7%*	-43%*	-14.9%**			

(*p<.05) **p<.001)

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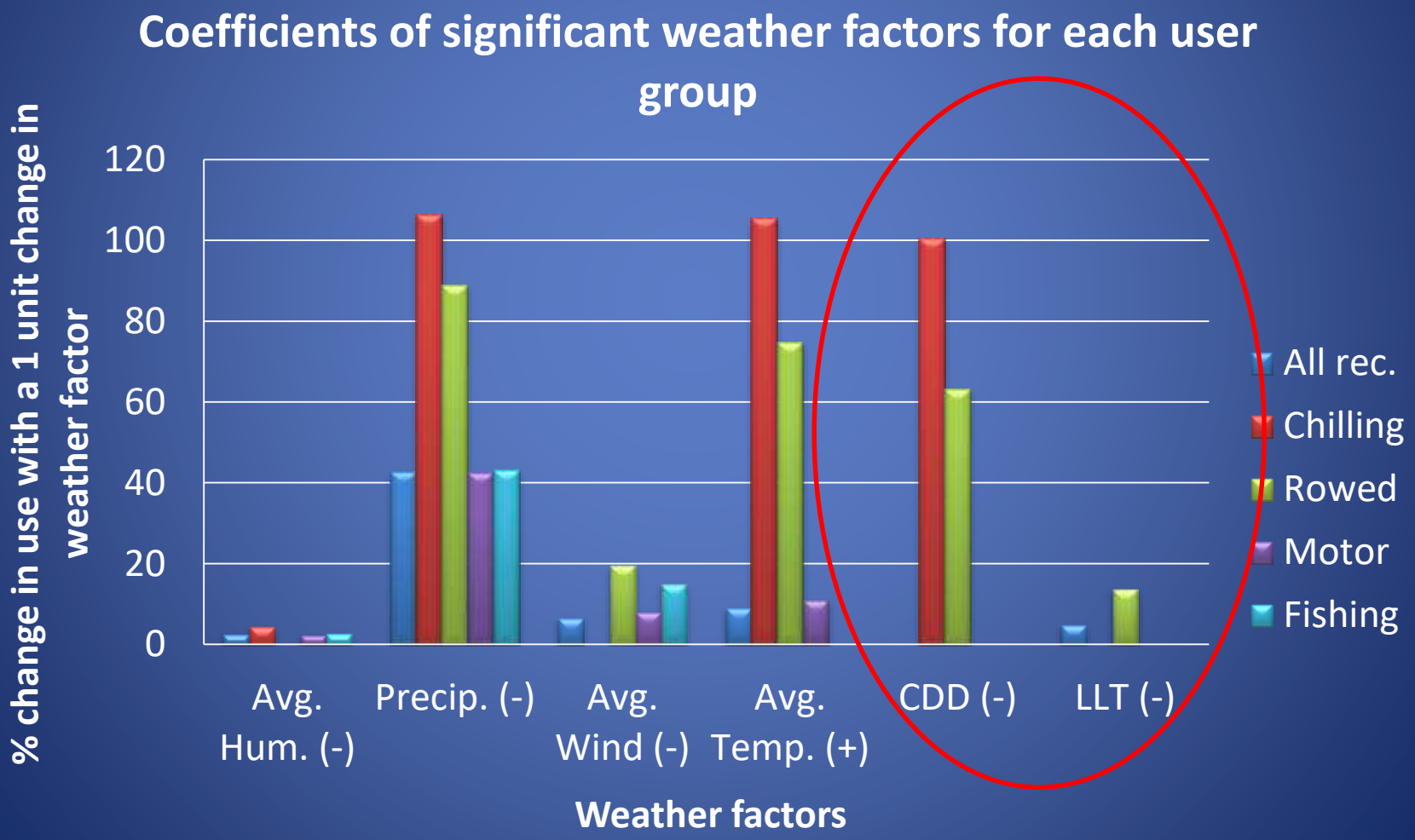
Observations Results

Relationships between daily tallies of observed activity (LN) and weather factors



(+) indicates positive relationship, (-) indicates negative relationship

Part B: Intercept Surveys

- Short intercept surveys of people using the lagoons
  - Boat ramps, marinas and along shore
- Dates and times randomly selected
- All present are queried for an interview

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Survey questions

- What uses were you engaged in today?
- What are the main reasons you came here today? Please list and rank from most important to least important.
- Did you check the weather before you came (Y/N)?
- How important was __ in your decision to come to the pond today? (1= not at all important to 5 = extremely important)
  - 11 weather factors total including
    - Weather forecast overall
    - Air temperature
    - Wind speed
    - Humidity, etc.
- What temperature would be too cold? Too warm?

Part B Results and Analysis

Reasons for coming (open ended):

- Qualitative analysis. Coded each distinct answer and noted repeats

Did you check the weather (Y/N)?

- Chi-square test to find if two user groups answers are significantly different

Stated importance of weather factors:

- Mann-Whitney U Test to find it two user groups answers are significantly different

- *As individuals often participated in more than one use, distinct groups cannot be tested.
  - Tested all people who DID participate in user group (i.e. chilling), against all people who DID NOT (non-chillers)

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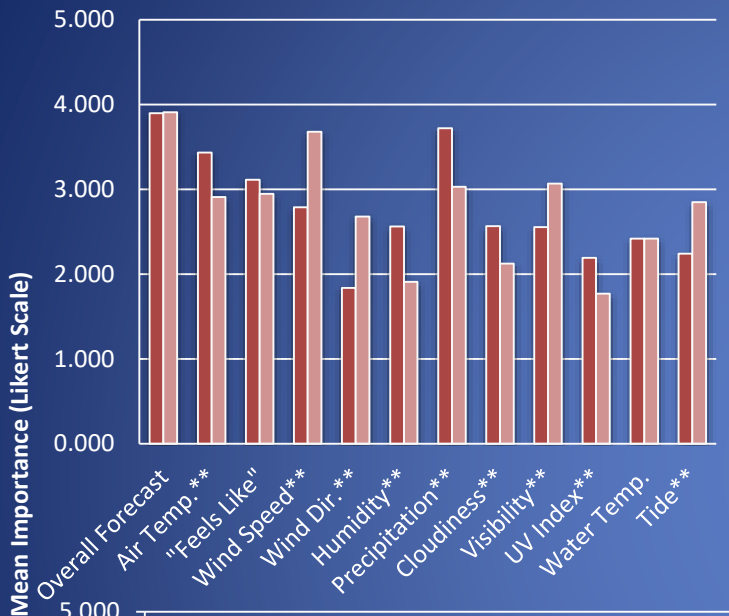
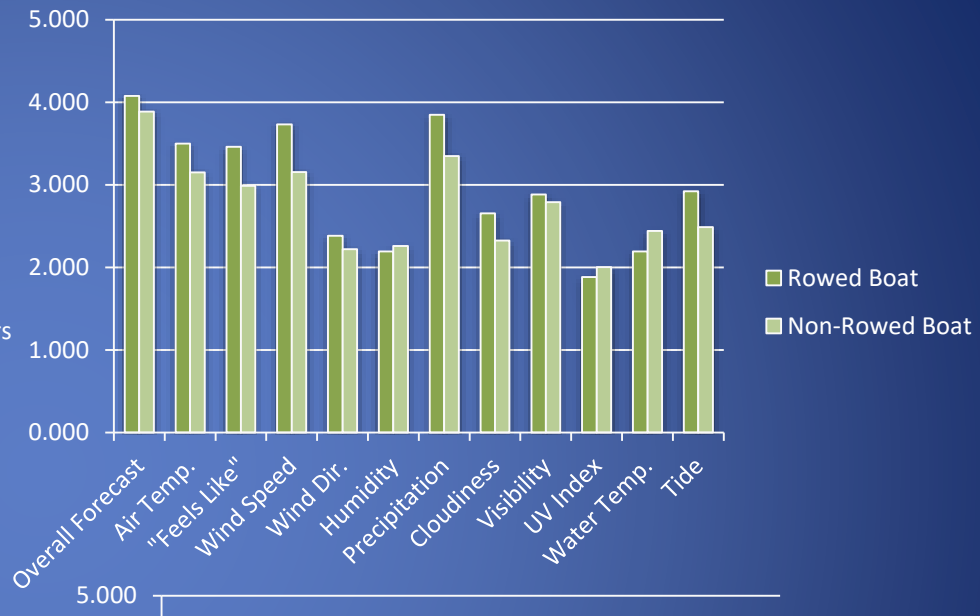
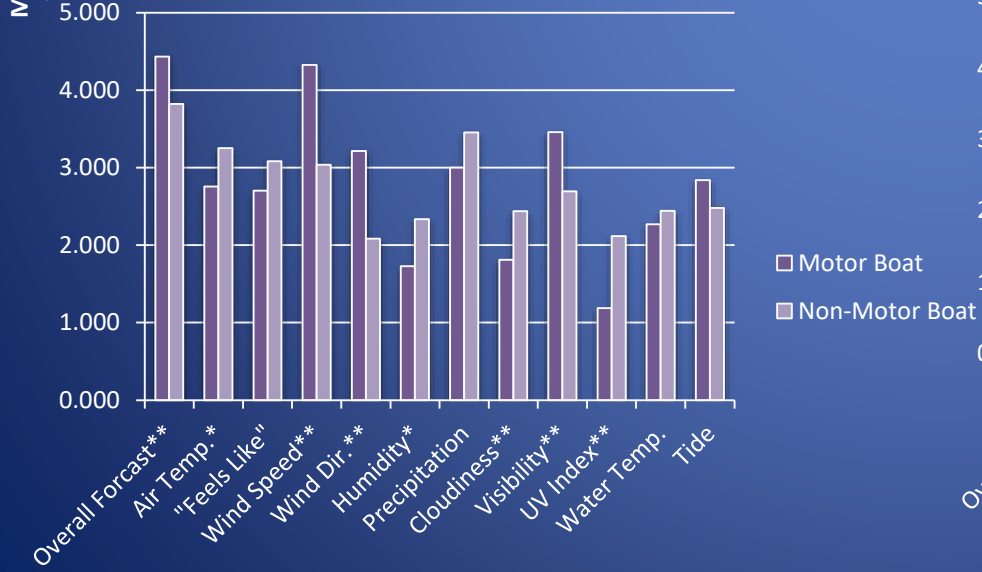
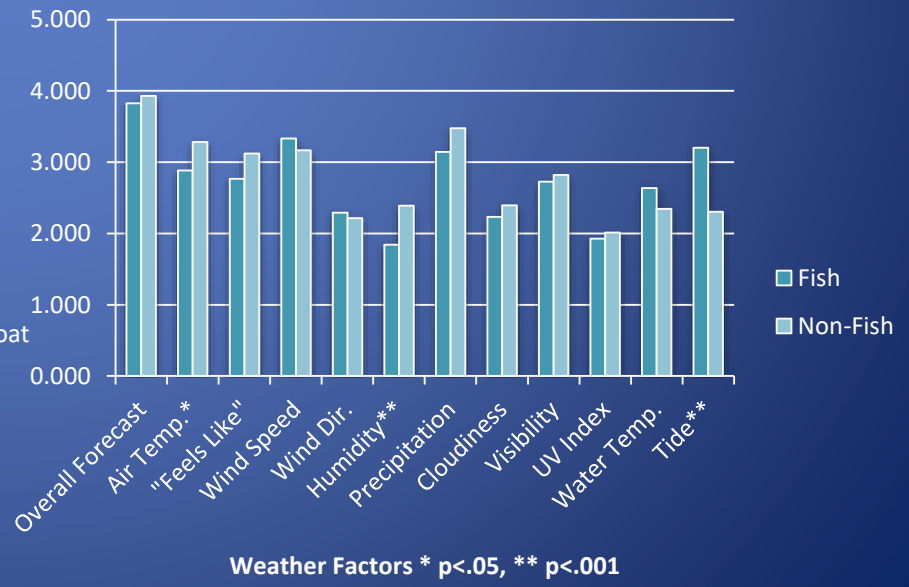
Stated Importance of Weather Factors

2. What factors affect an individual's decision to recreate, how important are they to the users, and are they different among different types of user groups?









Discussion

3. Can stated importance of weather factors explain observed effects of weather factors?

CHILLING	Air Temp	Wind Speed	Humidity	Precipitation
Regression	+105.5%**		-4.5%*	-106.4%
Average Stated Importance	3.4 (+)	2.8 (-)	2.6 (+)	3.8 (+)

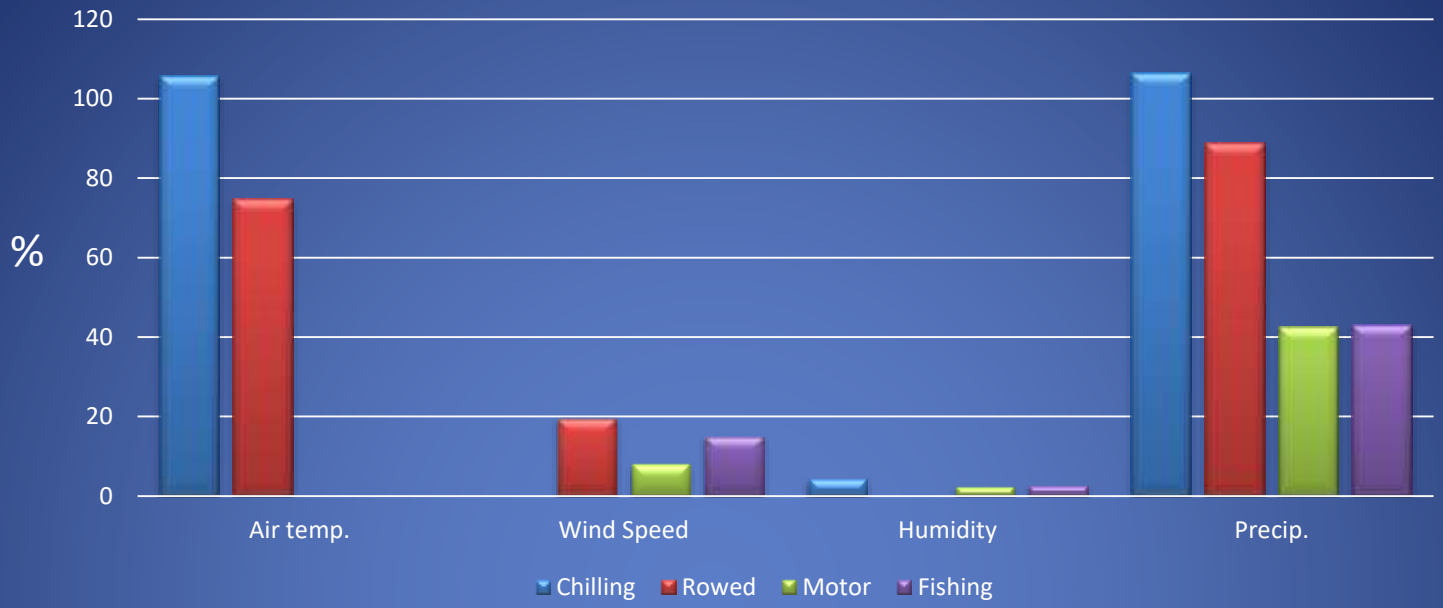
ROWED	Air Temp	Wind Speed	Humidity	Precipitation
Regression	+74.6%**	-19.6%**		-88.7%**
Average Stated Importance	3.5	3.7	2.2	3.8

MOTOR	Air Temp	Wind Speed	Humidity	Precipitation
Regression	+11%**	-8.1%**	-2.4%**	-42.5%**
Average Stated Importance	2.8 (-)	4.3 (+)	1.7 (-)	3

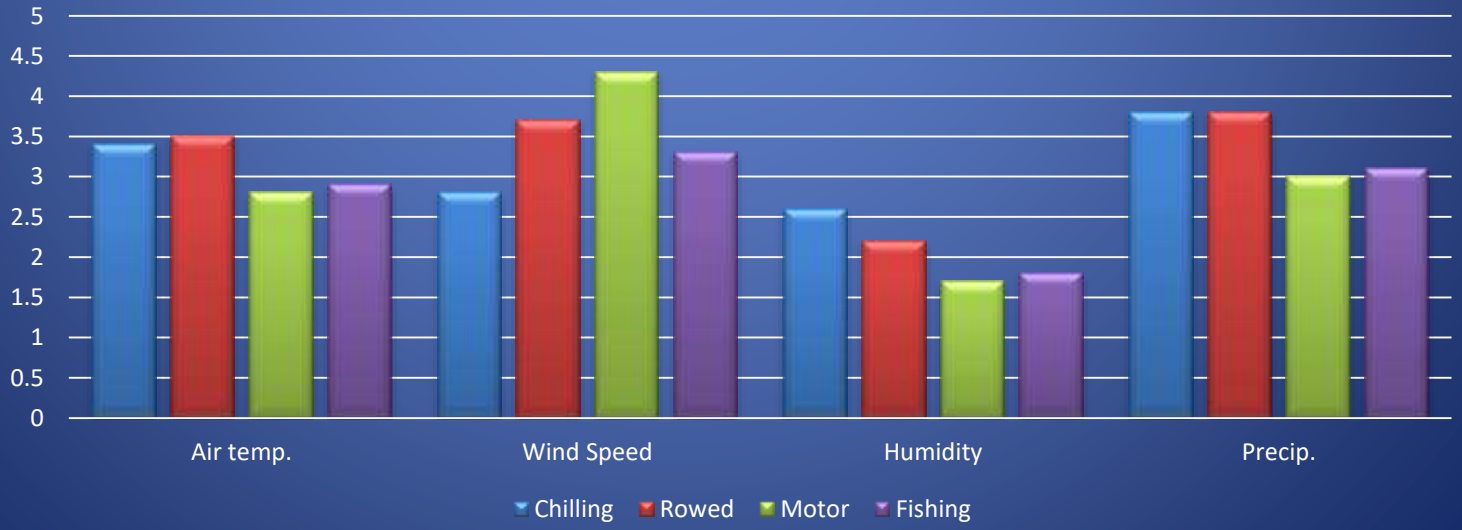
FISH	Air Temp	Wind Speed	Humidity	Precipitation
Regression		-14.9%**	-2.7%*	-43%*
Average Stated Importance	2.9 (-)	3.3	1.8 (-)	3.1

*=p<.05, **=p<.001, (-)=stated significantly less important than other user groups, (+)= stated significantly more important than other user groups.

Significant coefficients - Observational Data



Stated importance - Survey data



…but what about those unexplained variables?

In observational data, we found a significantly negative correlation with:

- CDD (-100.4% for chilling and -63% for rowing) and
- LTT (-13.8% for rowing)

Stated temperature limits:

- Found average stated temperature for high and low limit
- A number of respondents answered that there was no upper limit

  Chi square test to find if the number of people with no upper limit in one user group is significantly different from another

	Chilling	Non-Chilling
% stated no upper limit on air temperature	39%	54%

	Rowed Boats	Non-Rowed Boats
% stated no upper limit on air temperature	30%**	43%**

	Motor Boats	Non-Motor Boats
% stated no upper limit on air temperature	85%**	39%**

	Fishers	Non-Fishers
% stated no upper limit on air temperature	32%**	64%**

4. What other factors besides weather can explain changes in amount of use?

User Group	% reported checked the weather before coming to recreate at lagoon
All Interviewees	75%
Chilling	73%
Rowing	70%
Motoring	89%*
Fishing	76%
Short Distance Traveler	72.8%**
Long Distance Traveler	78.9%**
Locals	70%**
Visitors	78%**

Open Responses	1st Most Important	2nd Most Important	3rd Most Important
1st Most Common	Fishing (17%)	Weather (9%)	Relax (3%)
2nd Most Common	Relax (12%)	Relax (5%)	Scenery (2%)
3rd Most Common	Weather (10%)	Fishing (5%)	Play for Kids (2%)
4th Most Common	Play for Kids (9%)	Family/Friend visiting (4%)	Day off from work (2%)
5th Most Common	Family/Friend visiting (7%)	Boating (4%)	Free (as opposed to state beach) (2%)

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Conclusions

- In both stated importance and observed effect, different weather variables have different effects on recreation based on the user group. Qualitatively speaking, the general results from the two methods seem to support each other
- Motor boat users seem to care much more about the day of the week than the weather
- Fishers seem to care least about the weather being “nice”, which is supported by fishing being the most common open response to reasons for being on the lagoon.
- Based on the regression data, chilling and rowing have upper thermal limits for their activities. Based on the interviews, rowing and fishing are more sensitive to upper thermal limits for air temperature.

Conclusions

- As summer temperatures increase with climate change there may be fewer people chilling, rowing, and fishing
- There may be a shift in recreational use towards motor boating, which has implications for crowing on the lagoons and environmental effects

Questions?

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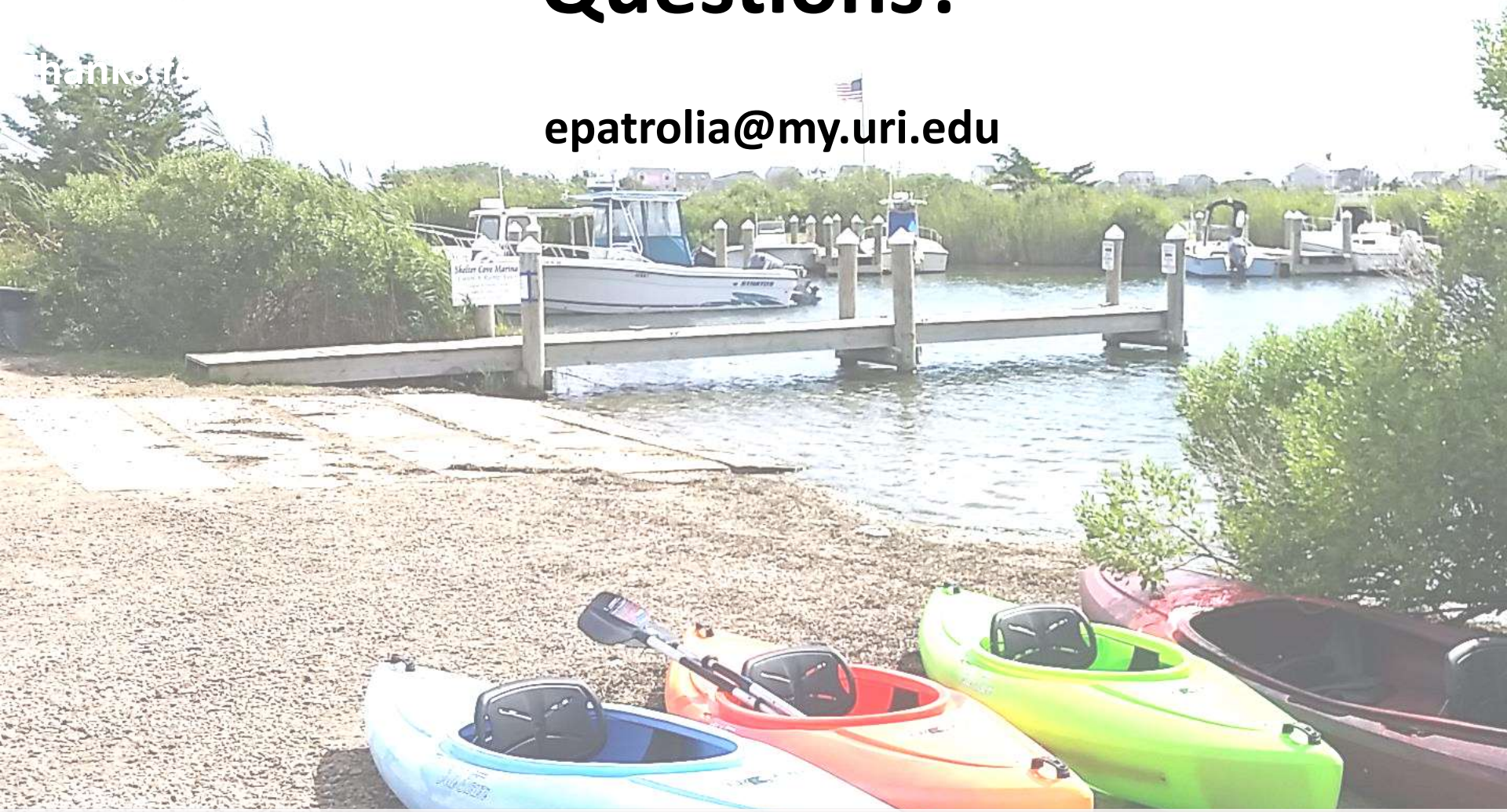

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