Appendix IV: Coastal Seabird Research Results

Contents

List of Figures

1 Species Codes

Species codes:

BLSC = Black scoter
SUSC = Surf scoter
WWSC = White-winged scoter
DWSC = Dark-winged scoter (i.e., unidentified BL/SUSC)
SCOT = unidentified scoter
LTDU = Long-tailed duck
COEI = Common eider
KIEI = King eider
EIDE = unidentified eider
COME = Common merganser
RBME = Red-breasted merganser
HOME = Hooded merganser
MERG = unidentified merganser
BAGO = Barrow's goldenye
COGO = Common goldeneye
GOLD = unidentified goldeneye
GOME = unidentified goldeneye/merganser
BUFF = Bufflehead
HARD = Harlequin duck
CANV = Canvasback
REDH = Redhead
RNDU = Ring-necked duck
SCAU = Scaup spp.
GRSC = Greater scaup
LESC = Lesser scaup
DUCK = unidentified sea duck
HOGR = Horned grebe
RNGR = Red-necked grebe
UNGR = unidentified grebe
COLO = Common loon
RTLO = Red-throated loon
LOON = unidentified loon
ATPU = Atlantic puffin
BLGU = Black guillemot
COMU = Common murre
DOVE = Dovekie
RAZO = Razorbill
TBMU = Thick-billed murre
UNMU = unidentified murre
UNLA = unidentified large alcid
ALCD = unidentified alcid
BBGU = Black-backed gull
BLKI = Black-legged kittiwake
BOGU = Bonaparte's gull
GBBG = Greater black-backed gull
GLGU = Glaucous gull
HERG = Herring gull
ICGU = Iceland gull
LAGU = Laughing gull
LBBG = Lesser black-backed gull
LIGU = Little gull
RBGU = Ring-billed gull
UNLG = Large gull
UNSG= Small gull
GULL = unidentified gull
UNLT = unidentified large tern (e.g., Caspian, Royal, Roseate)
UNMT = unidentified medium tern (e.g., Forster's, Gull-billed, etc.)
UNST = unidentified small tern (e.g., Least, Arctic, Common)
UNTE = unidentified tern
ARTE = Arctic Tern
BRTE = Bridled Tern
COTE = Common Tern
FOTE = Forster's Tern
GBTE = Gull-billed Tern
LETE = Least Tern
ROST = Roseate Tern
ROYT = Royal Tern
SOTE = Sooty Tern
BLTE = Black Tern
CATE = Caspian Tern

BRNO = Brown Noddy
BLSK = Black skimmer
NOFU = Northern fulmar
AUSH = Audubon's shearwater
BCPE = Black-capped petrel
COSH = Cory's shearwater
GRSH = Greater shearwater
SOSH = Sooty shearwater
MASH = Manx shearwater
UNSH = unidentified shearwater
UNSP = unidentified storm-petrel
LHSP = Leach's Storm-petrel
WISP = Wilson's Storm-petrel
BSTP = Band-rumped Storm-petrel
NOGA = Northern gannet
DCCO = Double-crested cormorant
GRCO = Great cormorant
UNCO = unidentified cormorant
BRPE = Brown pelican
AWPE = American white pelican
MAFR = Magnificent frigatebird
RBTR = Red-billed Tropicbird
WTTR = White-tailed Tropicbird
BIRD = unidentified seabird or diving duck

Other species recorded:

Sharks and Rays:
GWSH = Great white shark
SHAR = unidentified shark
MARA = Manta ray
UNRA = unidentified ray

Sea Turtles:
GRST = Green sea turtle
LEST = Leatherback sea turtle
LOST = Loggerhead sea turtle
KRST = Kemp's ridley sea turtle
UIST = unidentified sea turtle

Marine Mammals:
BODO = Bottlenose dolphin
UNSD = unidentified spotted dolphin
DOLP = unidentified dolphin
PORP = unidentified porpoise
HUWH = Humpback whale
PIWH = Pilot whale
RIWH = Right whale
WHAL = unidentified whale
GRSE = Gray seal
SEAL = unidentified seal
WIMA = West Indian manatee
UNMM = unidentified marine mammal

2 Database Field Glossary for USFWS surveys

2.1 Microsoft Access Database

ACWSD	indicator for whether or not transect was surveyed as part of the Atlantic Coast Winter Sea Duck Survey
ACWSDreport	indicator for whether or not transect was included in 2009 - 2011 Atlantic Coast Winter Sea Duck Survey report analysis
AvgCondition	distance-weighted average observation condition
Band	survey band in which bird was located (perpendicular to flight path): 0 = unknown or not recorded 1 = less than 100 meters from plane 2 = 100 to 200 meters from plane
CommonName	species common name
Condition	observation condition (measured on a 5-point Likert scale: 1 = poor and 5 = excellent)
Crew	crew name (typically designated by the four digit latitude of their northern-most transect)
Day	day the transect was surveyed
Depth	water depth for each observation (units = meters); negative values are meters below sea level (e.g., -1 means water depth for this observation was 1 meter below sea level)
Dist2Coast_m	distance each observation is from the coast (units = meters)
Dist2Coast_nm	distance each observation is from the coast (units = nautical miles)
DistFlown	distance surveyed on a transect by an observer (units = nautical miles)
EndDt	date the transect survey ended
FlockSize	number of individuals observed at a given location
GpsError	error associated with geographic coordinates recorded during surveys (value of -1 indicates that latitude, longitude, or seconds value was interpolated based on surrounding data points)
ImputedDistFlown	indicator for whether or not distance flown was imputed (due to unknown transect BEG/END points) by using crew member's distance flown value
Lat	latitude in decimal degrees (GCS = WGS84)
LatinName	species Latin (scientific) name
Long	longitude in decimal degrees (GCS = WGS84)
MissingTrackFile	indicator for whether or not track file from observer was missing
Month	month the transect was surveyed

Obs	observer initials
ObsInitials	initials of non-pilot observer(s)
ObsName	name of non-pilot observer(s)
PilInitials	initials of pilot(s)
PilName	name of pilot(s)
Replicate	transect replicate number for a particular survey (1 = first time transect was flown, 2 = second time transect was flown, etc.)
Seat	observer seat in plane:
	lf = left front (i.e., pilot)
	rf = right front
	lr = left rear
	rr = right rear
Sec	time in seconds from midnight as recorded by the computers' internal clock (specific to each observer)
	NOTE: observers were asked to set computer clocks to local time, but this was not always done; therefore, this value should not be used as a proxy for time of day
Slope	steepness of the ocean bottom based on changes in water depths (units = degrees)
Species	four letter code used to identify observations during survey (AOU band code was used when possible; see Species_Information table for details)
StartDt	date the transect survey started
SurveyDescription	brief description of survey
SurveyNbr	unique survey ID:
	1 = 2008 Preliminary ACWSD
	2 = 2009 ACWSD
	3 = 2010 ACWSD
	4 = 2010 Preliminary AMAPPS
	5 = December 2010 wind area additional flying
	6 = January 2011 wind area additional flying
	7 = 2011 ACWSD
	8 = 2011 Summer AMAPPS
	9 = 2012 Southern BLSC Survey
	10 = 2012 Mid-Atlantic Detection Survey
	11 = 2012 Spring AMAPPS
	12 = 2012 Fall AMAPPS

SurveyEndDt	date the survey ended
SurveyStartDt	date the survey started
Transect	unique ID for each survey line; the first four digits represent latitude in degrees decimal minutes and the last two digits indicate segment number
Type	type of GPS track point: BEGTRAN = beginning of transect ENDTRAN = end of transect BEGCNT = start counting again ENTCNT = stop counting while on transect COCH = location where observation condition changed along transect WAYPNT = GPS point along transect
WindArea	indicator for whether or not transect covers proposed BOEM offshore wind development area off Chesapeake Bay
Year	year the transect was surveyed

2.2 ESRI ArcMap Geodatabase

Observations	Point shapefile containing the location of seabird and sea duck flocks along the Atlantic Coast and the habitat covariates associated with each flock. Fields are the same as the Observations table located in the Atlantic_Coast_Surveys Access database.
Tracks	Point shapefile containing the location of each track point along a given transect. Fields are the same as the Tracks table located in the Atlantic_Coast_Surveys Access database.
Transect_Information	Polyline shapefile containing all transects surveyed during the 2008 - 2012 Atlantic Coast surveys. Fields are the same as the Transect_Information table located in the Atlantic_Coast_Surveys Access database.

3 Raw Density Estimates for Seabirds

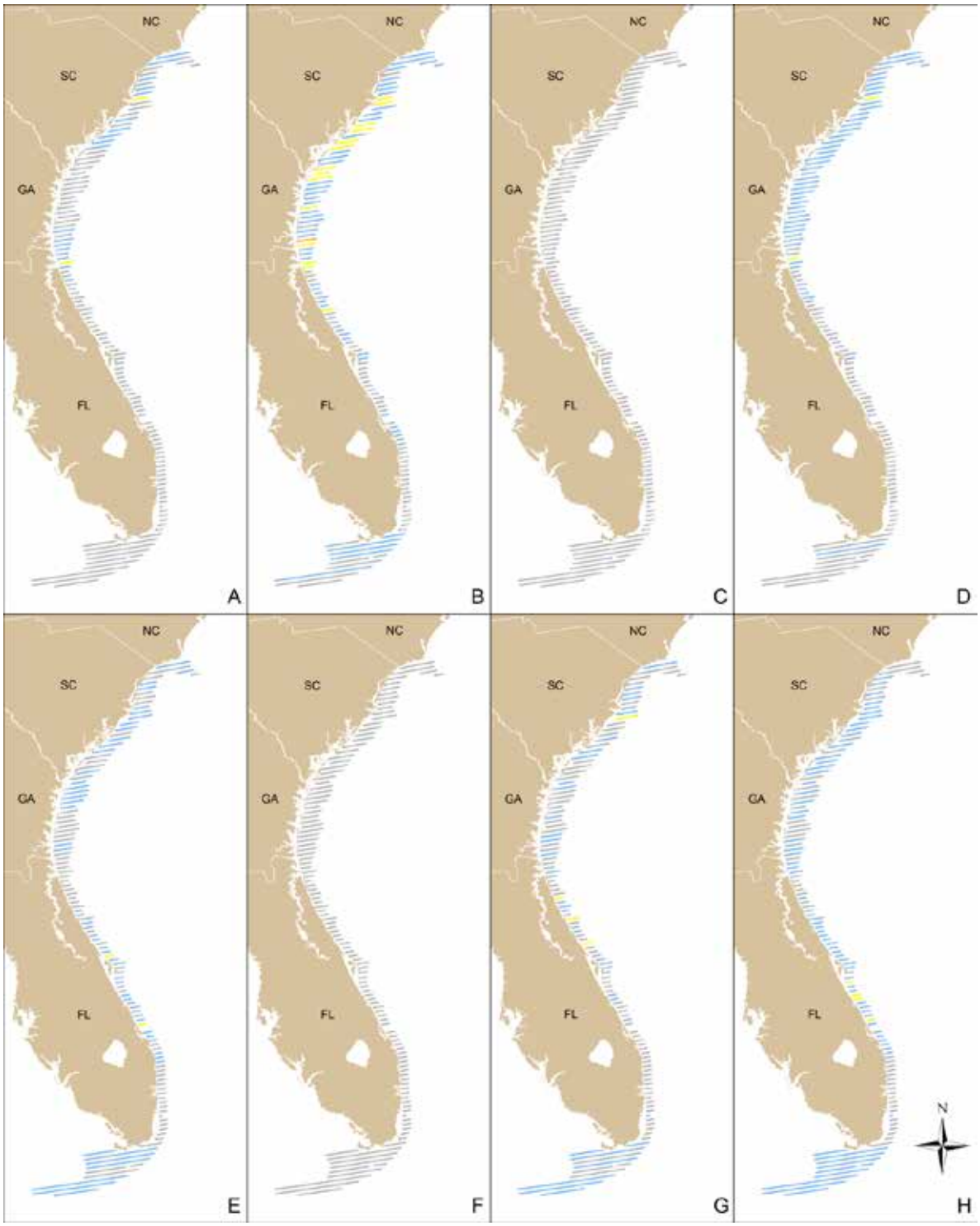

Figure 3-1 Transect density (total count/km^2) from August 2010 survey
For (A) alcids, (B) gulls, (C) loons, (D) northern gannets, (E) terns, (F) sea ducks and diving ducks, (G) marine mammals, and (H) sea turtles. Transects are colored according to density: gray(zero density), light blue (0.01 – 1 count/km^2, yellow (1.01 – 10 counts/km^2), orange (10.01 – 100 counts/km^2), red (>100 counts/km^2).

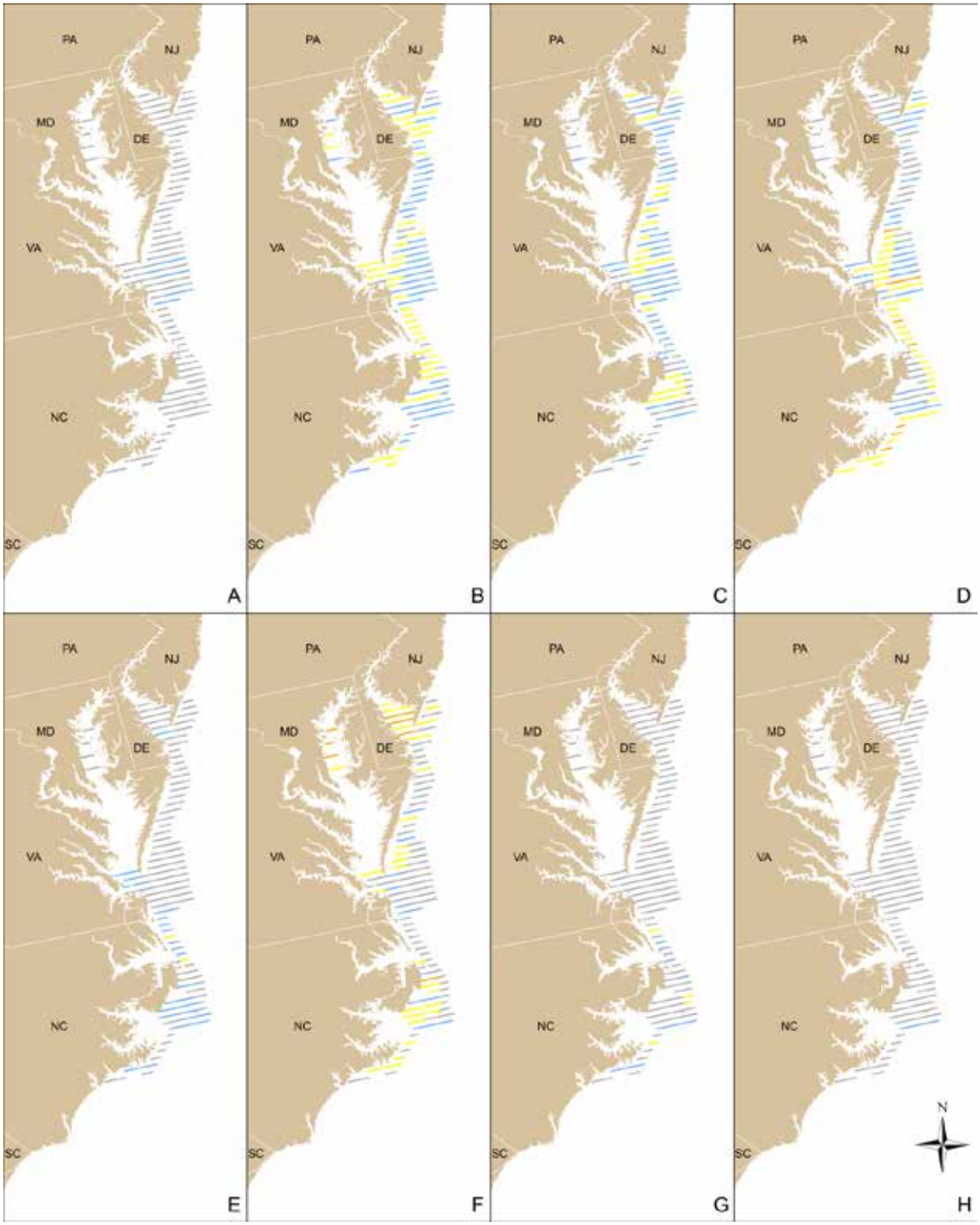

Figure 3-2 Transect density (total count/km2) from December 2010 to January 2011 survey
For (A) alcids, (B) gulls, (C) loons, (D) northern gannets, (E) terns, (F) sea ducks and diving ducks, (G) marine mammals, and (H) sea turtles. Transects are colored according to density: gray(zero density), light blue (0.01 – 1 count/km^2, yellow (1.01 – 10 counts/km^2), orange (10.01 – 100 counts/km^2), red (>100 counts/km^2).

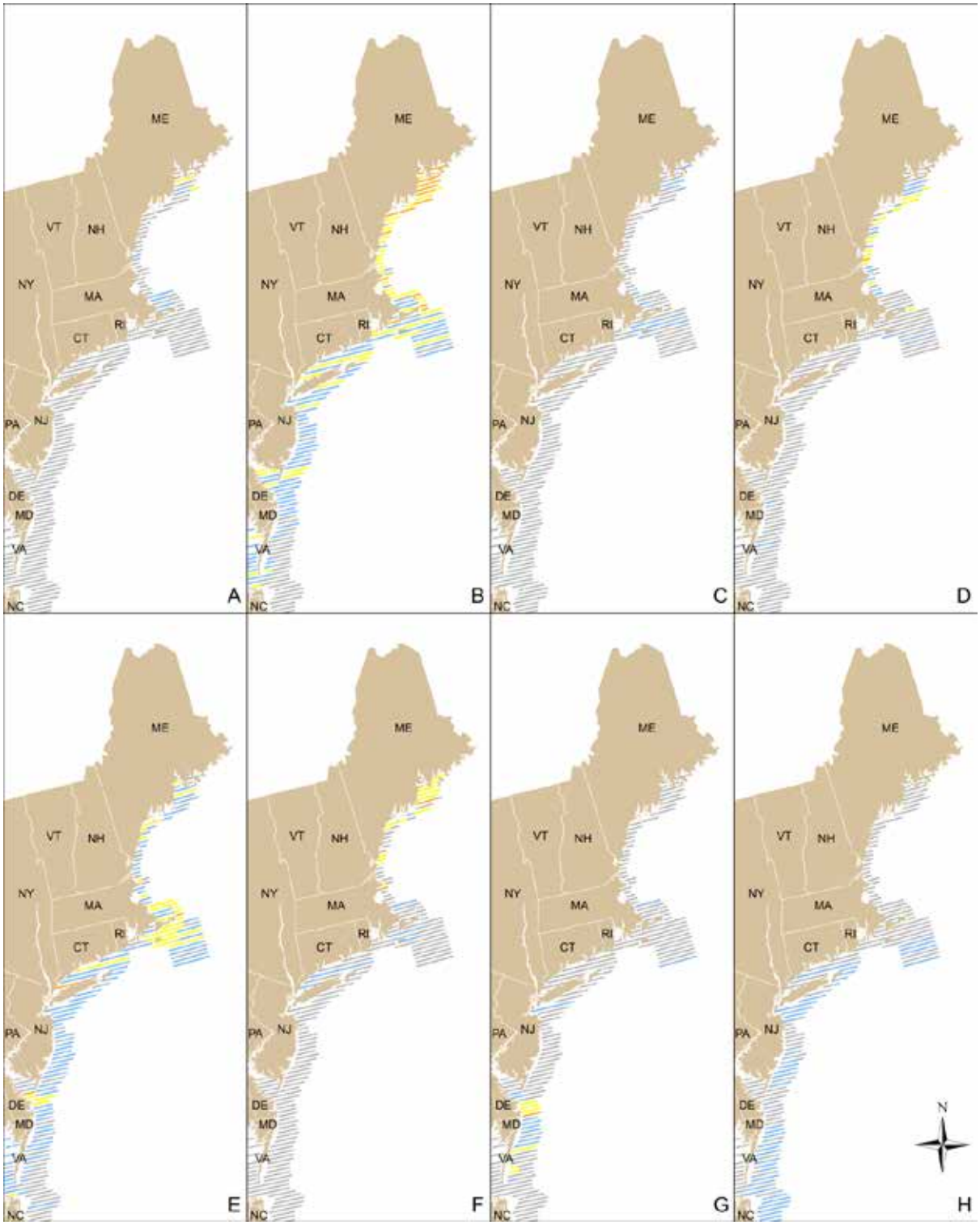

Figure 3-3 Transect density (total count/km2) from northern region of August 2011 survey
For (A) alcids, (B) gulls, (C) loons, (D) northern gannets, (E) terns, (F) sea ducks and diving ducks, (G) marine mammals, and (H) sea turtles. Transects are colored according to density: gray(zero density), light blue (0.01 – 1 count/km^2, yellow (1.01 – 10 counts/km^2), orange (10.01 – 100 counts/km^2), red (>100 counts/km^2).

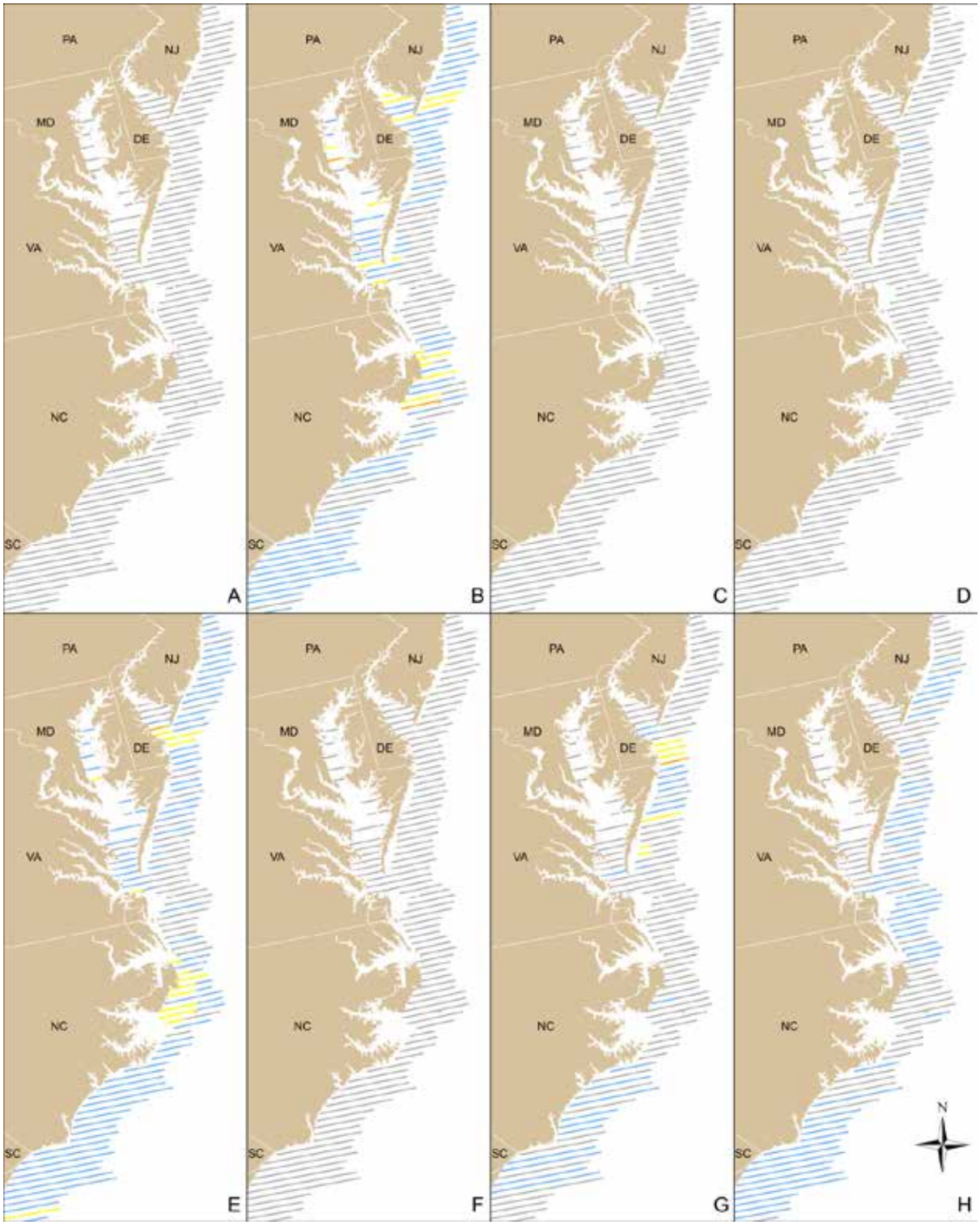

Figure 3-4 Transect density from mid-Atlantic region of August 2011 survey
For (A) alcids, (B) gulls, (C) loons, (D) northern gannets, (E) terns, (F) sea ducks and diving ducks, (G) marine mammals, and (H) sea turtles. Transects are colored according to density: gray(zero density), light blue (0.01 – 1 count/km^2, yellow (1.01 – 10 counts/km^2), orange (10.01 – 100 counts/km^2), red (>100 counts/km^2).

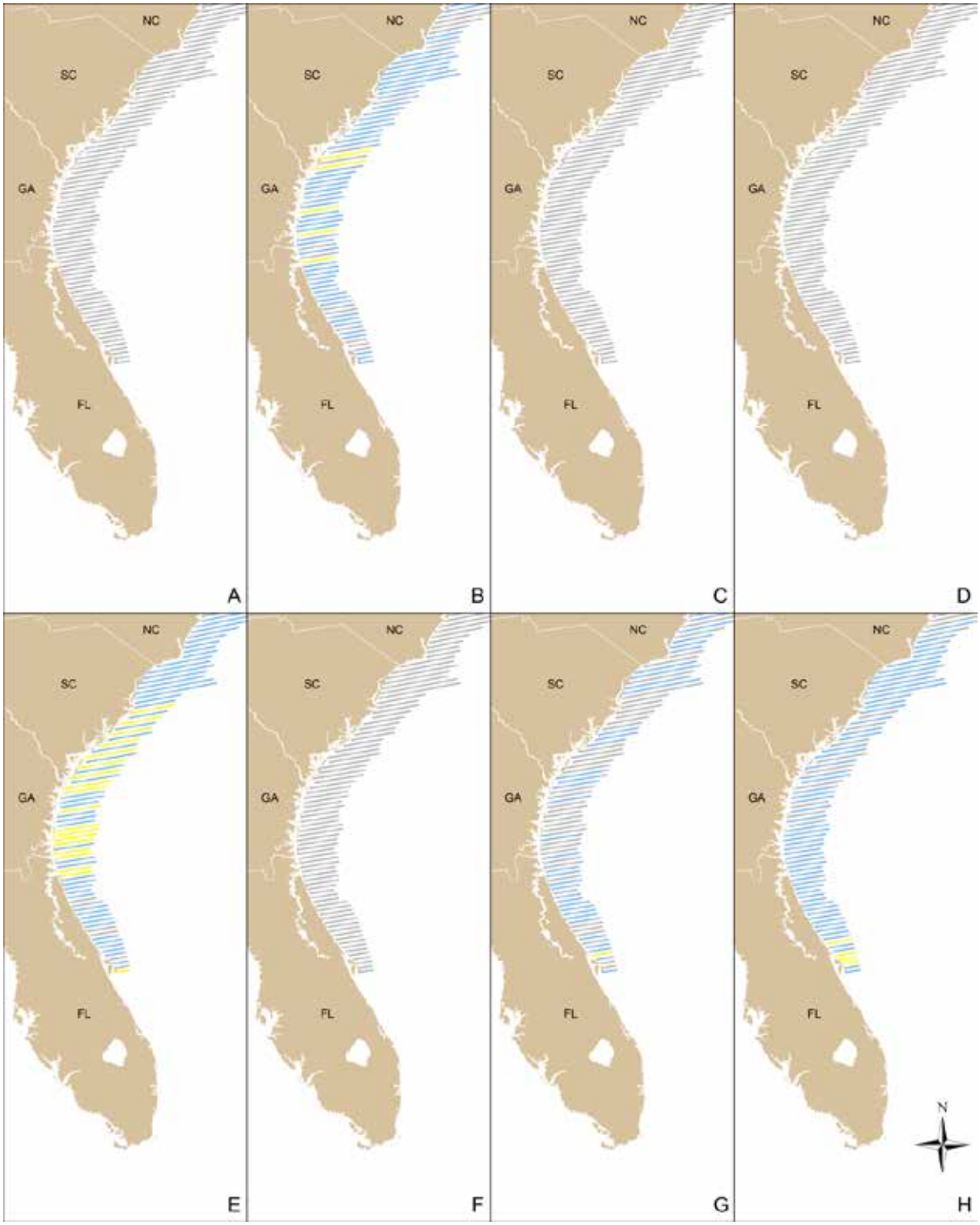

Figure 3-5 Transect density from southern region of August 2011 survey
For (A) alcids, (B) gulls, (C) loons, (D) northern gannets, (E) terns, (F) sea ducks and diving ducks, (G) marine mammals, and (H) sea turtles. Transects are colored according to density: gray(zero density), light blue (0.01 – 1 count/km^2, yellow (1.01 – 10 counts/km^2), orange (10.01 – 100 counts/km^2), red (>100 counts/km^2).

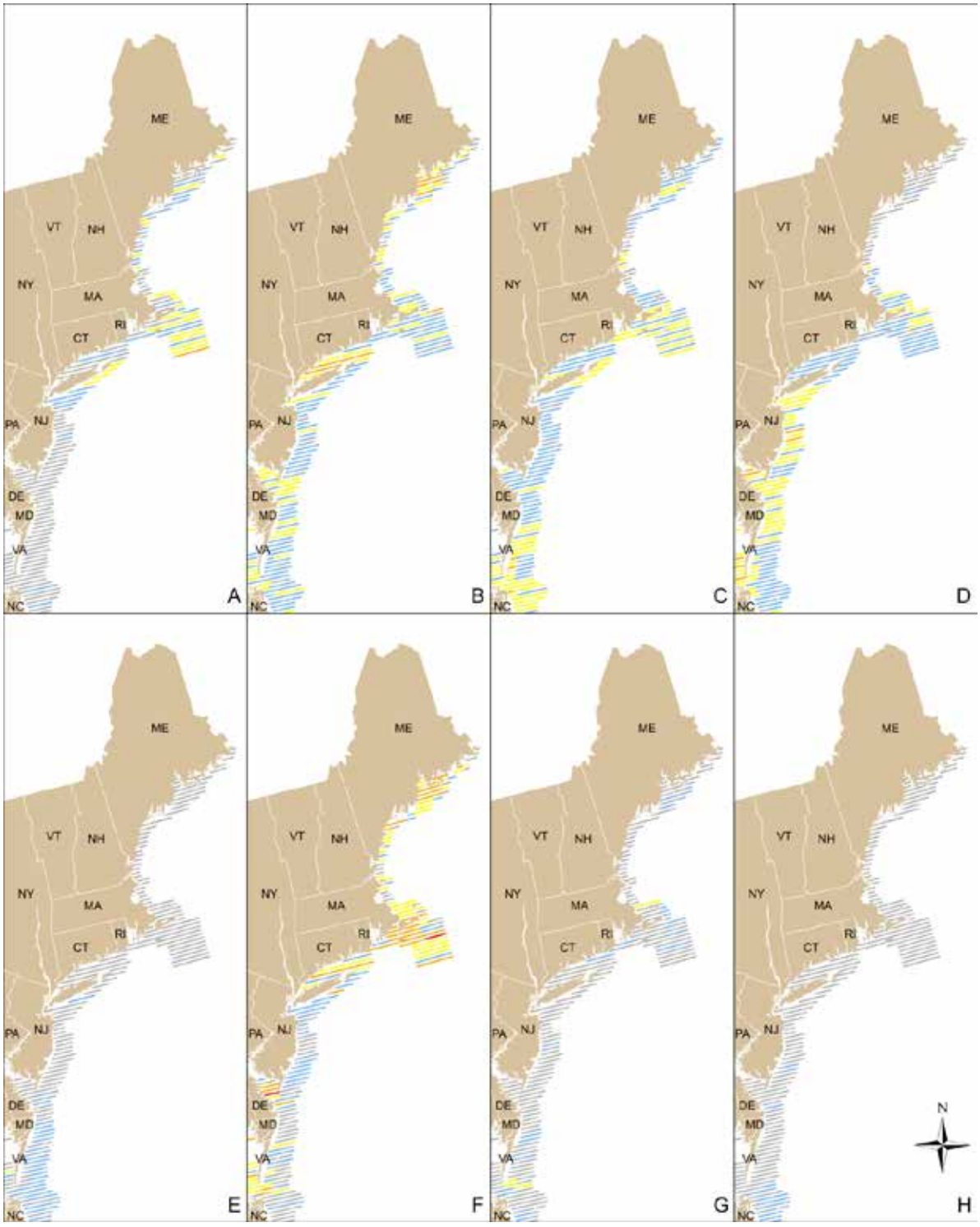

Figure 3-6 Transect density from northern region of March 2012 survey
For (A) alcids, (B) gulls, (C) loons, (D) northern gannets, (E) terns, (F) sea ducks and diving ducks, (G) marine mammals, and (H) sea turtles. Transects are colored according to density: gray(zero density), light blue (0.01 – 1 count/km^2, yellow (1.01 – 10 counts/km^2), orange (10.01 – 100 counts/km^2), red (>100 counts/km^2).

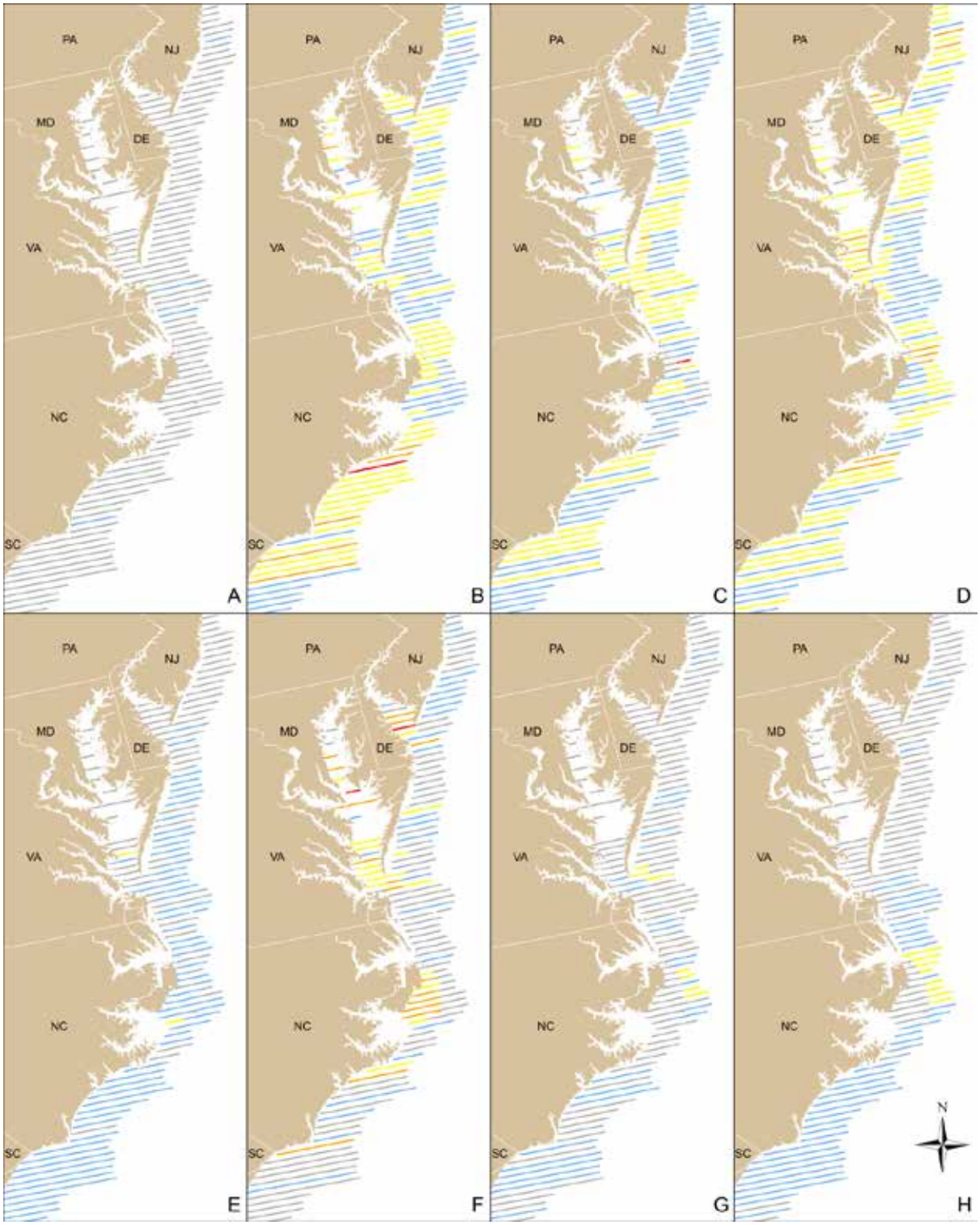

Figure 3-7 Transect density from mid-Atlantic region of March 2012 survey
For (A) alcids, (B) gulls, (C) loons, (D) northern gannets, (E) terns, (F) sea ducks and diving ducks, (G) marine mammals, and (H) sea turtles. Transects are colored according to density: gray(zero density), light blue (0.01 – 1 count/km^2, yellow (1.01 – 10 counts/km^2), orange (10.01 – 100 counts/km^2), red (>100 counts/km^2).

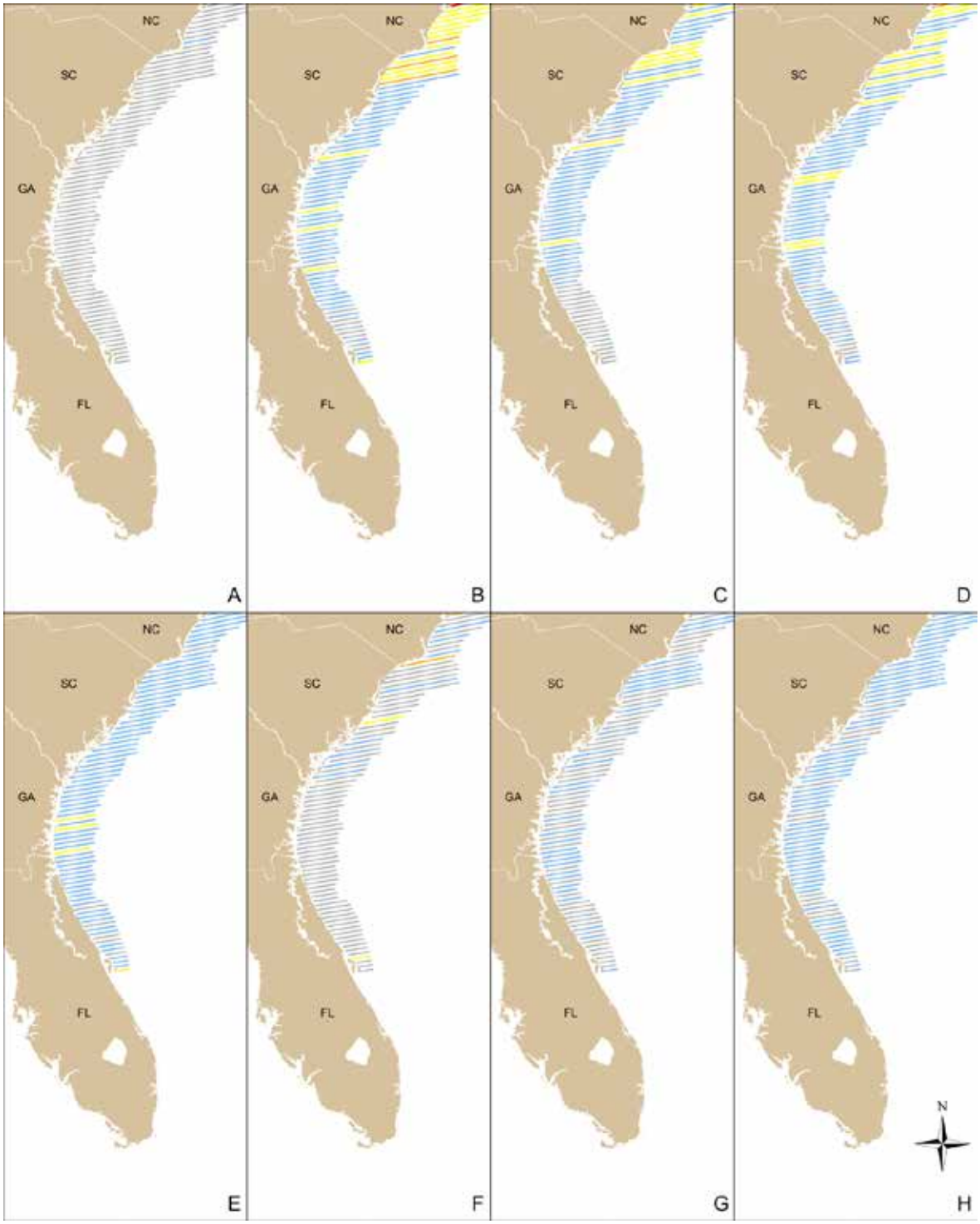

Figure 3-8 Transect density from southern region of March 2012 survey
For (A) alcids, (B) gulls, (C) loons, (D) northern gannets, (E) terns, (F) sea ducks and diving ducks, (G) marine mammals, and (H) sea turtles. Transects are colored according to density: gray(zero density), light blue (0.01 – 1 count/km2, yellow (1.01 – 10 counts/km2), orange (10.01 – 100 counts/km2), red (>100 counts/km2).

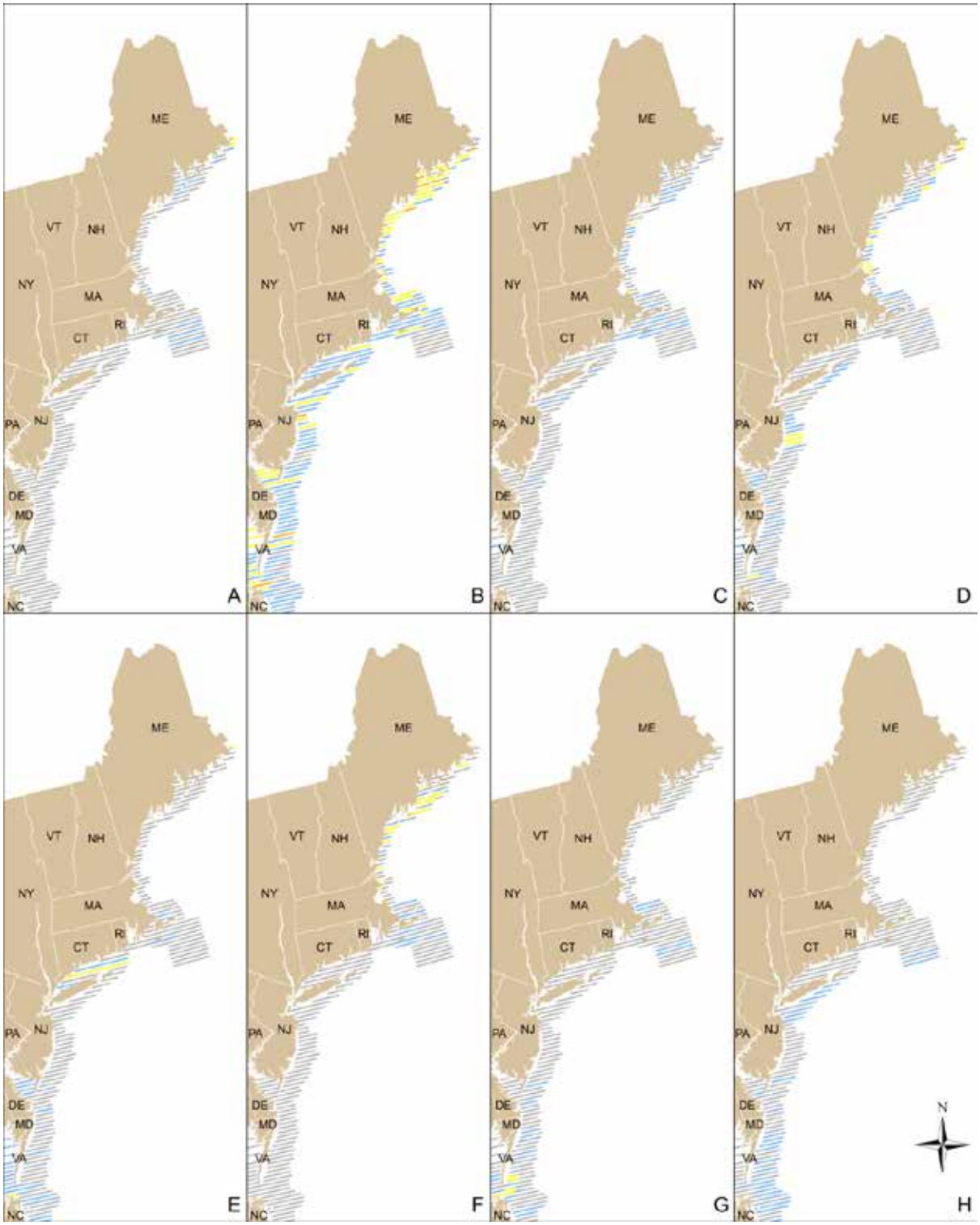

Figure 3-9 Transect density from northern region of October 2012 survey
For (A) alcids, (B) gulls, (C) loons, (D) northern gannets, (E) terns, (F) sea ducks and diving ducks, (G) marine mammals, and (H) sea turtles. Transects are colored according to density: gray(zero density), light blue (0.01 – 1 count/km^2, yellow (1.01 – 10 counts/km^2), orange (10.01 – 100 counts/km^2), red (>100 counts/km^2).

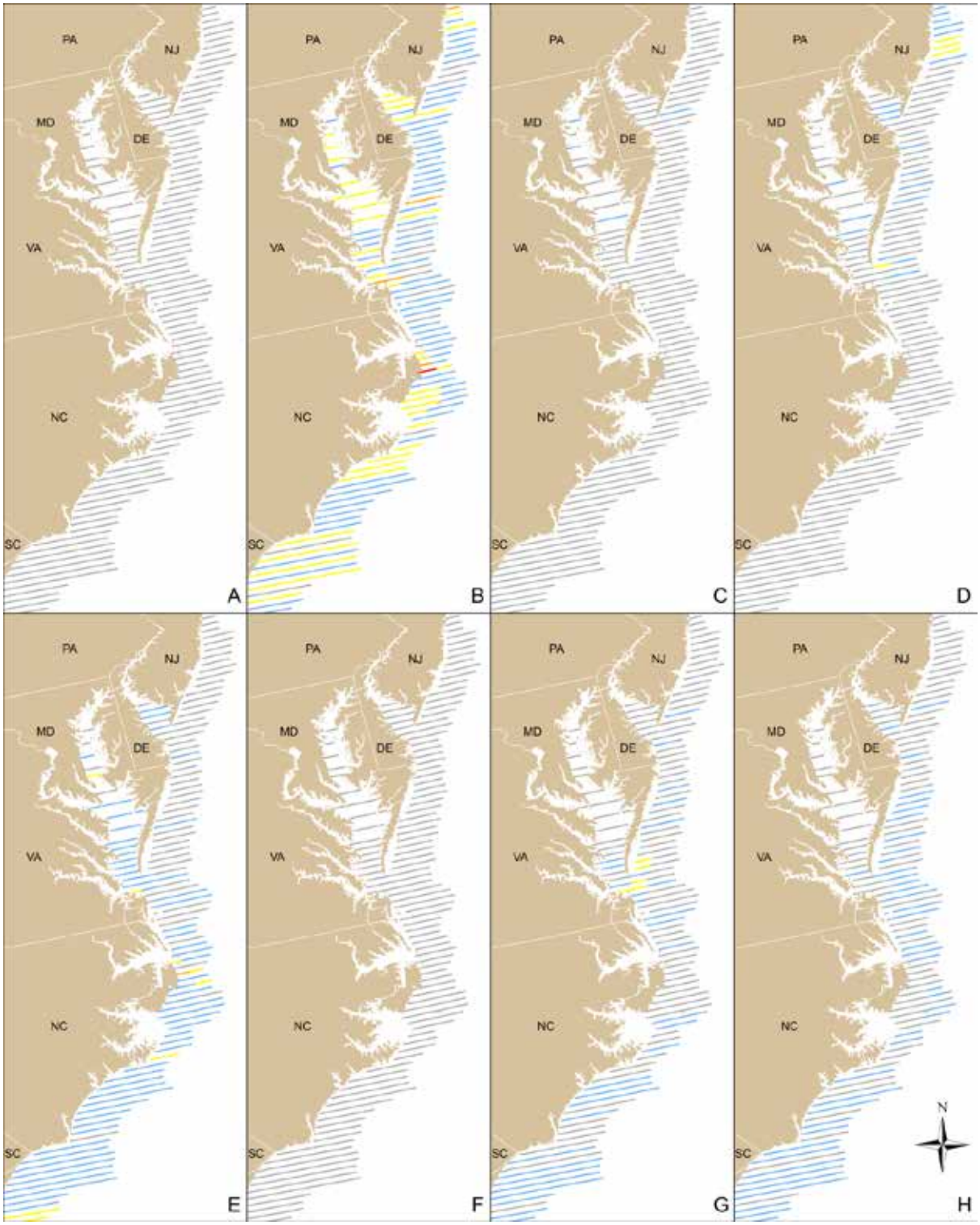

Figure 3-10 Transect density from mid-Atlantic region of October 2012 survey
For (A) alcids, (B) gulls, (C) loons, (D) northern gannets, (E) terns, (F) sea ducks and diving ducks, (G) marine mammals, and (H) sea turtles. Transects are colored according to density: gray(zero density), light blue (0.01 – 1 count/km^2, yellow (1.01 – 10 counts/km^2), orange (10.01 – 100 counts/km^2), red (>100 counts/km^2).

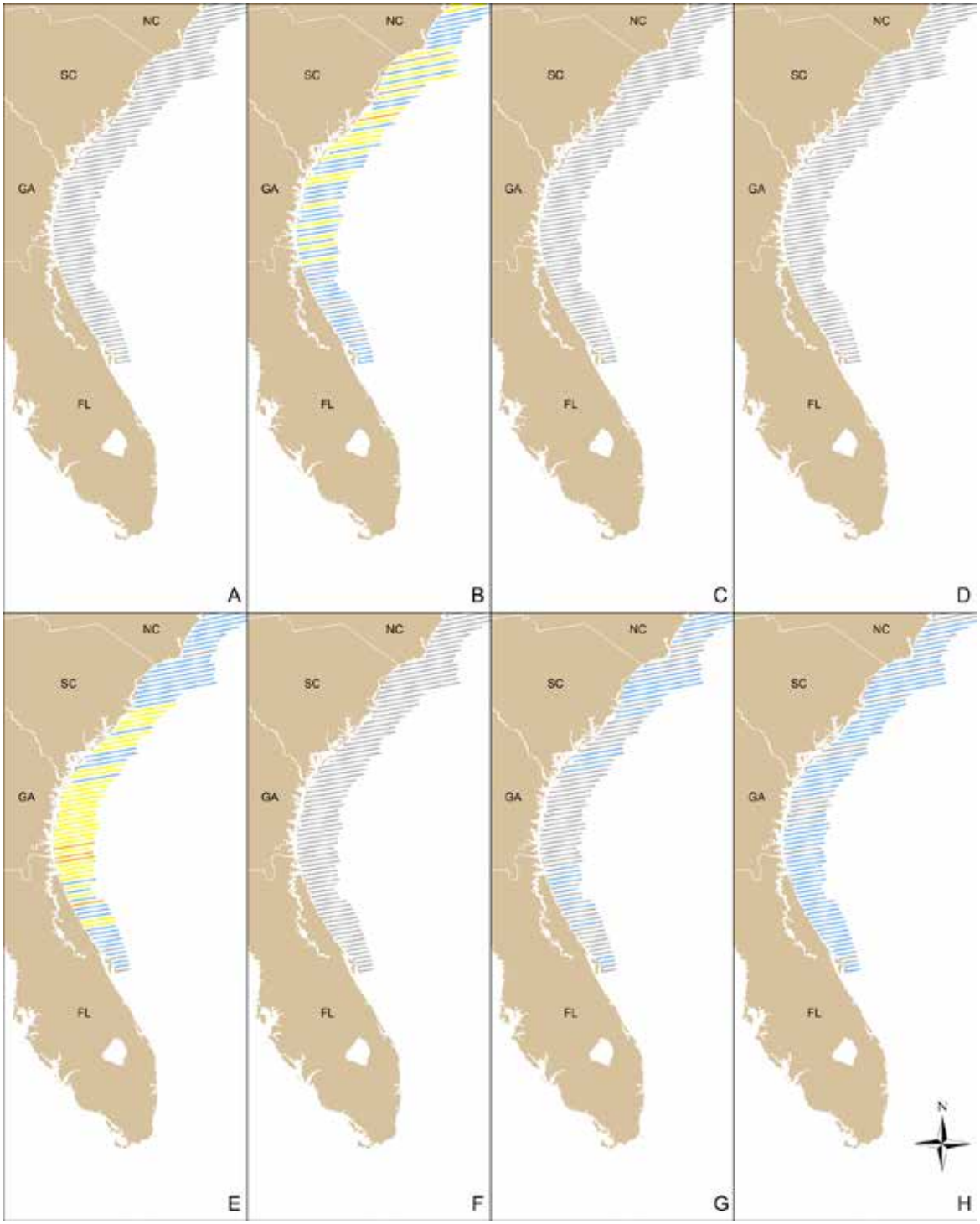

Figure 3-11 Transect density from southern region of October 2012 survey
For (A) alcids, (B) gulls, (C) loons, (D) northern gannets, (E) terns, (F) sea ducks and diving ducks, (G) marine mammals, and (H) sea turtles. Transects are colored according to density: gray(zero density), light blue (0.01 – 1 count/km^2, yellow (1.01 – 10 counts/km^2), orange (10.01 – 100 counts/km^2), red (>100 counts/km^2).

4 Key Sites of All Seabirds from All Surveys

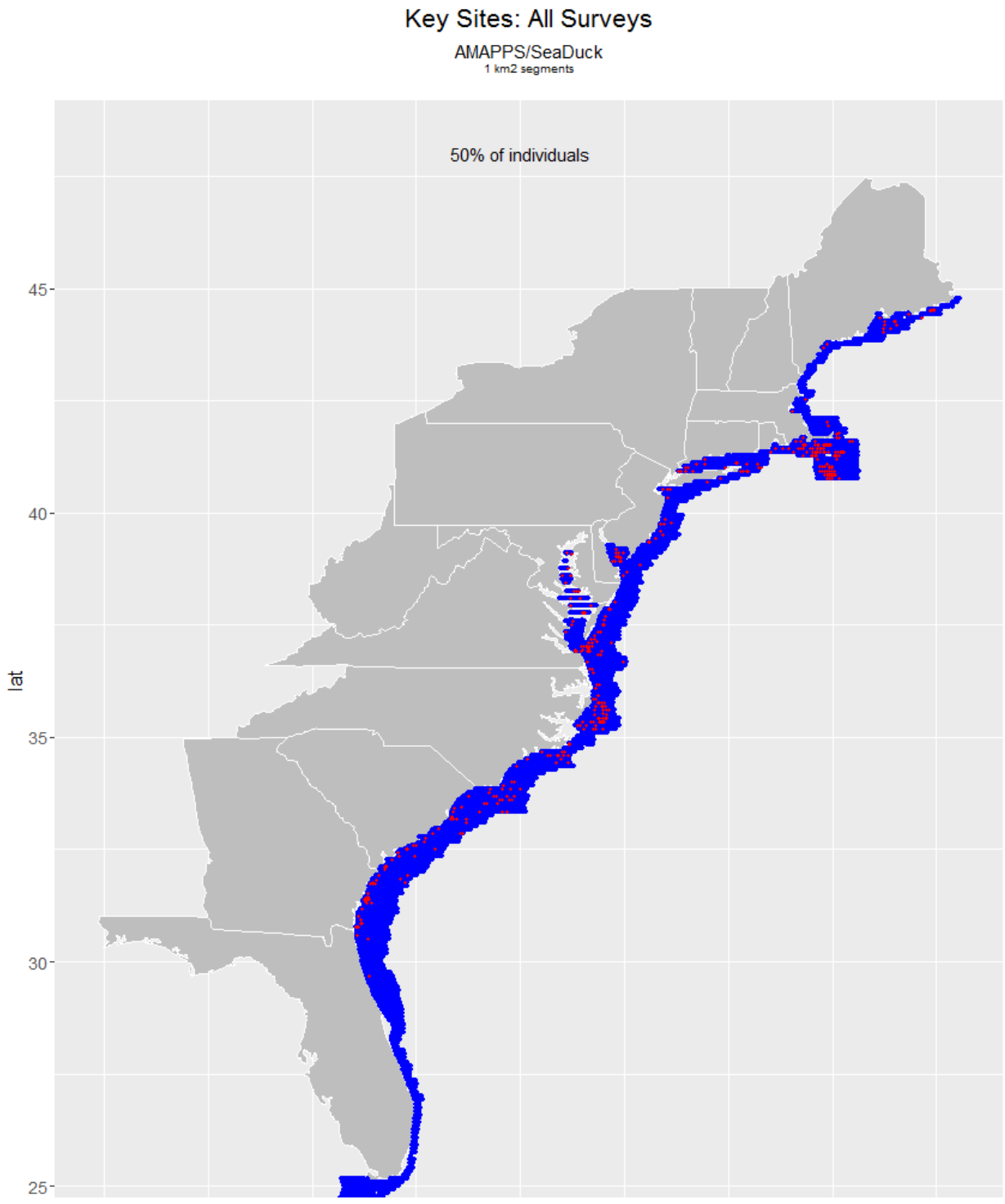

Figure 4-1 All seabirds from all surveys: Key sites with 50% of the individuals

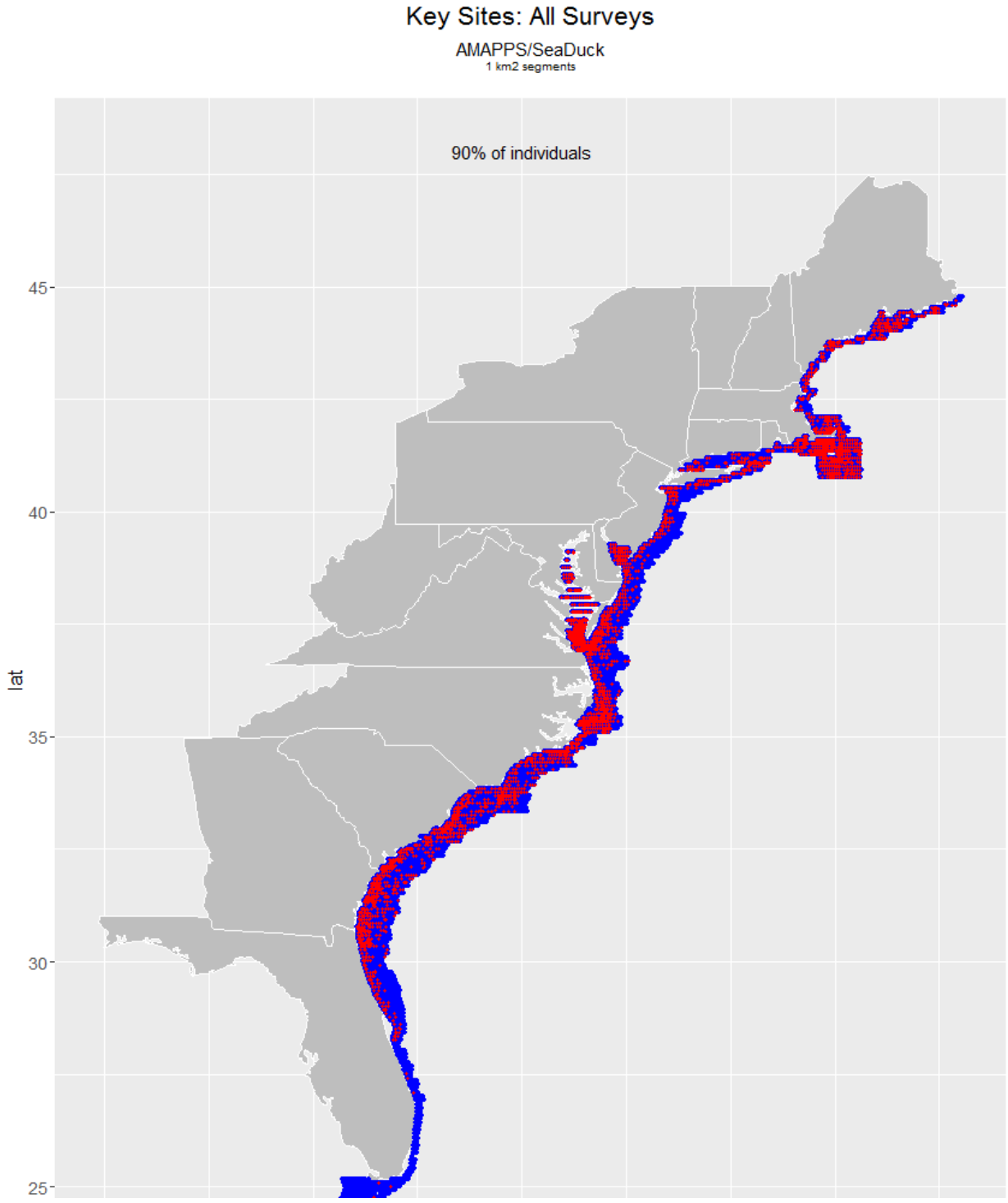

Figure 4-2 All seabirds from all surveys: Key sites with 90% of the individuals

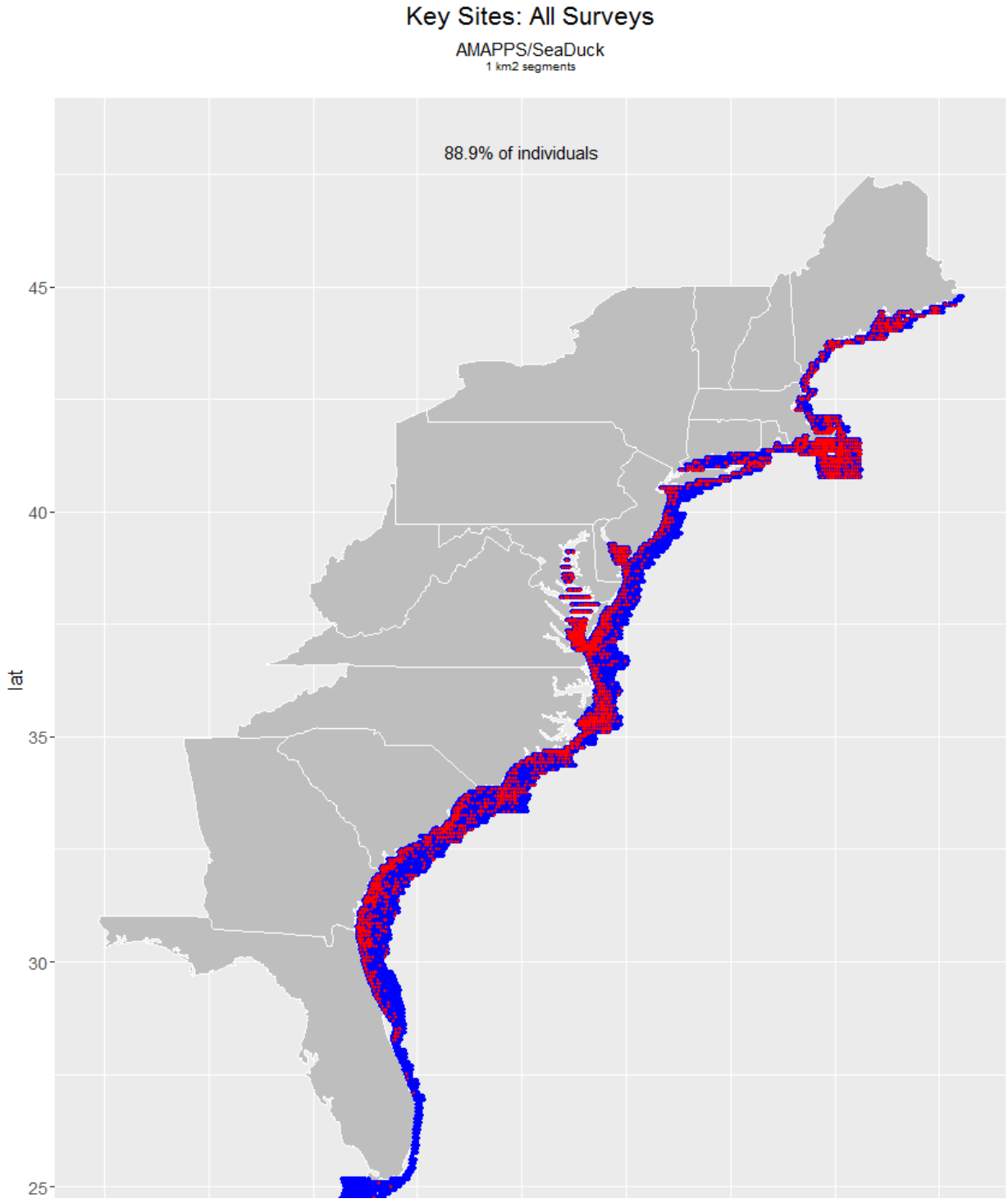

Figure 4-3 All seabirds from all surveys: Key sites with optimal individuals

5 Key Sites of All Seabirds by Season

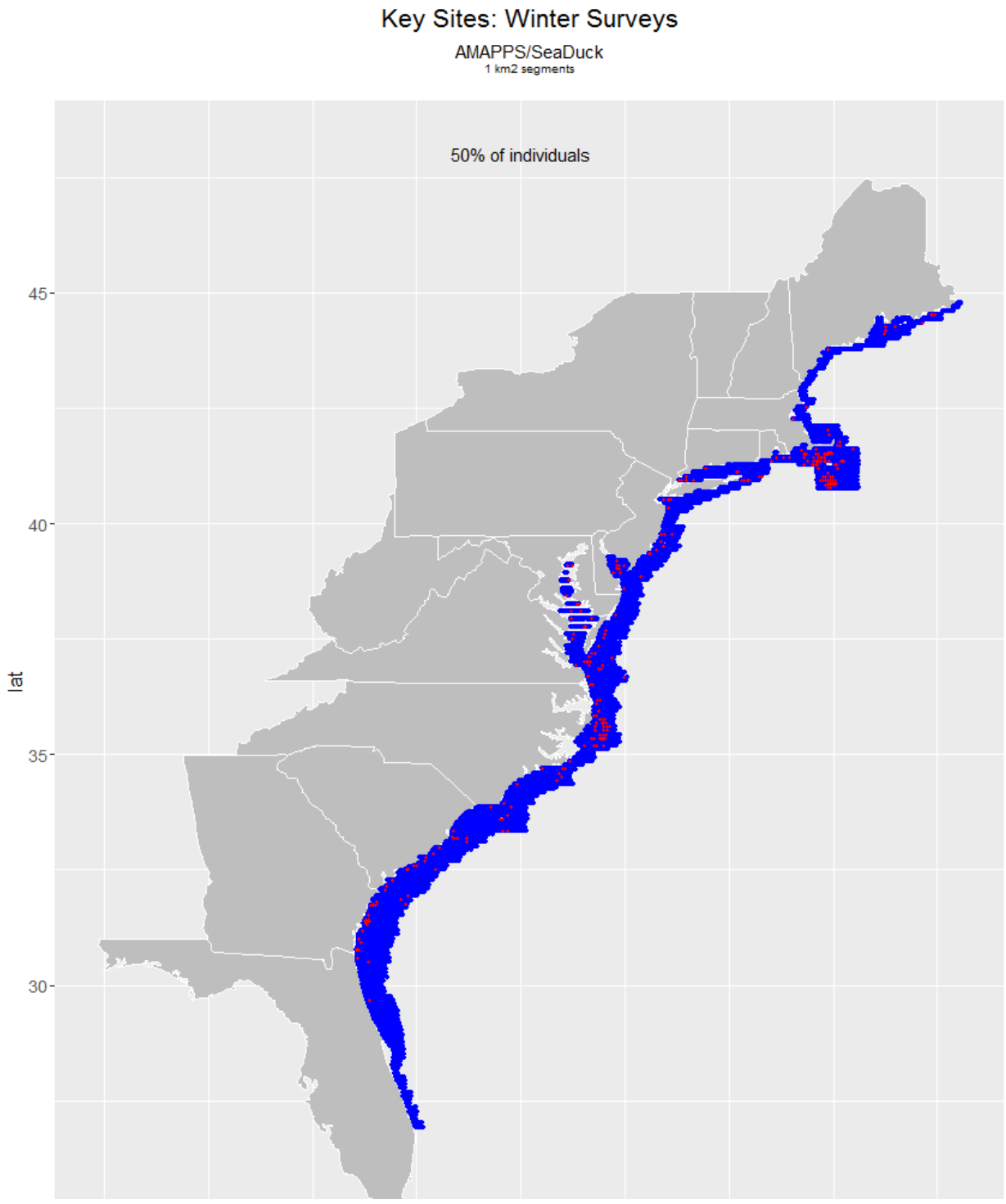

Figure 5-1 All seabirds from winter surveys: Key sites with 50% of the individuals

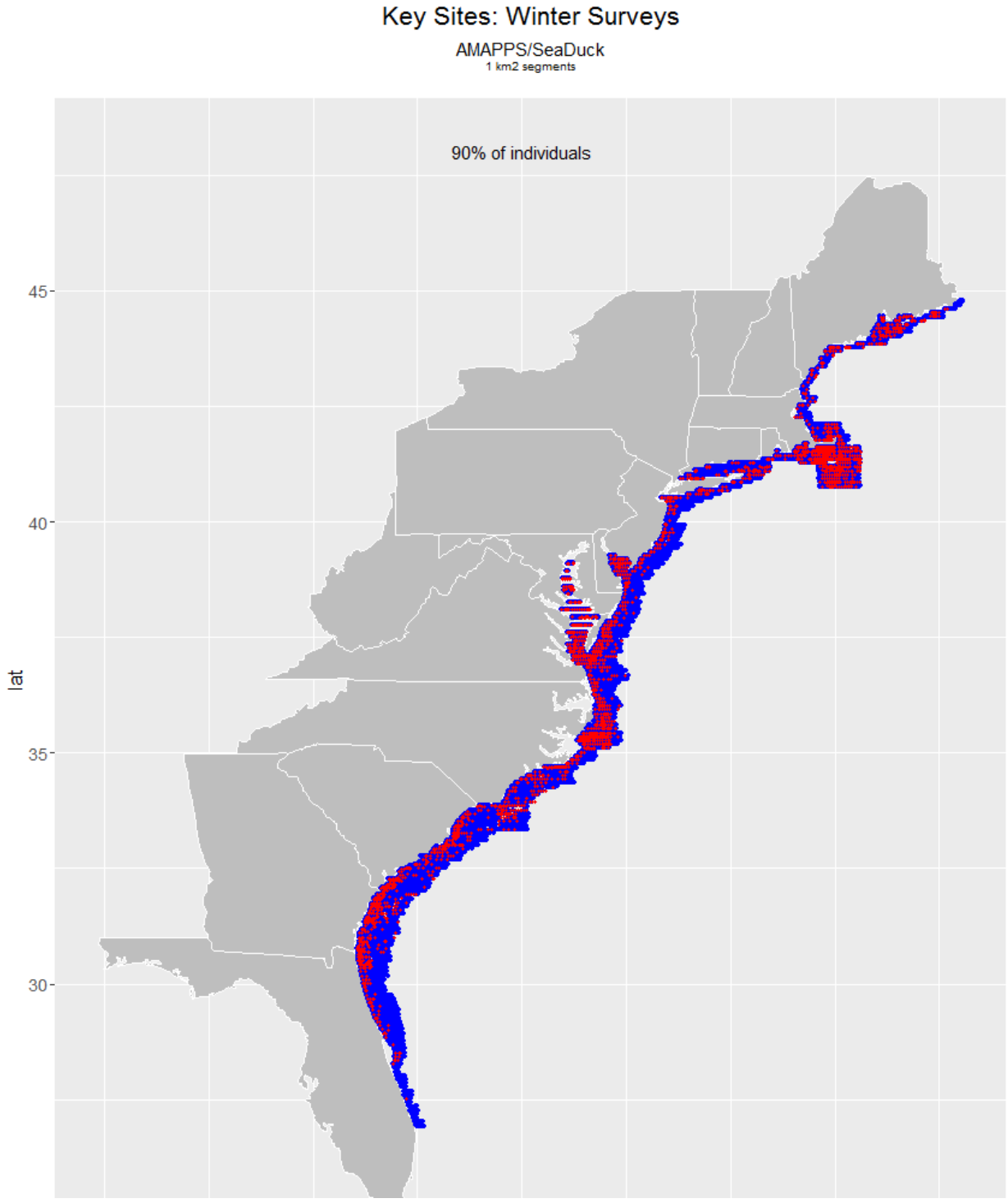

Figure 5-2 All seabirds from winter surveys: Key sites with 90% of the individuals

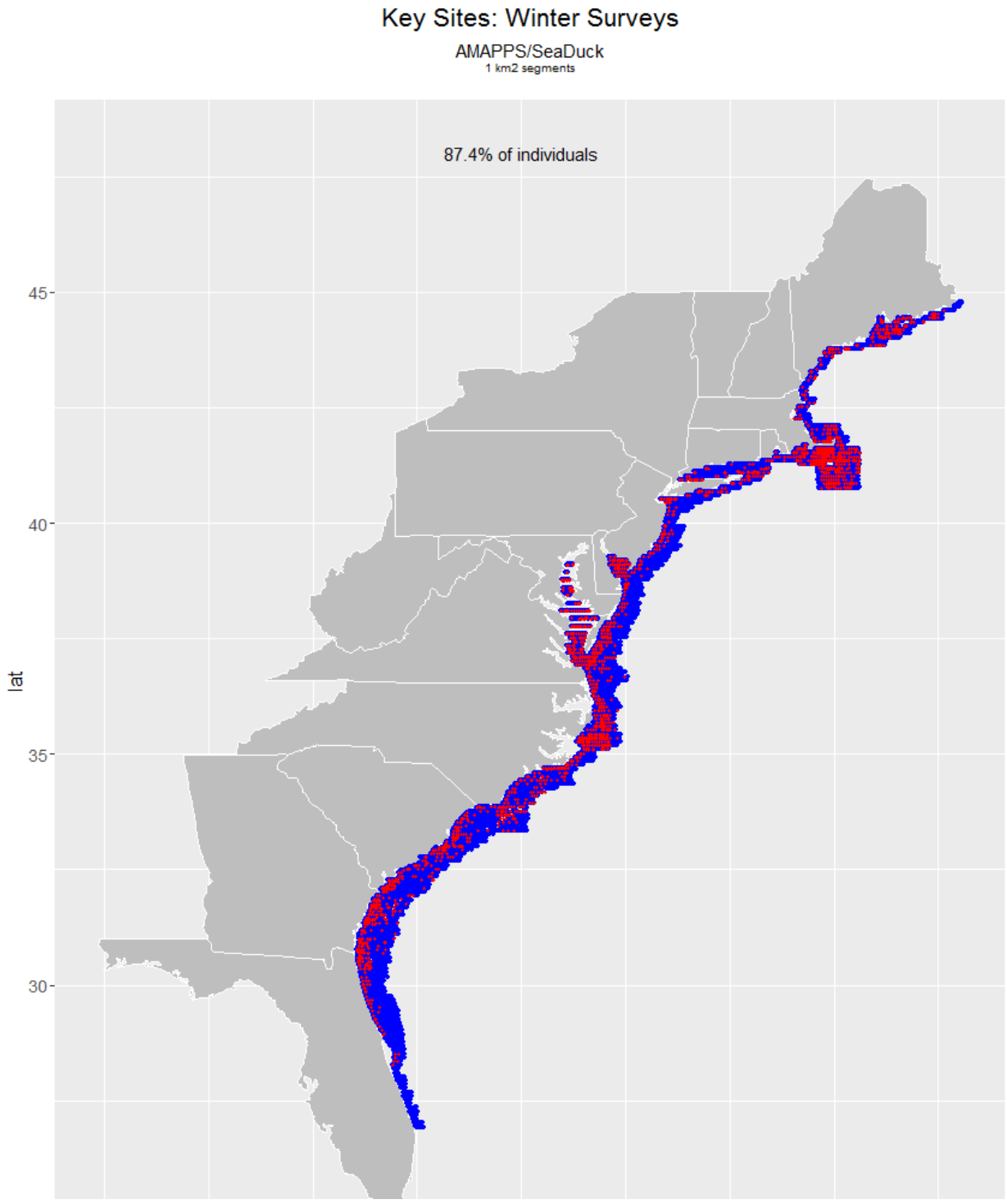

Figure 5-3 All seabirds from winter surveys: Key sites with optimal individuals

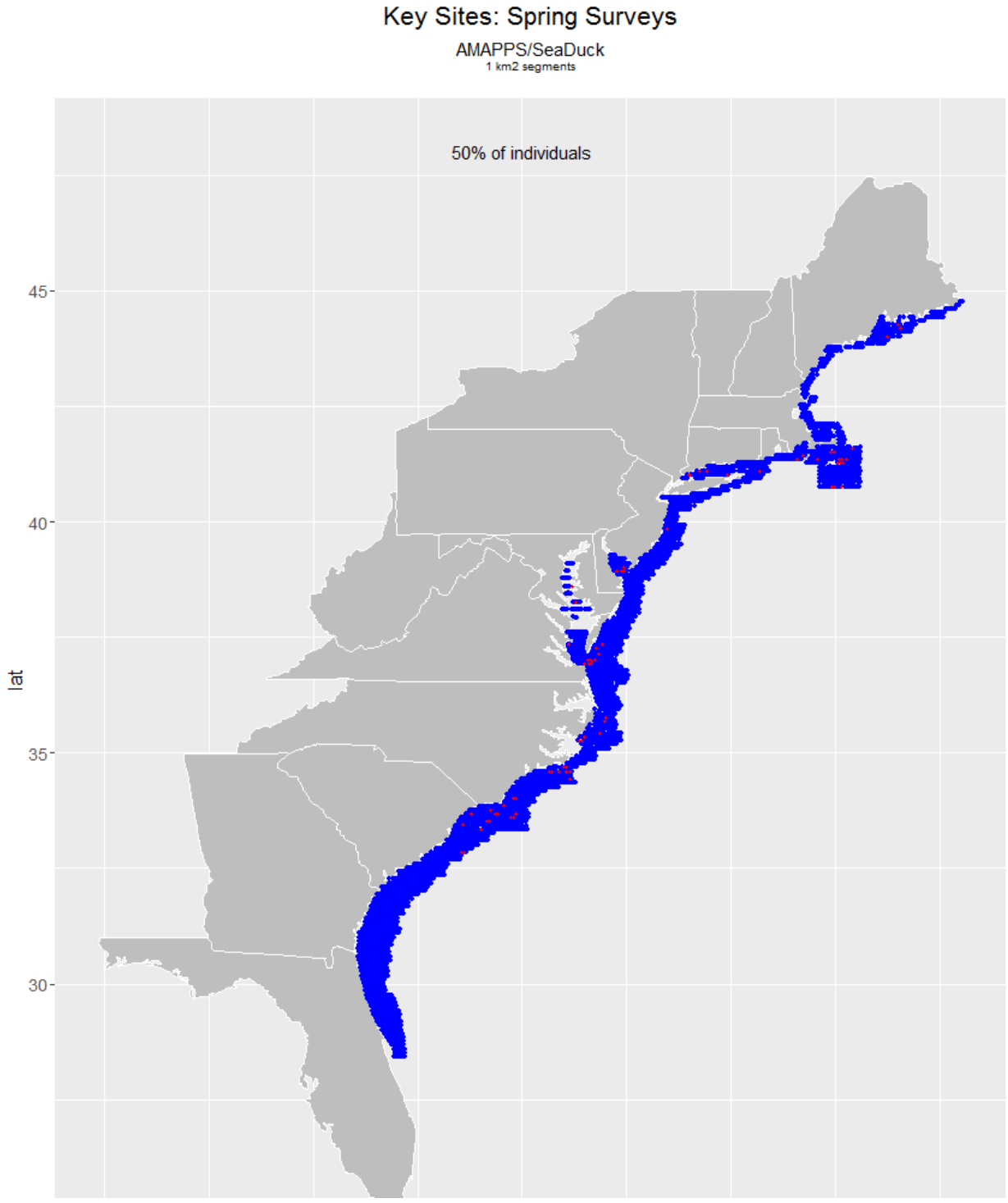

Figure 5-4 All seabirds from spring surveys: Key sites with 50% of the individuals

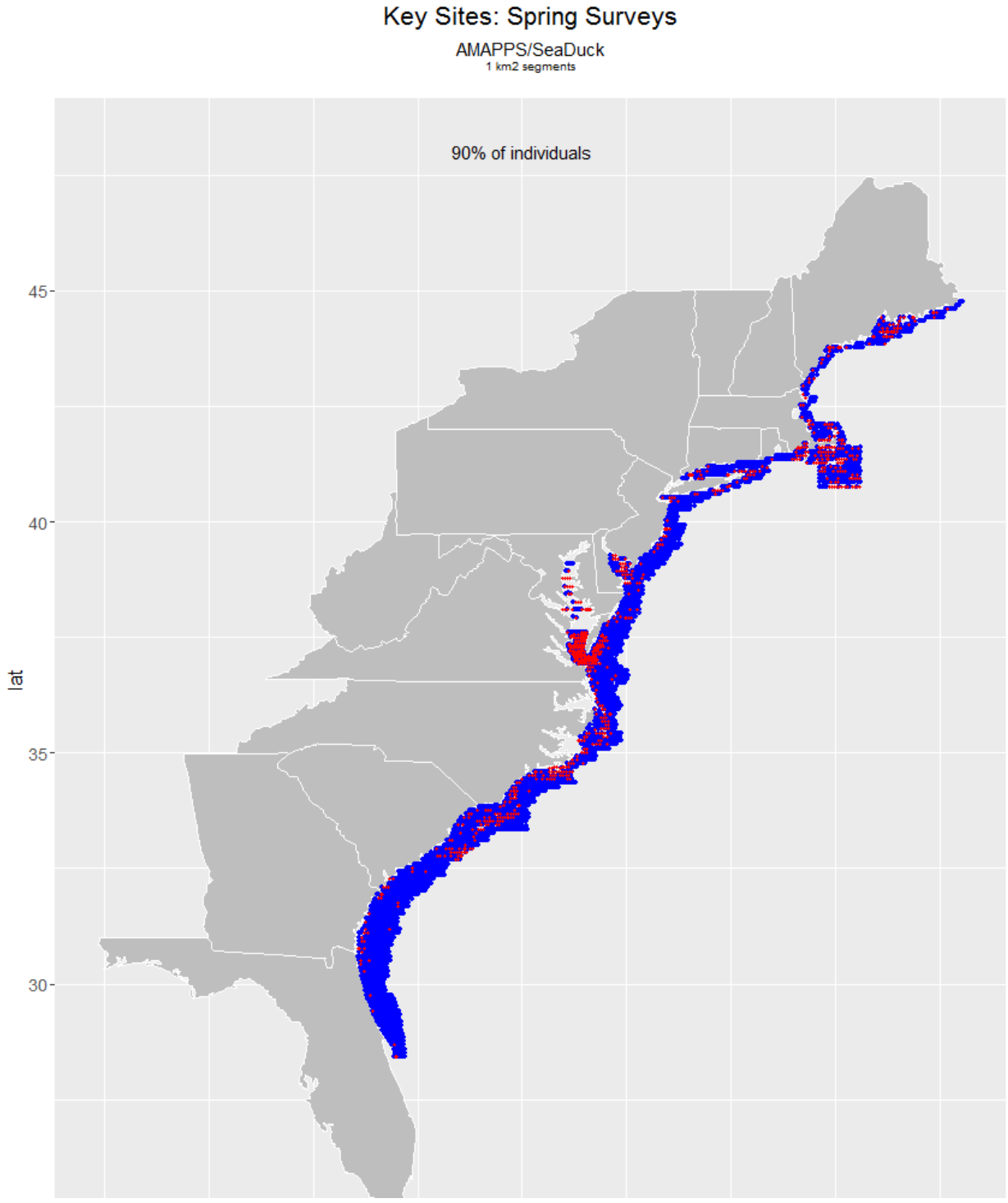

Figure 5-5 All seabirds from spring surveys: Key sites with 90% of the individuals

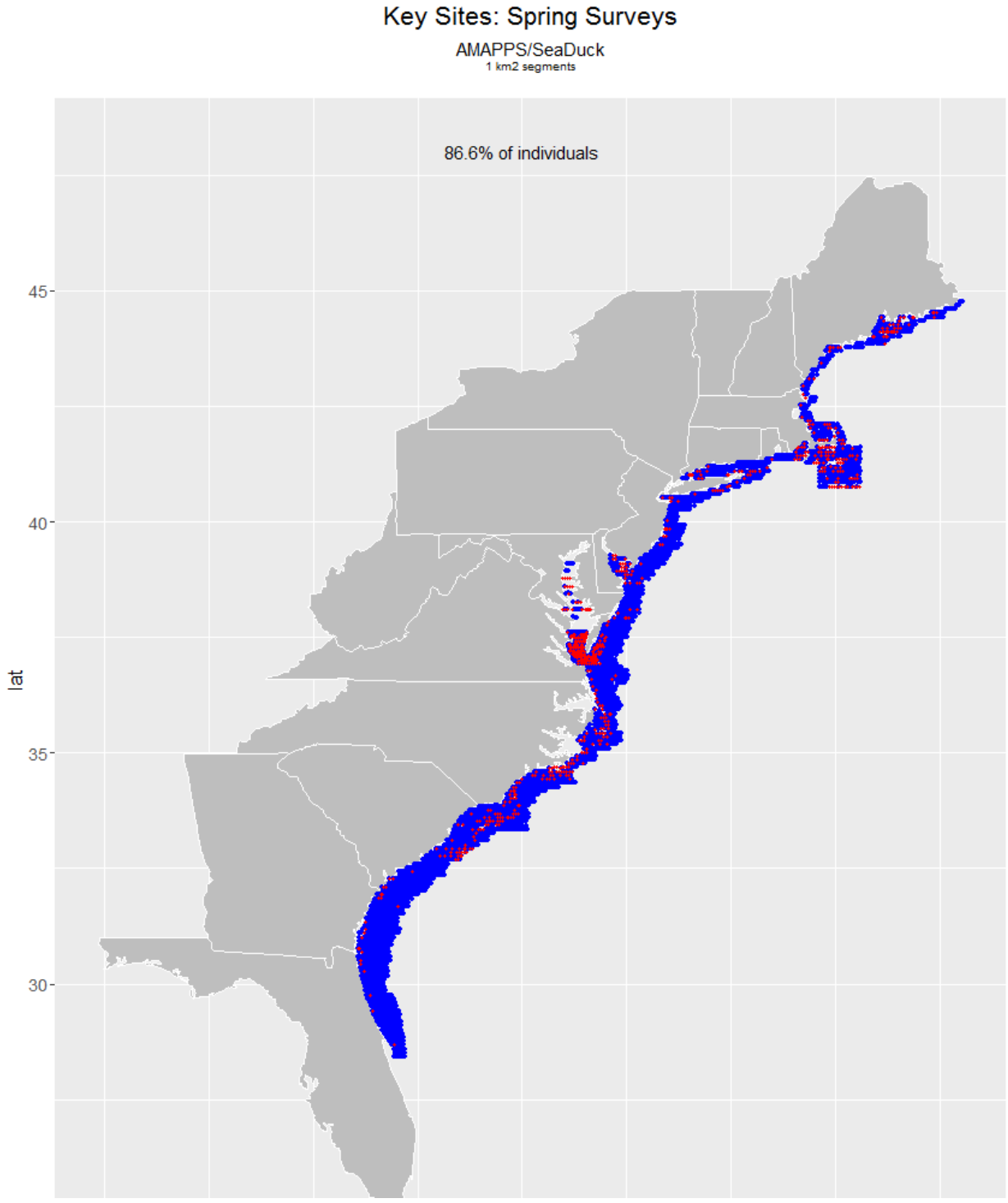

Figure 5-6 All seabirds from spring surveys: Key sites with optimal individuals

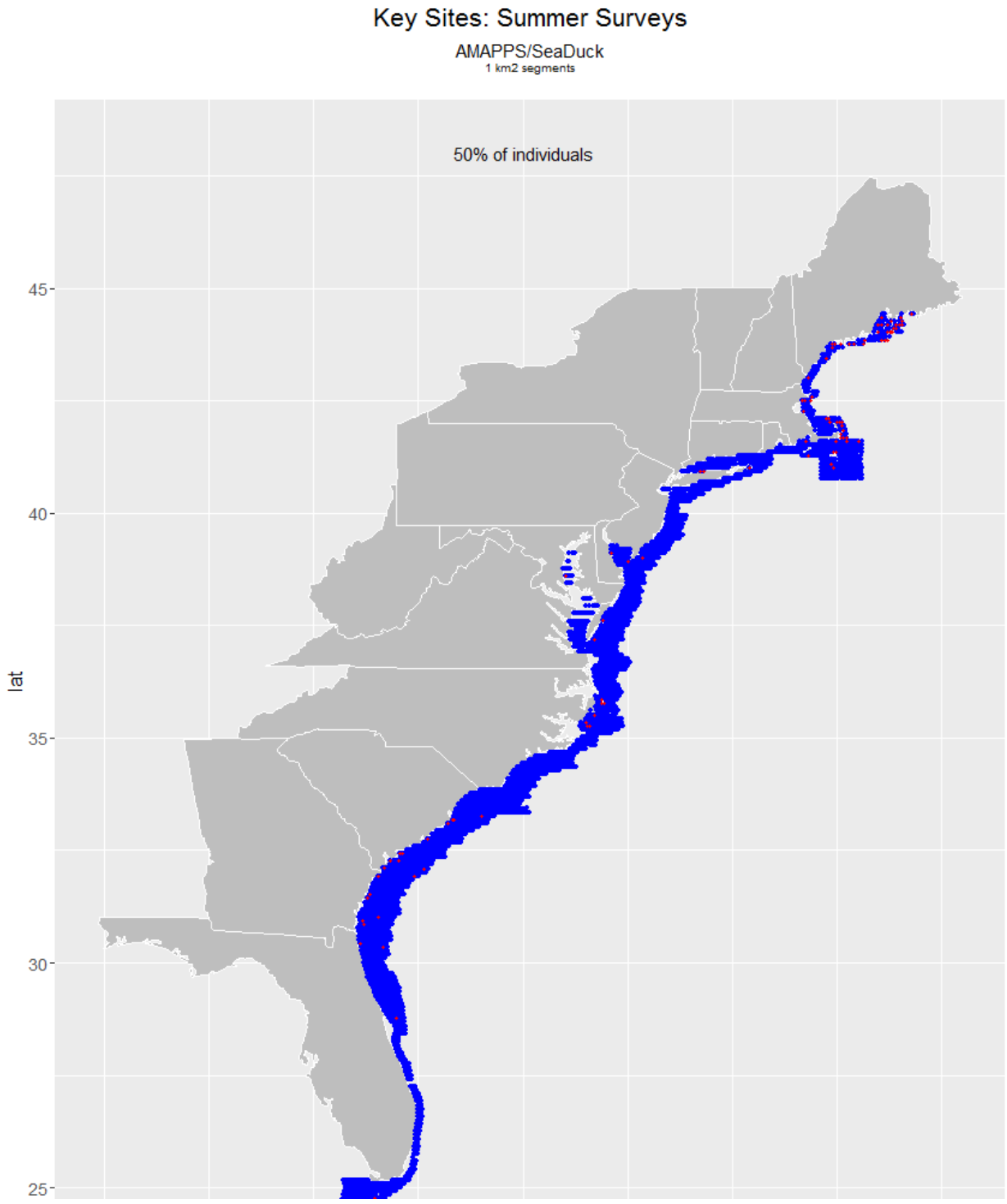

Figure 5-7 All seabirds from summer surveys: Key sites with 50% of the individuals

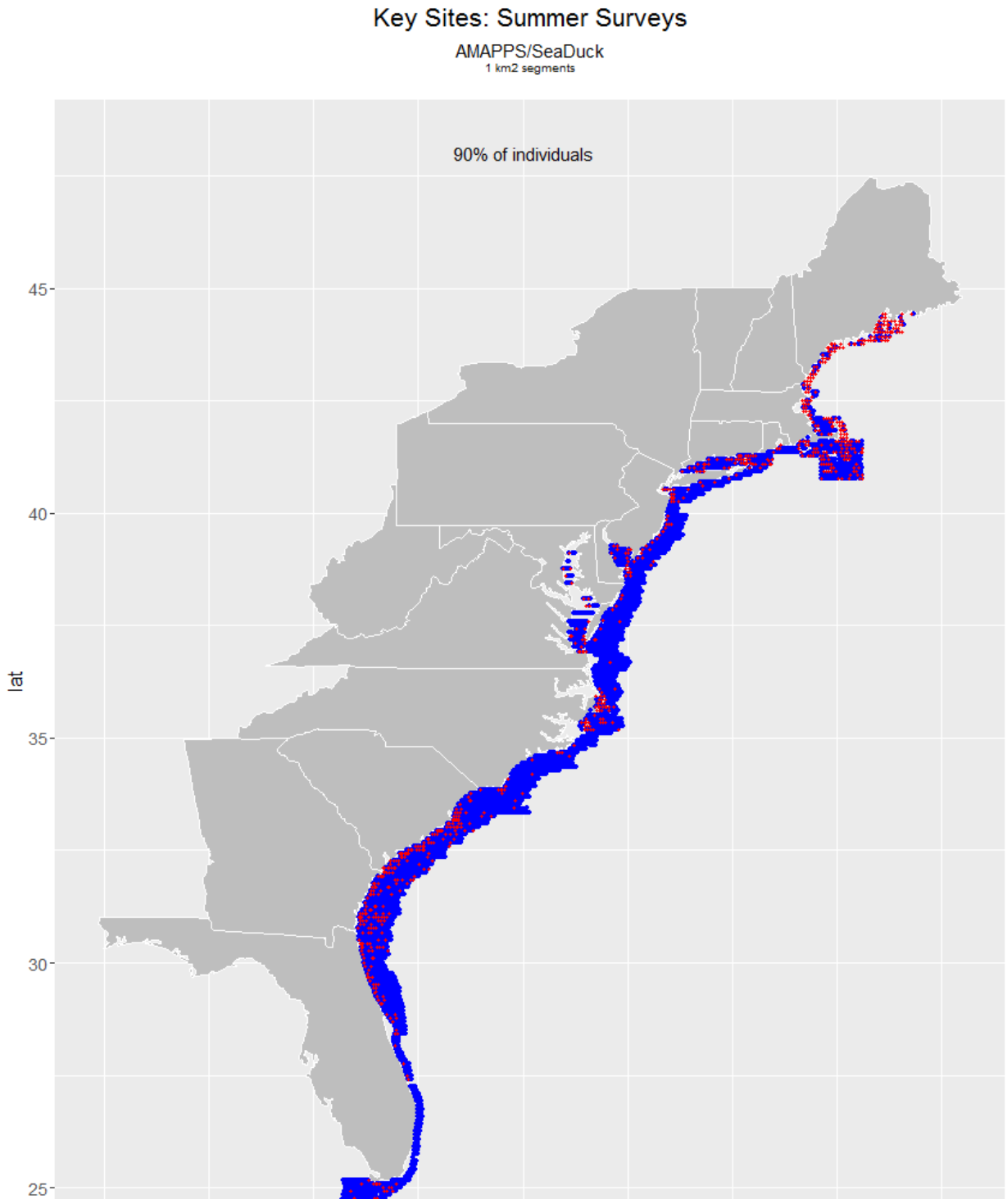

Figure 5-8 All seabirds from summer surveys: Key sites with 90% of the individuals

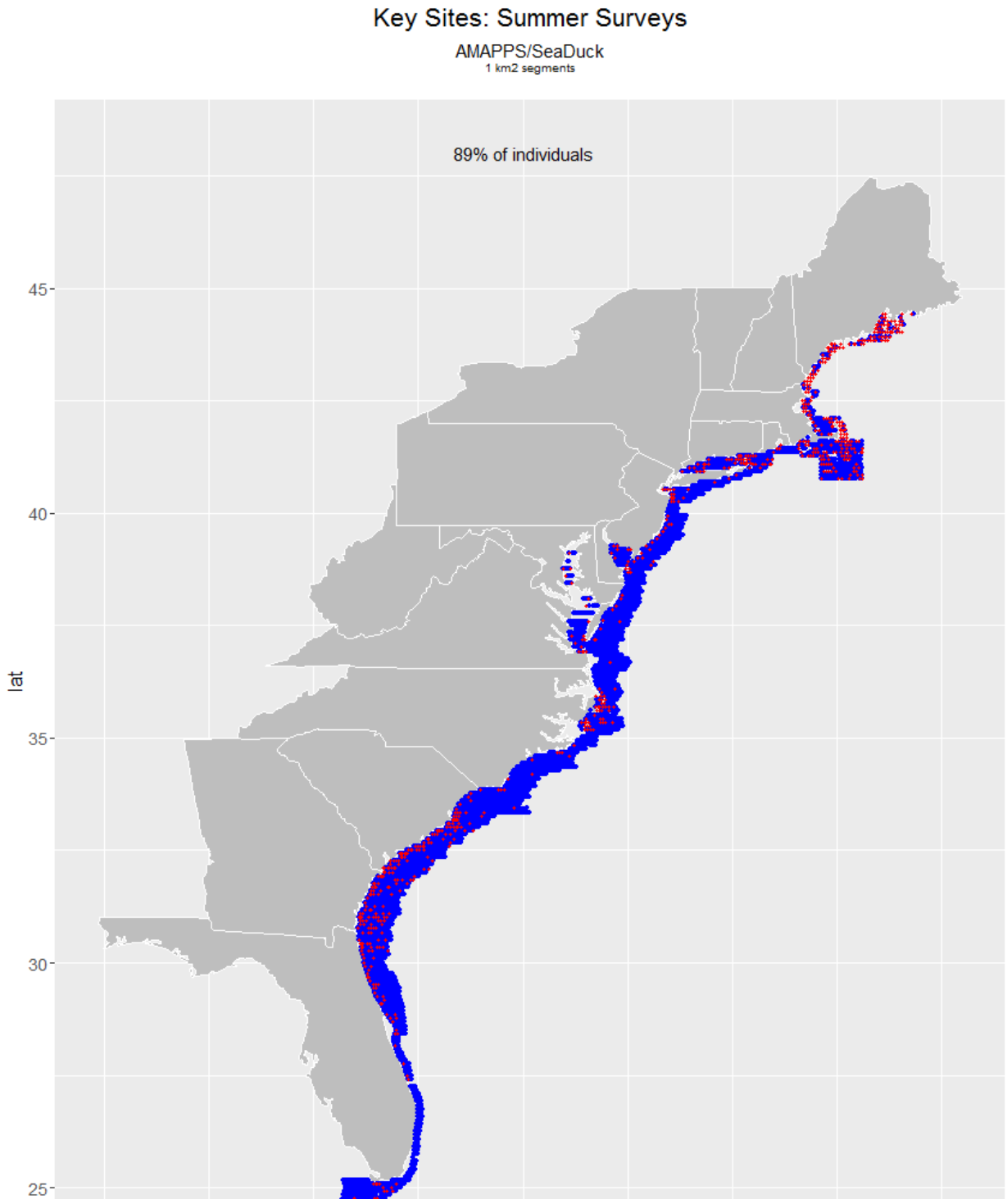

Figure 5-9 All seabirds from summer surveys: Key sites with optimal individuals

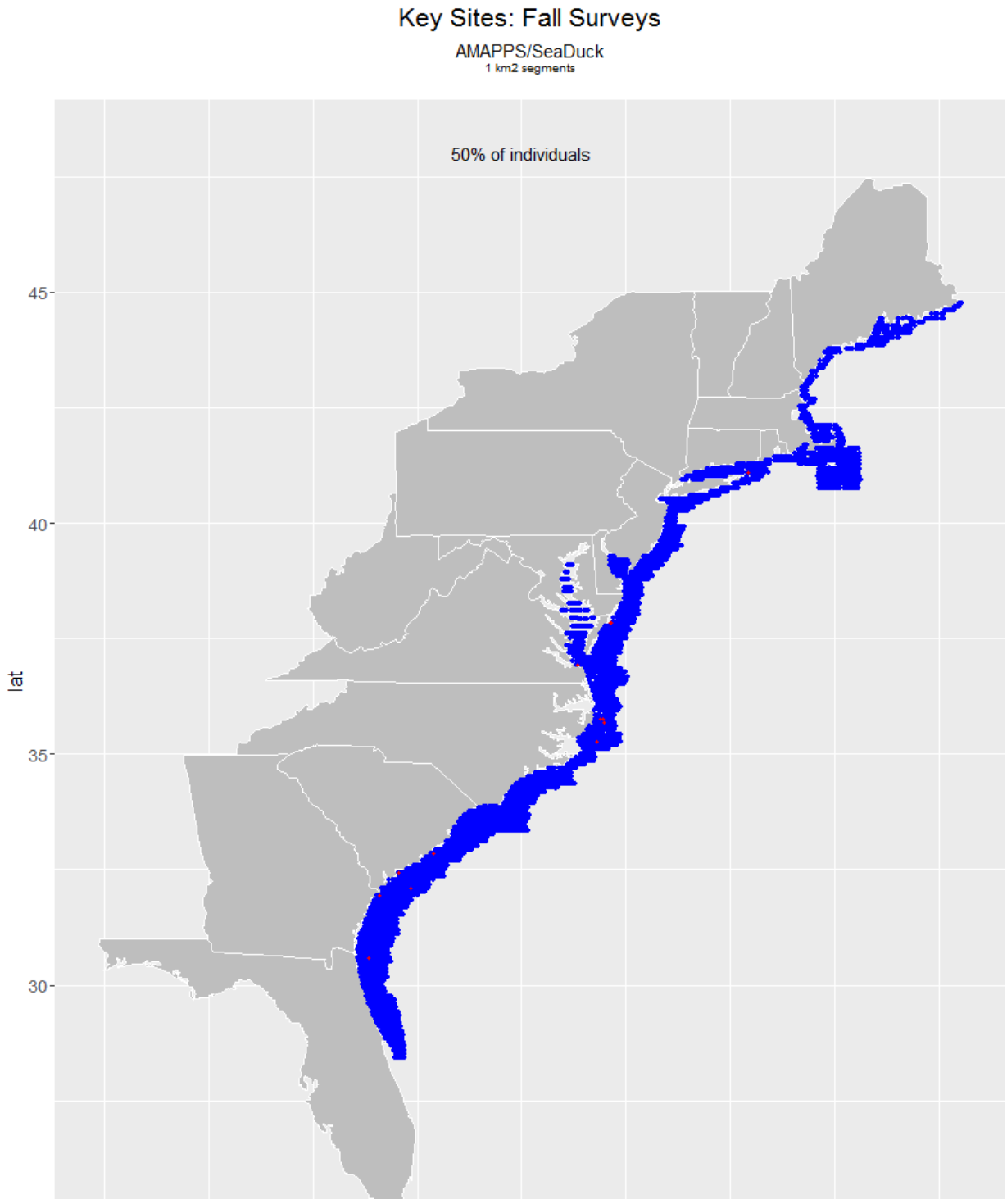

Figure 5-10 All seabirds from fall surveys: Key sites with 50% of the individuals

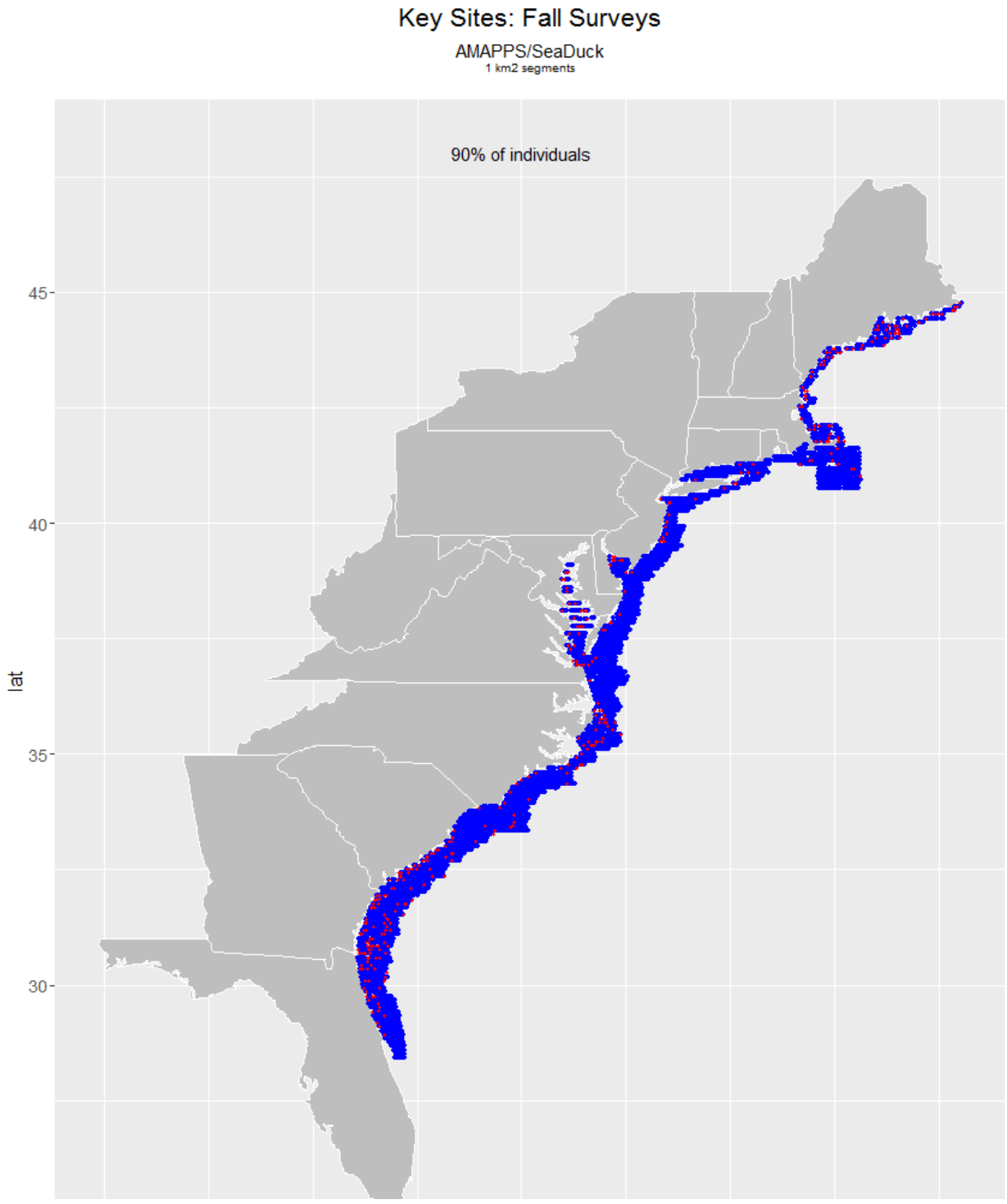

Figure 5-11 All seabirds from fall surveys: Key sites with 90% of the individuals

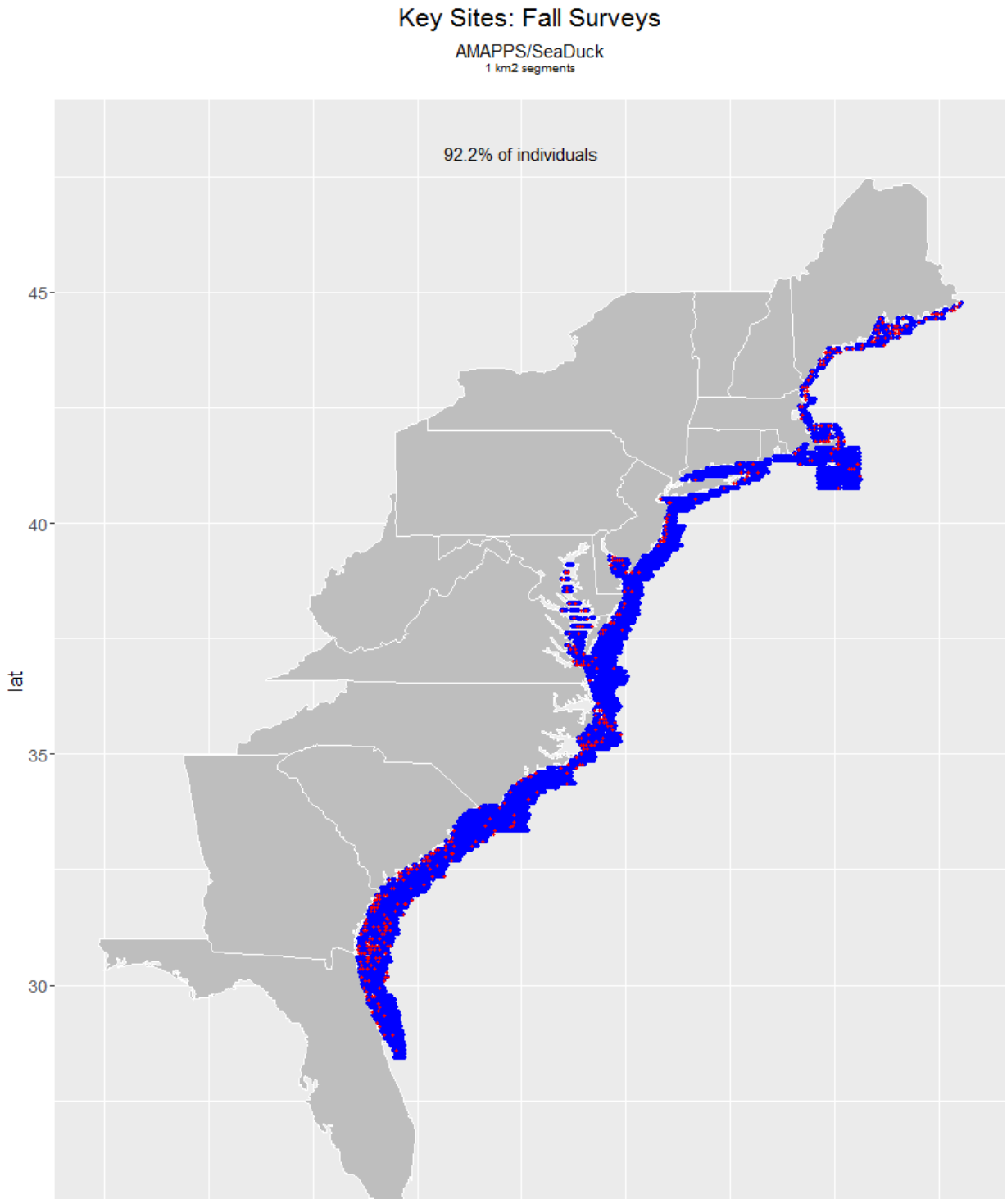

Figure 5-12 All seabirds from fall surveys: Key sites with optimal individuals

6 Key Sites of Eider Ducks

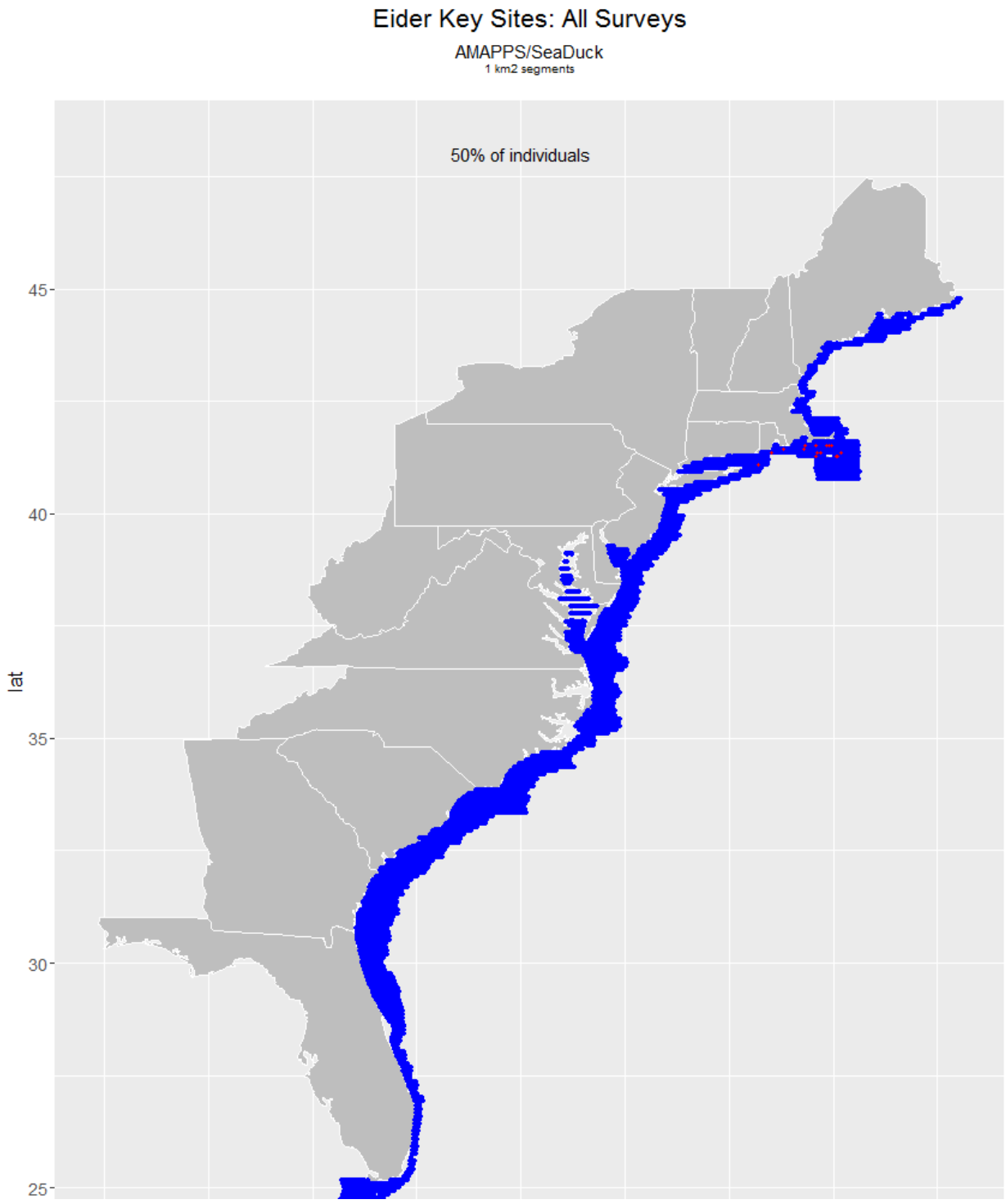

Figure 6-1 Eider ducks: Key sites with 50% of the individuals

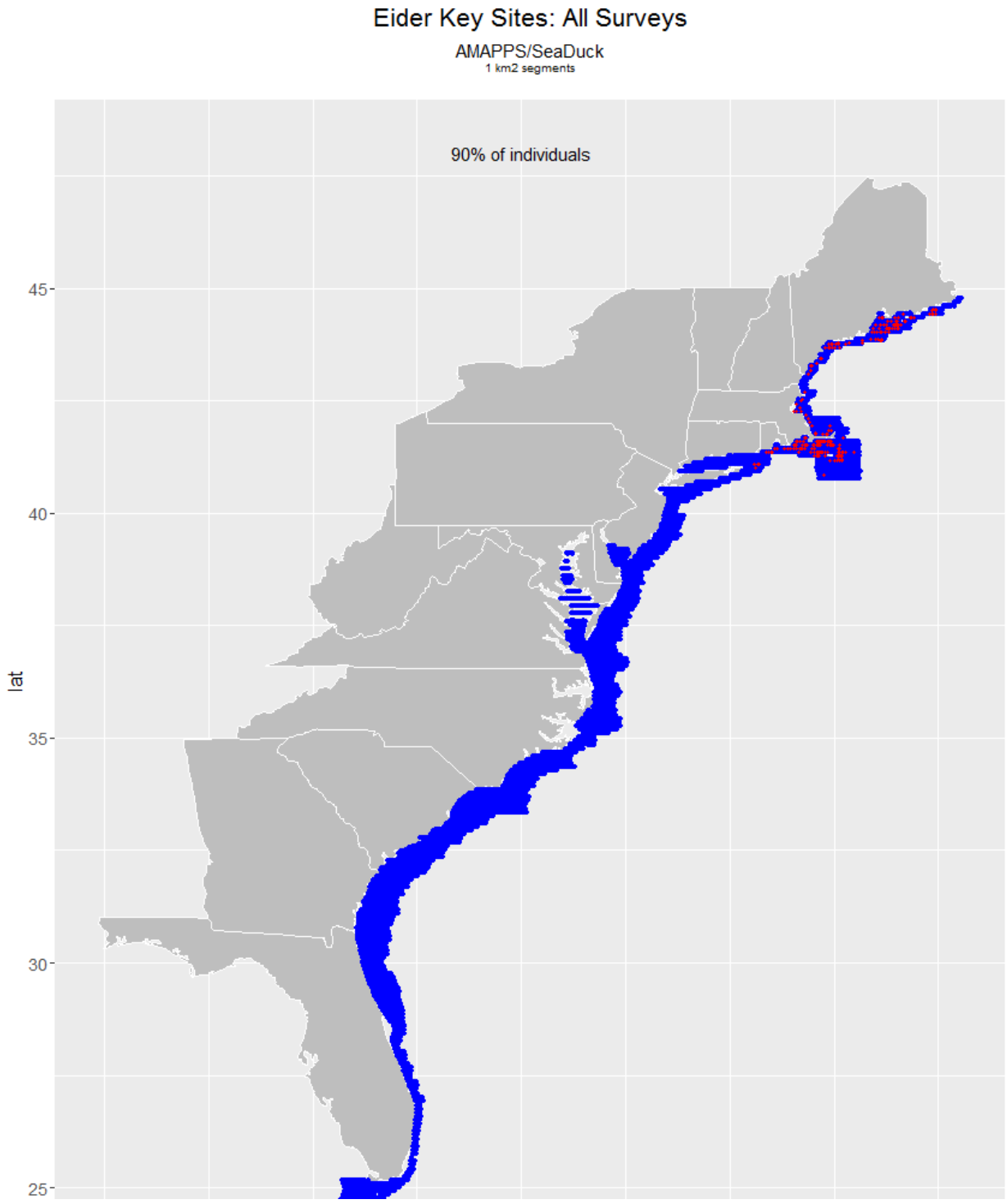

Figure 6-2 Eider ducks: Key sites with 90% of the individuals

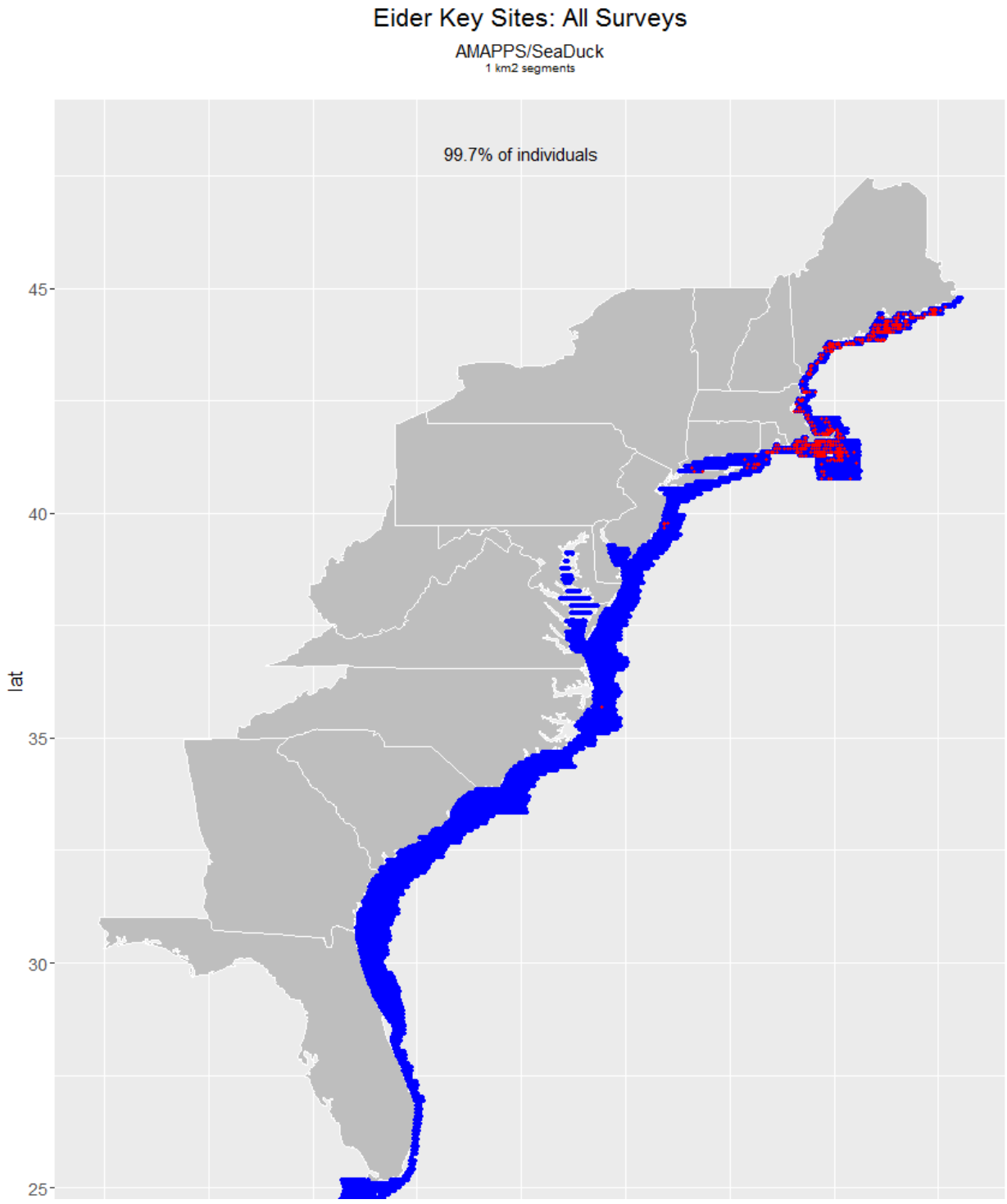

Figure 6-3 Eider ducks: Key sites with optimal individuals

7 Key Sites of Goldeneye Ducks

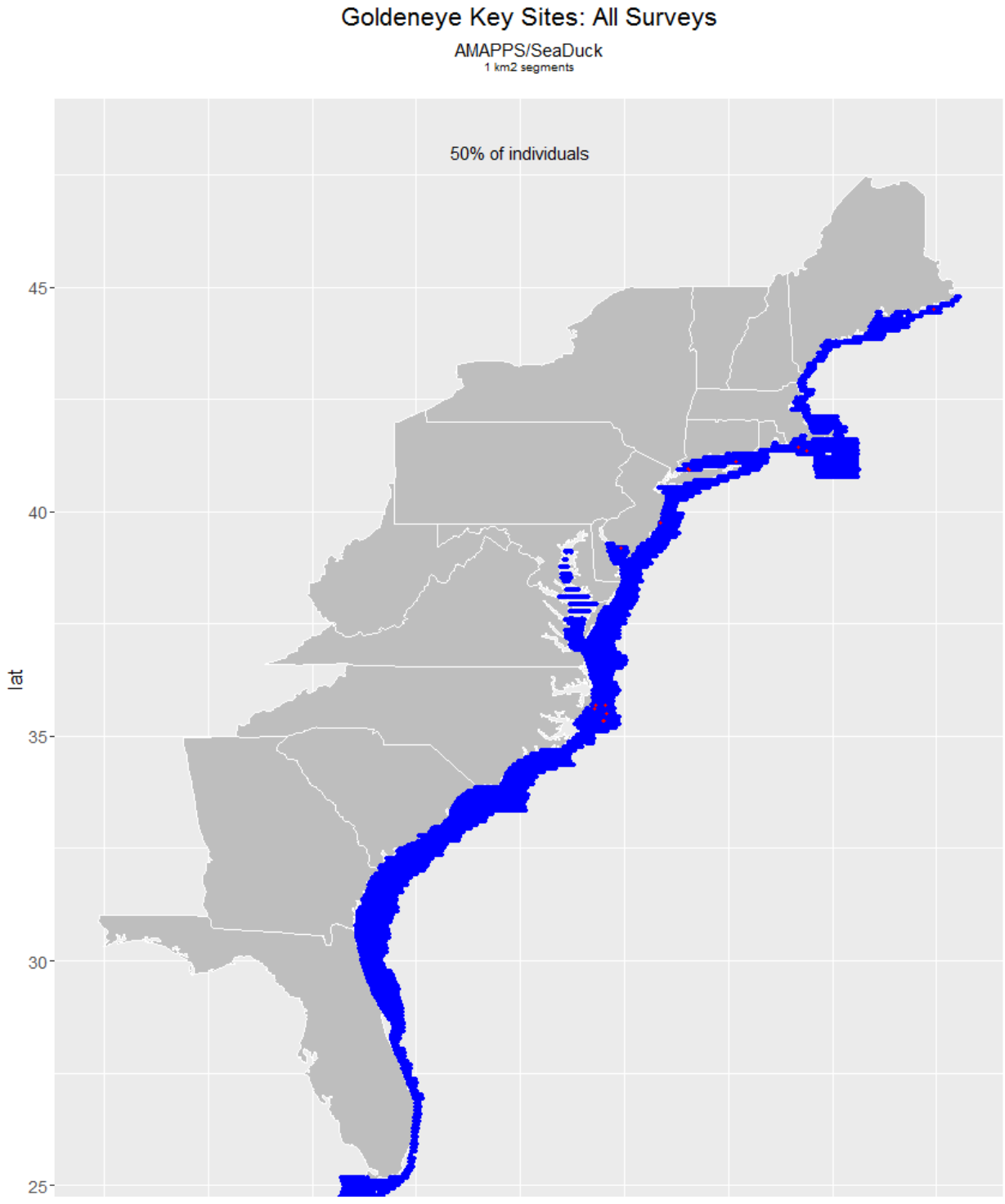

Figure 7-1 Goldeneye ducks: Key sites with 50% of the individuals

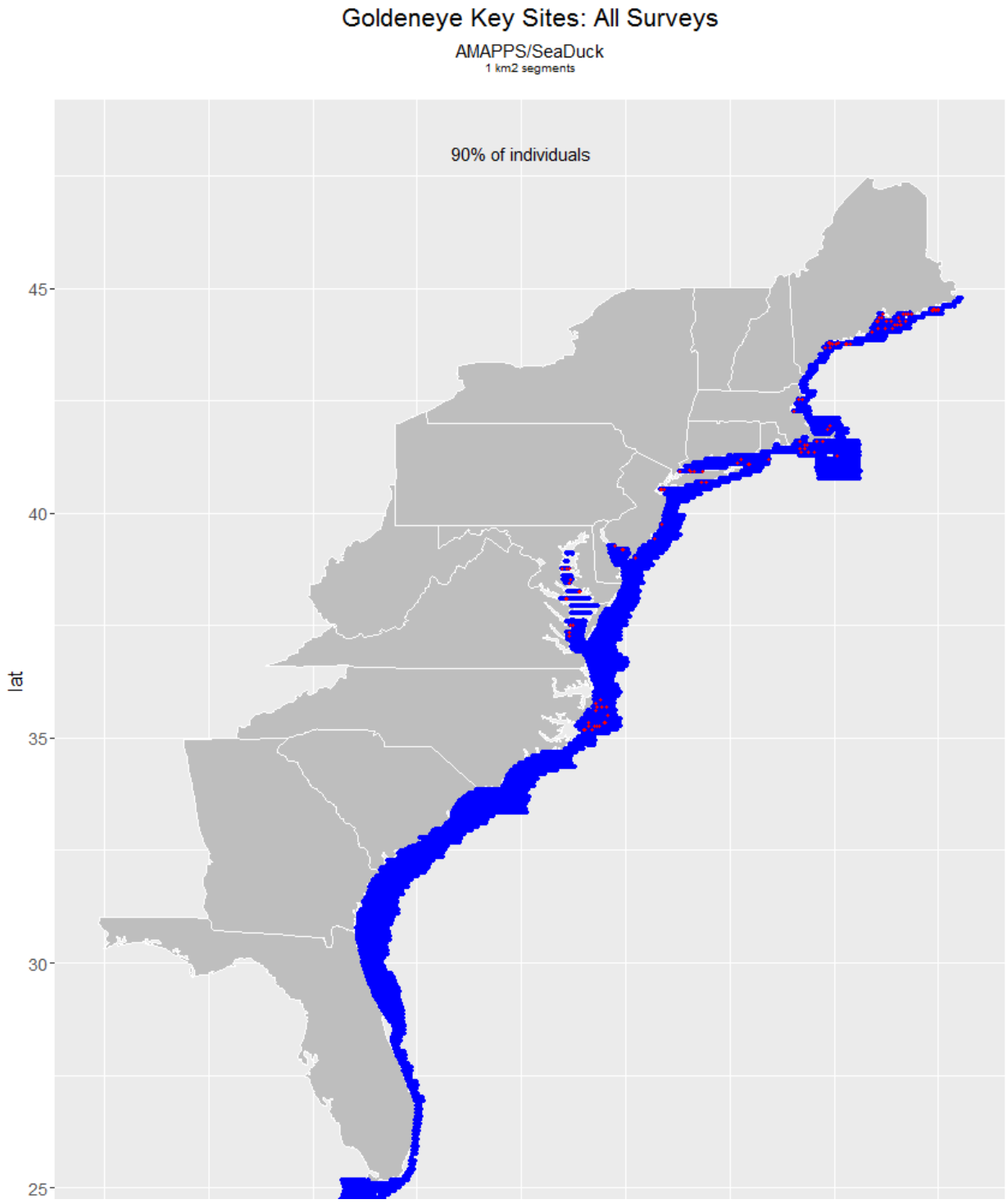

Figure 7-2 Goldeneye ducks: Key sites with 90% of the individuals

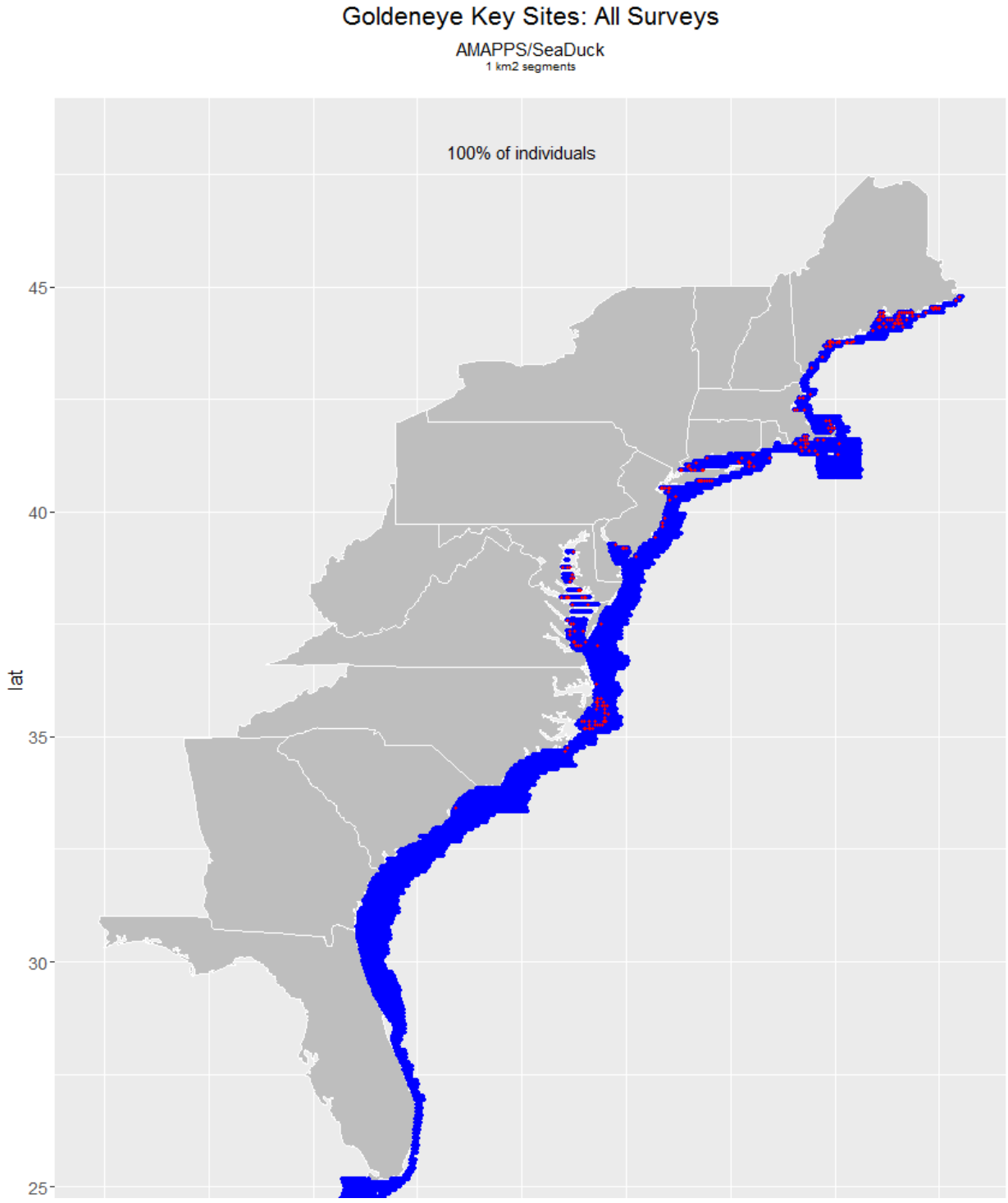

Figure 7-3 Goldeneye ducks: Key sites with optimal individuals

8 Key Sites of Merganser ducks

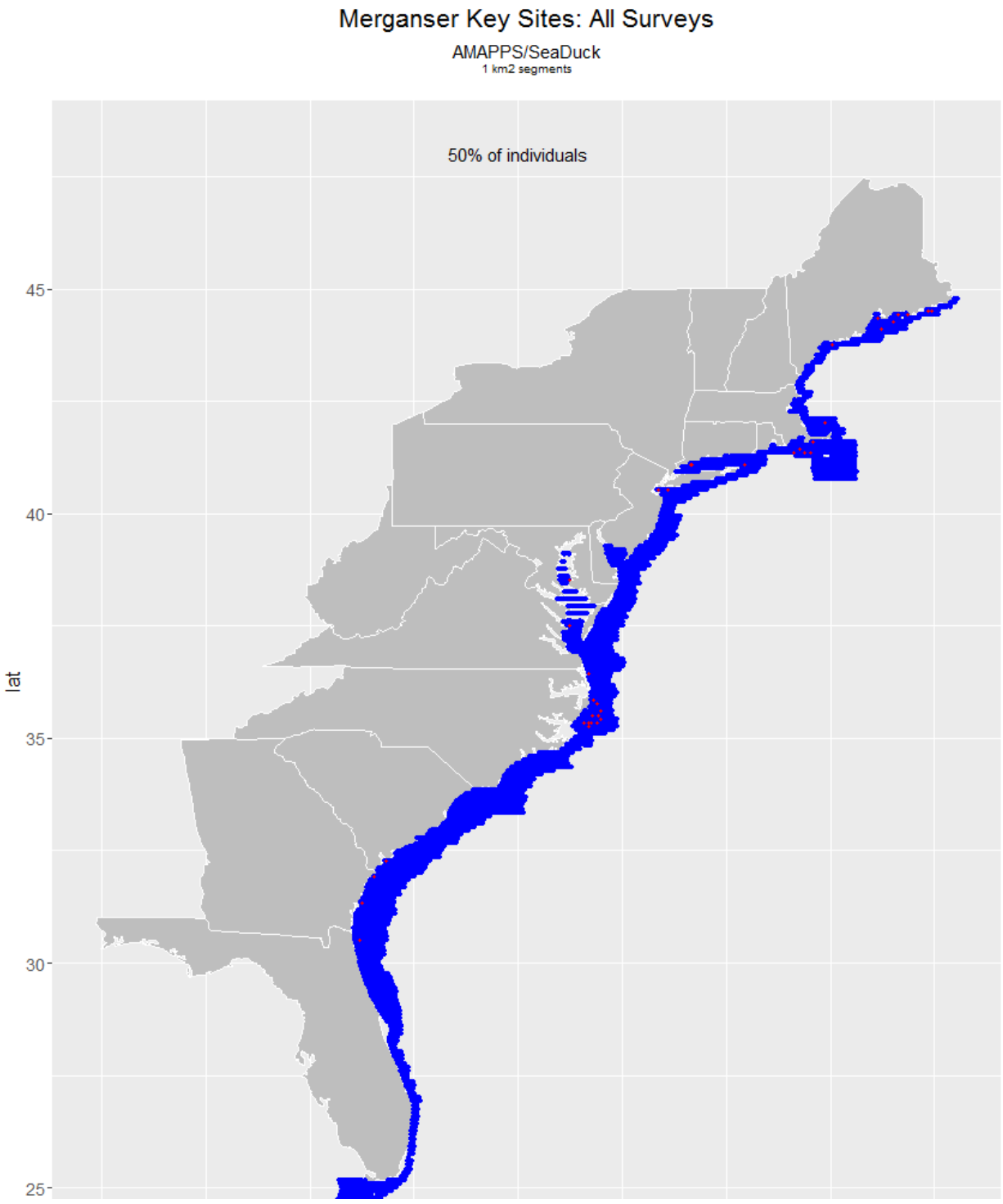

Figure 8-1 Merganser ducks: Key sites with 50% of the individuals

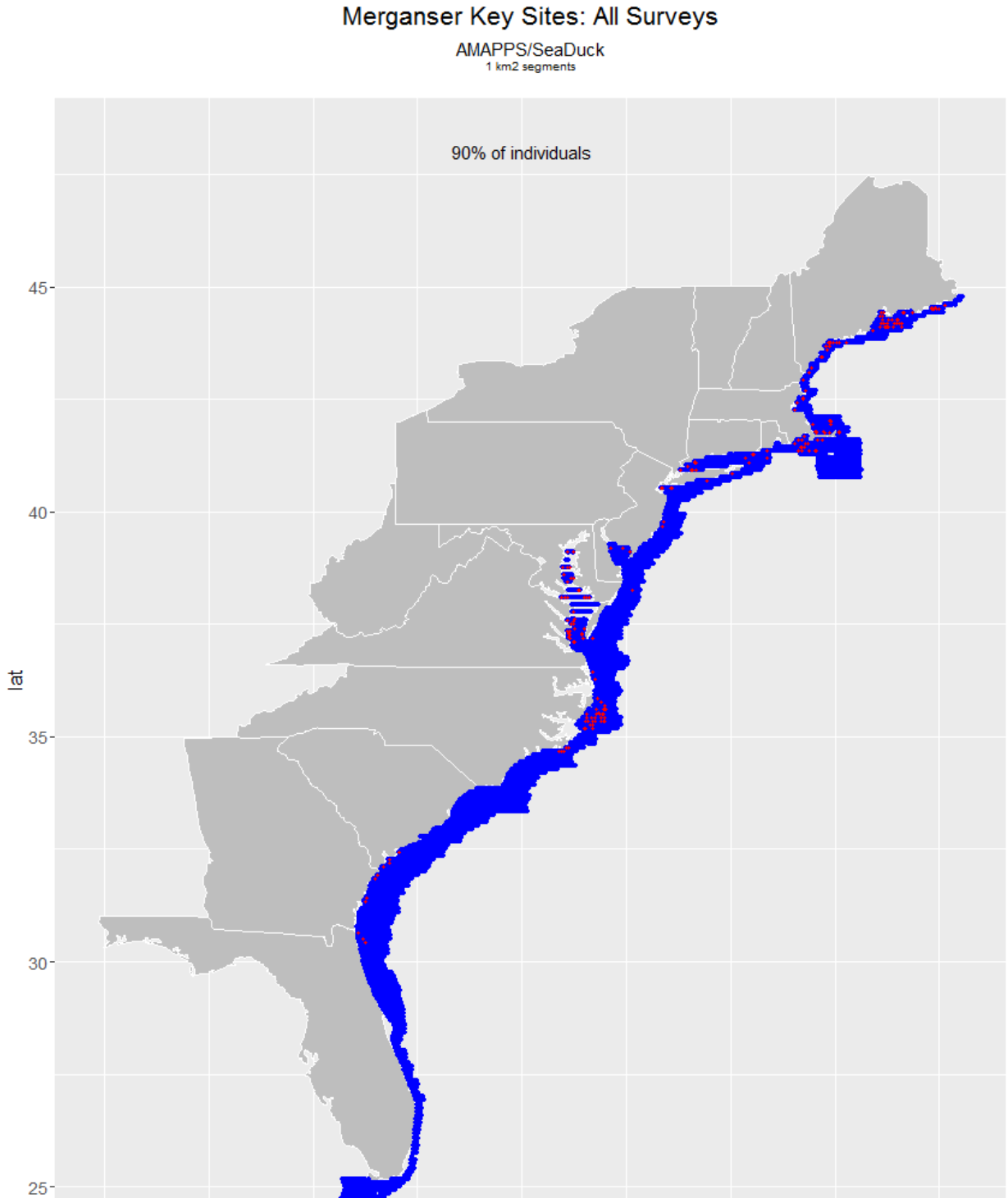

Figure 8-2 Merganser ducks: Key sites with 90% of the individuals

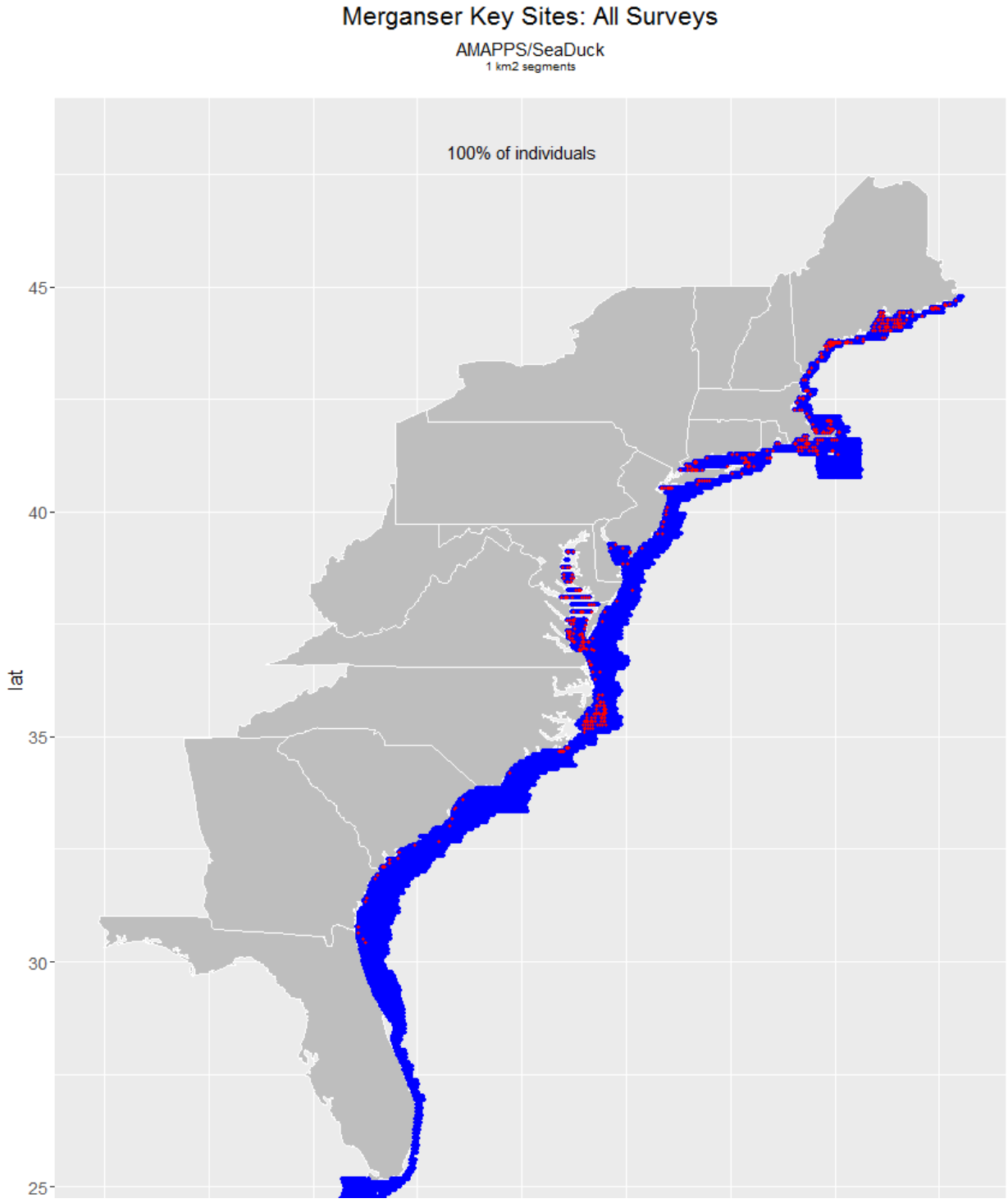

Figure 8-3 Merganser ducks: Key sites with optimal individuals

9 Key Sites of Scaup Ducks

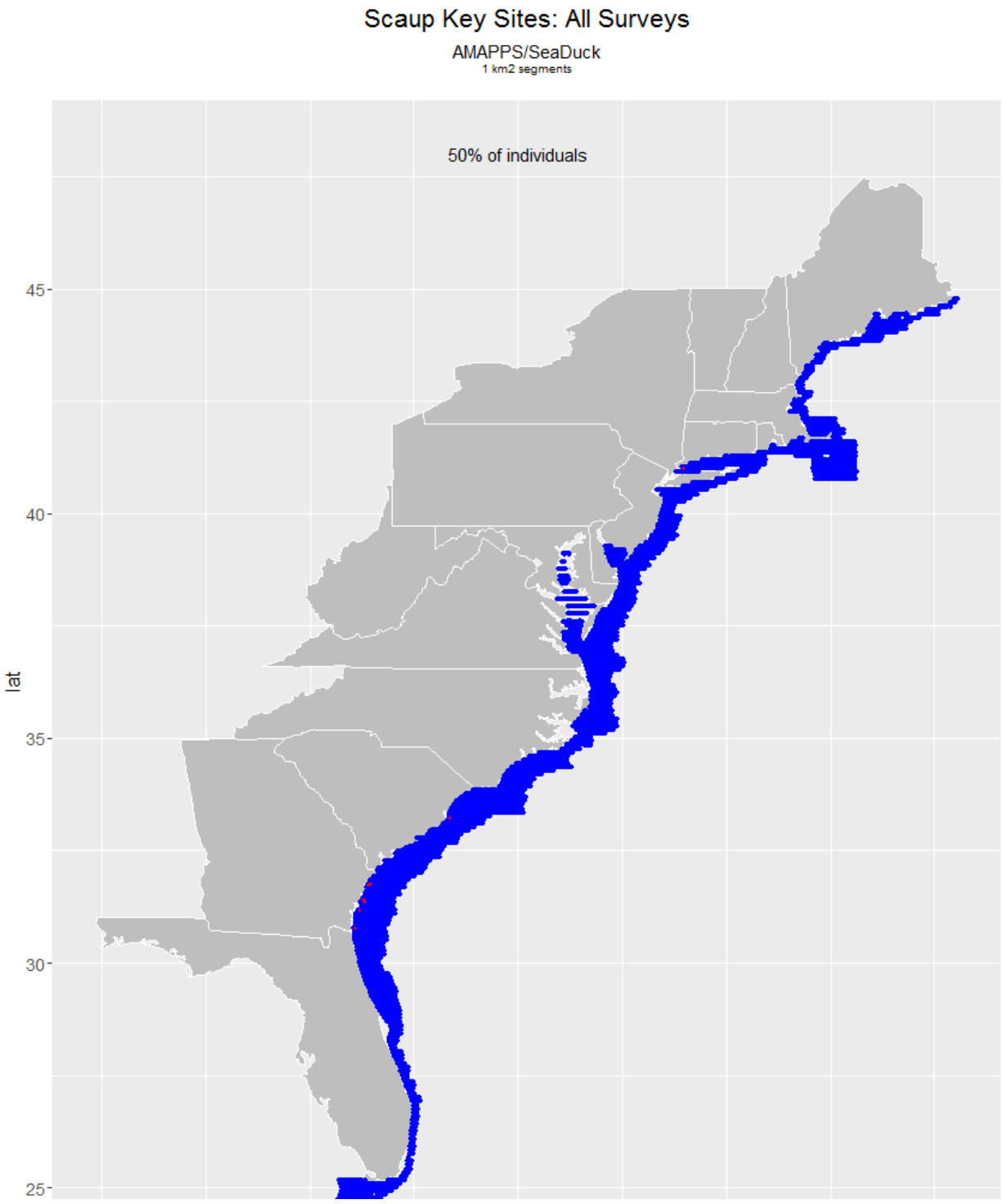

Figure 9-1 Scaup ducks: Key sites with 50% of the individuals

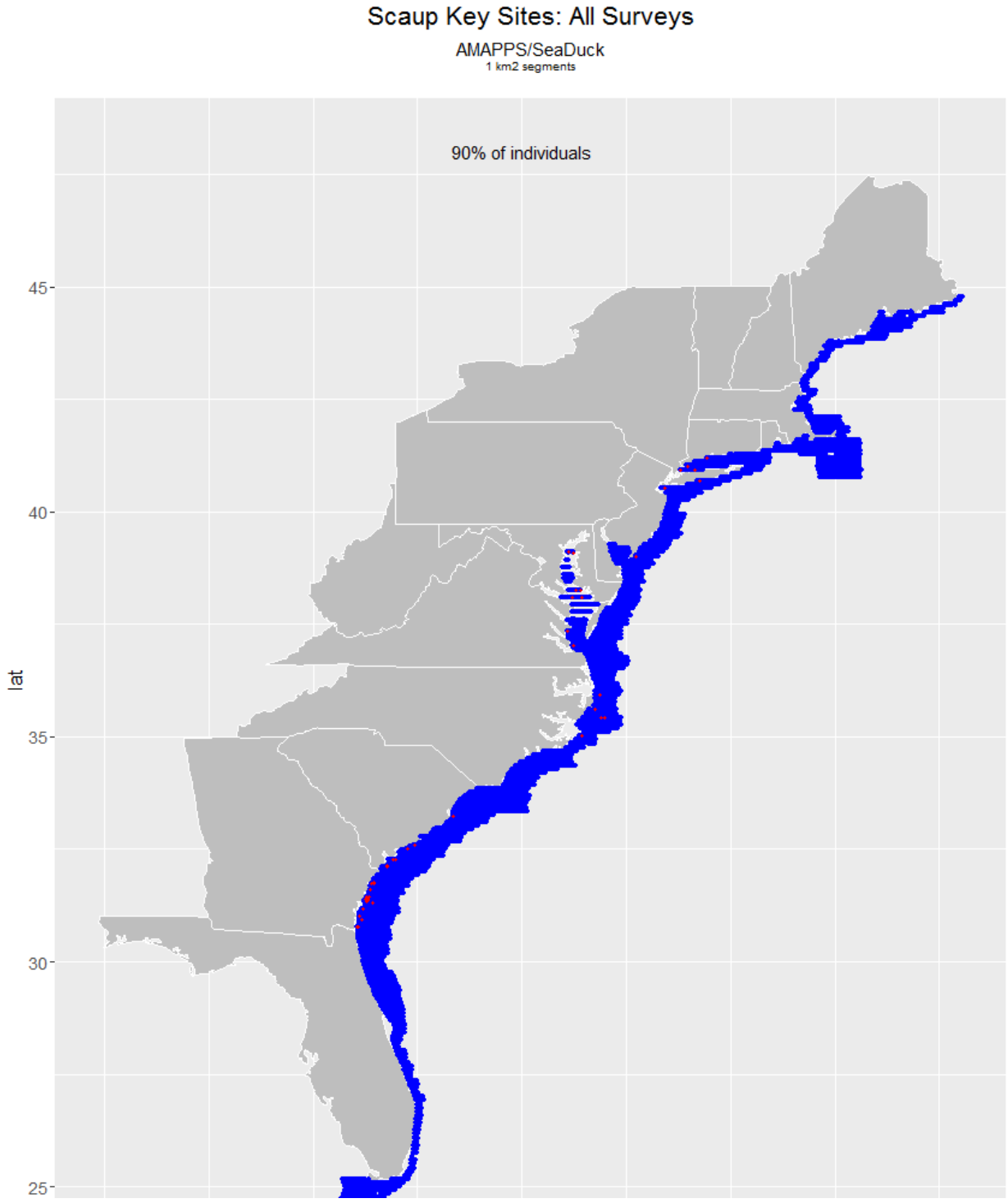

Figure 9-2 Scaup ducks: Key sites with 90% of the individuals

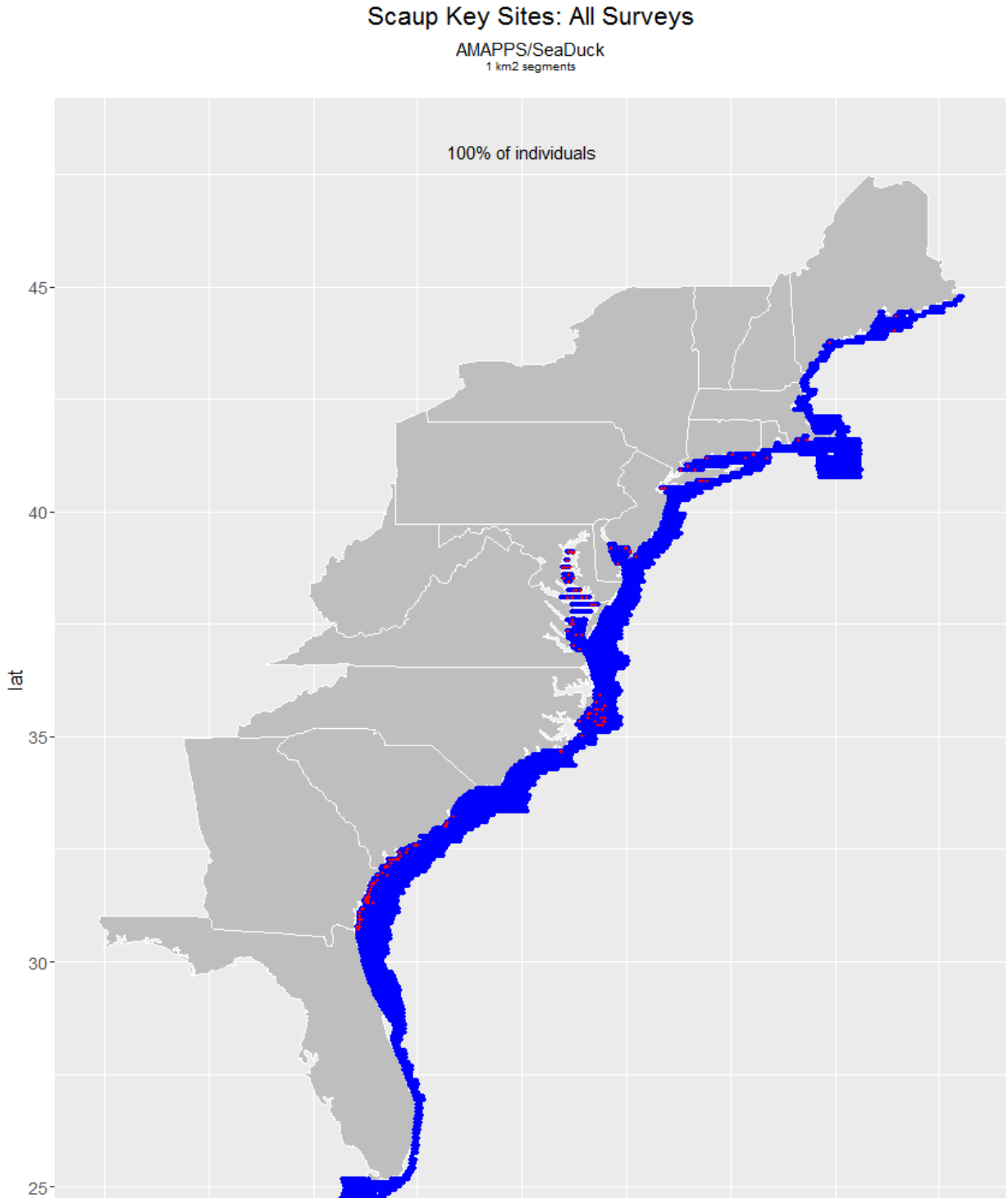

Figure 9-3 Scaup ducks: Key sites with optimal individuals

10 Key Sites of Scoter Ducks

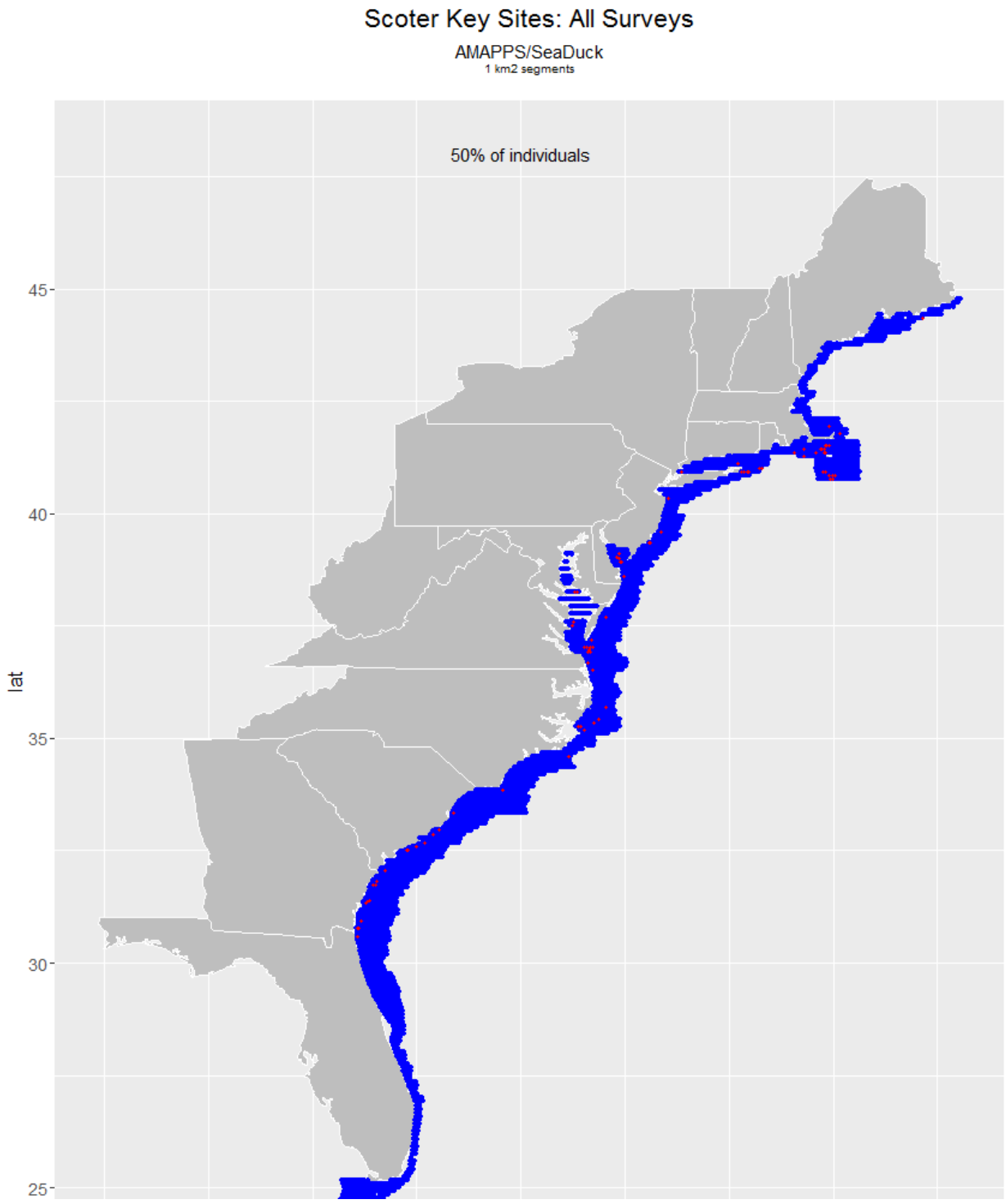

Figure 10-1 Scoter ducks: Key sites with 50% of the individuals

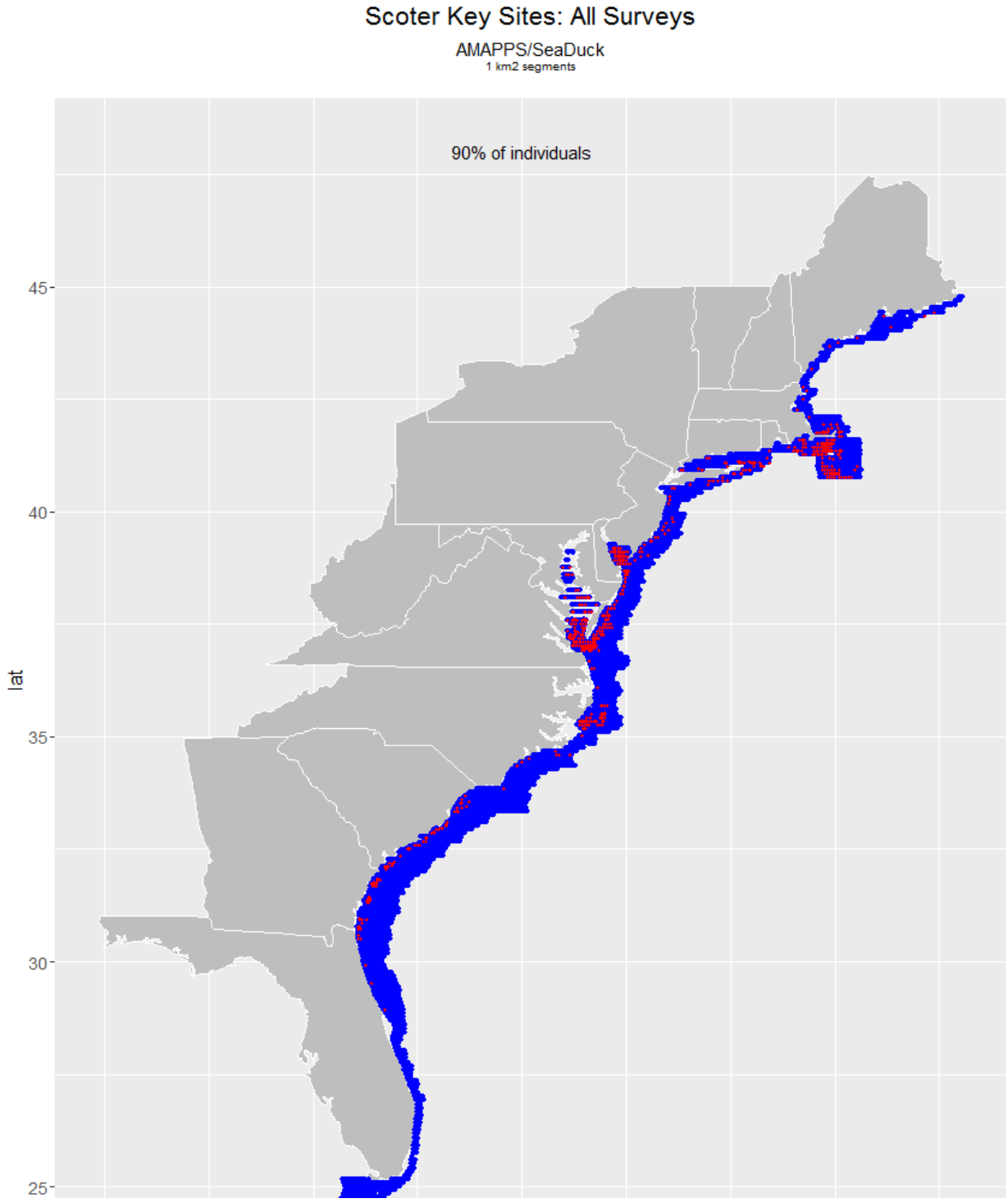

Figure 10-2 Scoter ducks: Key sites with 90% of the individuals

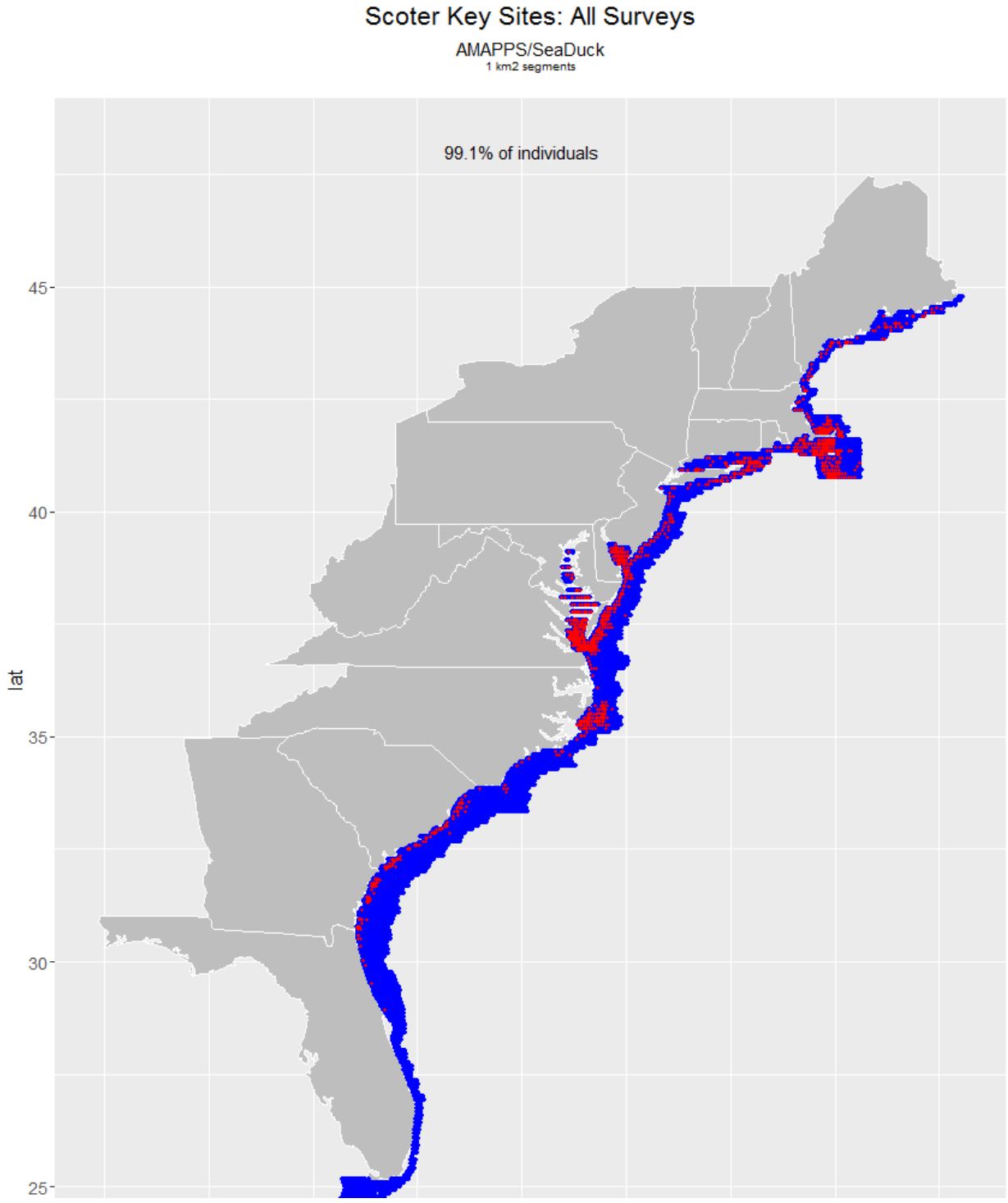

Figure 10-3 Scoter ducks: Key sites with optimal individuals

11 Key Sites of Other Ducks

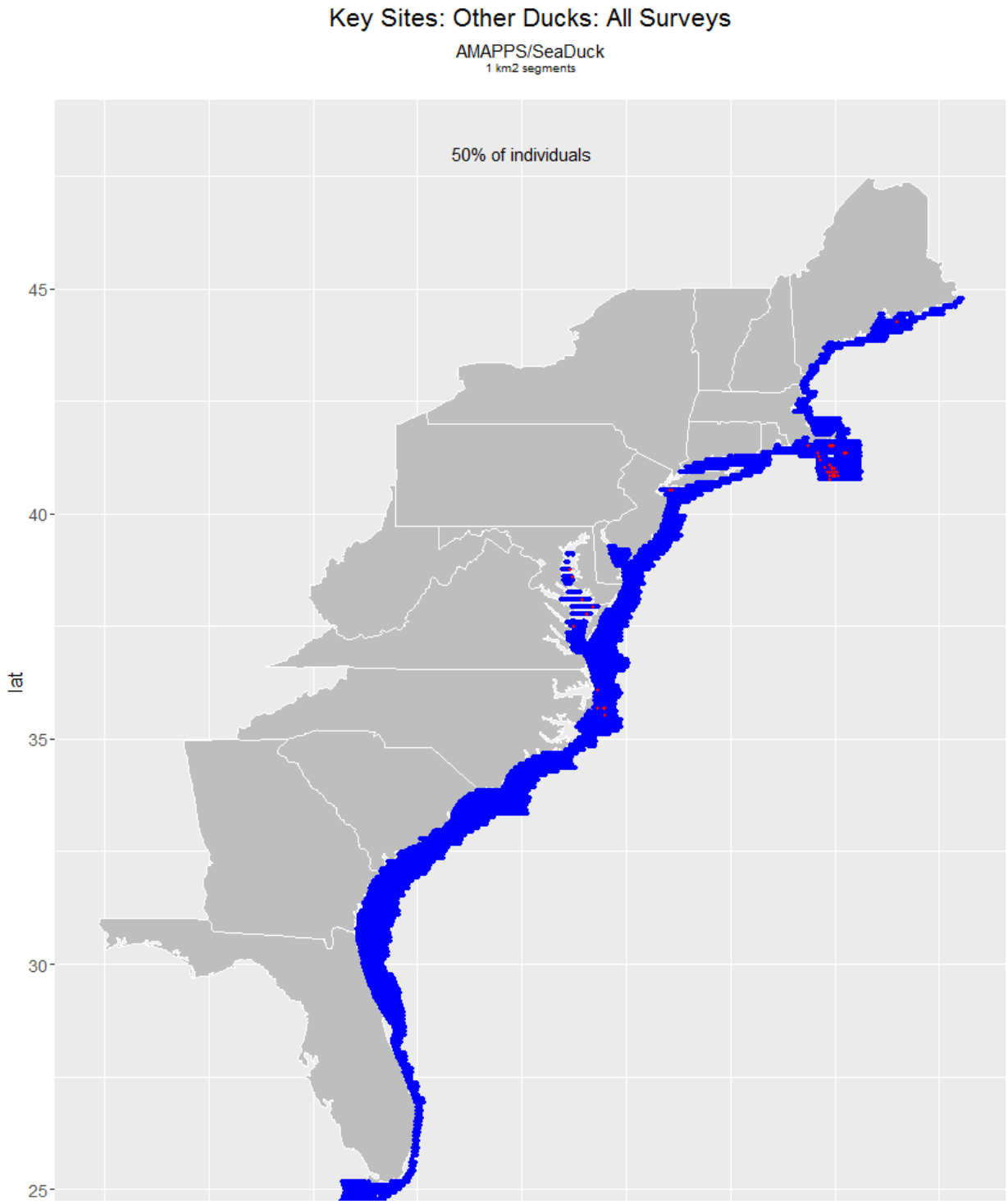

Figure 11-1 Other ducks: Key sites with 50% of the individuals

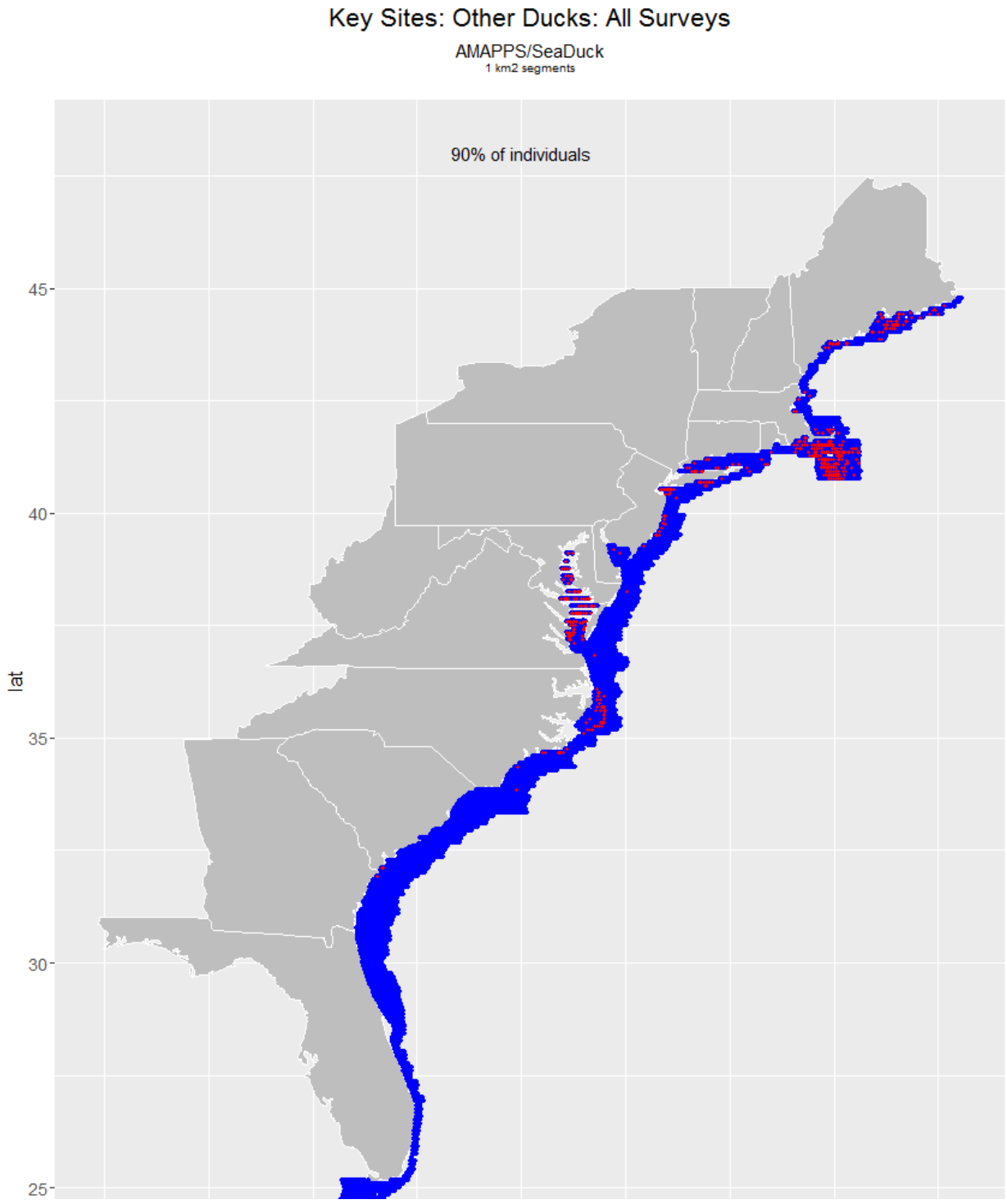

Figure 11-2 Other ducks: Key sites with 90% of the individuals

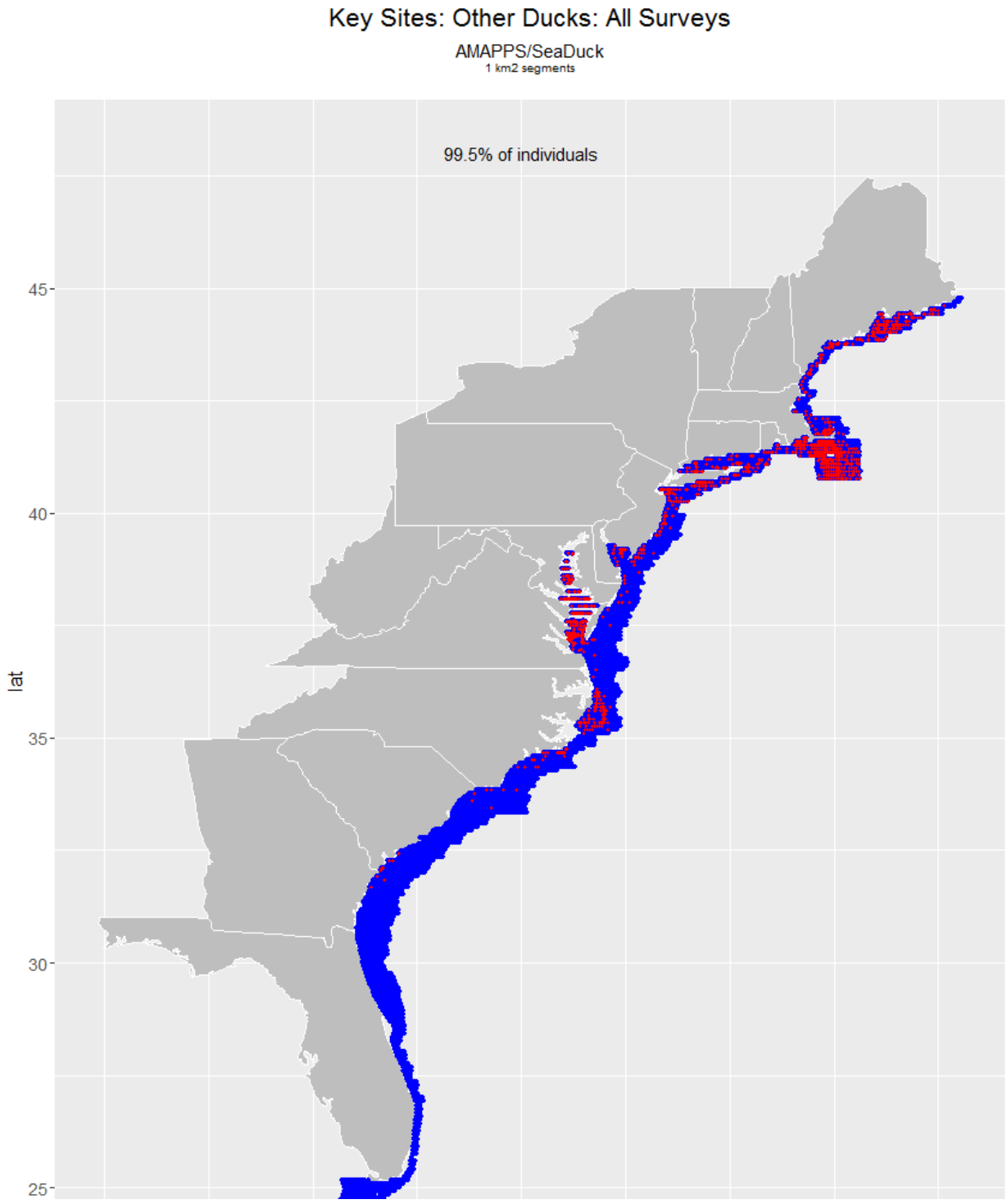

Figure 11-3 Other ducks: Key sites with optimal individuals

12 Key Sites of Northern Gannets

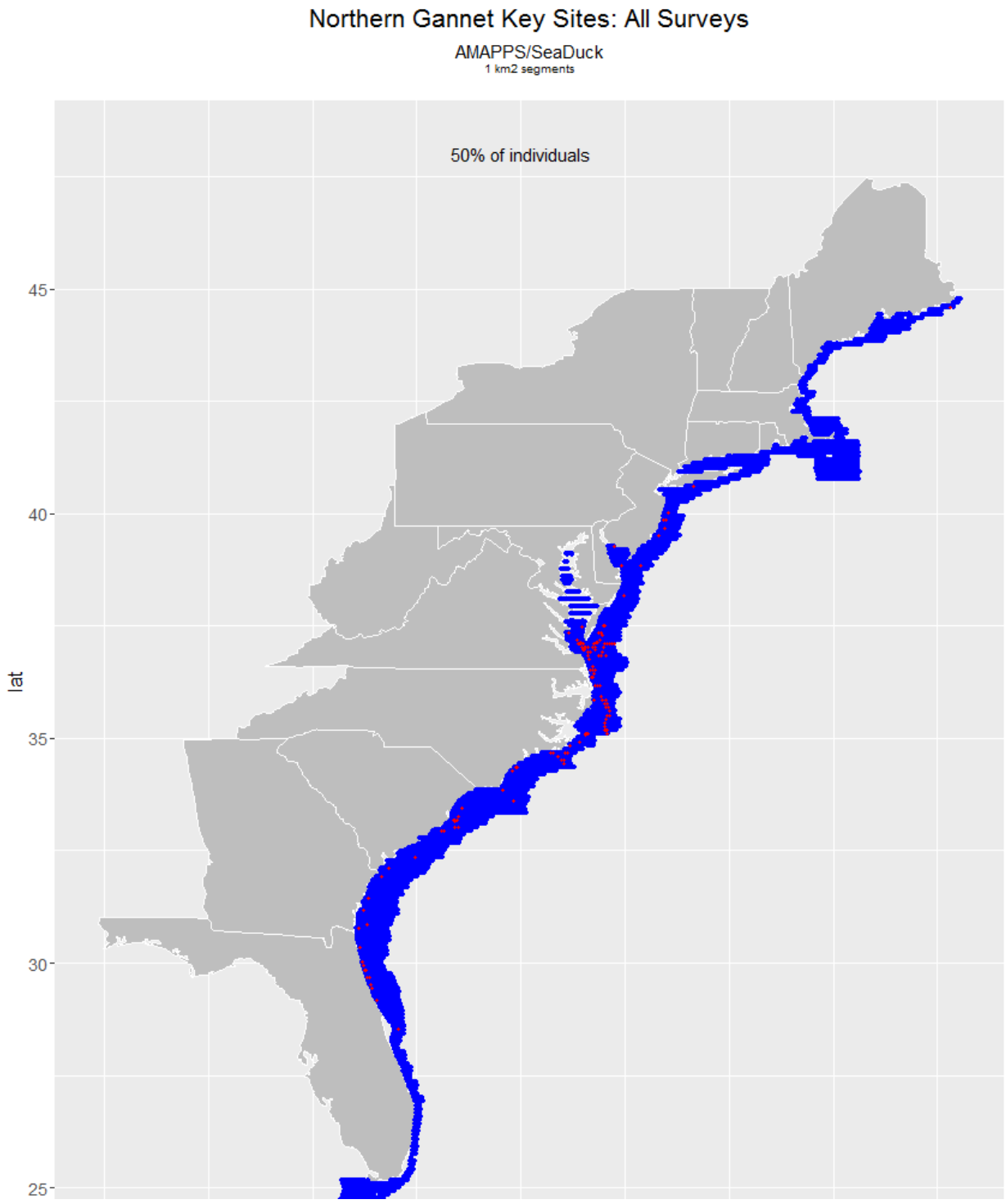

Figure 12-1 Northern Gannet: Key sites with 50% of the individuals

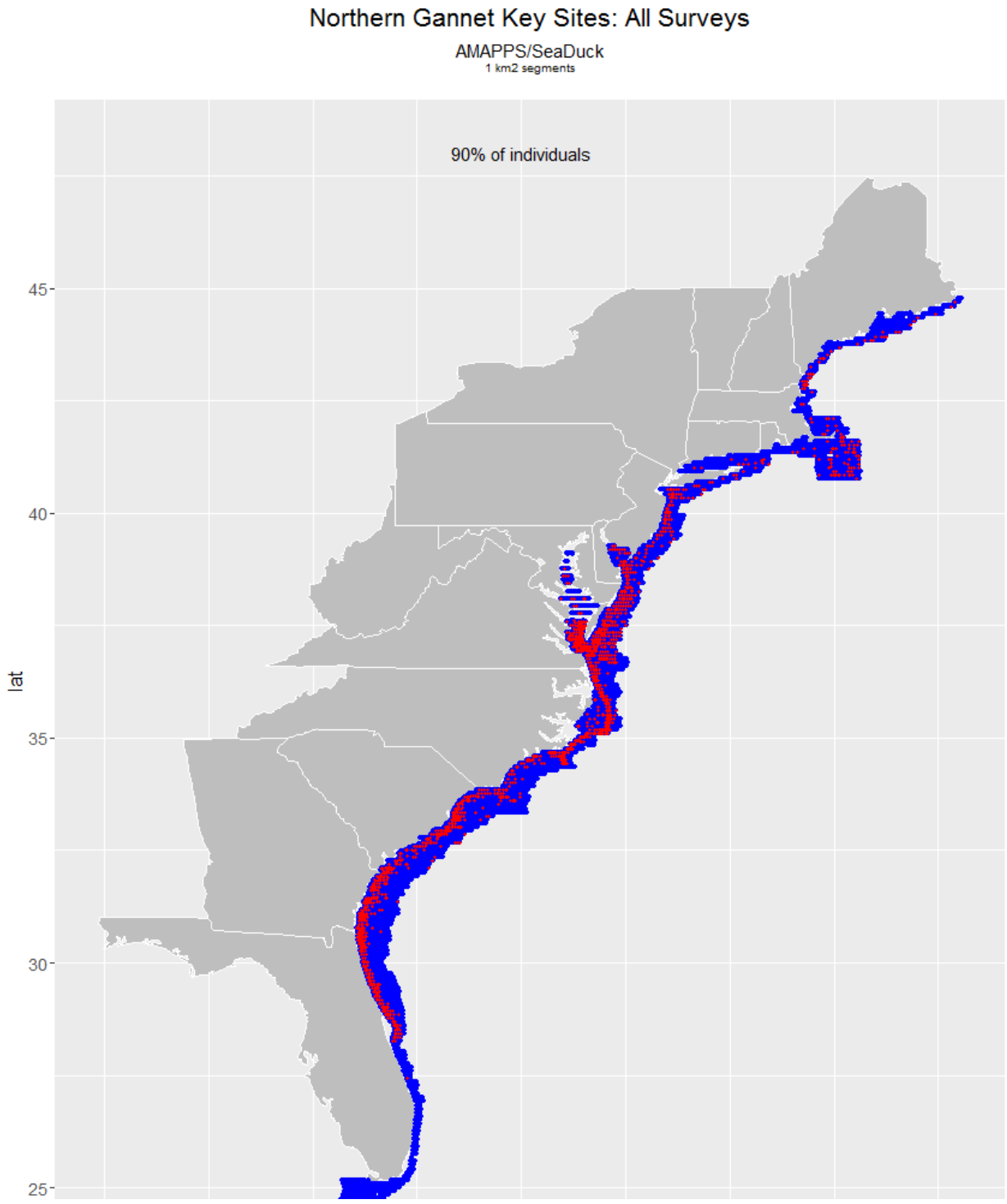

Figure 12-2 Northern Gannet: Key sites with 90% of the individuals

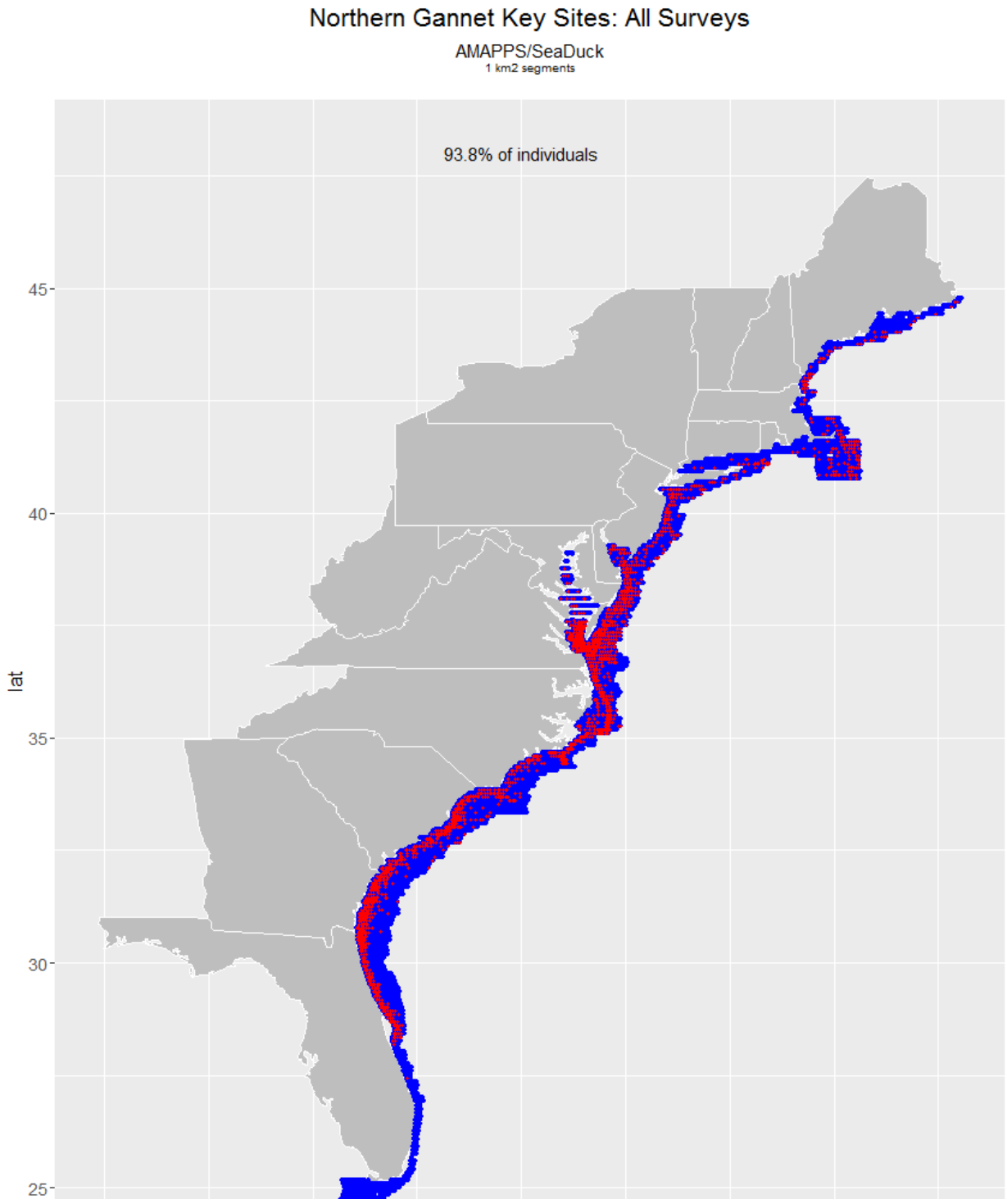

Figure 12-3 Northern Gannet: Key site with optimal individuals