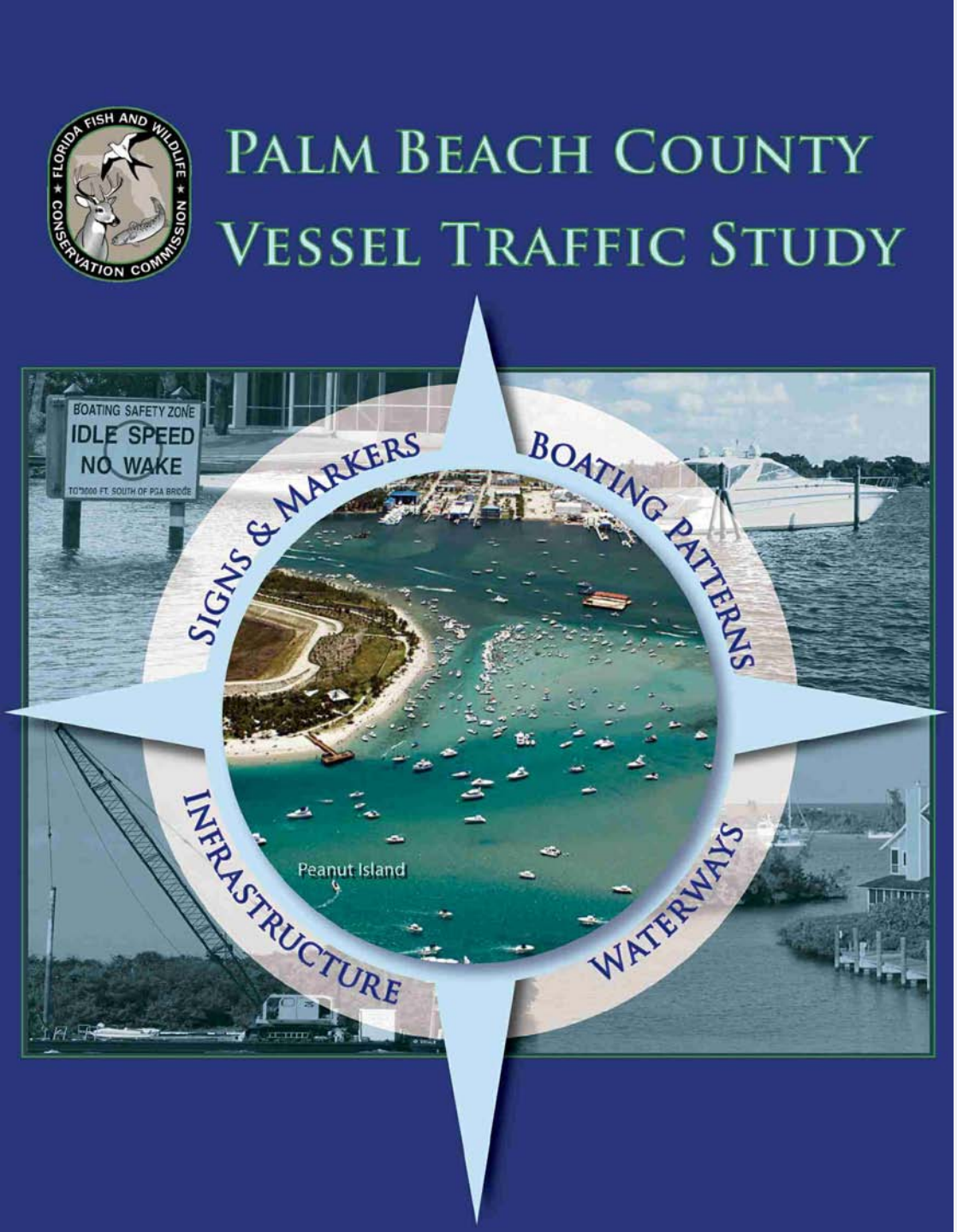

A GIS-Based Method for Evaluating Boating Regulatory Area Options: A Case Study of Martin and Palm Beach Counties, Florida

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The Need

A standardized, data-driven approach to evaluate boating regulatory area (speed zone) options for the ICW that:

- Uses “best available digital data”, in accordance with the requirements and specifications of Rule 68D-23.105, and
- Is transferable to other coastal areas in Florida – a statewide framework for boating speed zone evaluation.

The Product

A data visualization tool to:

- Query and map information relative to Rule 68D-23.105 FAC and display recreational boating risk categories for ICW segments.
- Identify locations that warrant more detailed evaluation.

Deliverables:

- GIS shapefiles that delineate recreational boating risk categories for the ICW in Martin and Palm Beach Counties as per boating safety situations identified in Rule 68D-23.105, FAC.
- Shapefiles of the spatial data used in the GIS analysis.
- Compilation of GIS data within the ArcReader format.
- A report that describes the methods, results, and recommendations for extension of the procedure.

Overall Process

- Consider FWC statutory, public safety and operational requirements
- Vessel Traffic Study
- Public Input
- Revise/establish boating regulatory areas

Vessel Traffic Studies

- GOAL: to provide insight and understanding into the issue of recreational boating safety risk in the ICW

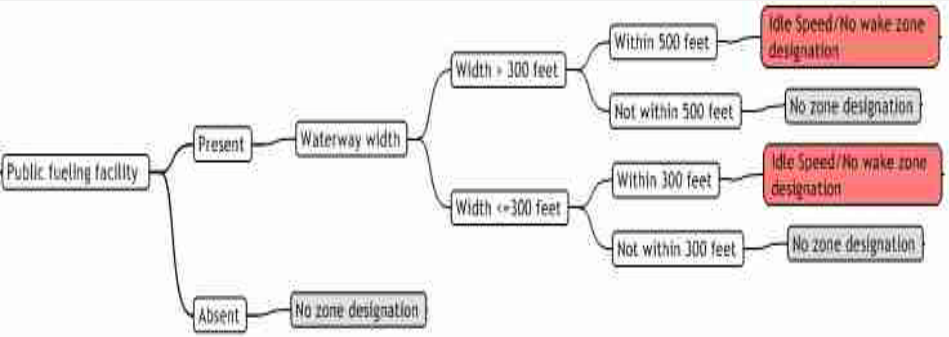
- OBJECTIVE: to serve as one component of FWC's decision-making process with regard to boating regulation and public safety

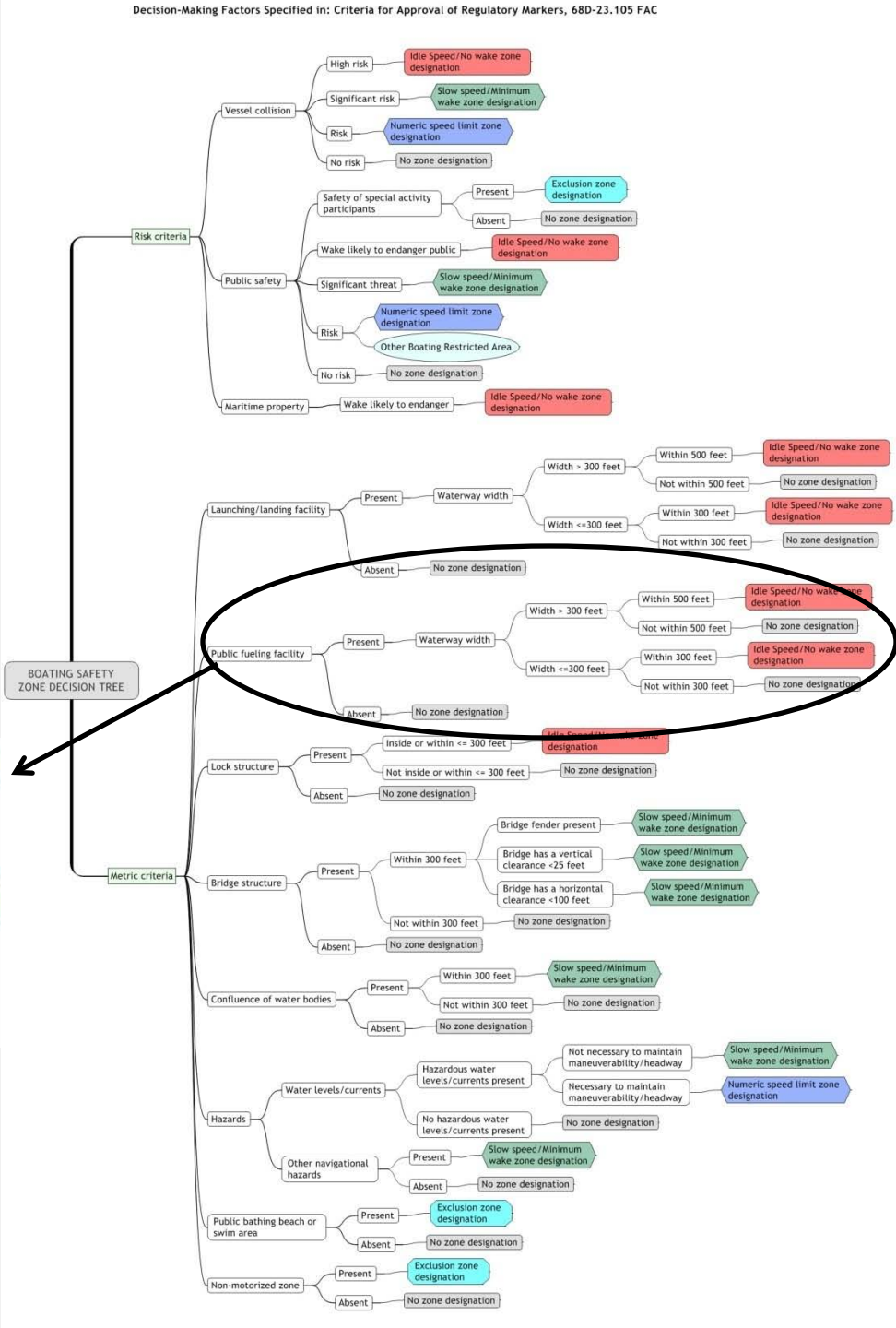
Vessel Traffic Study Approach

- **Deconstruct the Rule** (68D-23.105 FAC)
- **Best available digital data** (e.g. ICW features, marine infrastructure, navigation hazards, accident reports, citation reports)
- **Field inventories** (supplement, update and verify existing data; aerial counts of vessels; video monitoring of vessel traffic; interview FWC field officers)
- **Boating safety risk survey**

Analysis of Rule 68D-23.105

- Define connections between boating safety situations, evaluation criteria, risk levels and regulatory zone options





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Boating Safety Risk Evaluation Process

Safety Situations → Risk Criteria Ranking → Attribute Weighting → Boating Safety Risk Levels

Derived from Risk Criteria	Metric Criteria	Criteria Attributes	Output
Public Safety Risk Vessel Collision Risk Maritime Property Endangerment	Bridge Ramp Marina Fuel Dock Waterway Vessels Accidents Citations	Bridge Height Bridge Width Distance to ICW Water Width Visibility Shallow Water # of Vessels Accident Type Citation Type Injuries	High Risk Significant Risk Risk Low Risk

GIS Data Layers

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Question 4

Cause of Accident	Safety Situation	Risk: Low		Medium				High
Vessel wake	Vessel Collision	1	2	3	4	5	6	7
	Maritime Property	1	2	3	4	5	6	7
	Public Safety	1	2	3	4	5	6	7
Hazardous waters	Vessel Collision	1	2	3	4	5	6	7
	Maritime Property	1	2	3	4	5	6	7
	Public Safety	1	2	3	4	5	6	7
Congested waters	Vessel Collision	1	2	3	4	5	6	7
	Maritime Property	1	2	3	4	5	6	7
	Public Safety	1	2	3	4	5	6	7

Question 10

Presence of Marine Infrastructure	Safety Situation	Risk: Low		Medium				High
Mooring field	Vessel Collision	1	2	3	4	5	6	7
	Maritime Property	1	2	3	4	5	6	7
	Public Safety	1	2	3	4	5	6	7
Public marina	Vessel Collision	1	2	3	4	5	6	7
	Maritime Property	1	2	3	4	5	6	7
	Public Safety	1	2	3	4	5	6	7
Boat ramp	Vessel Collision	1	2	3	4	5	6	7
	Maritime Property	1	2	3	4	5	6	7
	Public Safety	1	2	3	4	5	6	7
Fuel dock	Vessel Collision	1	2	3	4	5	6	7
	Maritime Property	1	2	3	4	5	6	7
	Public Safety	1	2	3	4	5	6	7
Lock	Vessel Collision	1	2	3	4	5	6	7
	Maritime Property	1	2	3	4	5	6	7
	Public Safety	1	2	3	4	5	6	7
Bridge	Vessel Collision	1	2	3	4	5	6	7
	Maritime Property	1	2	3	4	5	6	7
	Public Safety	1	2	3	4	5	6	7

Score calculation:

- Public Safety Risk, "Cause of Accident" perceived risk response = 6 of a potential 7 points
- Calculate sub score by dividing 6/21 = 0.2857 (maximum possible score for Question 4 - 7 points x 3 "Cause of Accident" attributes)
- Sum all sub scores for Public Safety Risk
- Divide Public Safety Risk sub score by largest score value of all 10 questions = 0.8333
- Repeat this process for all Criteria and Safety Situations

Weight calculation:

- Vessel collision perceived risk response = 6 of a potential 7 points
- Calculate weight by dividing 6/7 = 0.8571

Composite Weighted Score calculation:

- Multiply score x weight = weighted score
- Sum weighted scores for each waterway segment

Result:

- Scores are standardized so that Criteria with different numbers of attributes are equivalent
- This allows comparison and ranking of criteria within each Safety Situation

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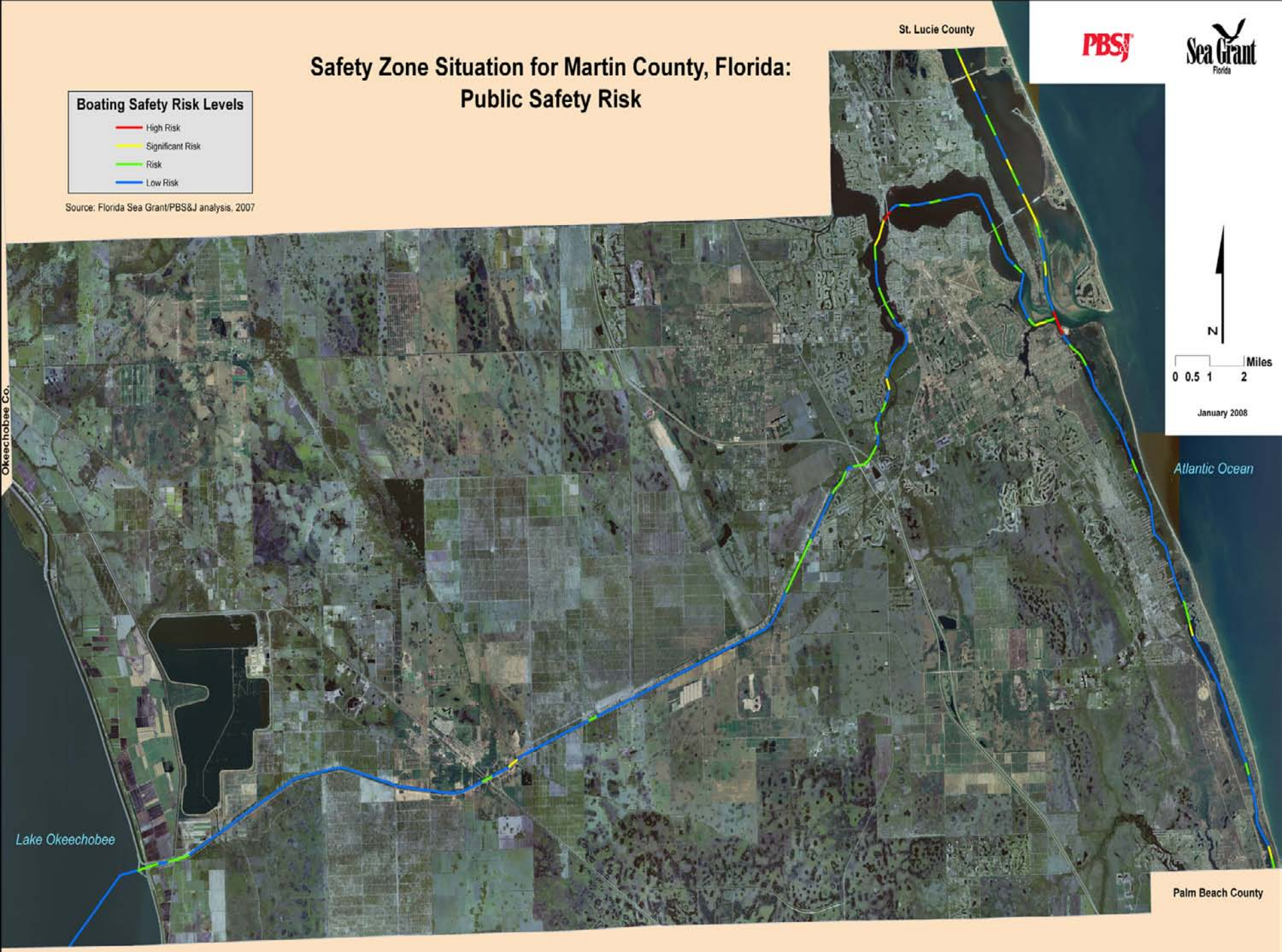
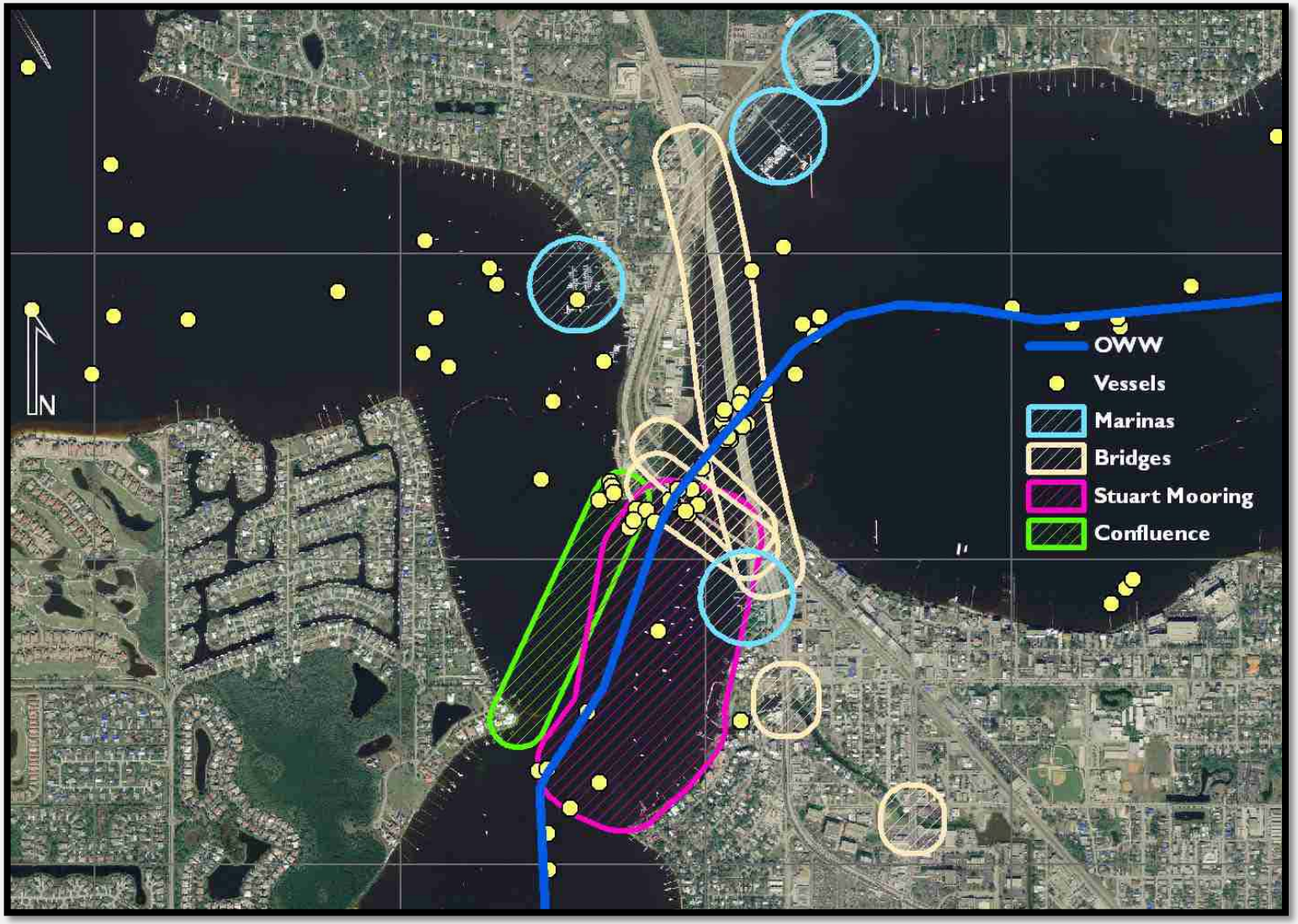
Safety Zone Situation for Martin County, Florida: Public Safety Risk



Martin County: Stuart Bridges Area



GIS Linear Referencing Analysis

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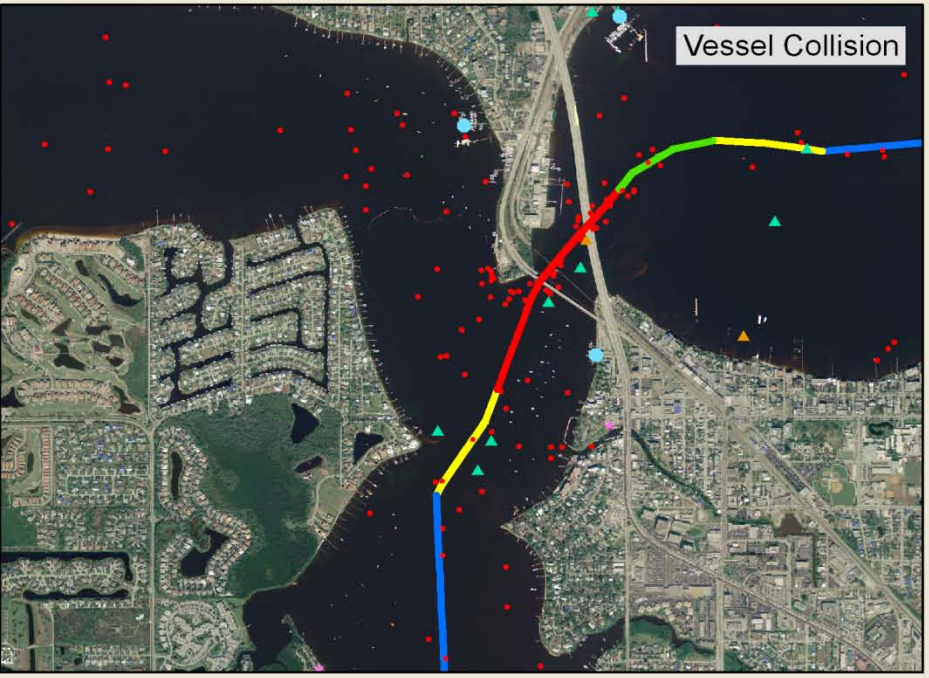
Stuart "Bridges" Area



Risk Criteria

Bridge	3
Marinas	No
Ramps	No
Vessels	232
Accidents / Injuries / Fatalities (10 / 2 / 0)	
Citations	6

No Damaging Wakes

ISNW

SSMW

NSL

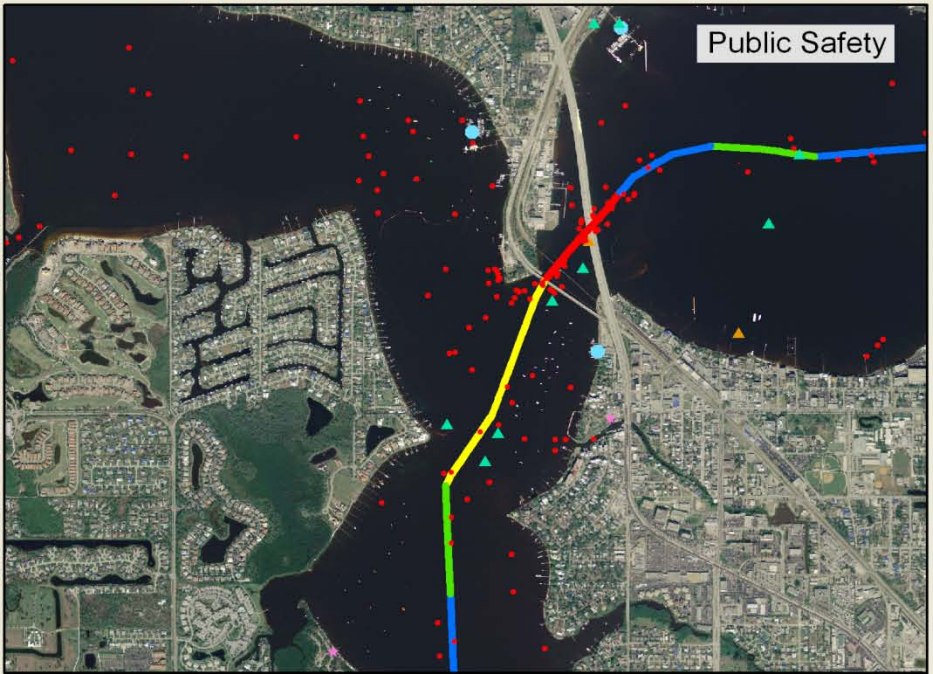
Collision type, number of accidents, bridges, and the presence of a mooring field are the triggers for lthe "High Risk" level estimate.

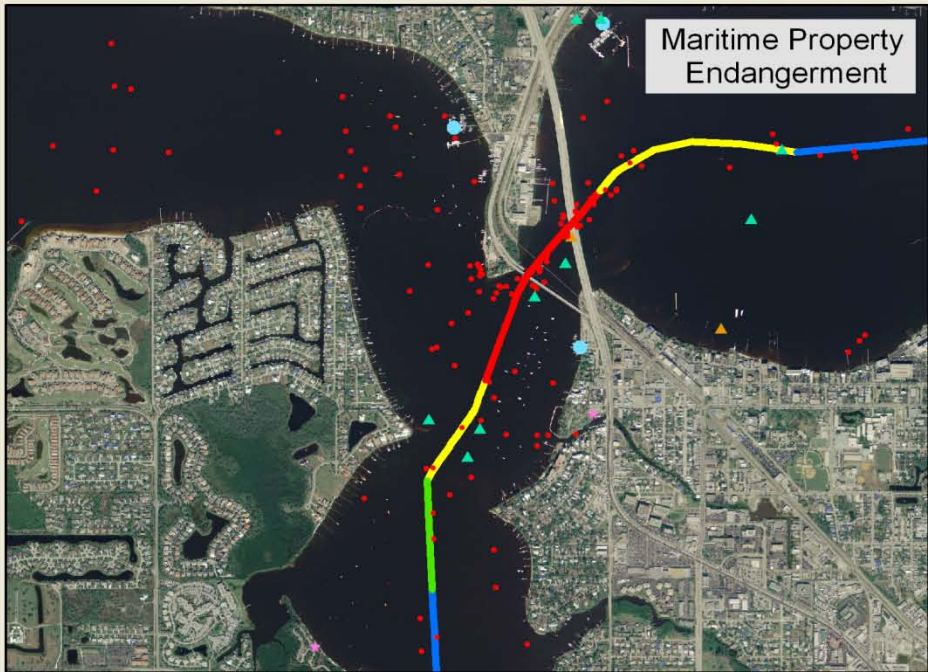
Estimated Risk Levels

- High Risk
- Significant Risk
- Risk
- Low Risk

N

Miles 0 0.35 0.7





Palm Beach County Vessel Traffic Study: Public Safety Risk Results

Boating Safety Risk Levels

- High Risk
- Significant Risk
- Risk
- Low Risk

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Focus Area Reference Map

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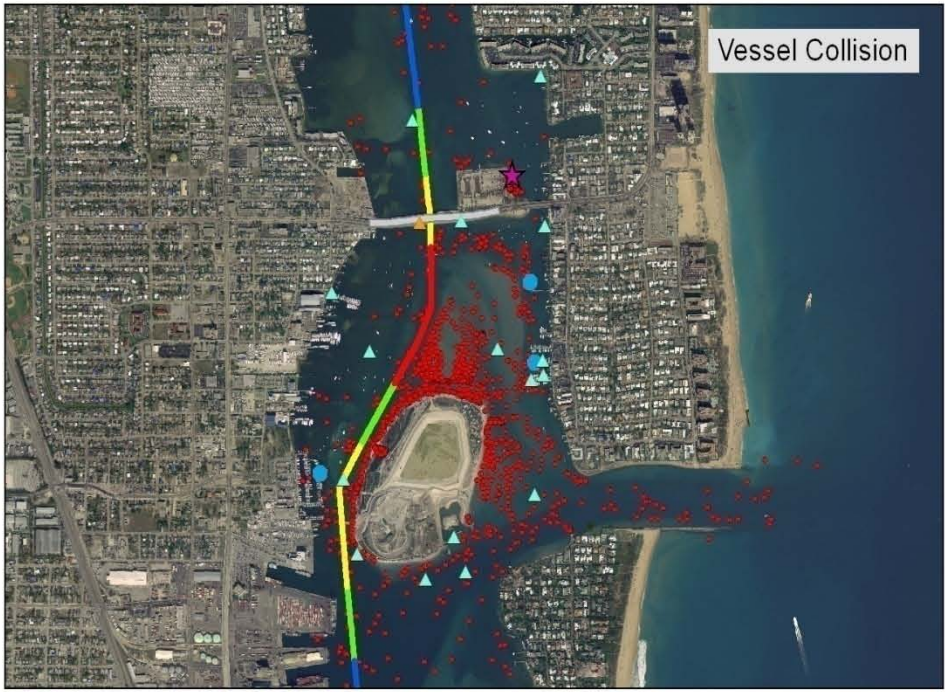


Peanut Island Focus Area

Risk Criteria

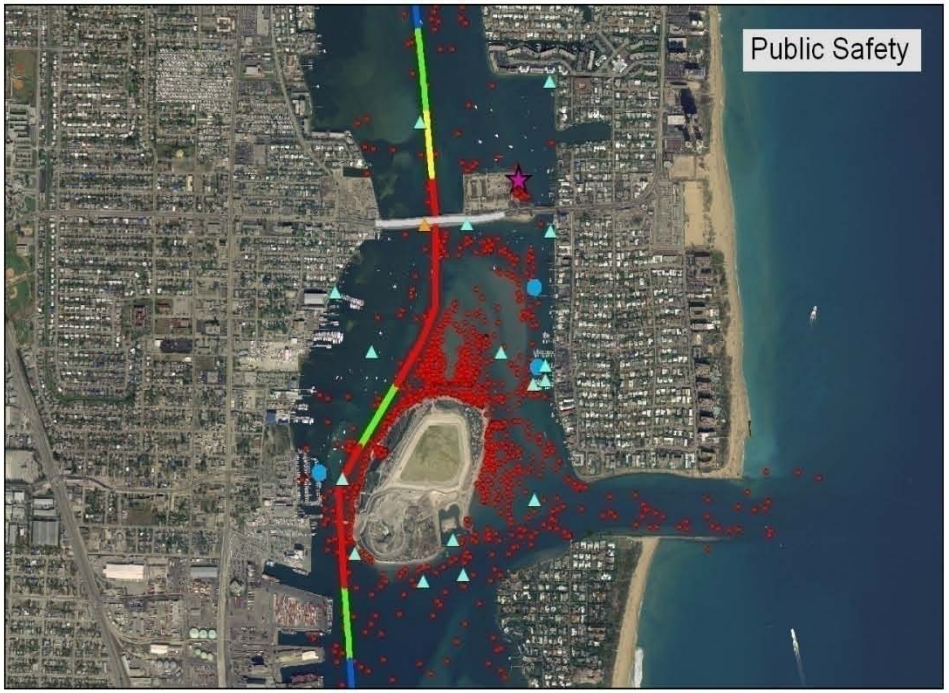
- Bridge (1)
- Public Ramps (0)
- Vessels (1098; 34% of total)
- Public Marinas (1; 1 Fuel Dock)
- Accidents/ Injuries/ Fatalities (9 Collision w/ Vessel; 1 Collision w/ Piling; 2 Wakes; 1 Collision w/ Underwater Object; 1 Congested Waters; 21% of total/ 3 Injuries/ 0 Fatalities)
- Citations (1; NO PFD; 10% of total)
- Blind Corners (0)
- Strong Currents (0)
- Shallow Waters (0)

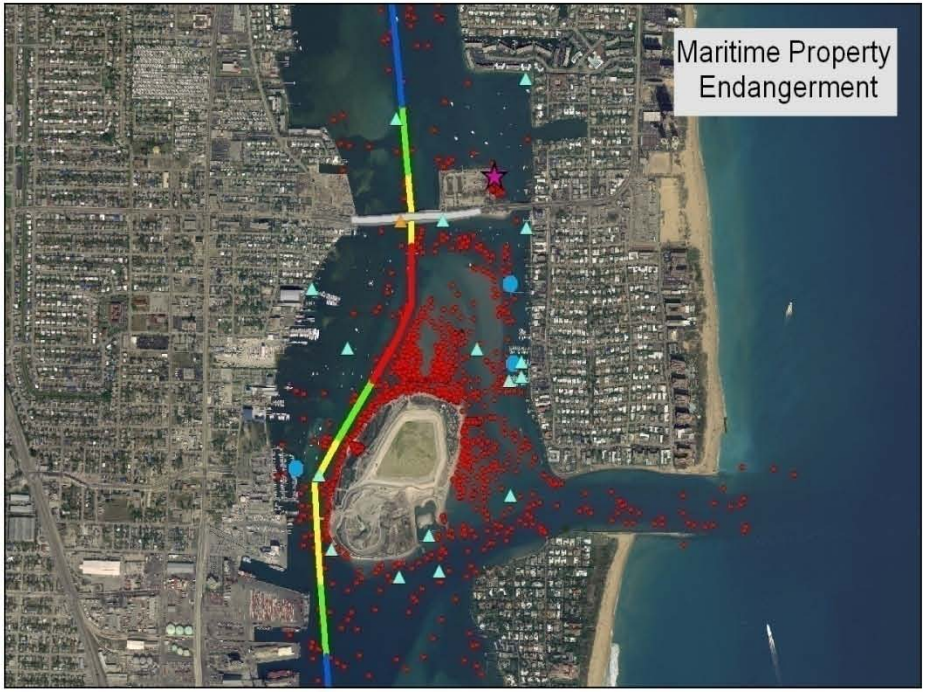
Estimated Risk Levels

- High Risk
- Significant Risk
- Risk
- Low Risk

N

0 0.2 0.4 0.8 Miles





Peanut Island Focus Area with Existing Boating Restricted Area

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Peanut Island Focus Area and Existing Manatee Zones

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Recommendations

Improvement/modification of data

- Accident and citation locations
  - Make accident and citation primary and secondary causes more consistent with Rule stipulations.
    - (e.g., collision options; “reckless” behavior)
- Risk criteria and attribute ranking and weighting
  - More data (surveys)
  - Sensitivity analysis
- Suitable segment or “Reach” length

Enhancement of GIS method

- GUI and automation of analysis
- Flexible user input for variable ranking and weighting, segment length

Additional Information:

http://myfwc.com/boating/waterways/index.htm

Contributors

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