Defining Port Environs in a changing landscape

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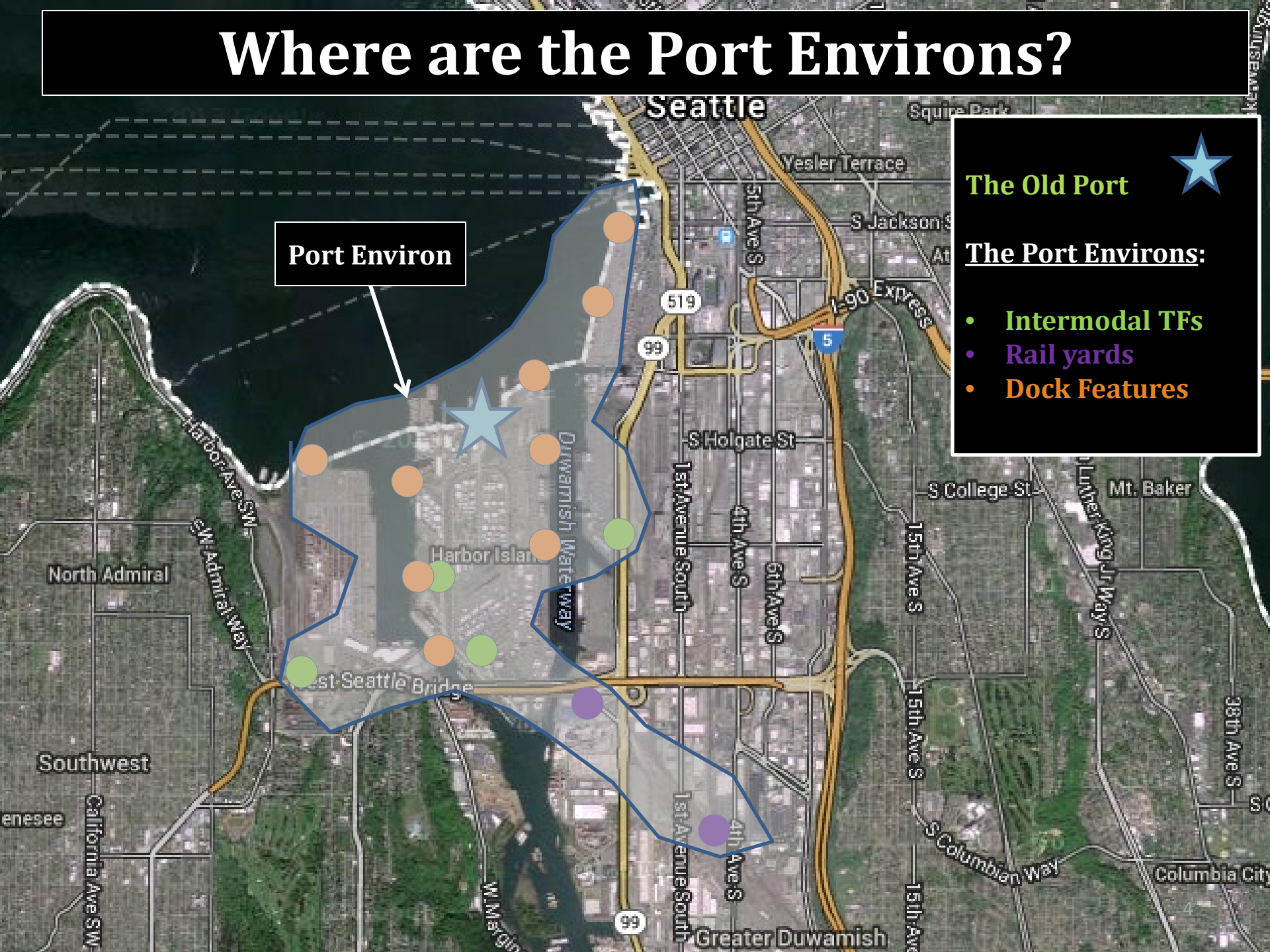
Changes in trade patterns

- Trade patterns shifting from ports to downstream locations – rapid movement of goods
- Increased volume of imports = increased volume of pests
- Where to survey for new incursions?

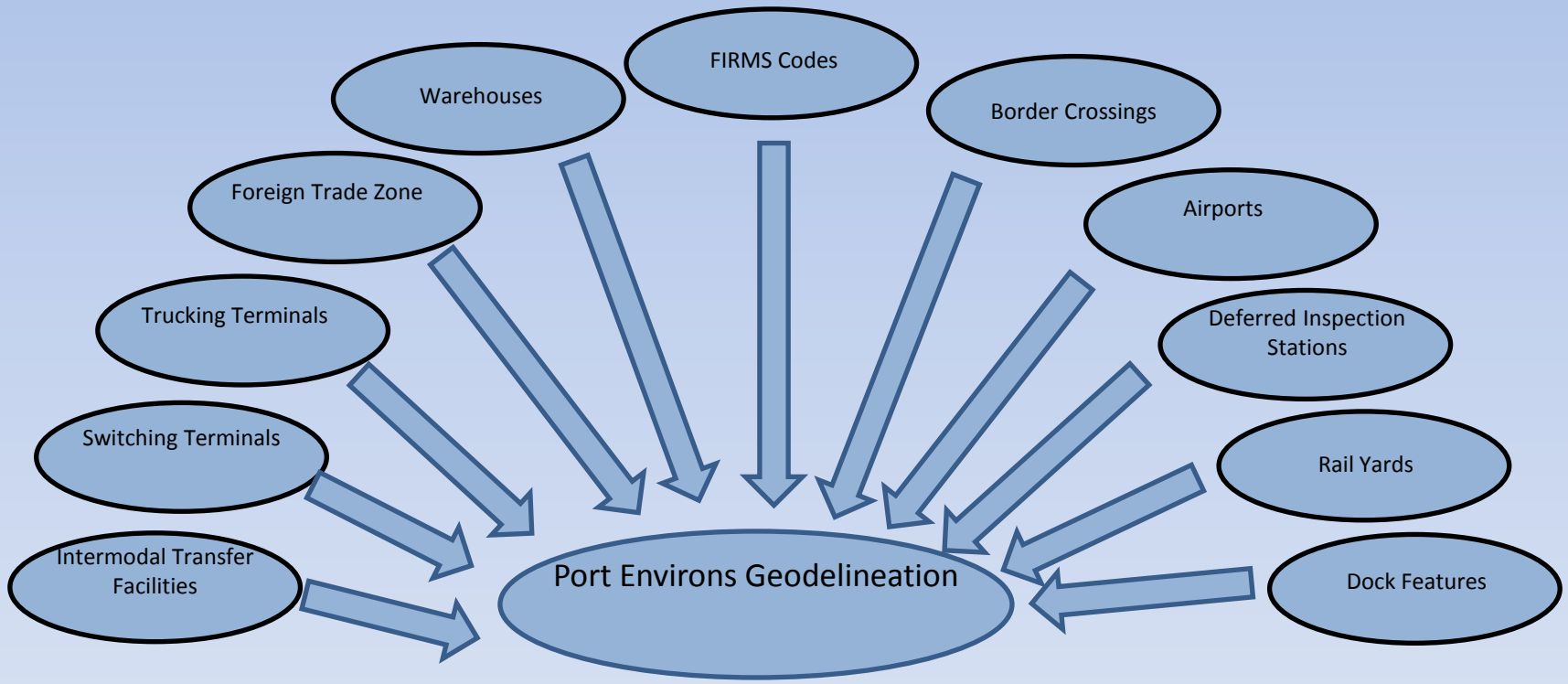
Defining the Port Environs

- The *port environs* is the area where imported material is moved through various pathways for unlading, transfer, storage, and distribution, and associated locations of primary exotic pest dispersal.
- Immediate port vicinity under CBP control
  - Not reflective of current status
  - Prioritize areas of risk for pest arrival beyond port of entry

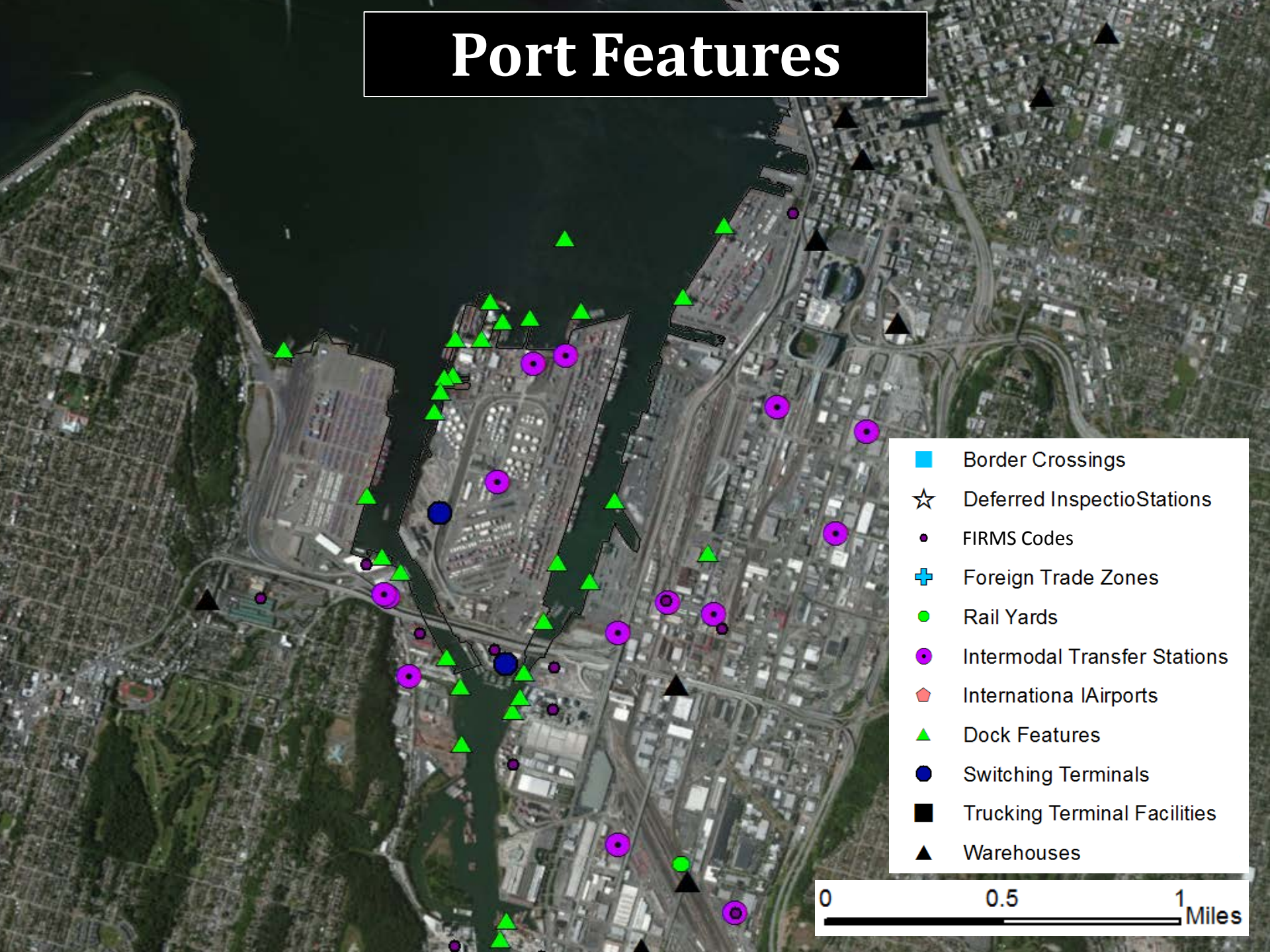
Where are the Port Environs?



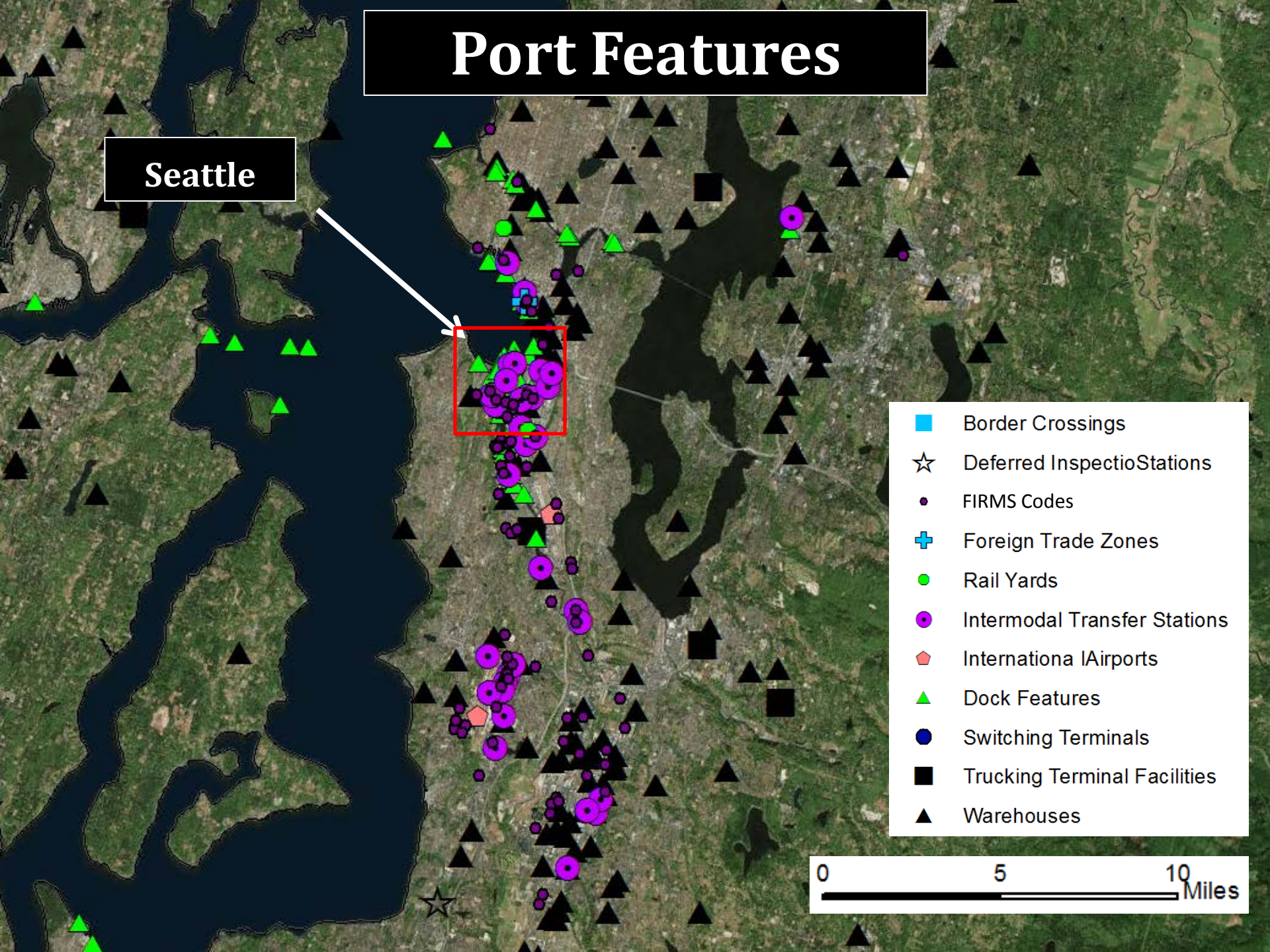
Identifying High Risk Sites

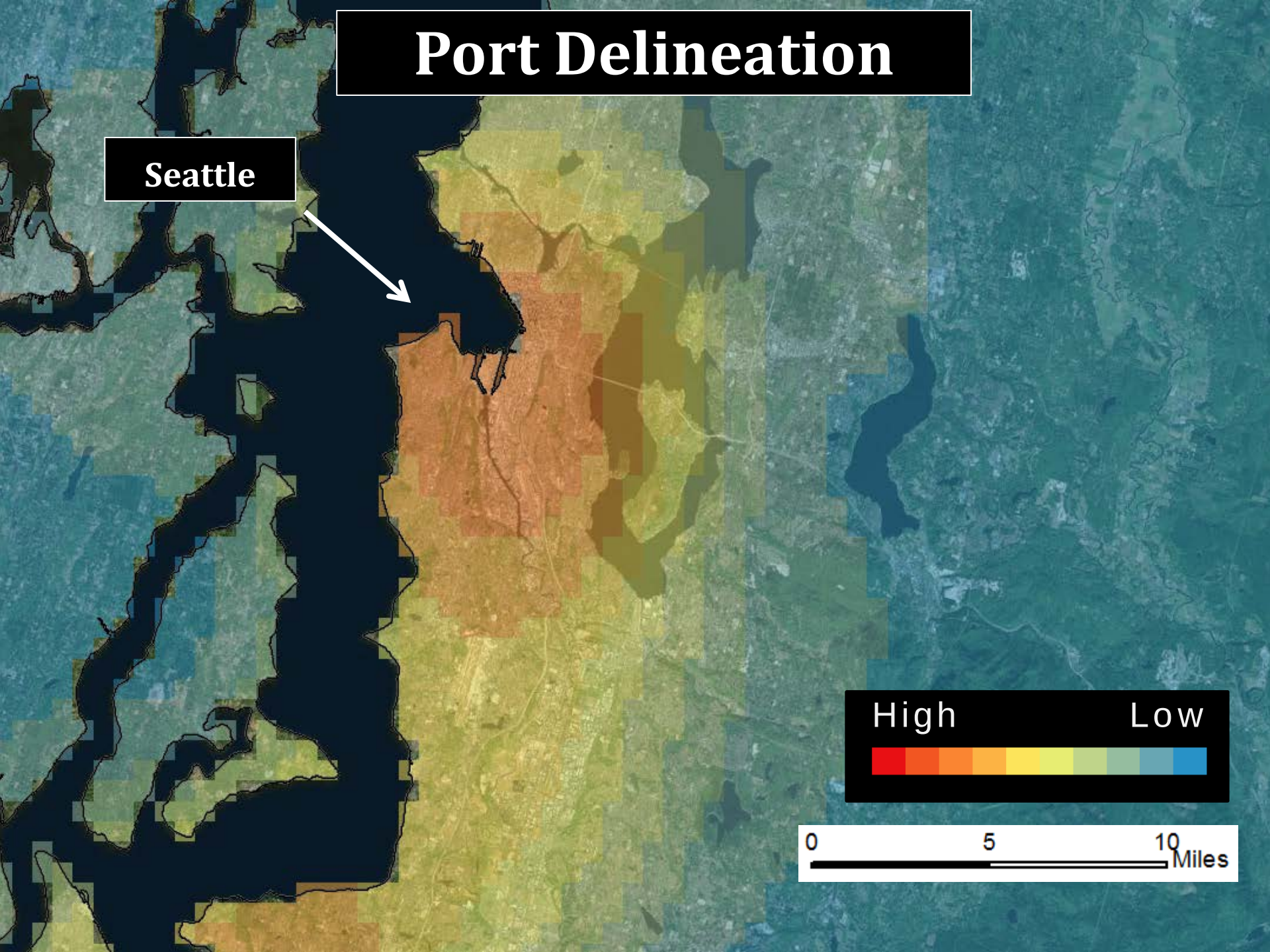


Port Features



Port Features

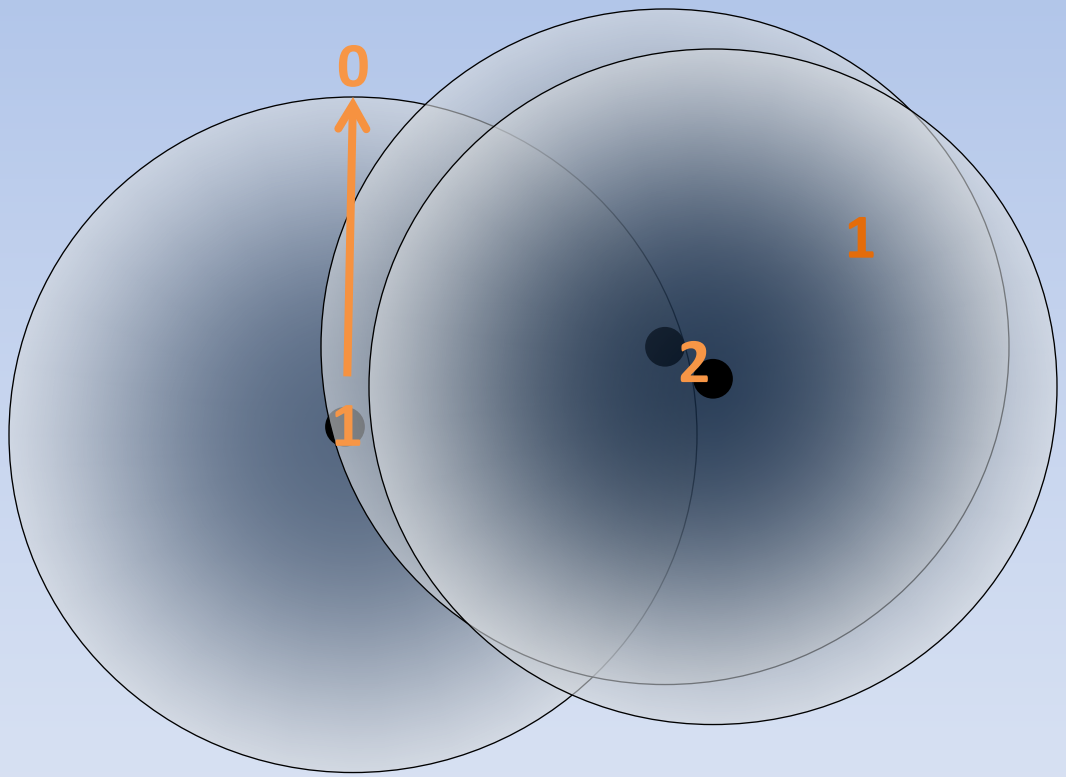



Port Delineation
Seattle
High
Low
0
5
10
Miles

Delineating the Port Environs

- Kernel Density
  - Calculates density of point features per unit area (e.g. points per km^2)
  - Creates smooth raster surface of decreasing value with increasing distance, using search radius
  - Can include a weighting factor

Kernel Density

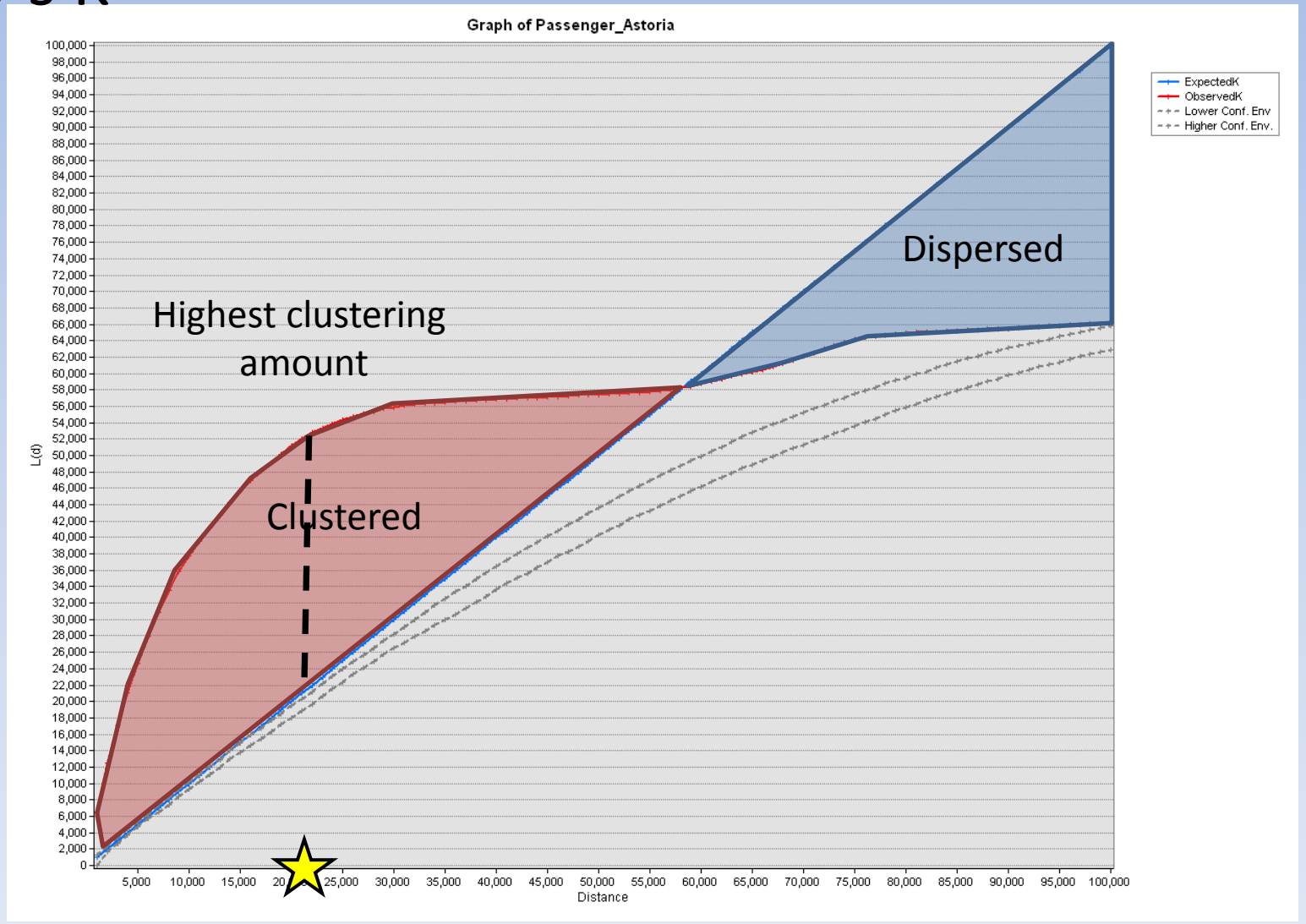


Delineating the Port Environs

- Kernel Density
  - Calculates density of point features per unit area (e.g. points per km^2)
  - Creates smooth raster surface of decreasing value with increasing distance, using search radius
  - Can include a weighting factor
- Ripley's K
  - Determines how clustered features are at various distances
  - Used for determining Kernel Density search radius distance

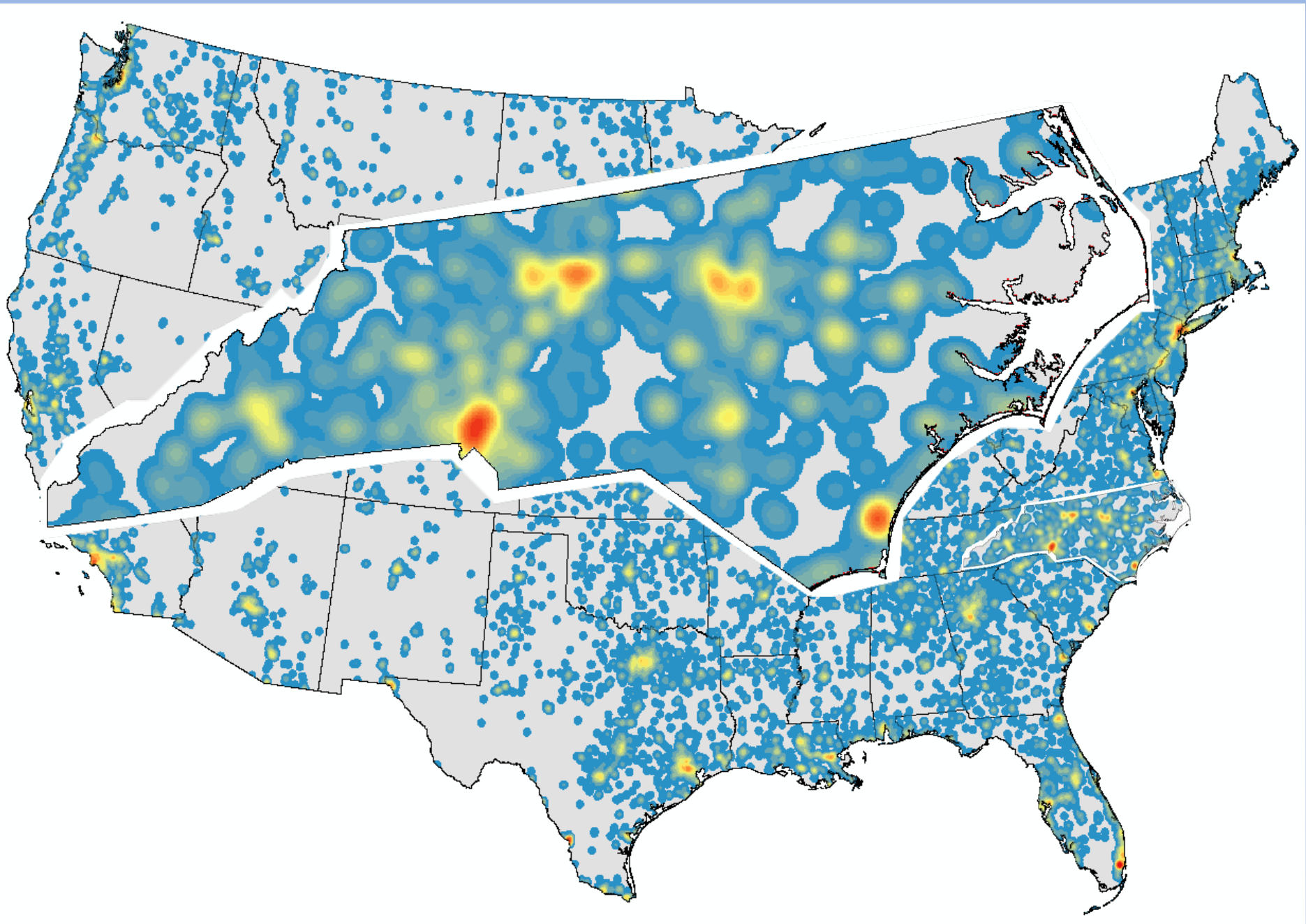
Clustering Analysis

Ripley's K



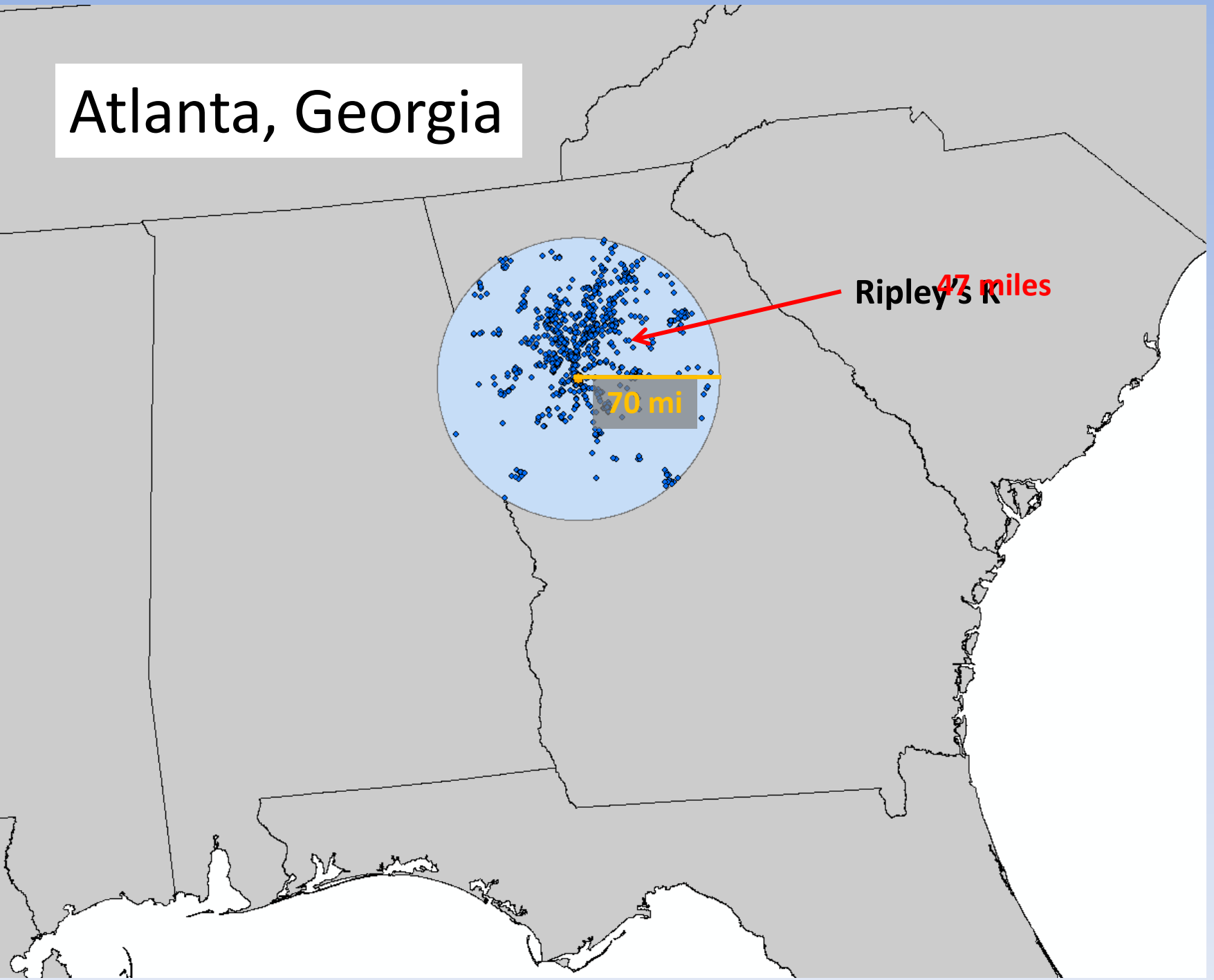
Delineating the Port Environs

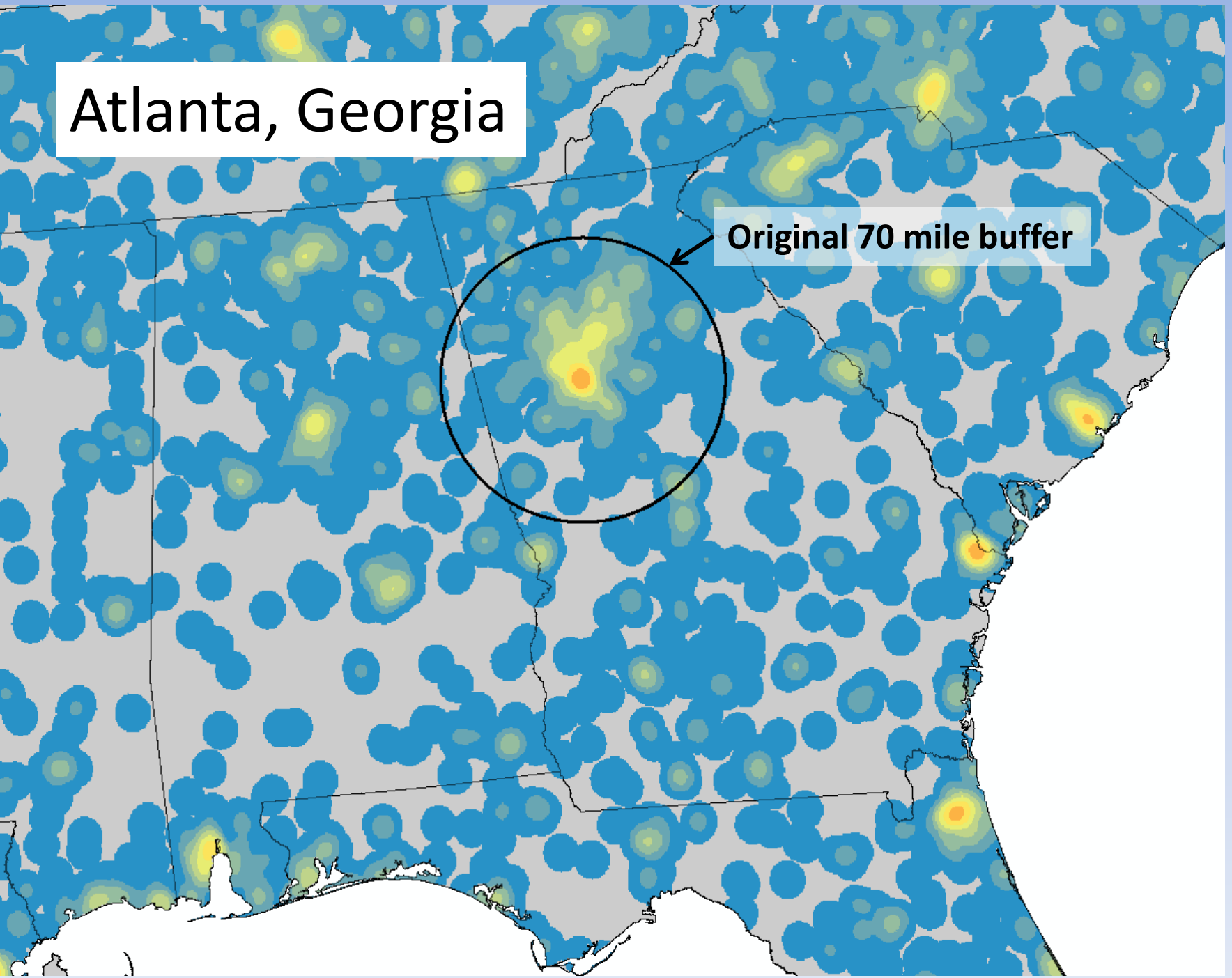
- 3 spatial scales
  - National, state, port
- Create Kernel Density surface for entire U.S.
- Extract raster to finer scales
  - Highlight dense areas
- How to determine search radius for national scale?

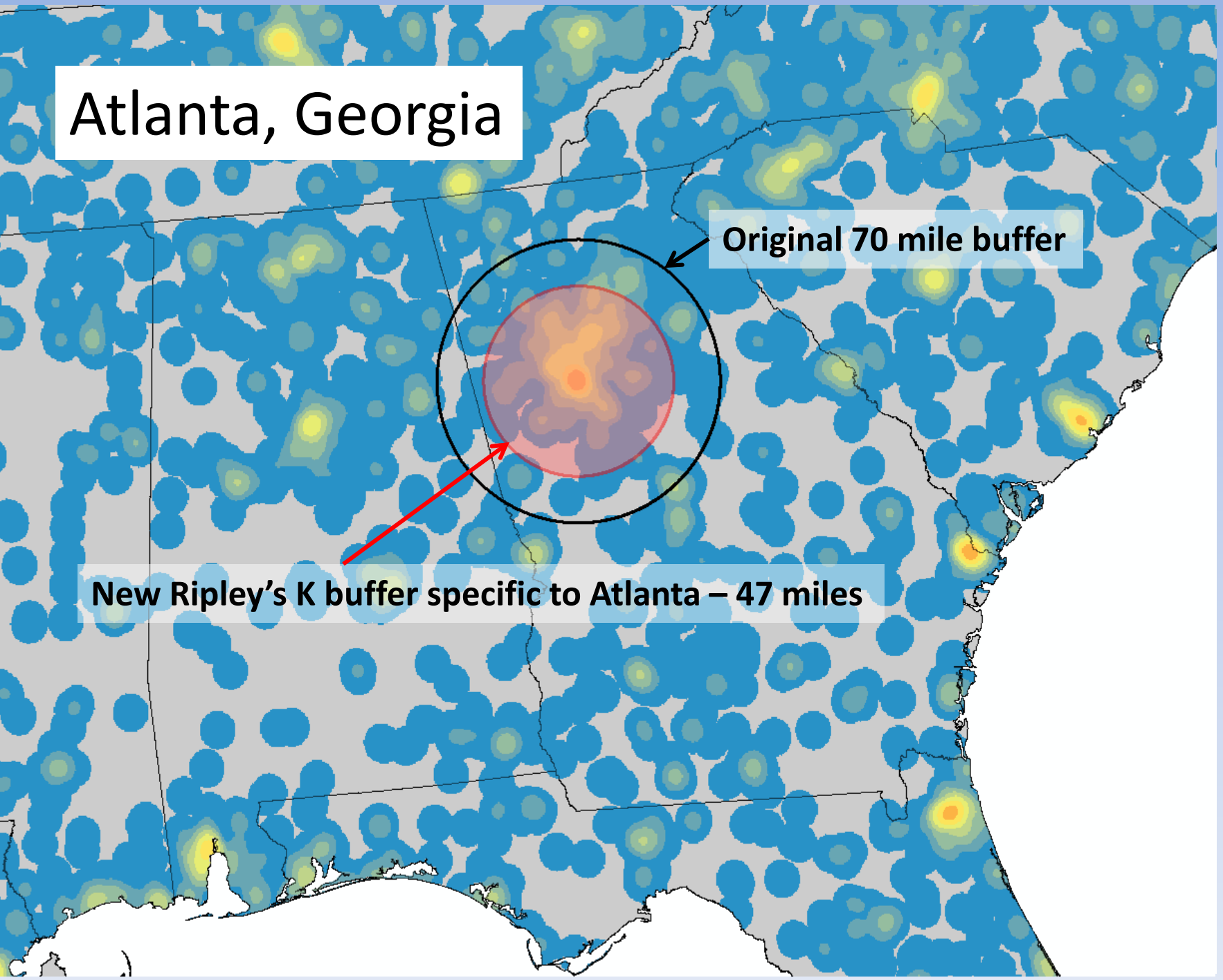


Port scale Port Environs

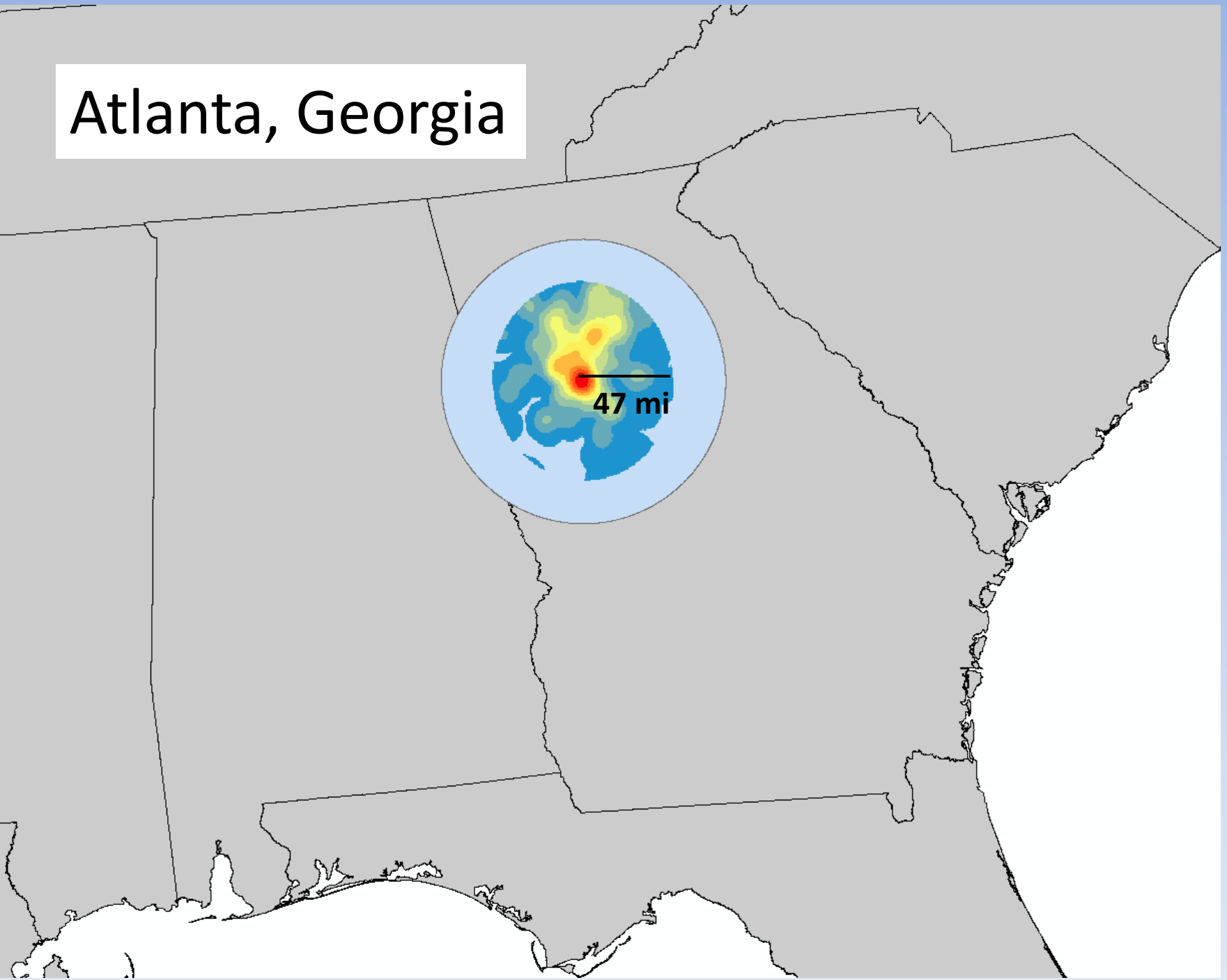
- Ports vary in size, so port environs will also vary
- Each port gets unique Ripley's K search distance
- This distance for each port is used to extract the kernel density

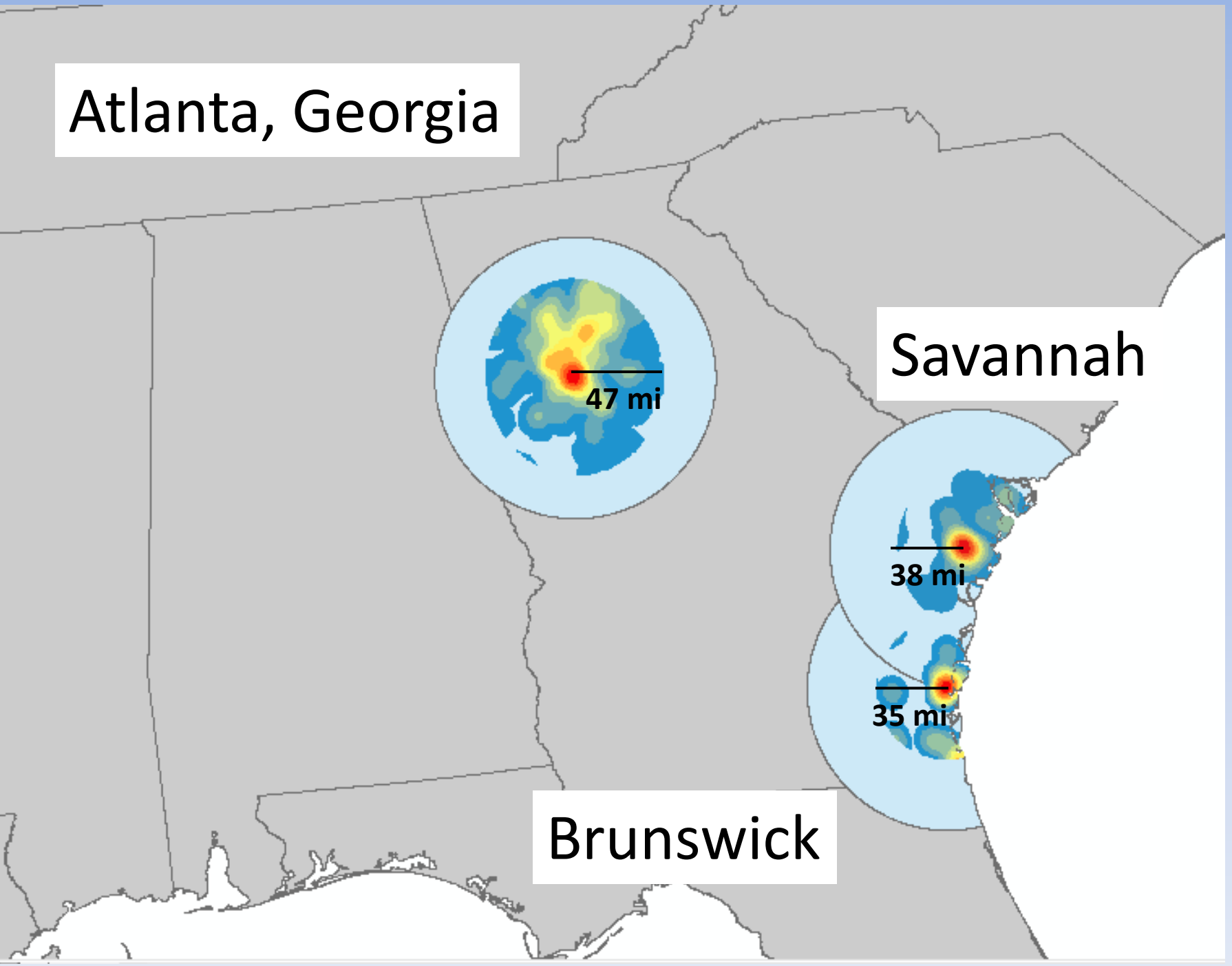

Atlanta, Georgia
Ripley's K
47 miles
70 mi


Atlanta, Georgia
Original 70 mile buffer


Atlanta, Georgia
Original 70 mile buffer
New Ripley's K buffer specific to Atlanta – 47 miles

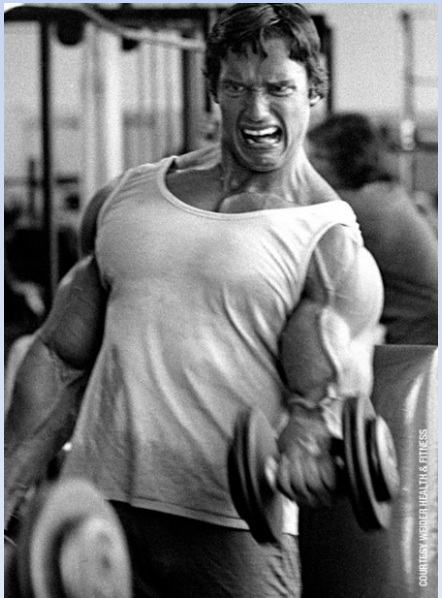
Atlanta, Georgia




Atlanta, Georgia
47 mi
Savannah
38 mi
35 mi
Brunswick

Weighting the Port Environs

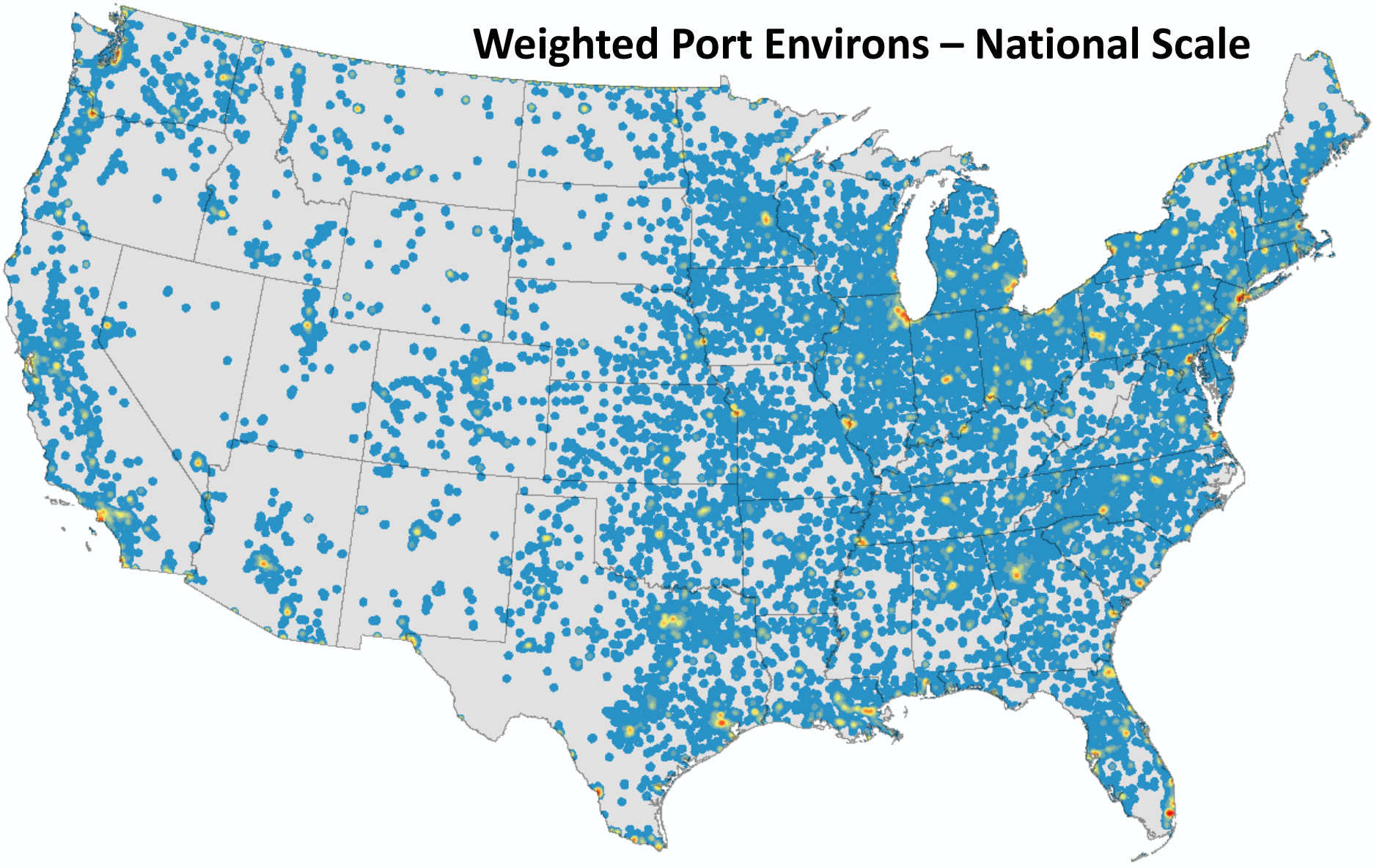
- Not all features are equal
  - Many warehouses, fewer intermodal transfer stations
  - Intermodals can get washed out of the analysis with equal weighting, warehouses artificially high
- Need to weight features

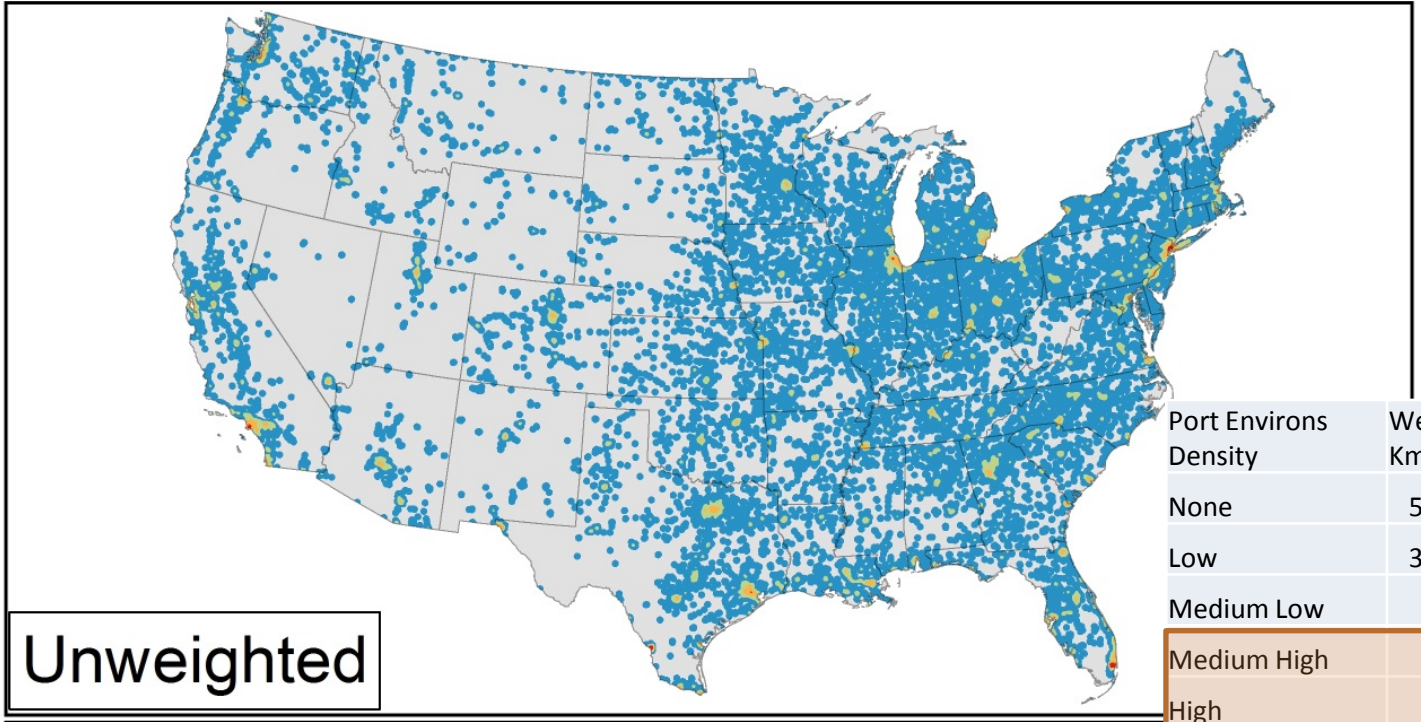


Weighting the Port Environs

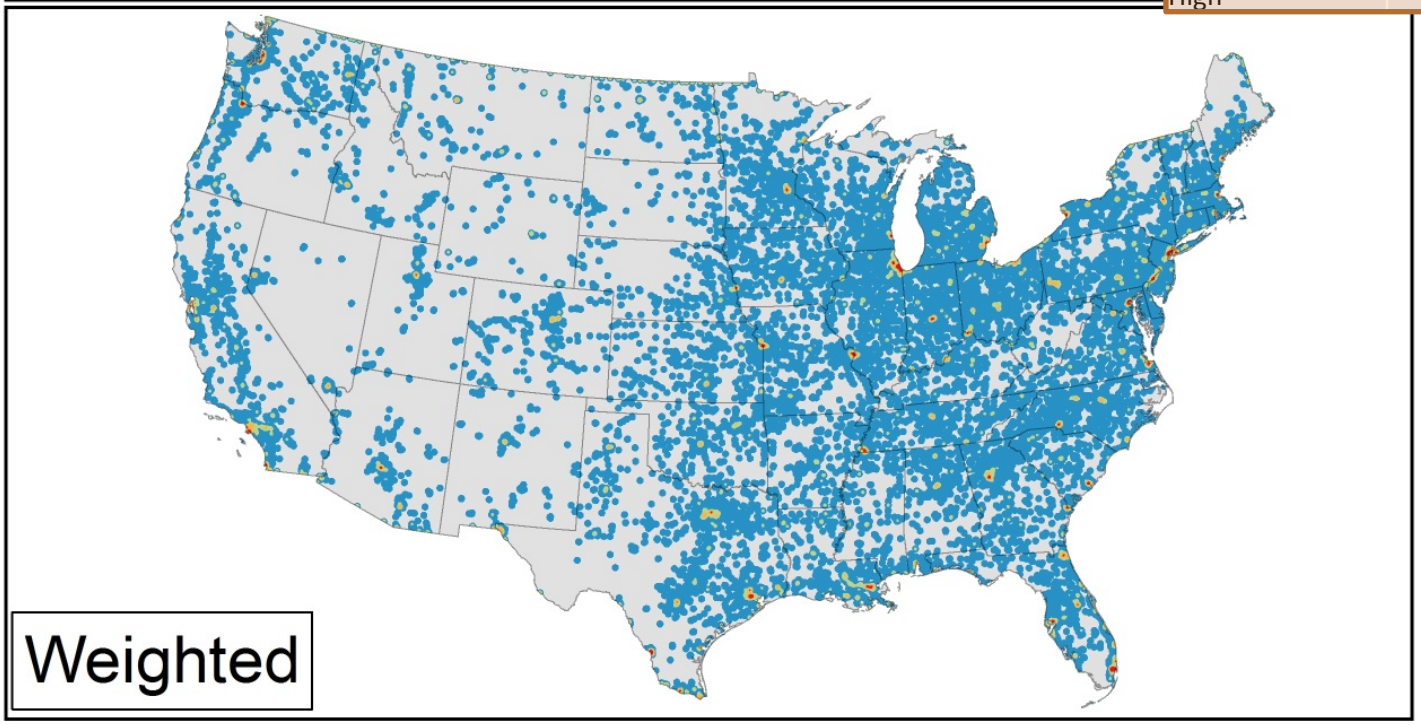
- Standardize data
  - Divided total number of ports by each feature type
  - Intent to balance feature types
  - ~38,000 warehouses, ~3,000 intermodal transfer stations

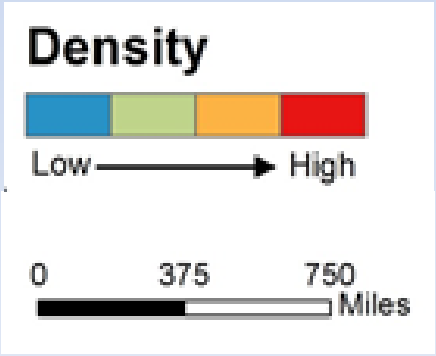
Weighted Port Environs – National Scale





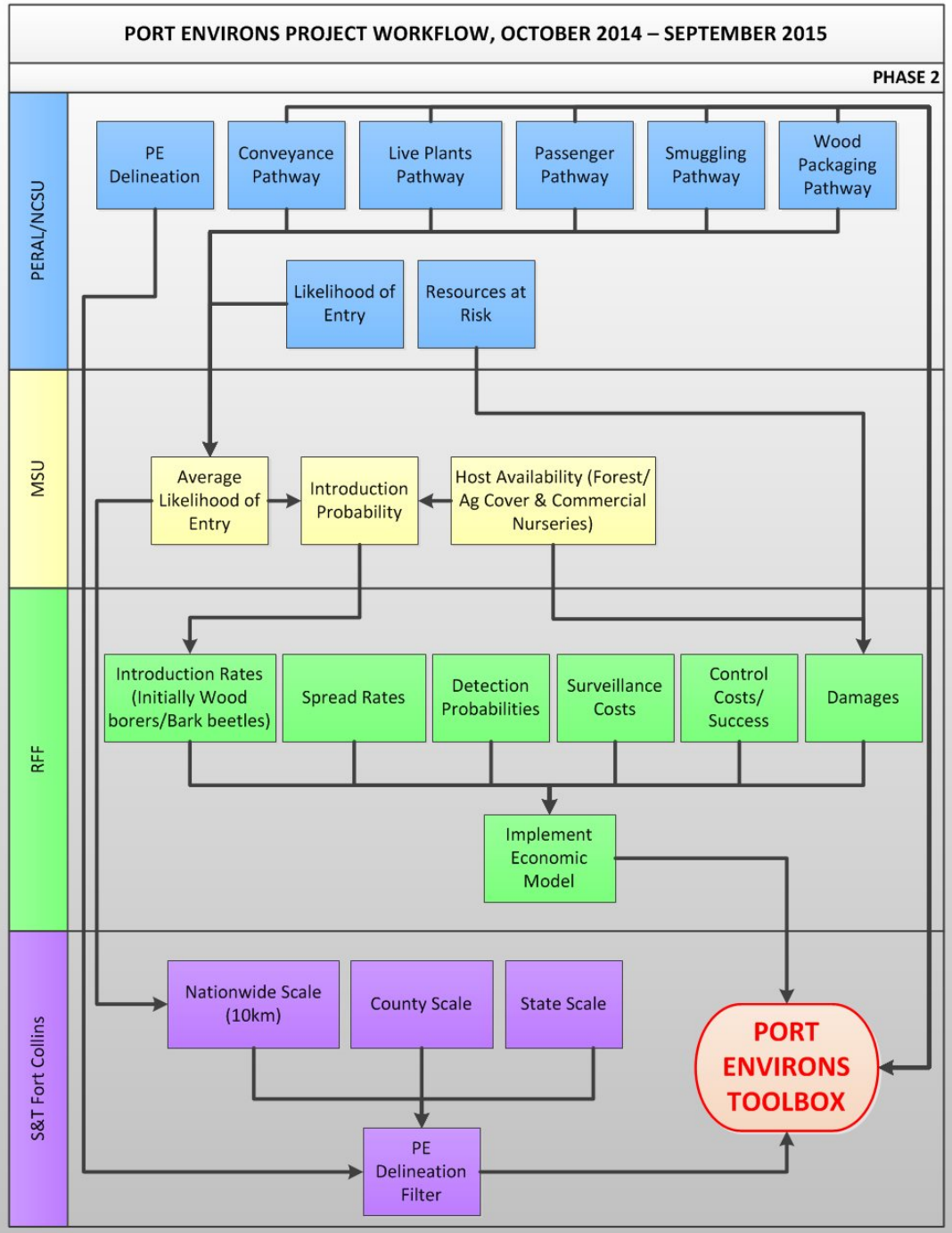
Port Environs Density	Weighted Area (Sq. Km)	Unweighted Area (Sq. Km)
None	5,862,273	5,882,202
Low	3,288,735	3,246,749
Medium Low	135,113	163,014
Medium High	**29,639**	**23,964**
High	**6,825**	**1,378**





Things to consider

- Delineation of port environs does not necessarily equate to risk of pest entry
- Other factors like import volume or value of imports more indicative of risk
- Although continuous, a threshold cutoff value can be used to delineate boundaries
- Just one piece of the puzzle


PORT ENVIRONS PROJECT WORKFLOW, OCTOBER 2014 – SEPTEMBER 2015
PHASE 2
PERAL/NCSU
MSU
RFF
S&T Fort Collins
PE Delineation
Conveyance Pathway
Live Plants Pathway
Passenger Pathway
Smuggling Pathway
Wood Packaging Pathway
Likelihood of Entry
Resources at Risk
Average Likelihood of Entry
Introduction Probability
Host Availability (Forest/ Ag Cover & Commercial Nurseries)
Introduction Rates (Initially Wood borers/Bark beetles)
Spread Rates
Detection Probabilities
Surveillance Costs
Control Costs/ Success
Damages
Implement Economic Model
Nationwide Scale (10km)
County Scale
State Scale
PE Delineation Filter
PORT ENVIRONS TOOLBOX

Next Steps

- Consider alternate approach to Ripley's K
  - Perhaps use a default setting from kernel density tool
- Update weighting approach to better reflect reality
  - Expert opinion
- Continue developing pathways

Thank you!

Questions?