

Endangered Marine Species

Managing Right Whale Ship Strikes

Hauke L. Kite-Powell

WHOI Marine Policy Center

November 2002

Outline

- Background: ESA and MMPA
- Northern Right Whale problem
- Cost of proposed management measures
- Effectiveness of proposed management measures

Legislative Basis: Endangered Species Act of 1973

- “endangered” = in imminent danger of extinction throughout all of a significant portion of its range
- “threatened” = likely to become endangered in the foreseeable future
- NMFS – most marine species
- Fish and Wildlife Service – all other plants and animals

Legislative Basis:

Marine Mammal Protection Act of 1973

- Moratorium on taking of marine mammals by US citizens, and on importing/exporting
- “take” = to harass, hunt, capture, or kill, or attempt to harass...
- Exception: Indian/Eskimo/Aleut subsistence hunting
- 1994 reauthorization: new focus on commercial fishing

ESA Process

- Stock assessments
- Recovery plans/Management plans

Listed Species: Finfish

- Endangered:
 - Atlantic salmon
 - Shortnose sturgeon
- Threatened:
 - Chinook salmon
 - Coho salmon
 - Chum salmon
 - Gulf sturgeon
 - Sockeye salmon
 - Steelhead

Smalltooth sawfish: proposed for listing

Listed Species: Marine Mammals

- Endangered:
 - Blue whale
 - Bowhead whale
 - Fin whale
 - Hawaiian monk seal
 - Humpback whale
 - Northern right whale
 - Sei whale
 - Sperm whale
- Threatened:
 - Guadalupe fur seal
 - Steller sea lion

Listed Species: Marine Turtles

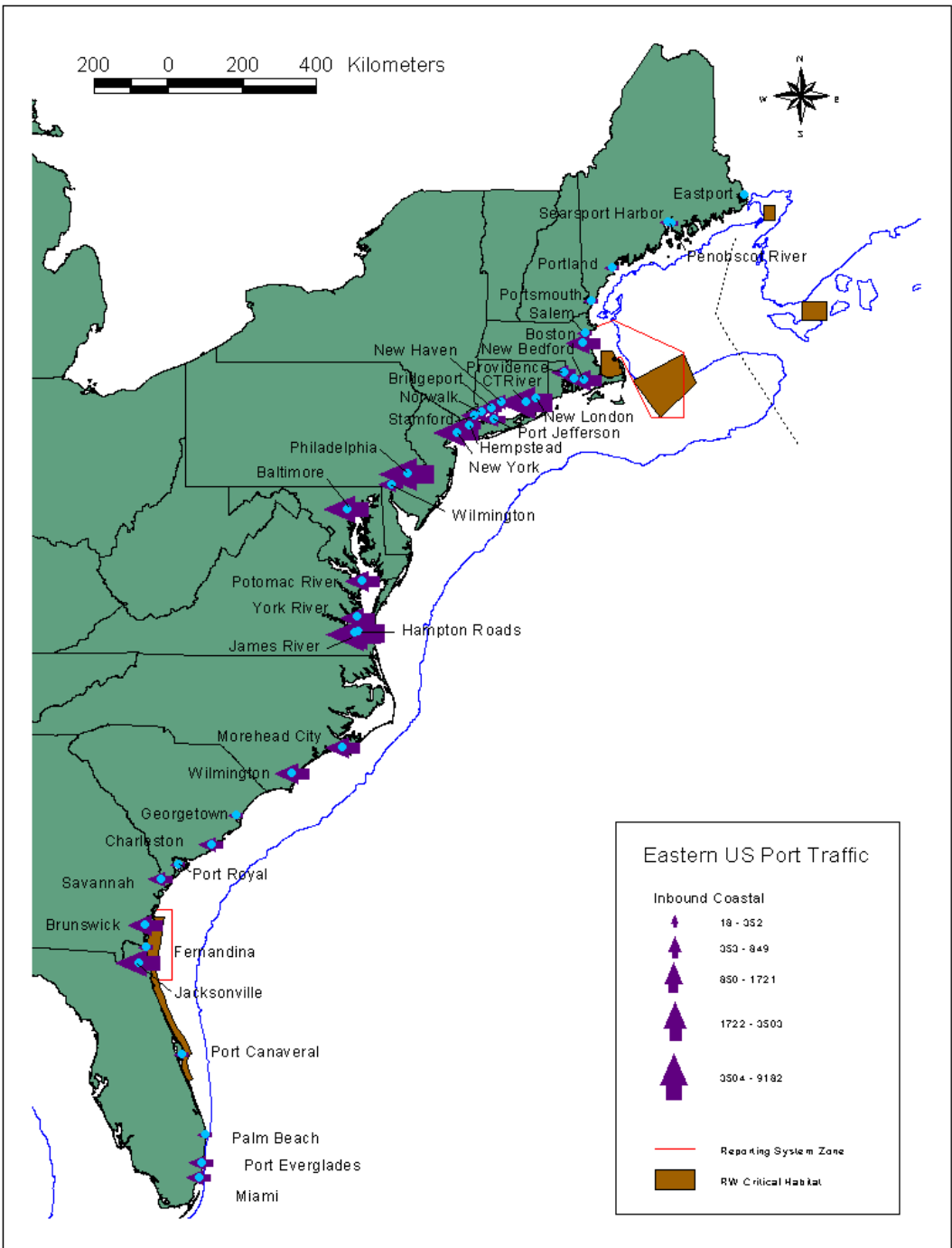
- Endangered:
 - Green sea turtle
 - Hawksbill
 - Kemp's ridley
 - Leatherback
 - Olive ridley
- Threatened:
 - Green sea turtle
 - Loggerhead
 - Olive ridley

Listed Species: Other Marine

- Johnson's sea grass
- White abalone
- International:
 - Chinese River dolphin
 - Gray whale (western north Pacific)
 - Gulf of California harbor porpoise
 - Indus River dolphin
 - Mediterranean monk seal
 - Ringed seal
 - Southern right whale
 - Totoaba

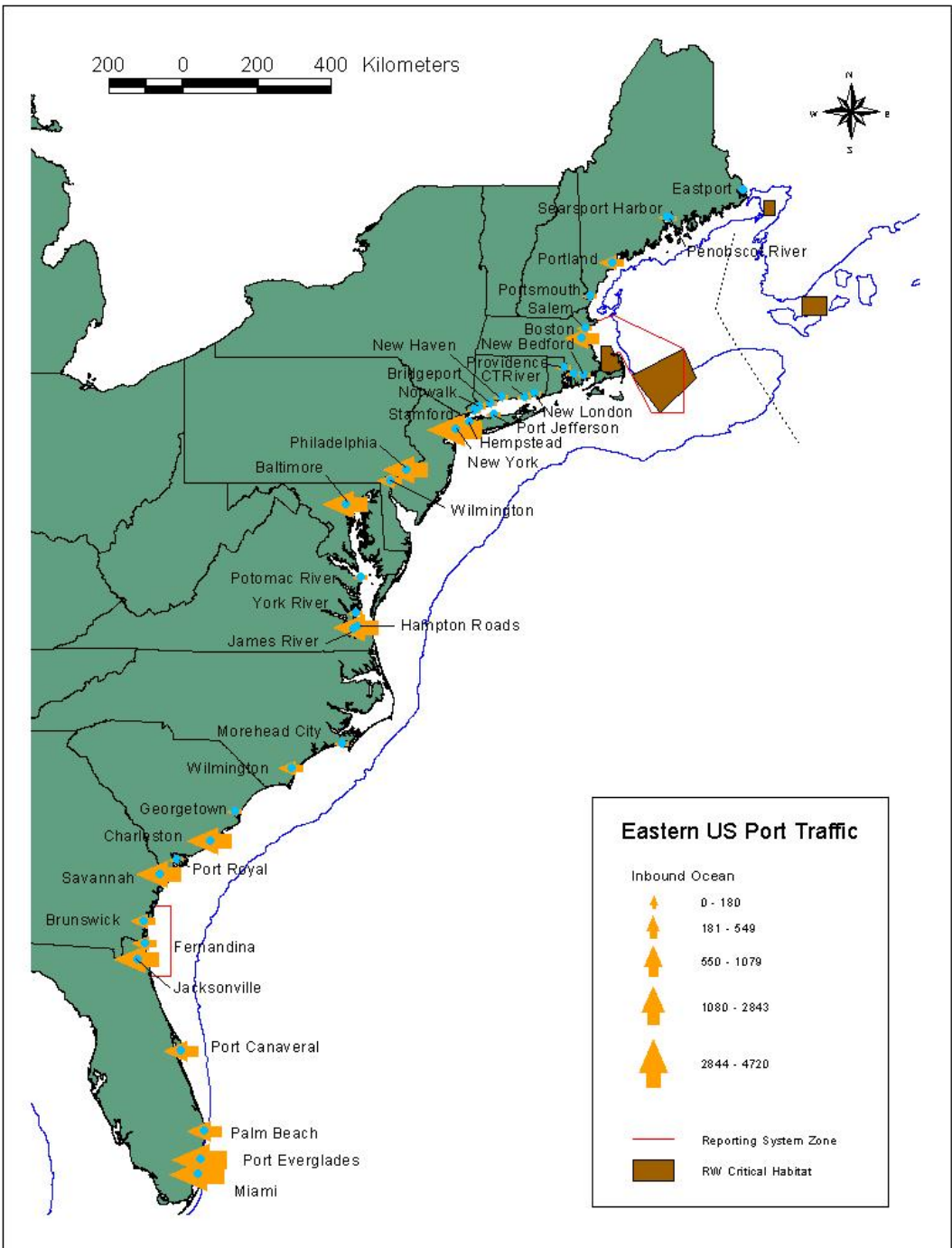
Northern Right Whale Ship Strike Problem

- Population around 300
- Seasonal migrations along US east coast
- Losses due to entanglement (fishing gear) and ship strikes
- Management measures: area closures (rerouting) and/or speed restrictions
- Cost? Effectiveness?



1999 Coastal Transits (domestic cargo)

Boston	petro
NY/NJ	petro, raw, food, manufac
Philadelphia	petro
Baltimore	coal, manufac
Hampton Roads	coal
Wilmington NC	petro, chem
Jacksonville	chem, food, manufac



1999 Seaward Transits

(foreign cargo)

NY/NJ	petro, raw, food manufac
Philadelphia	petro, manufac
Baltimore	coal, raw, manufac, food
Hampton Roads	coal, petro, manufac
Charleston	petro, chem, manufac, food
Savannah	raw, chem, food, manufac
Jacksonville	petro, raw, manufac, food
Port Everglades	petro, manufac
Miami	food, manufac

Cost/Effect Categories

- operating cost due to increased transit time
considered explicitly
- dockside and operating costs from missed tide window due to unanticipated delays (“port” costs)
considered explicitly
- long-term shifts in ship call schedules and port utilization
not considered

Boston Port Calls

	port calls 2000 (Massport)	inbound transits 1999 (ACoE)	port calls used for analysis
Dry bulk	117	400	150
Car carrier	101		125
Container	145		180
Cruise	172		200
Tanker (product)	294	390	350
LNG	45		75
Dry barge	188	170	50
Tank barge		900	200
Navy	86	--	--

Transits Used for Analysis

	inbound			outbound		
	CCCanal	GSC	GoMaine	CCCanal	GSC	GoMaine
Dry bulk	10	80	60	10	80	60
Car carrier	25	100	--	25	100	--
Container	--	120	60	--	90	90
Cruise*	20	30	150	20	55	125
Tanker	--	120	230	--	120	230
LNG	--	75	--	--	75	--
Dry barge	40	5	5	40	5	5
Tank barge	180	10	10	180	10	10

*April - October

Schedule Constraints

- container: tide
 - more than 1 hour delay causes 12 hour loss
 - results in \$20,000 longshore penalty
- cruise: schedule
 - more than 3 hour delay: \$100,000 penalty
- tankers: tide, daylight
 - more than 1 hour delay causes 24 hour loss
- LNG: tide
 - more than 1 hour delay causes 12/24 hour loss

Vessel Type Assumptions

	normal operating speed (knots)	daily charter + OPEX cost (\$/24 hours)
Dry bulk (handymax)	14	12,000
Car carrier	14.5	24,000
Container (3,000 TEU)	24	40,000
Cruise	25	50,000
Tanker (product)	14	18,000
LNG	20	65,000
Dry barge	12	12,000
Tank barge	12	12,000

Boston Routes

Traffic Management Regime

- approaches from Gulf of Maine and Cape Cod Canal
 - dynamic speed restriction over 30 nm
 - 90 day window
 - base case: 10 kts, 20 nm, 30 days
- Great South Channel approach
 - 30 nm static speed restriction across Mass Bay, 30 days
 - dynamic speed restriction over 30 nm in GSC, 90 days

Boston Routes

Traffic Response Alternatives (GSC)

1. high risk strategy

- no schedule adjustment, take chance on delay
- penalties for “port” delays on **all** affected transits

2. low risk strategy

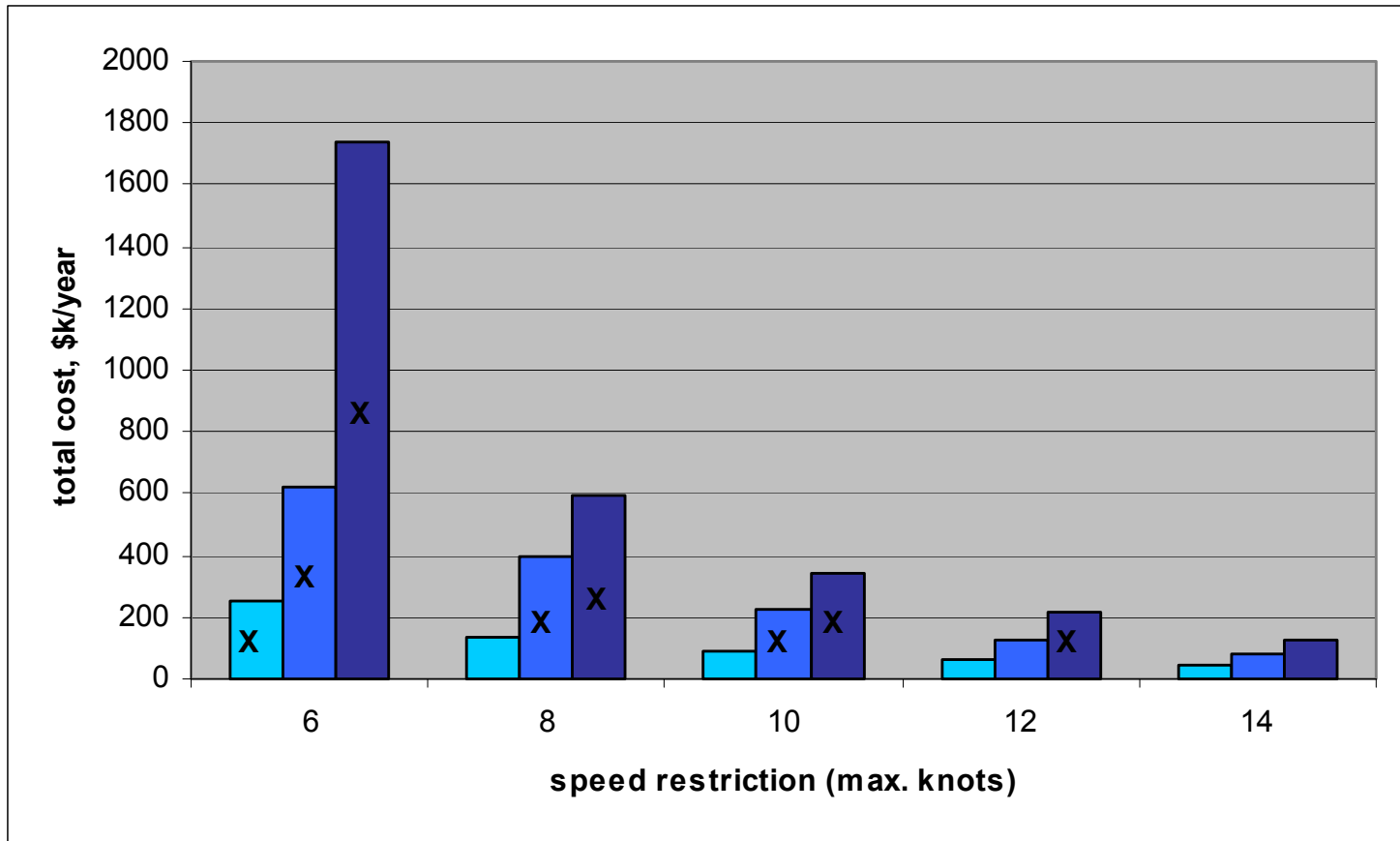
- schedule for maximum delay on each transit
- no unexpected (port) delays

Model Results

- maximum additional transit time:
 - Gulf of Maine, Cape Cod Canal:
 - about 45 minutes for bulker carriers
 - about 90 minutes for container & cruise ships
 - Great South Channel:
 - about 90 minutes for bulk carriers
 - 3 to 3.5 hours for faster ships

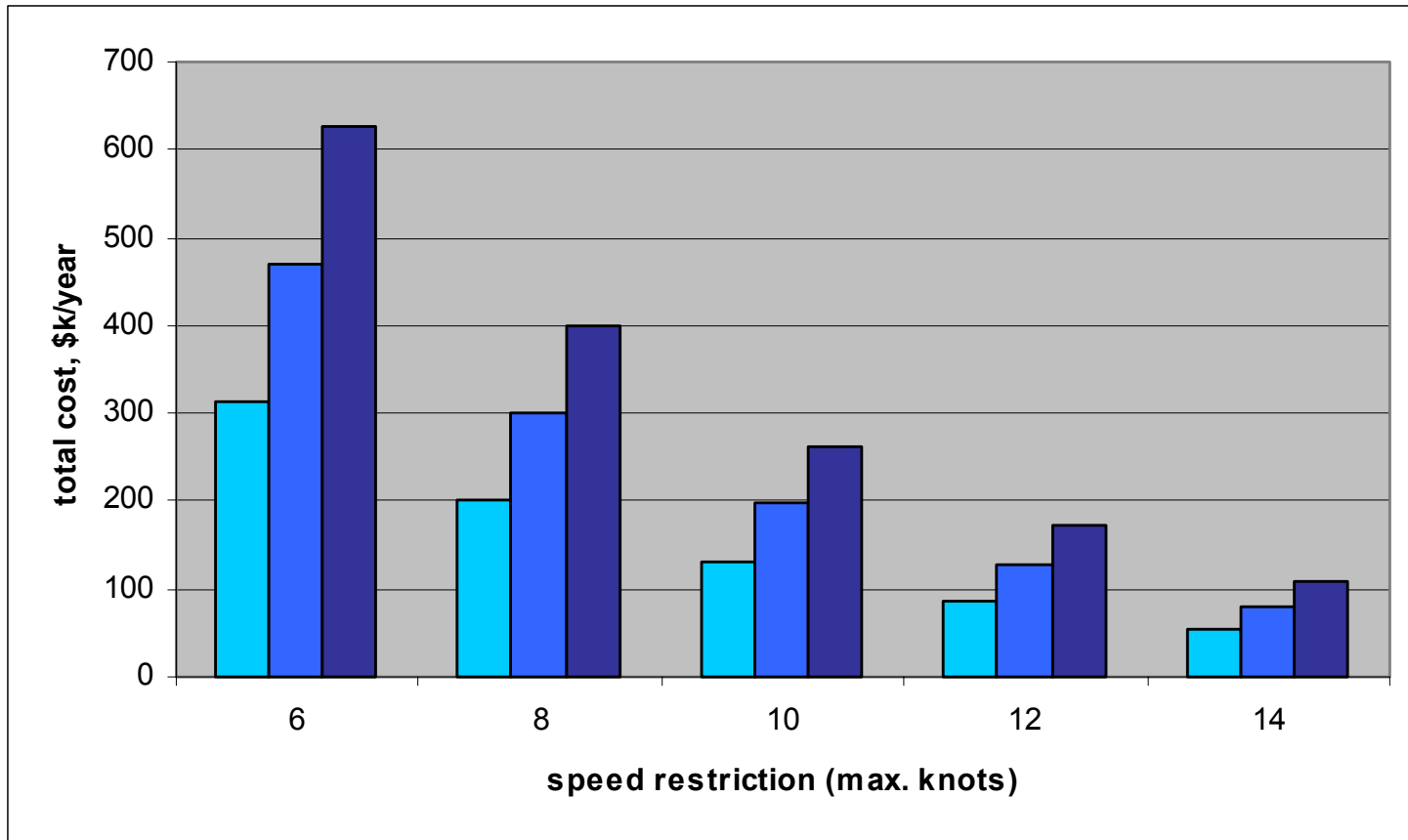
Boston North Approach (Gulf of Maine)

(base case: 30/20)



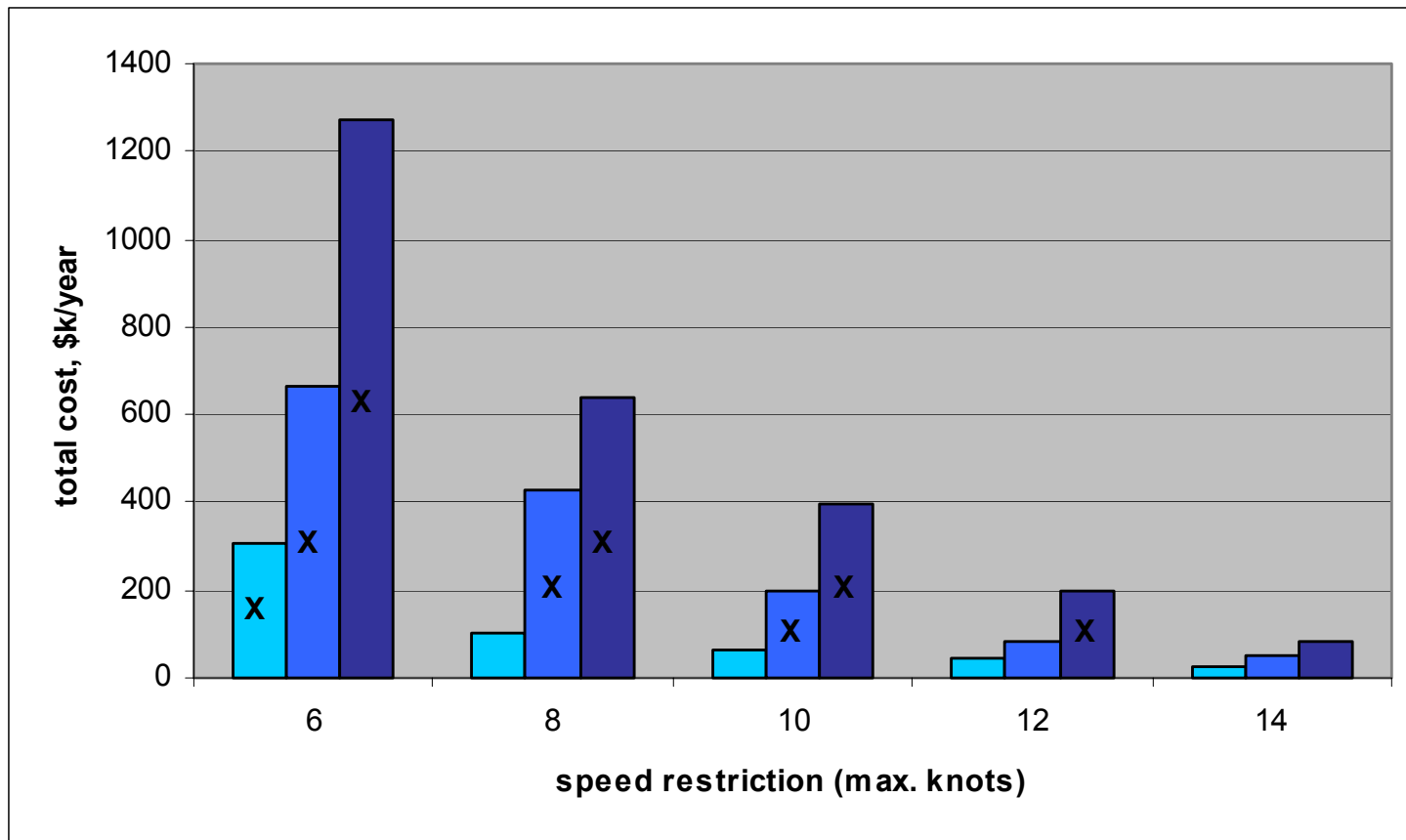
Great South Channel Static Segment

(base case: 30/30)



Great South Channel Dynamic Segment

(base case: 30/20)

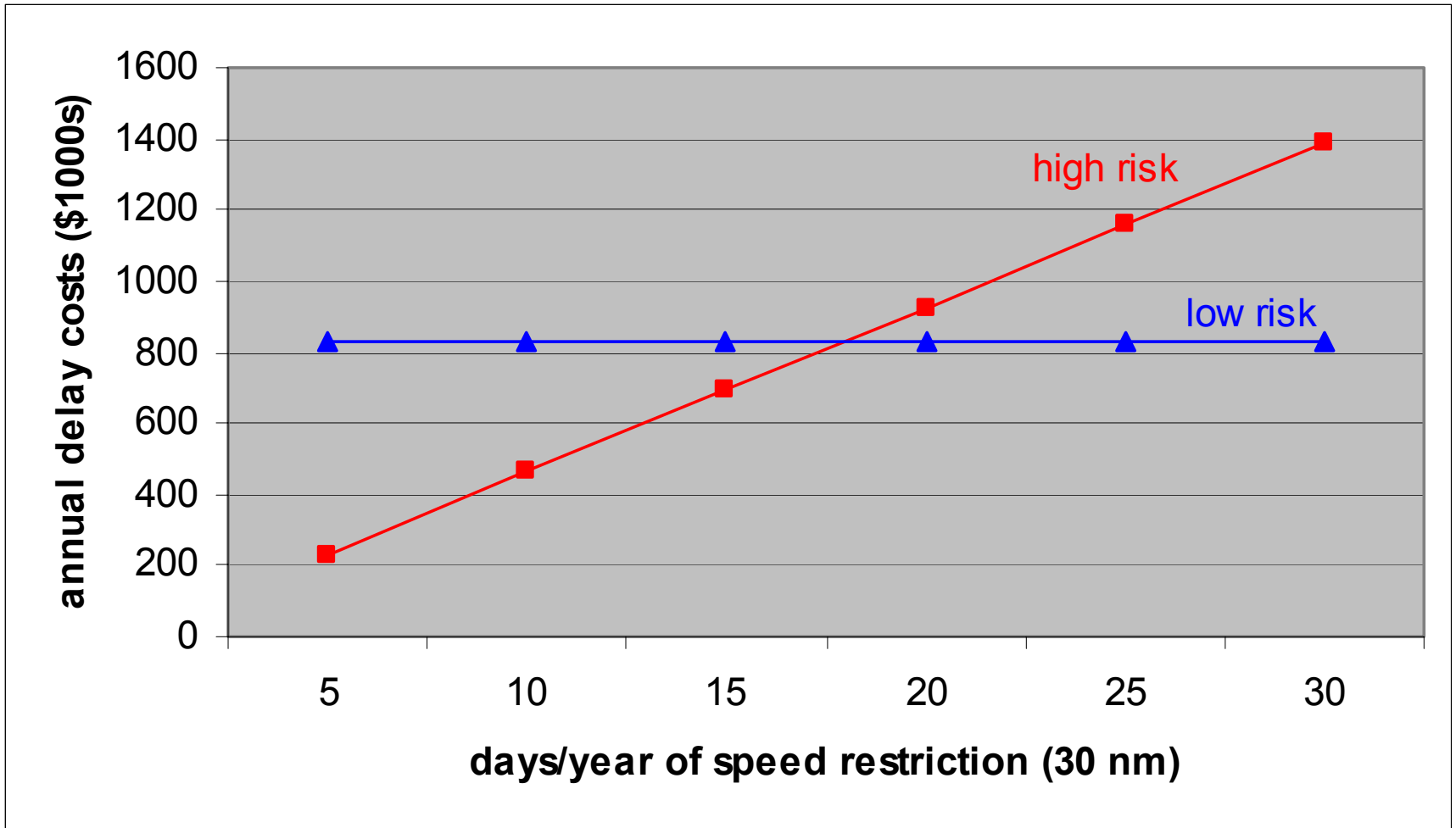


Model Results: Boston Traffic Annual Cost

(base case, \$1,000)

	<i>northern approach (Gulf of Maine)</i>	<i>southern approach (Cape Cod Canal)</i>	<i>Great South Channel approach</i>		total
			<i>Race Point (static)</i>	<i>GSC (dynamic)</i>	
<i>dry bulk</i>	3	1	6	4	14
<i>tanker</i>	16	--	13	8	37
<i>container</i>	72	--	58	101	231
<i>LNG</i>	--	--	50	34	84
<i>car carrier/RoRo</i>	--	2	15	10	27
<i>cruise</i>	136	20	44	42	242
<i>dry barge</i>	--	2	--	--	2
<i>tank barge</i>	--	4	--	--	4
total	227	29	186	199	641

GSC: High and Low Risk Strategies



Port Calls

(estimated, from 1999 Army Corps of Engineers data)

	Portland	NY/NJ *	Phila	Baltim	Hamp Roads	Wilm DE
Dry bulk		910	1,900	1,100	2,500	250
Car carrier/RoRo		1,500				
Container		5,600	100	500	1,200	110
Cruise	170	550				
Tanker	350	2,630	1,100	160	530	270
LNG						
Dry barge	20	600	2,200	1,700	4,000	1,000
Tank barge	120	1,000	5,000	1,800	860	600
Navy	--	--	--	--	--	--

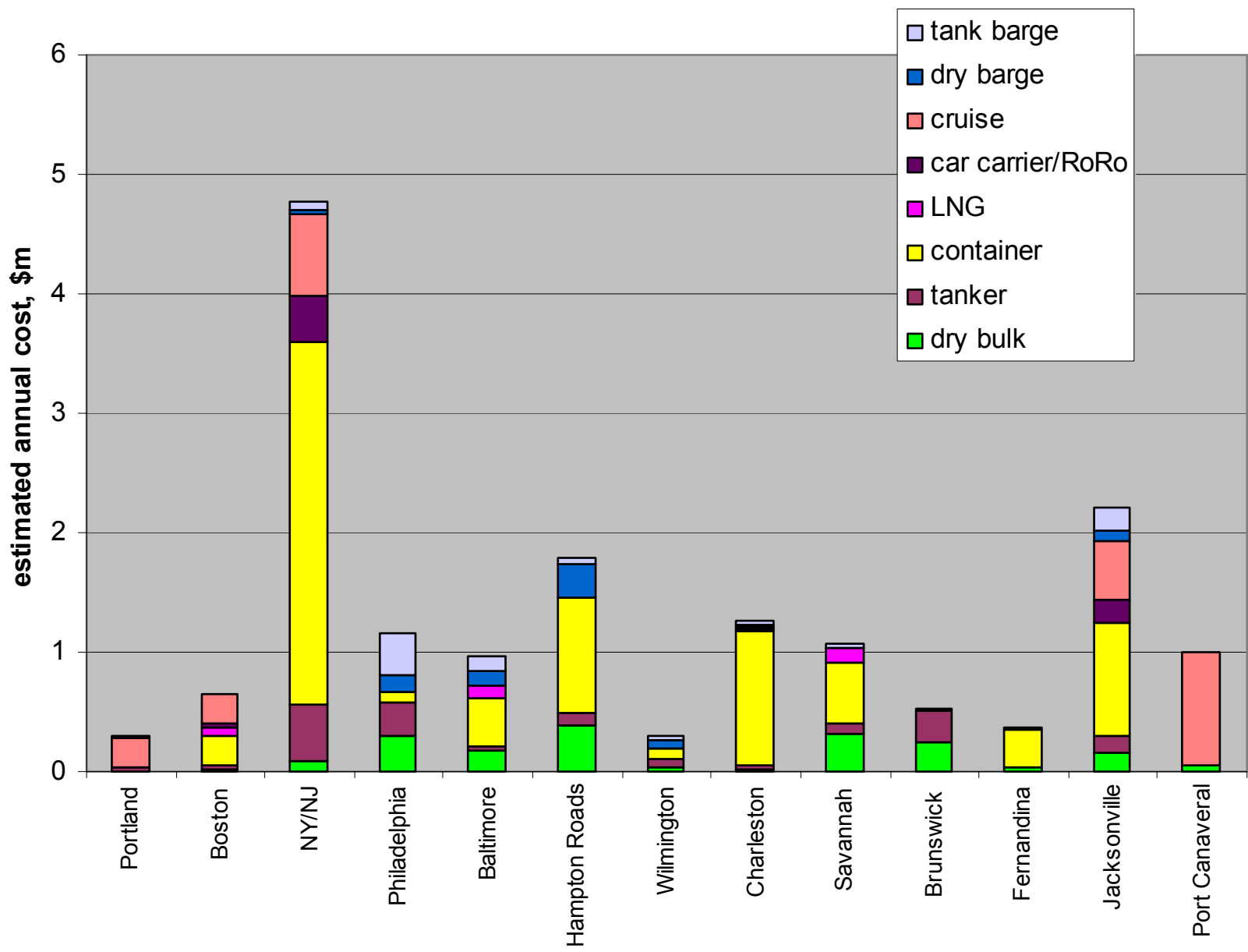
*NY/NJ Port Authority data, 2001 (2010 forecast)

Port Calls

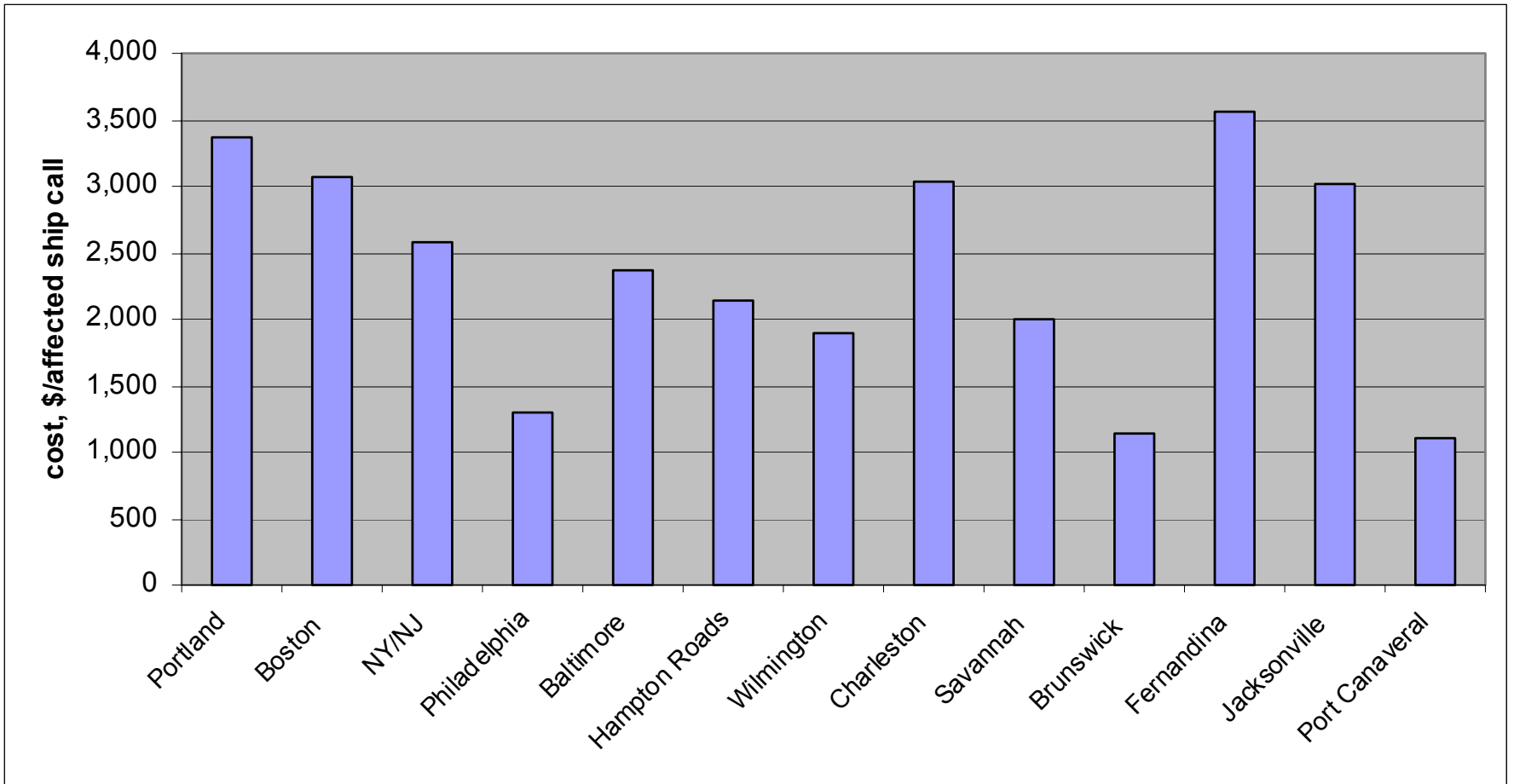
(estimated, from 1999 Army Corps of Engineers data)

	Charles*	Savan	Bruns	Fern Beach	Jax	Port Canav
Dry bulk	160	2,050	770	100	900	790
Car carrier/RoRo	70					
Container	1,990	650		200	600	
Cruise	20				200	1,900
Tanker	190	320	590		240	60
LNG		100				
Dry barge	320	120	10	10	700	50
Tank barge	310	500	160	100	1,400	300
Navy	--	--	--	--	--	--

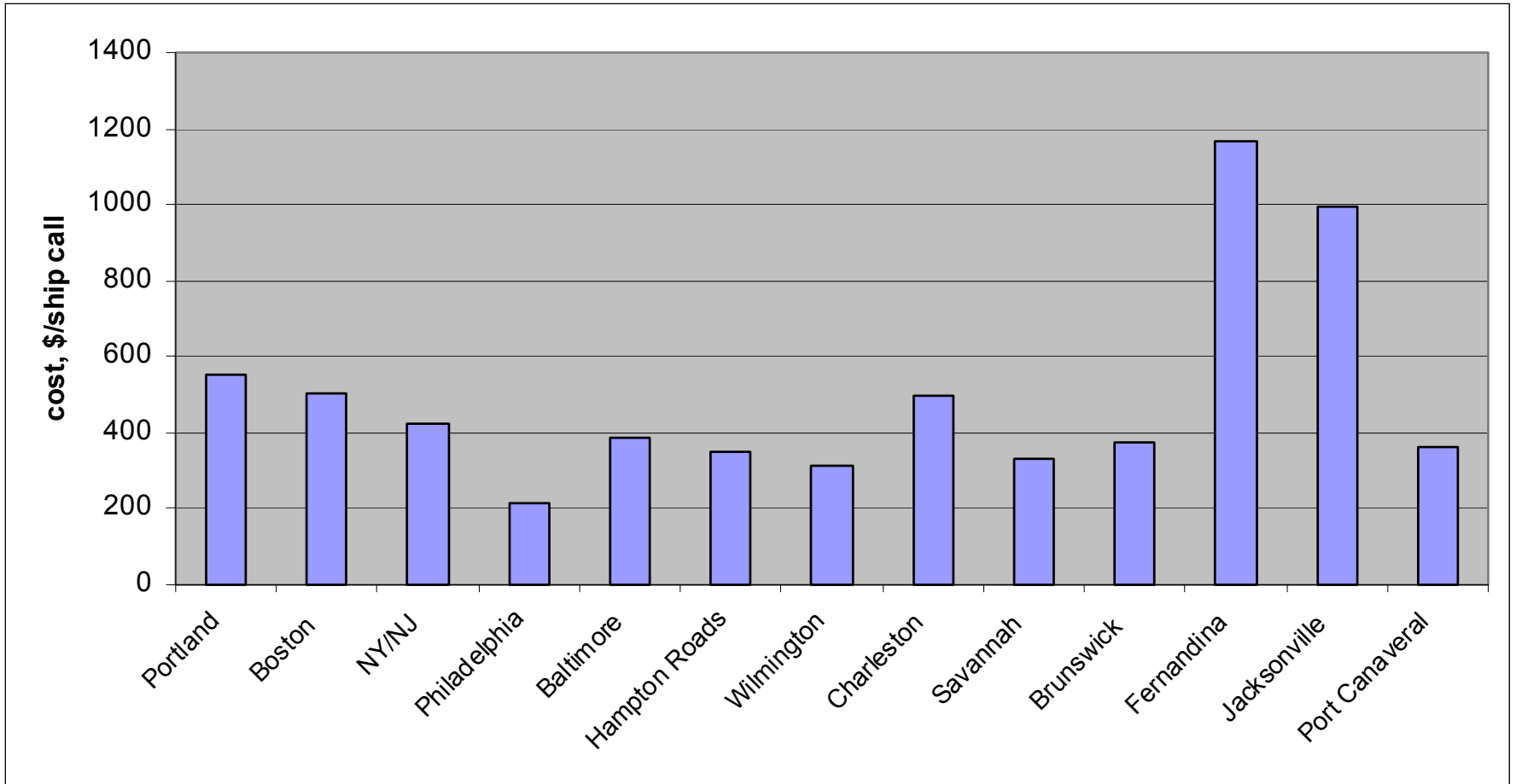
*South Carolina Port Authority data, 2000



Average Cost per Affected Vessel



Average Cost per Vessel

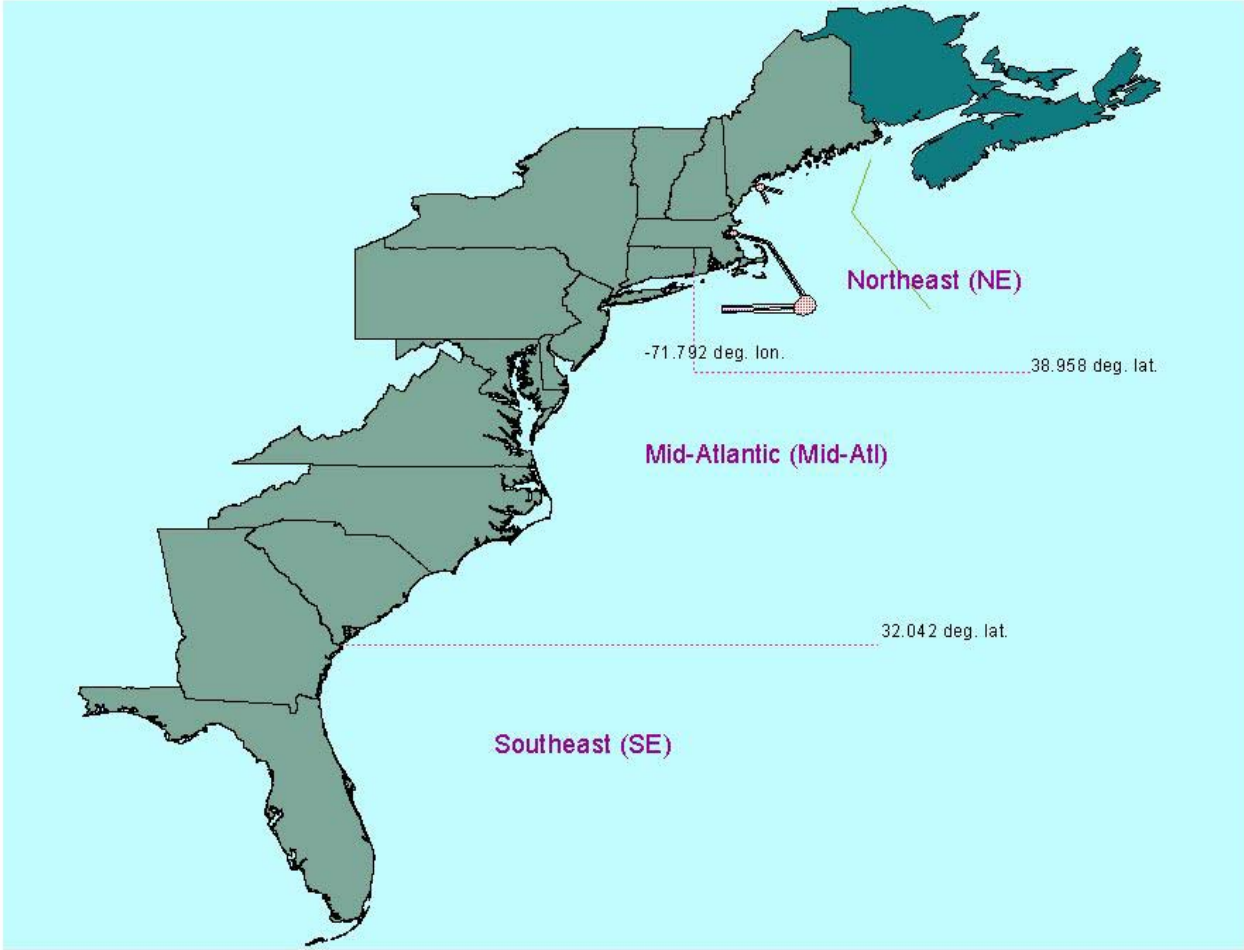


Summary: Cost Estimates

- overall cost to Boston shipping estimated \$600-700,000/year
 - total east coast: about \$10 million/year
- Boston: about \$500/ship call, or \$3,000 per affected ship call
- GSC (2/3) and northern approach (1/3)
- container and cruise ships

Effectiveness: Background

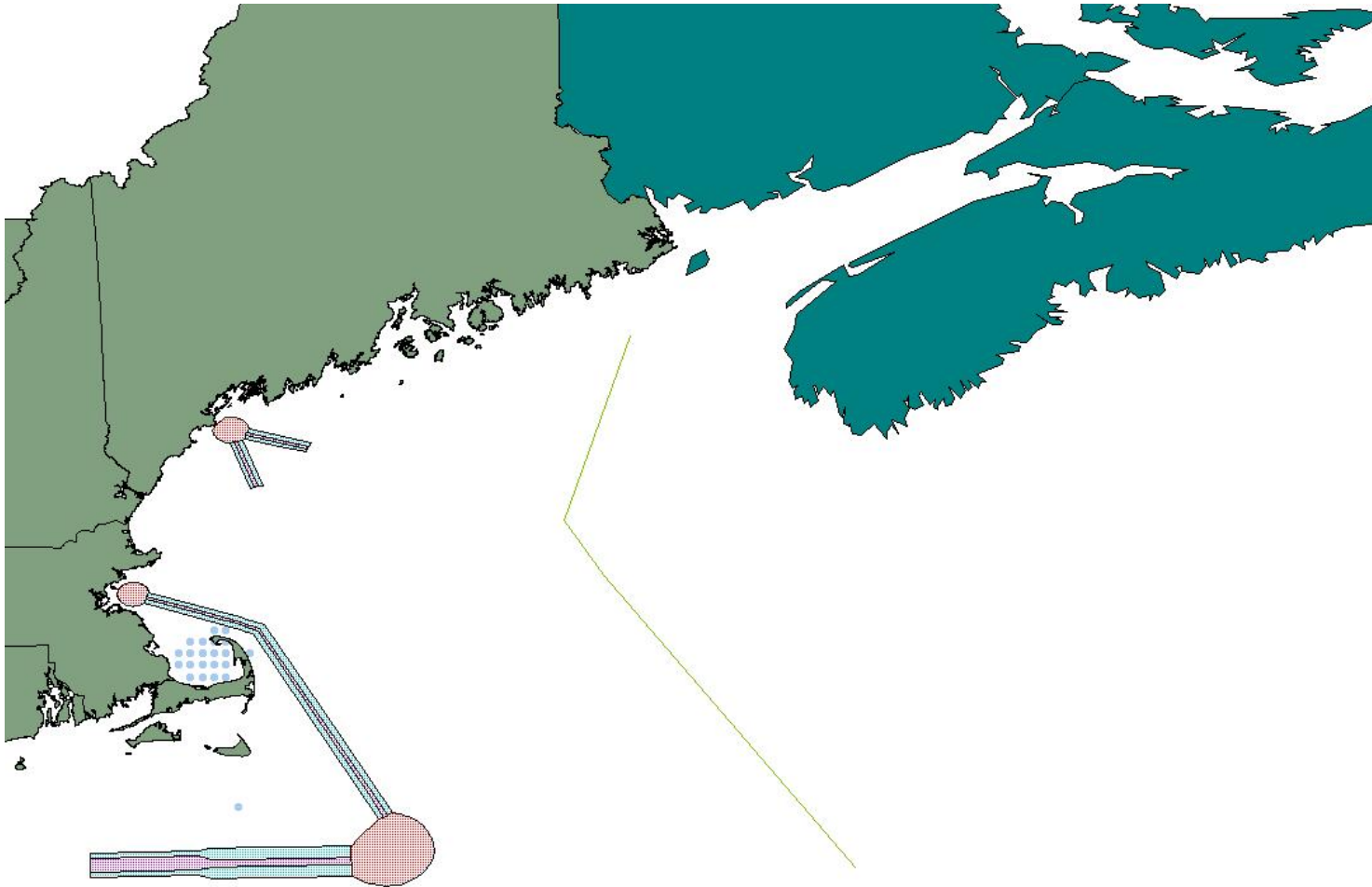
- Consortium data on sightings and effort
 - 1978-2001
 - 5-minute squares, by month
 - “QC” by Bob Kenney
- SPUE = sightings/km survey trackline
- density = SPUE/average survey track width
 - don't know track width (W_t)
 - but: can make reasonable estimate given total population size



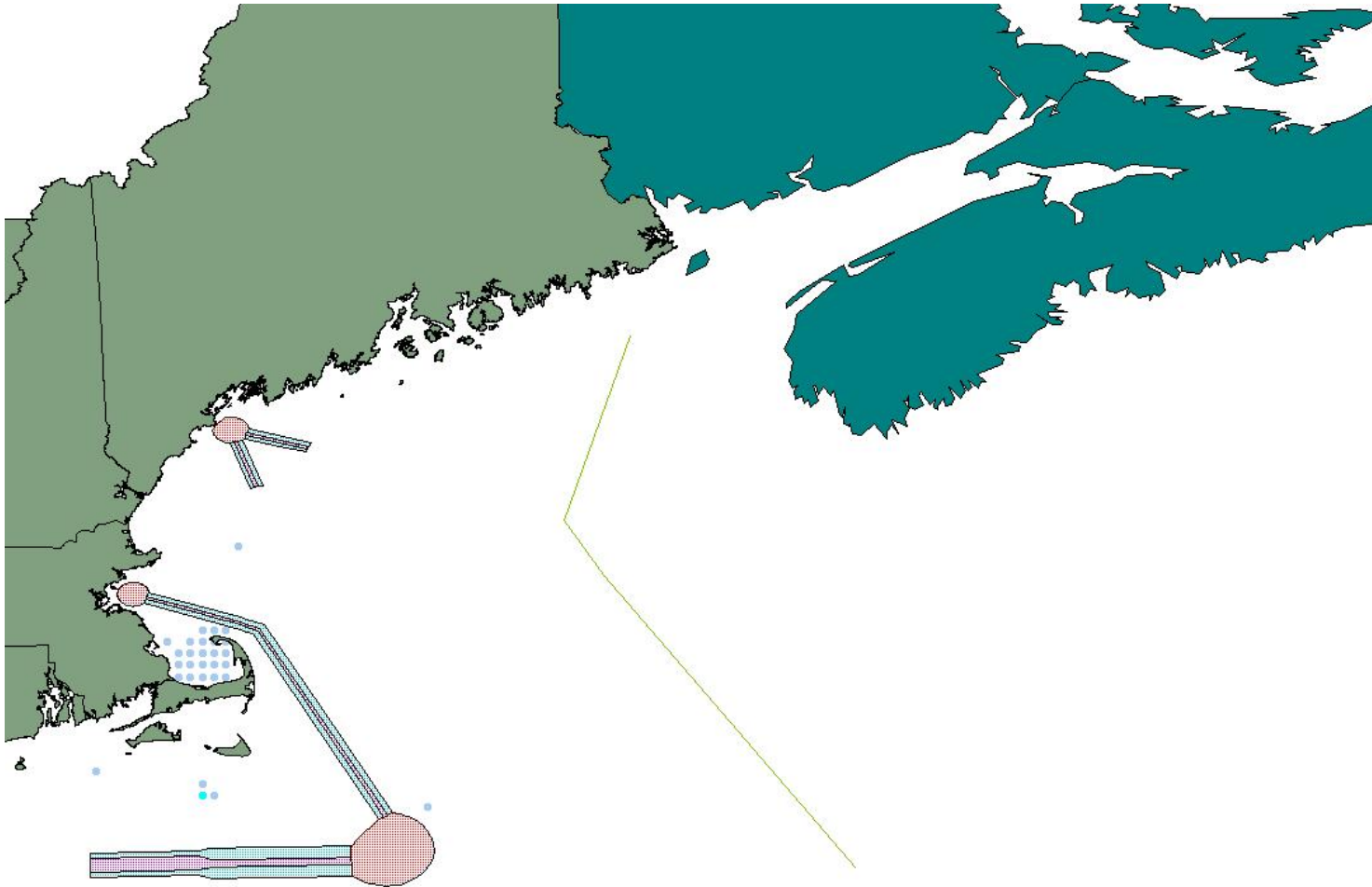
RW Population, NE: January



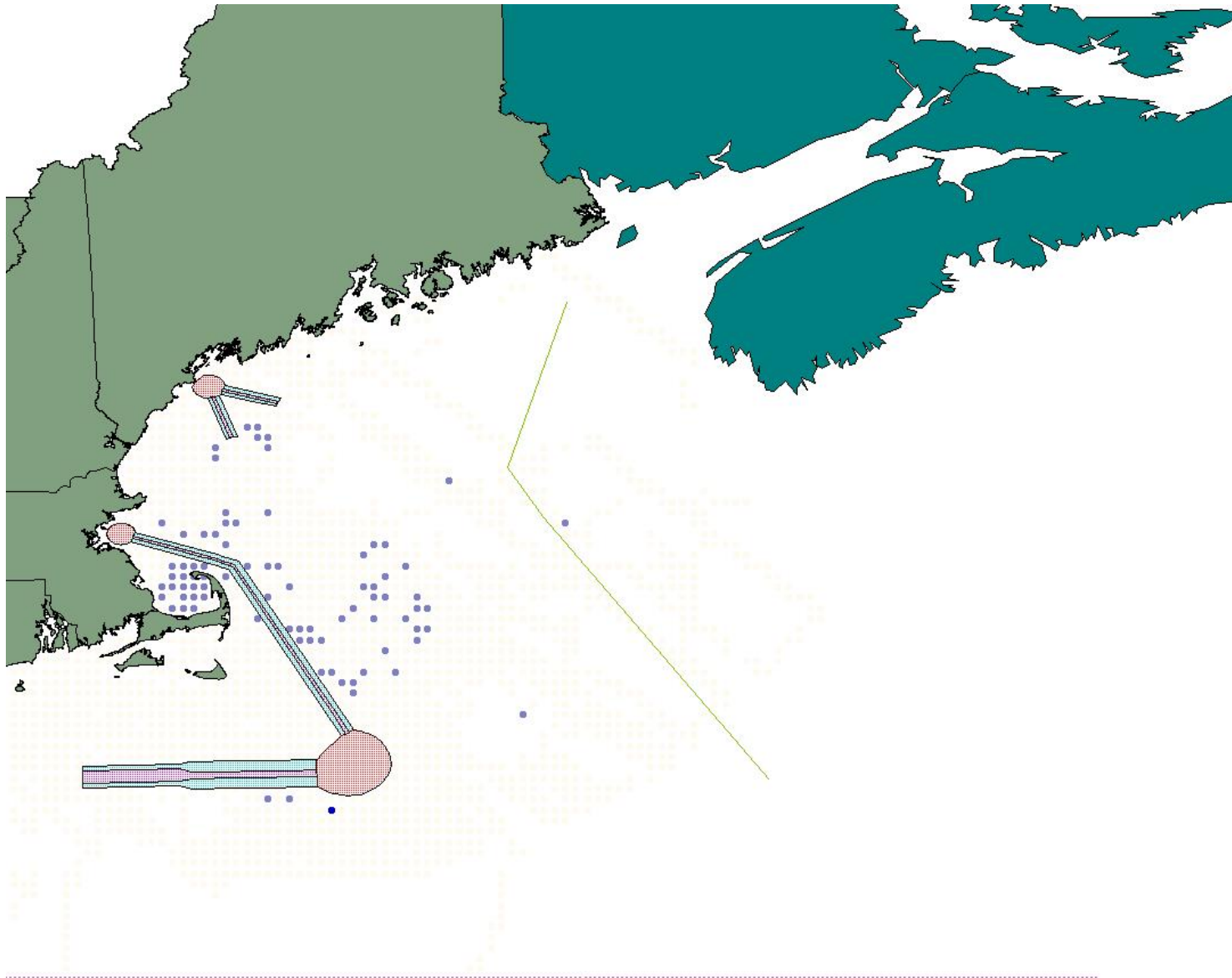
RW Population, NE: February



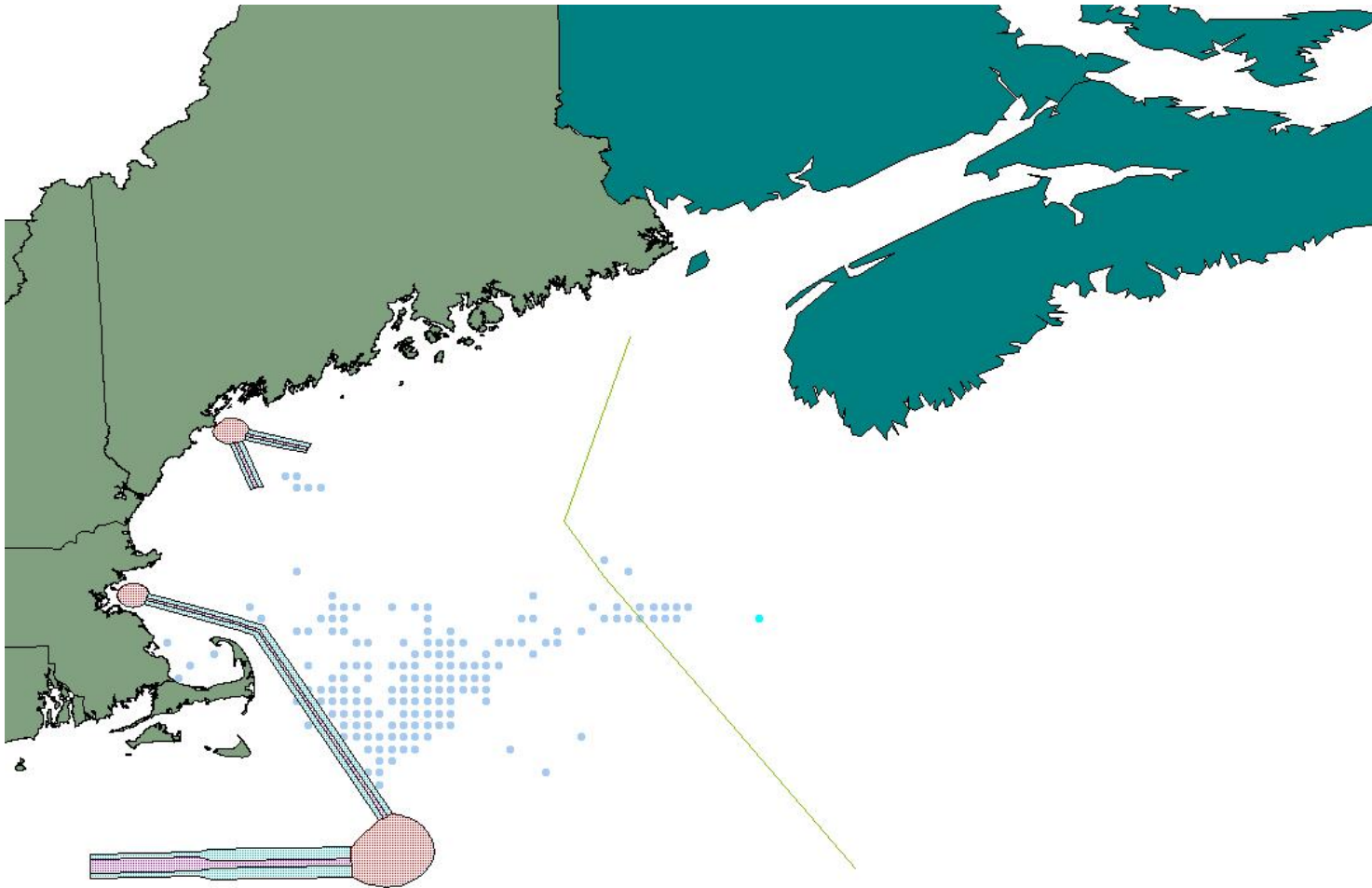
RW Population, NE: March



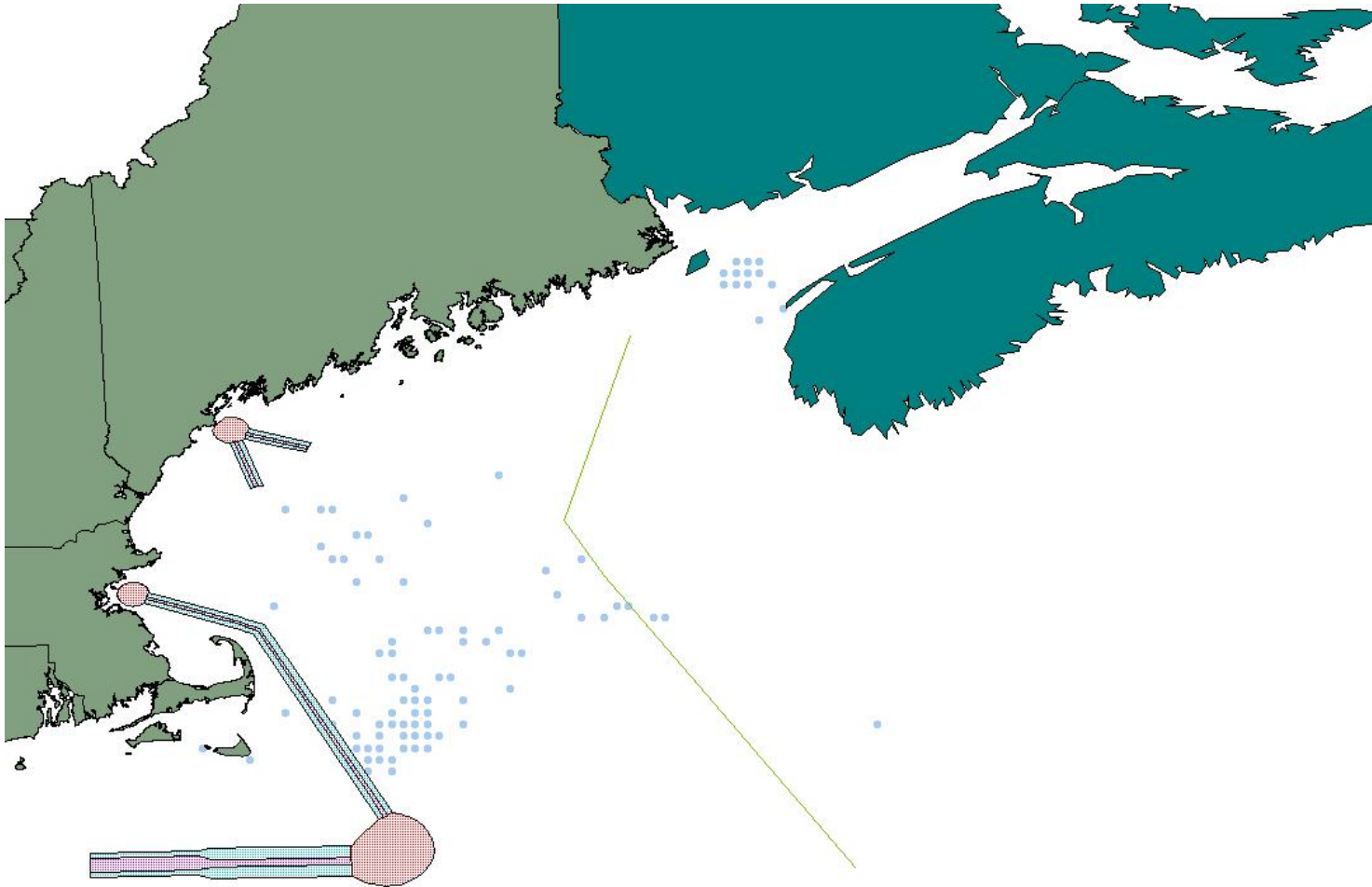
RW Population, NE: April



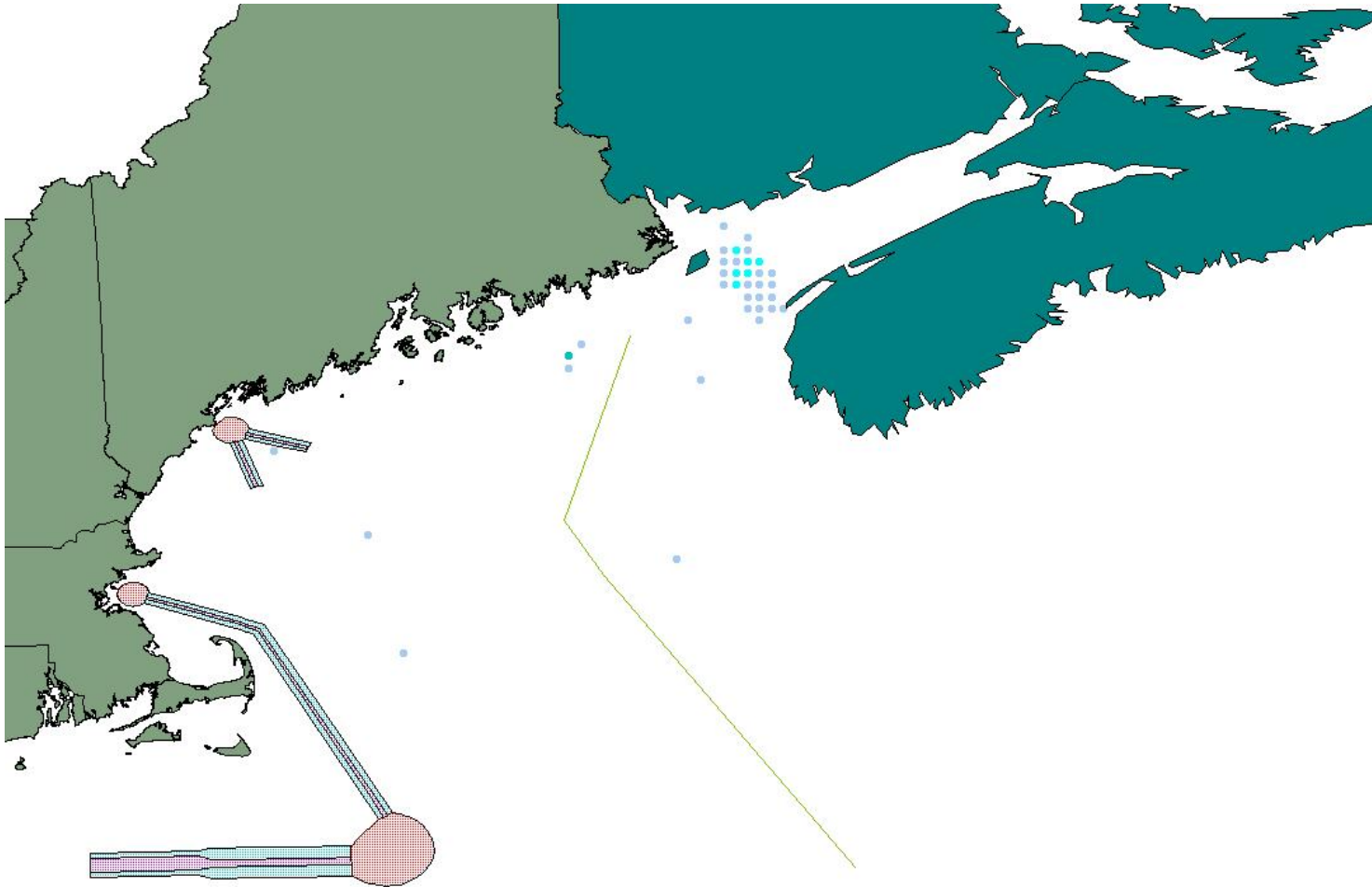
RW Population, NE: May



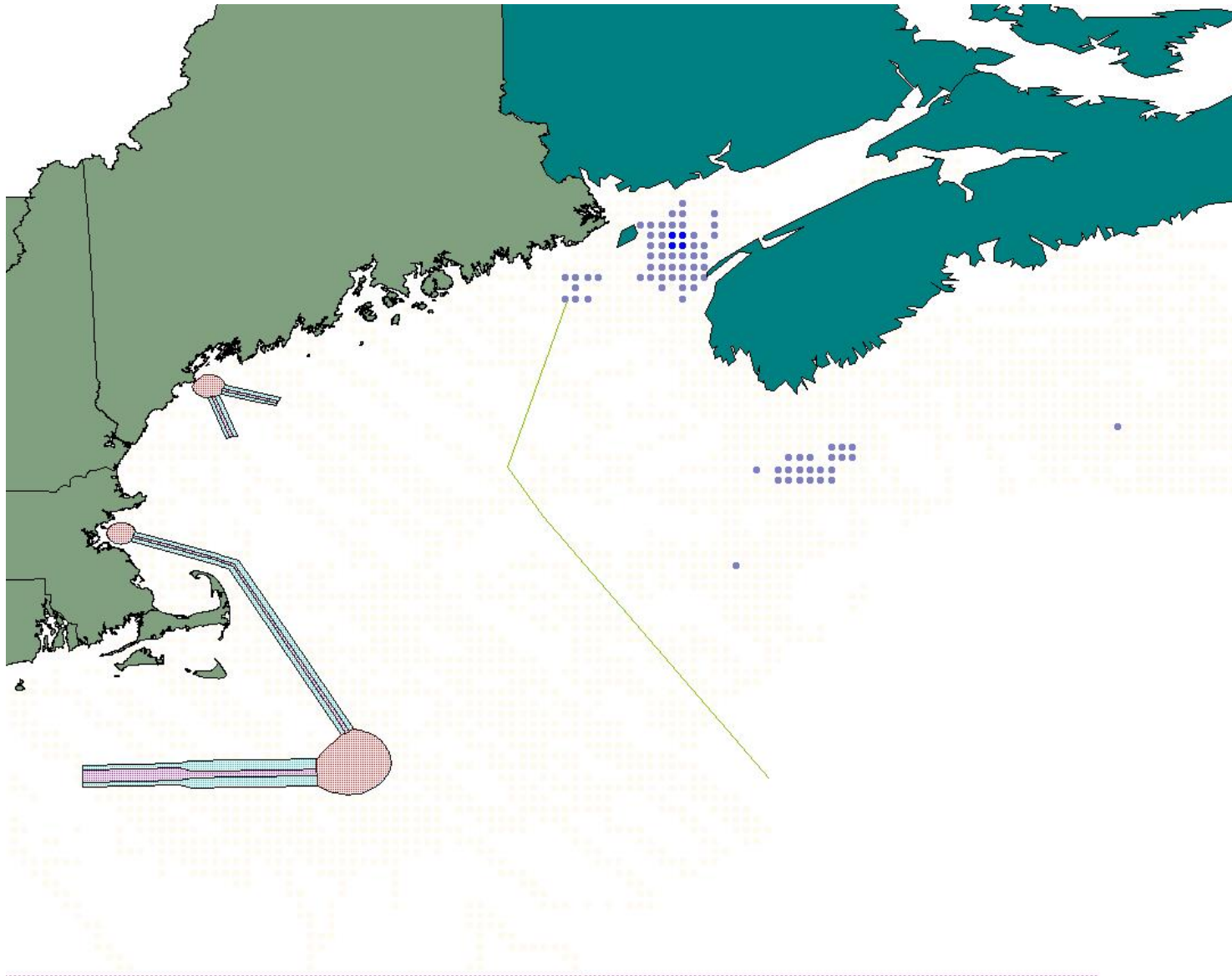
RW Population, NE: June



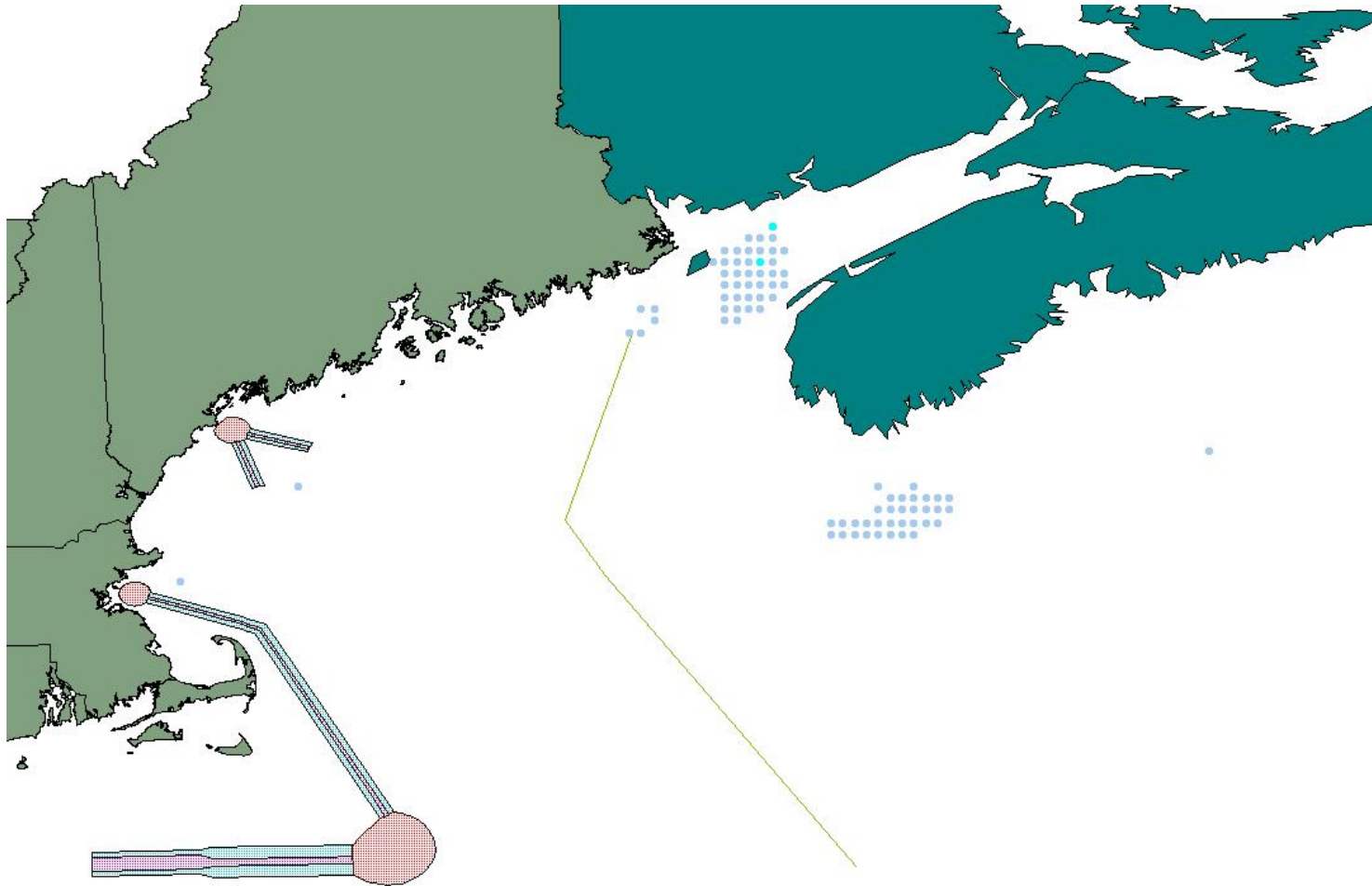
RW Population, NE: July



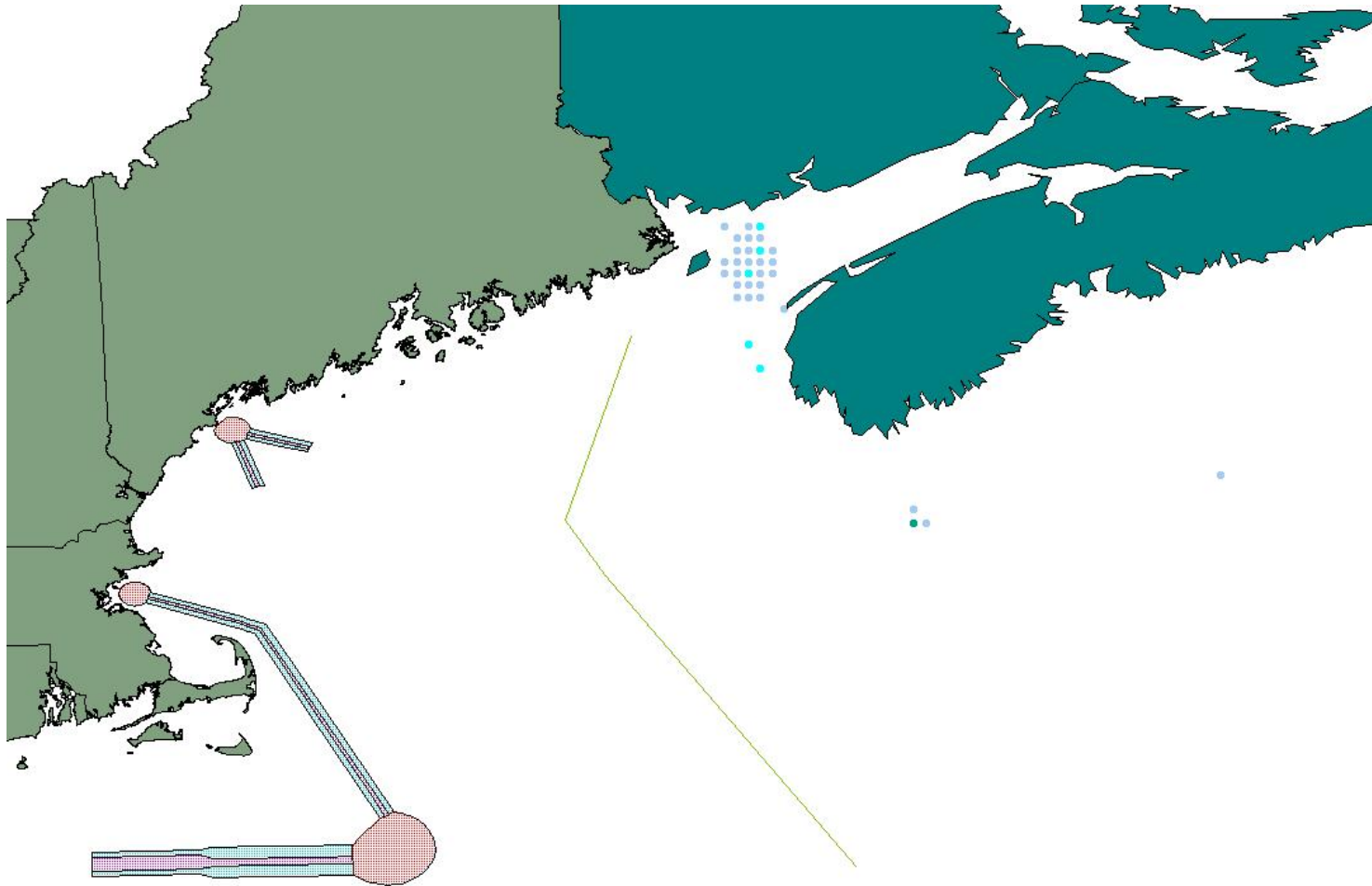
RW Population, NE: August



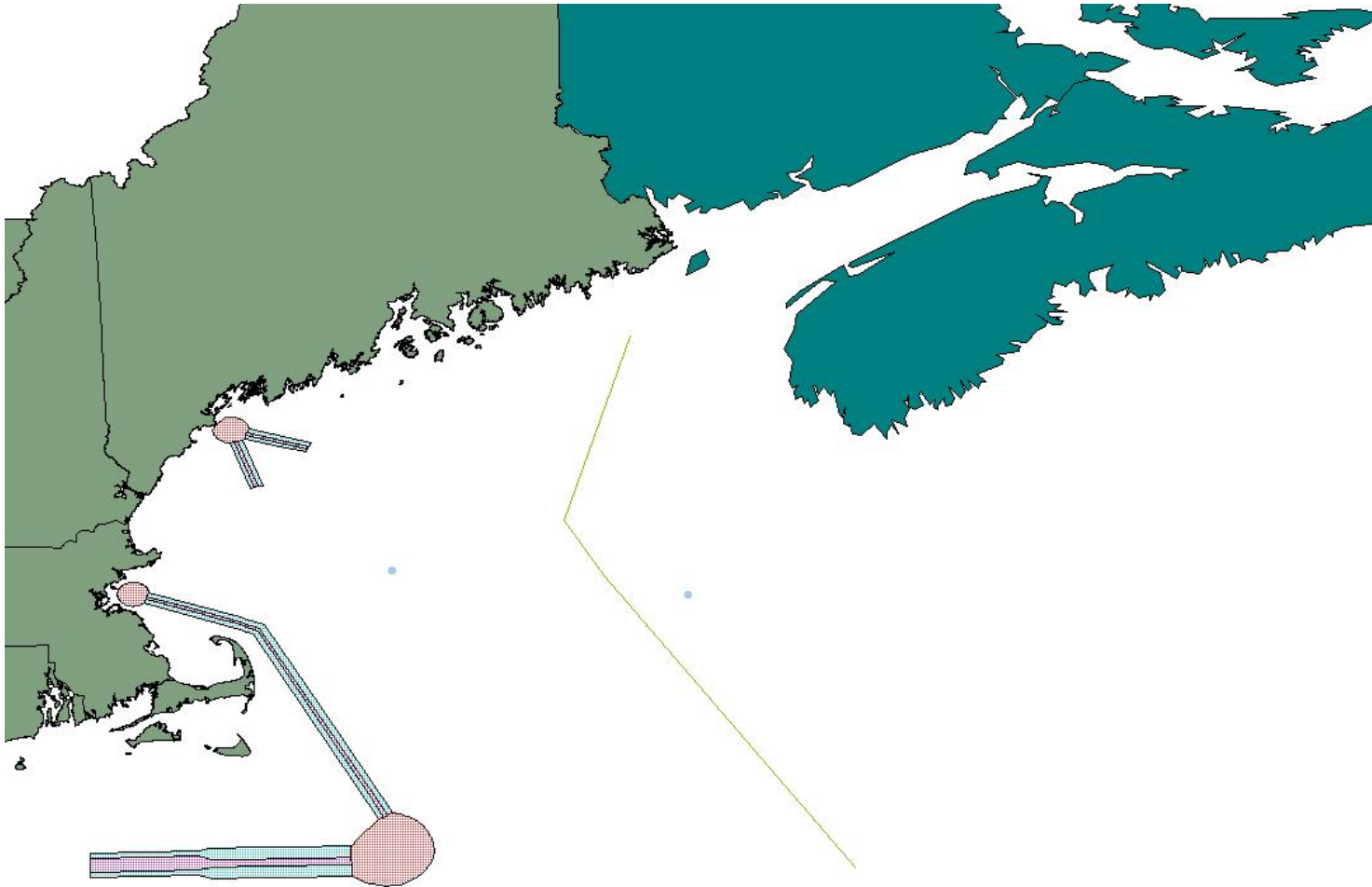
RW Population, NE: September



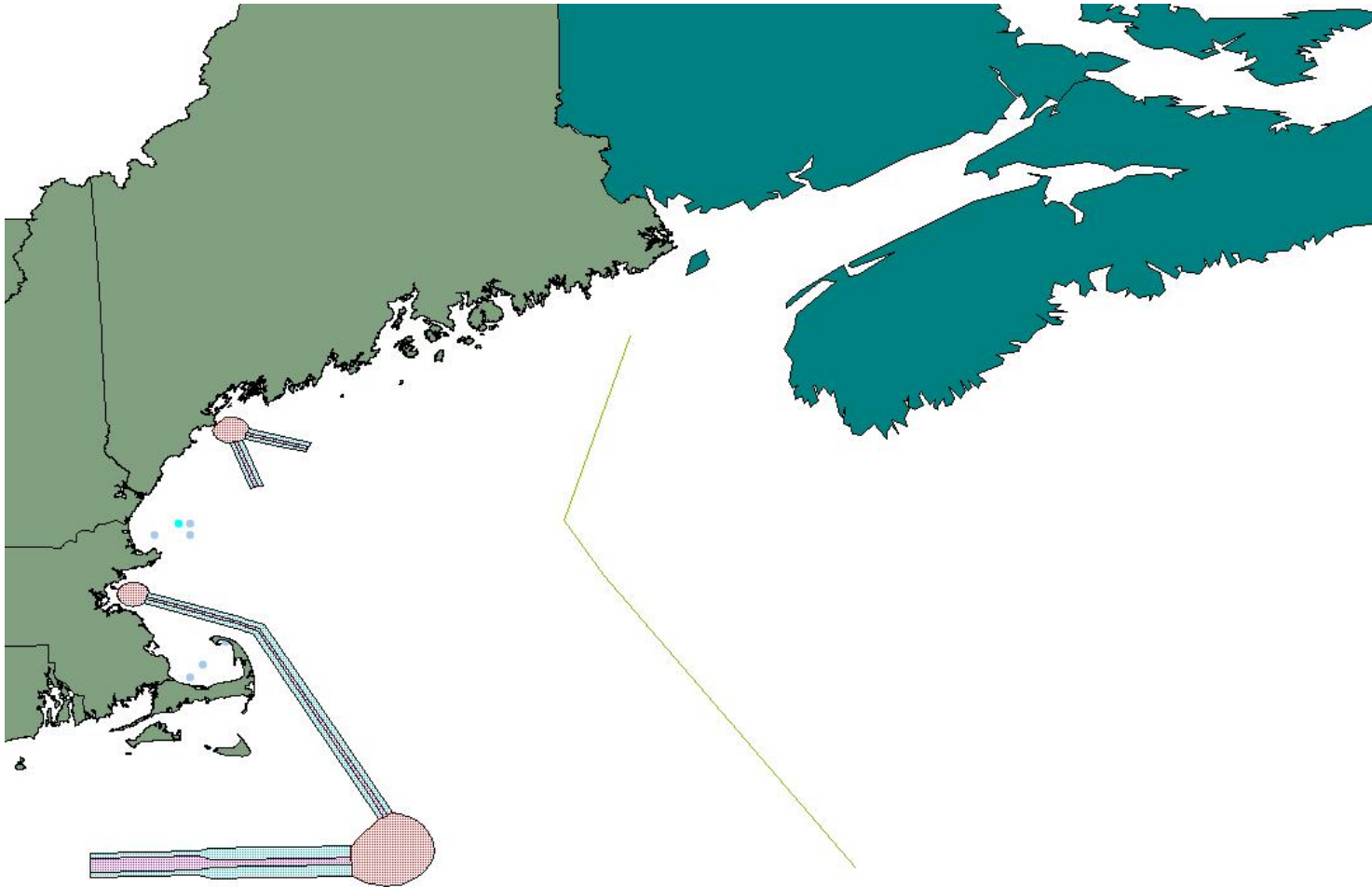
RW Population, NE: October



RW Population, NE: November

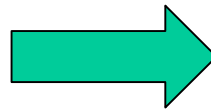


RW Population, NE: December



Estimated Population with $W_t=1.5$ km

MONTH	Pop. Estimate*			
	NE Mid-Atl	SE	Total	
Jan	23	4	43	70
Feb	44	11	31	86
Mar	103	25	13	141
Apr	249	0	0	250
May	291	4	0	295
Jun	210	0	0	210
Jul	265	0	0	265
Aug	376	0	0	376
Sep	589	0	0	589
Oct	297	0	0	297
Nov	8	10	0	19
Dec	57	2	14	73



= 282 when $W_t = 2$ km

= 294 when $W_t = 3$ km

* $W_t=1.5$ km

Average Estimated Density by month and region

MONTH	Density (whales/1000km ²)			
	NE	Mid-Atl	SE	Total
Jan	4.9	0.1	2.3	2.4
Feb	1.1	0.5	1.8	2.7
Mar	14.2	0.3	0.6	2.9
Apr	8.7	0	0.1	5.2
May	8.3	0.1	-	7.6
Jun	4.4	0	-	3.5
Jul	32.1	0	0	23.9
Aug*	44.1	0	-	37.2
Sep**	21.6	0	0	16.1
Oct	19.2	0	0	10.2
Nov	0.1	0.3	0.2	0.2
Dec	1.4	0	0.9	0.8
*Trackline width assumed to be 2km				
**Trackline width assumed to be 3km				

Estimating Encounters

- for a given route:
 - length of track through each square
 - effective width and number of vessels
- Great South Channel:
 - approx. 7 encounters/year
 - April – June
 - includes “submerged encounters”
 - no allowance for avoidance

Comparing Management Measures

- routing:
 - comparison of estimated encounters
 - moderated by evasive action (surveys/ships) and whale behavior(?)
- speed
 - no effect on estimated encounter rates
 - may allow more effective evasive action