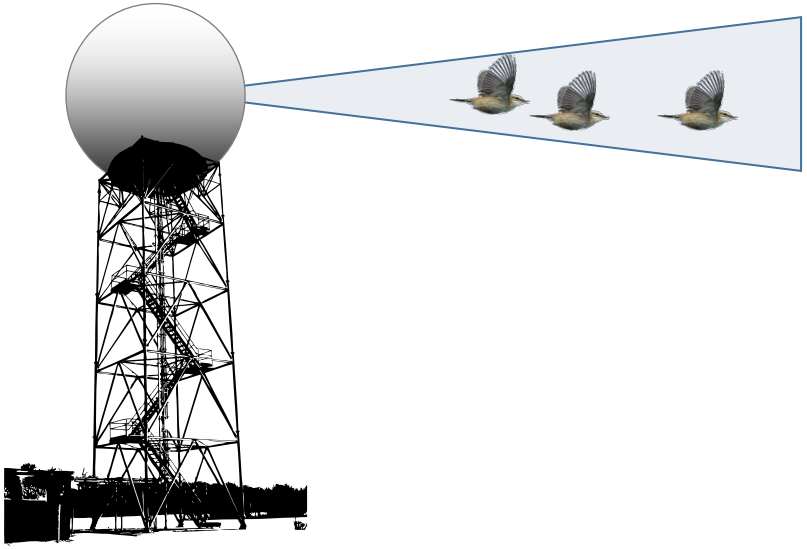
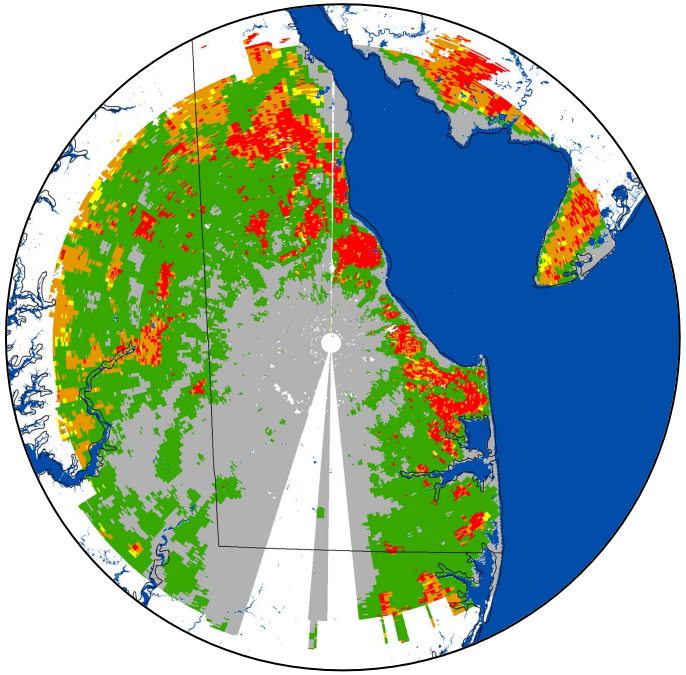
Bird use of Delaware wetlands during fall migration based on weather radar observations





Jeffrey J. Buler[1], Tim D. Schreckengost[1], Jaclyn Smolinsky[1], James McLaren[1], Deanna K. Dawson[2], Eric L. Walters[3]

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USGS science for a changing world

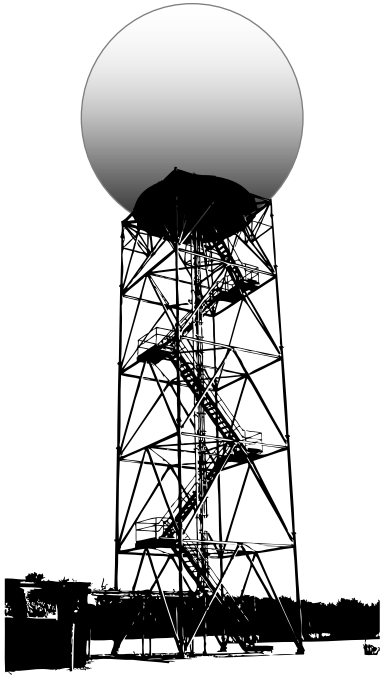
[3] Dept. of Biological Sciences

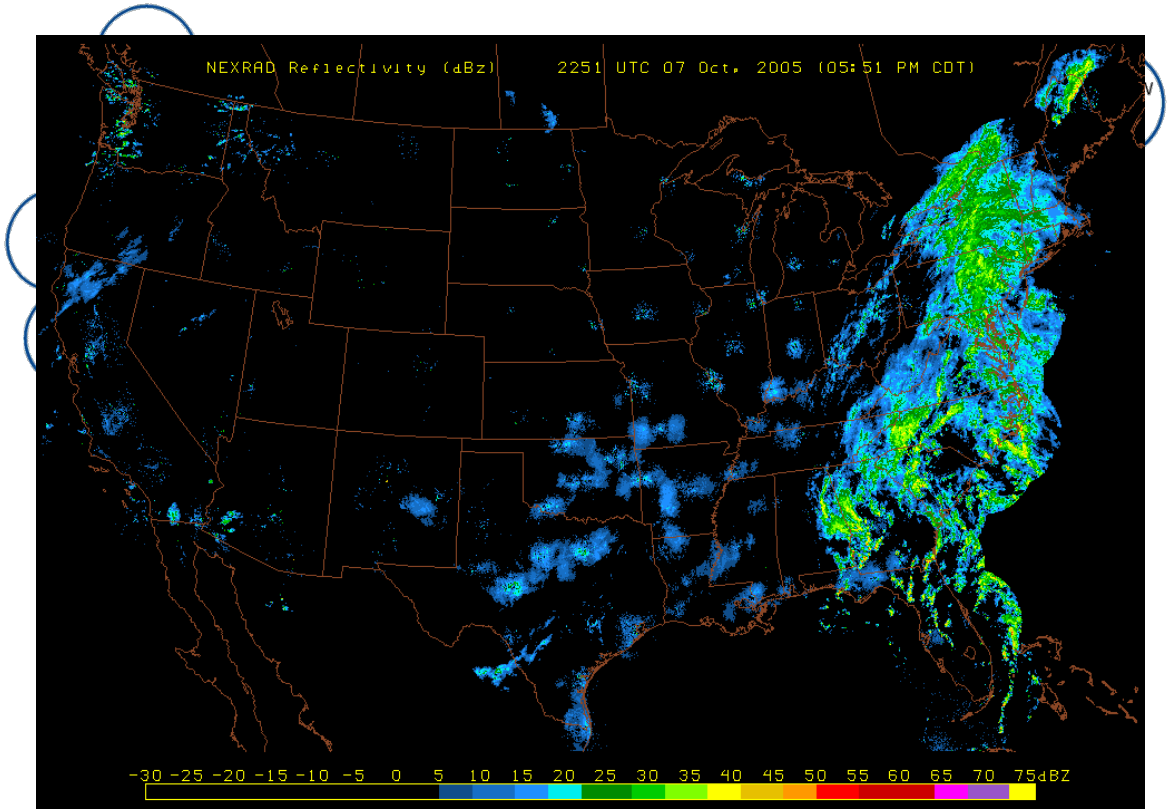
Old Dominion University

WSR-88D

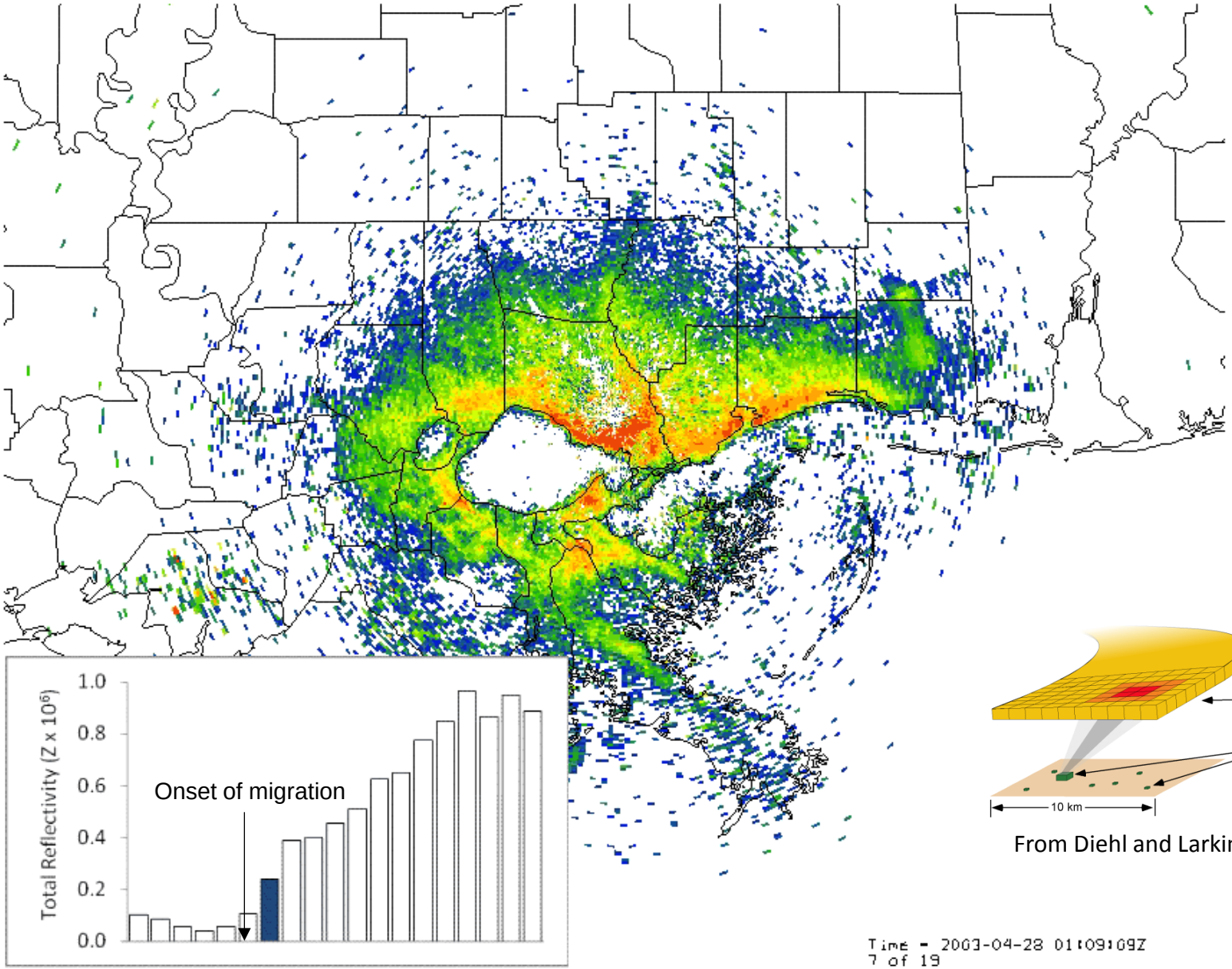
Weather Surveillance Radar – 1988 Doppler

(a.k.a. NEXRAD)



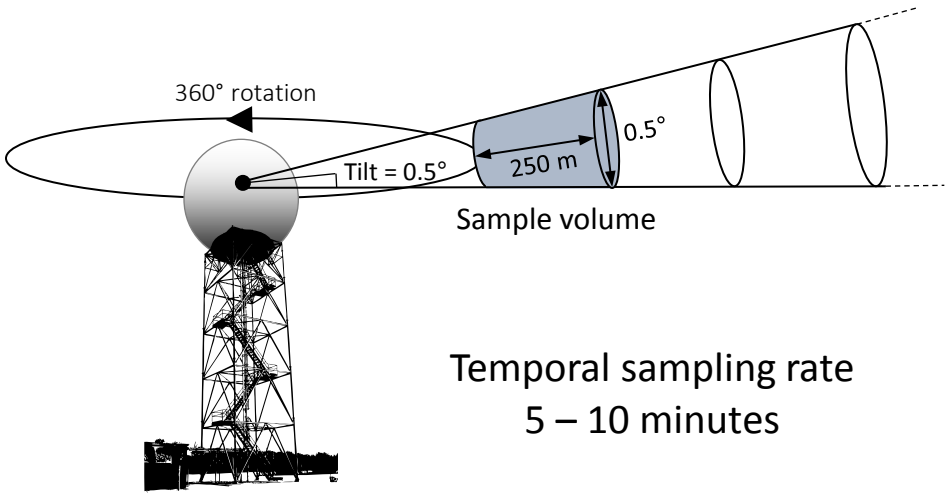


Initiation of nocturnal migration



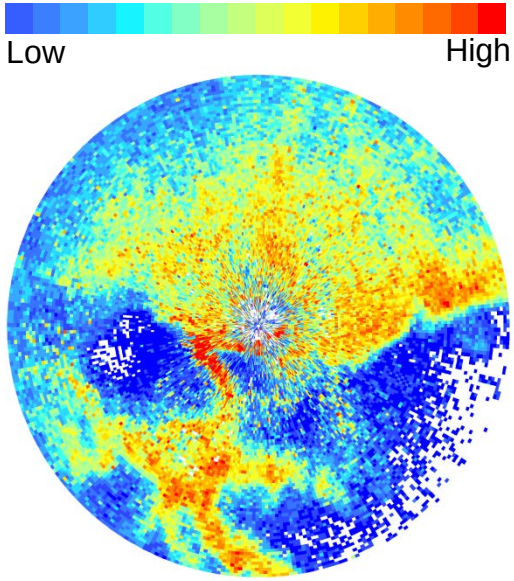
From Diehl and Larkin 2005

WSR-88D operation and data products

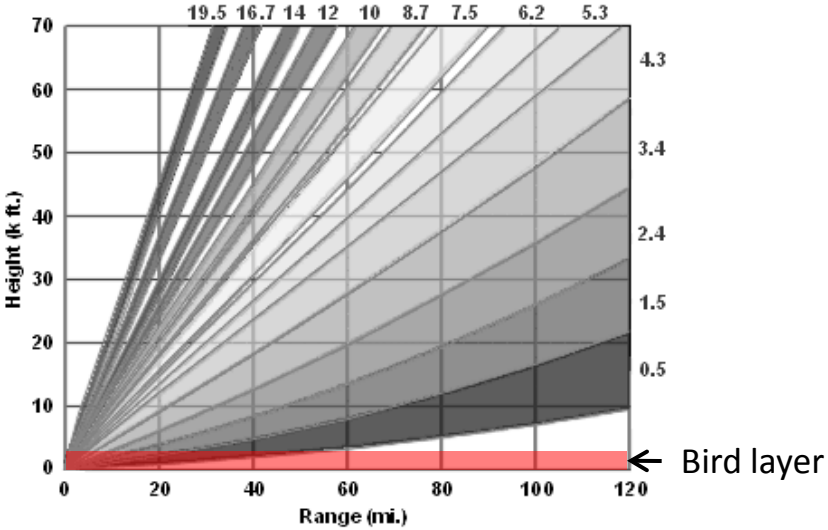


Temporal sampling rate
5 – 10 minutes

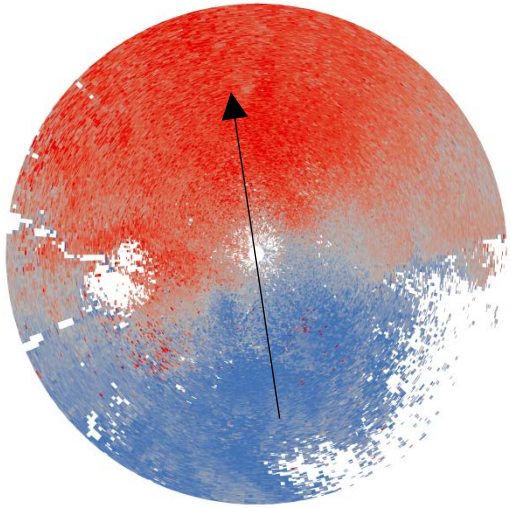
Reflectivity (Z or cm^2/km^3)
(relative bird density)



Volume scan



Radial Velocity (m/s)

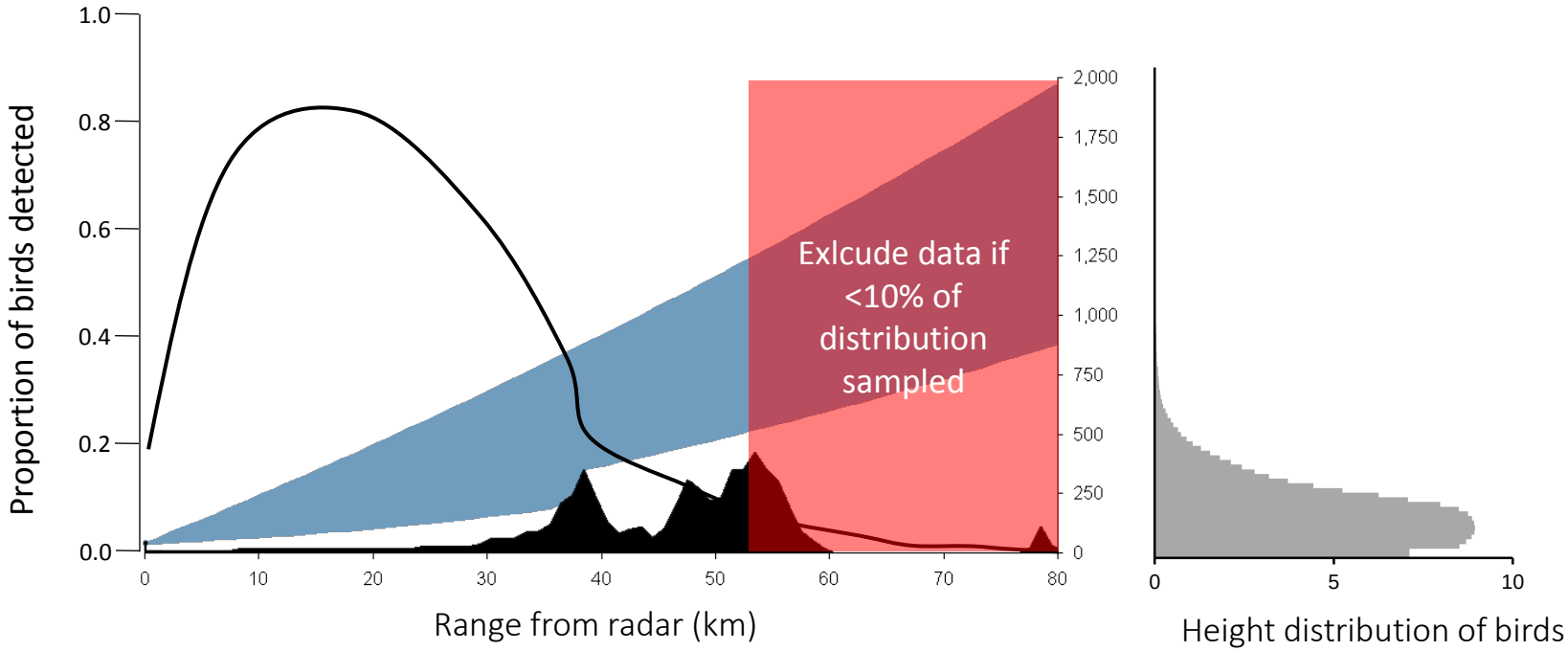


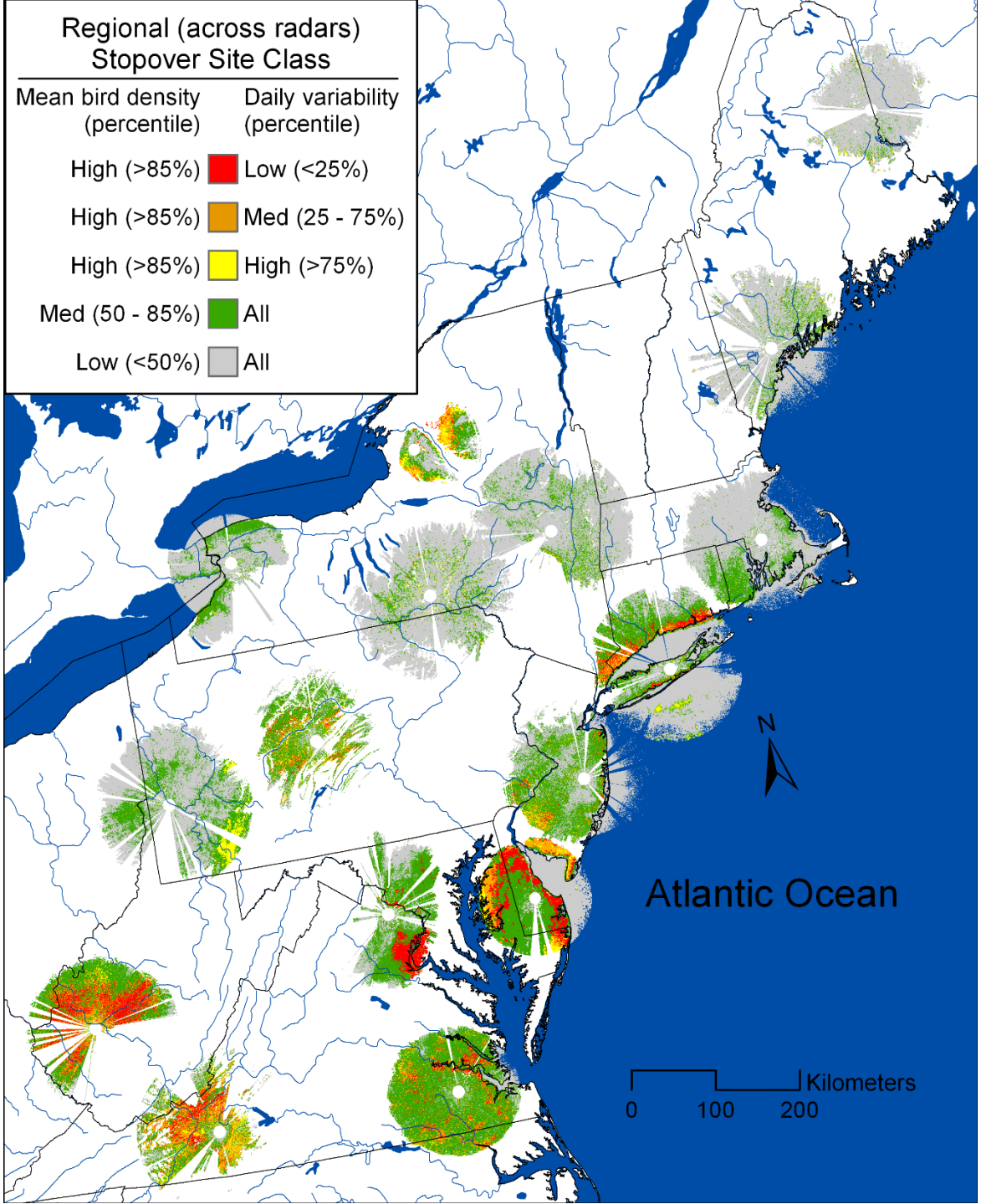
Adjustment for range bias

Buler & Diehl. 2009. *IEEE Trans. Geosci. Remote Sens*.

1 – Beam propagation (Where is the beam?)

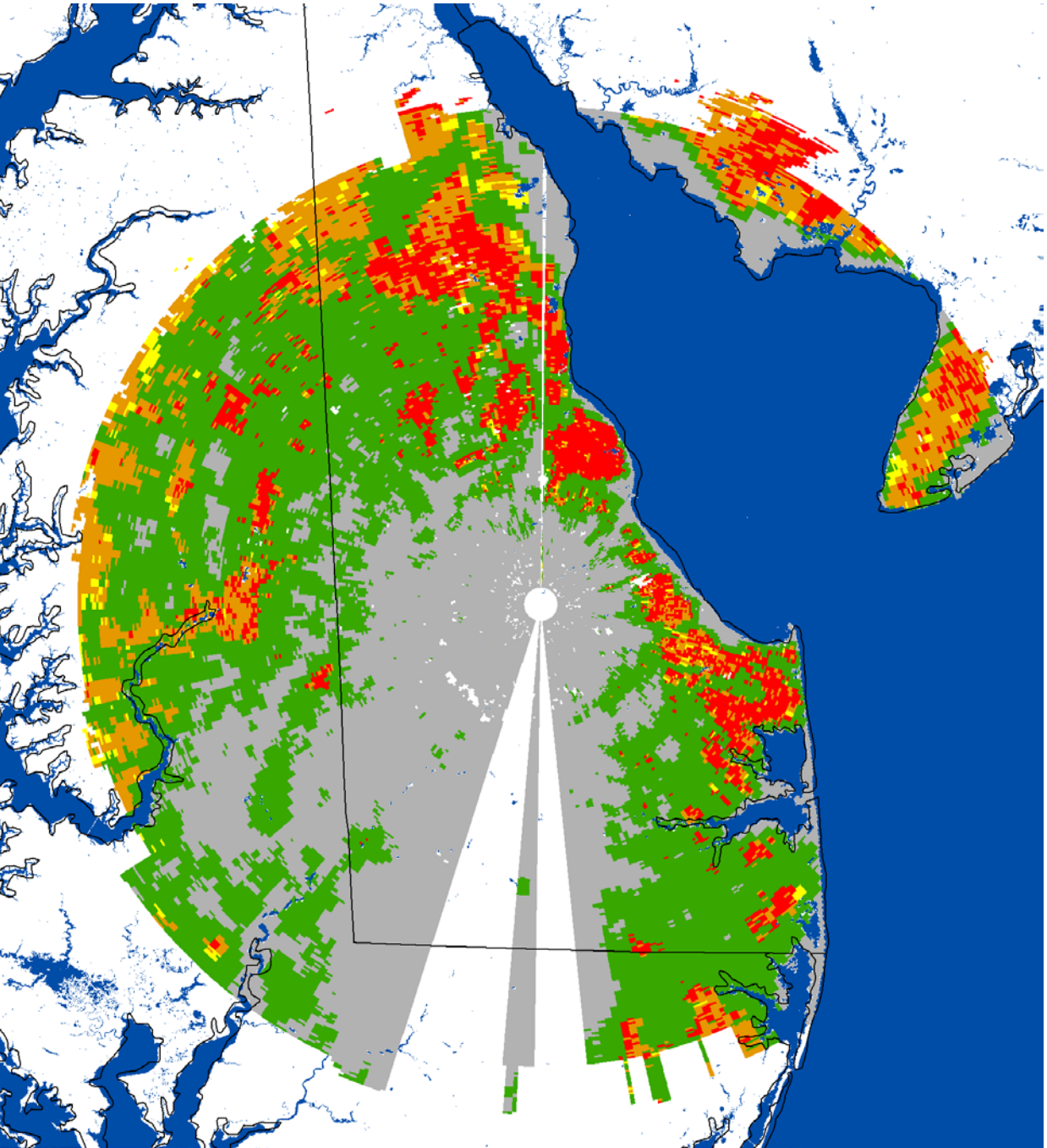
2 – Height distribution of birds (Where are the birds?)





Autumn
(2008 & 2009)

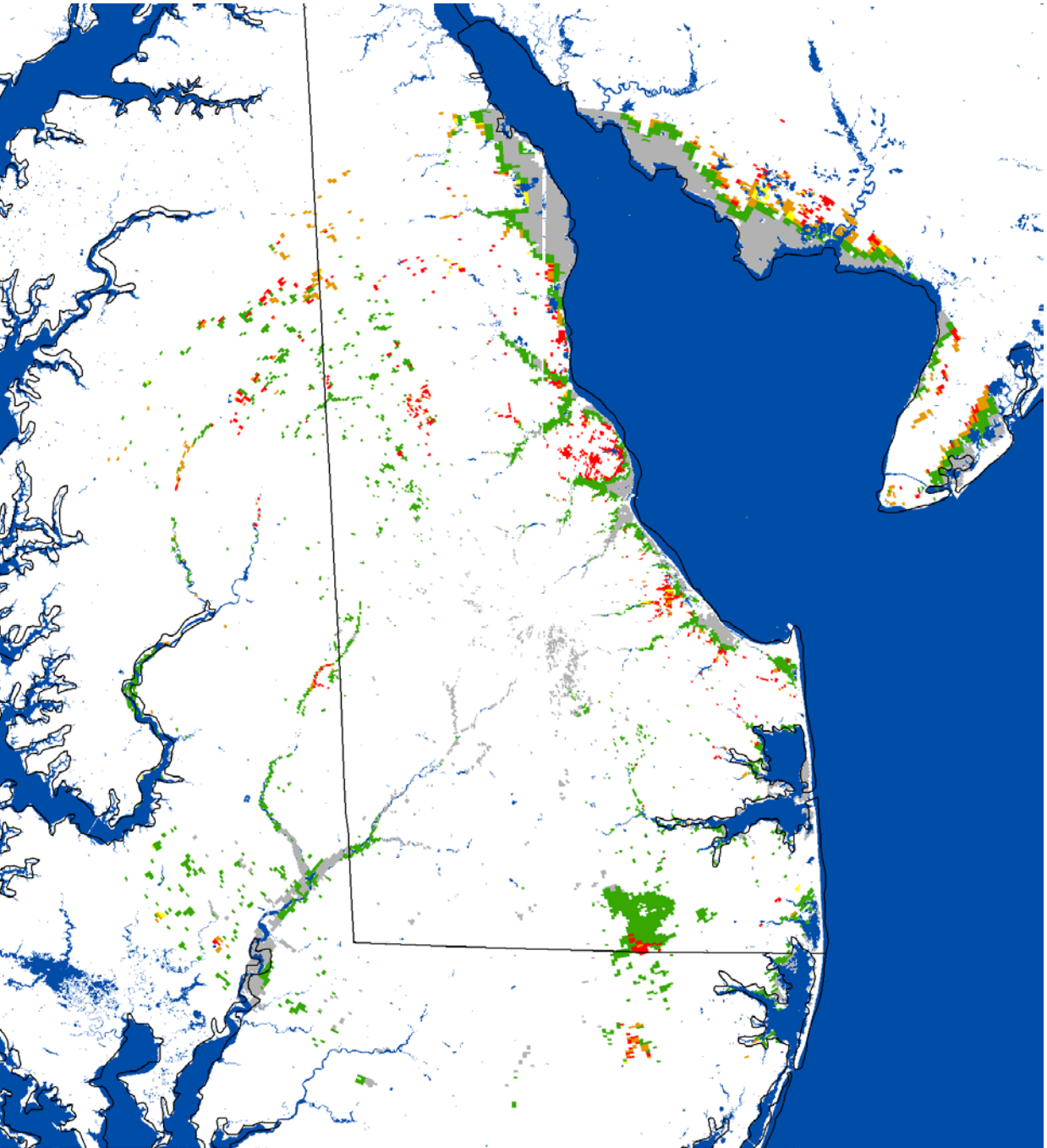
Buler & Dawson (2014)



Pooled Autumns 2008 – 2014 (*n* = 91 days)

Stopover Site Class

Mean bird density (percentile)	Daily variability (percentile)
High (>85%)	Low (<25%)
High (>85%)	Med (25-75%)
High (>85%)	High (>75%)
Med (50-85%)	All
Low (<50%)	All



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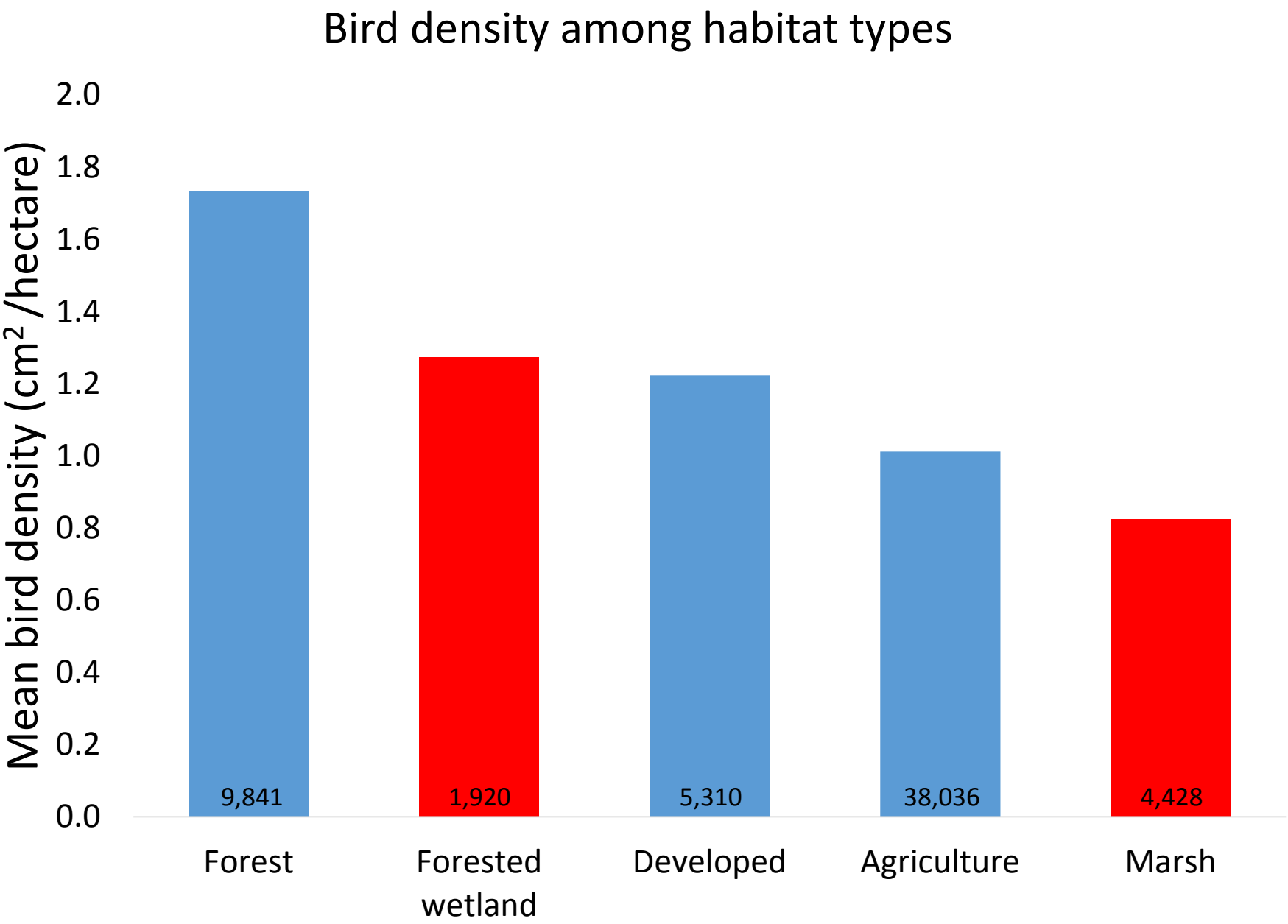
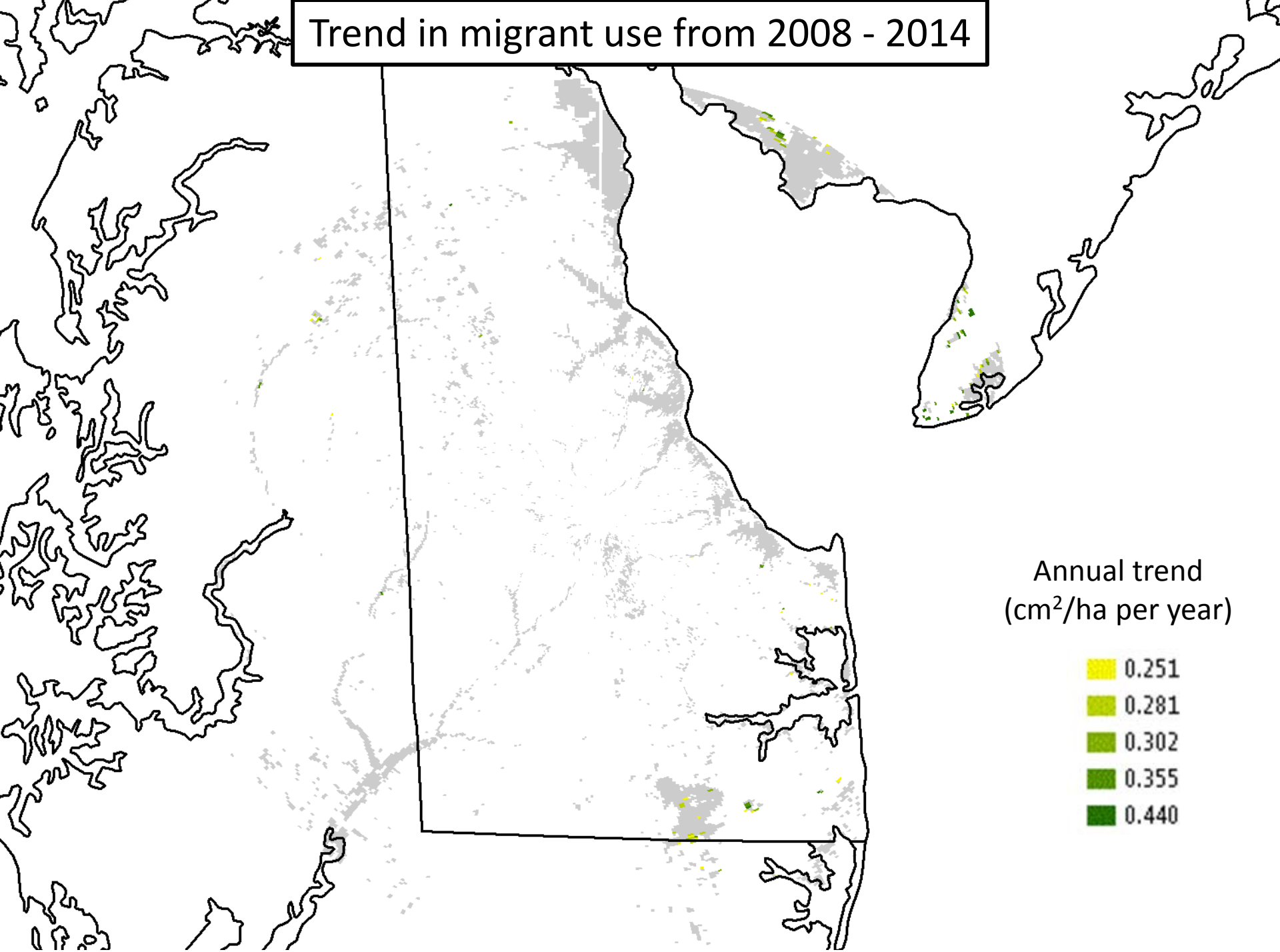
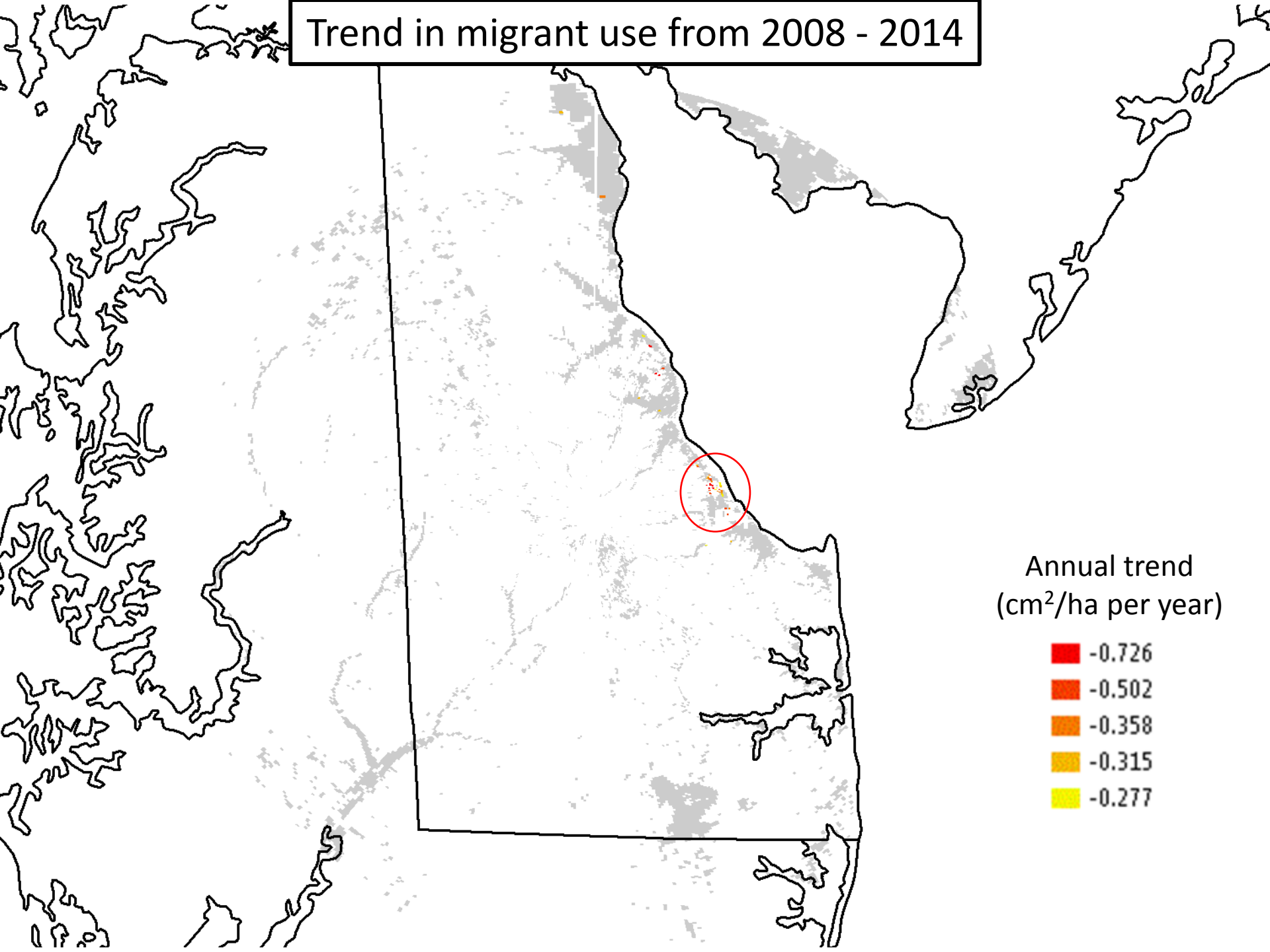

Bird density among habitat types
Mean bird density (cm2 /hectare)
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
9,841
1,920
5,310
38,036
4,428
Forest
Forested wetland
Developed
Agriculture
Marsh

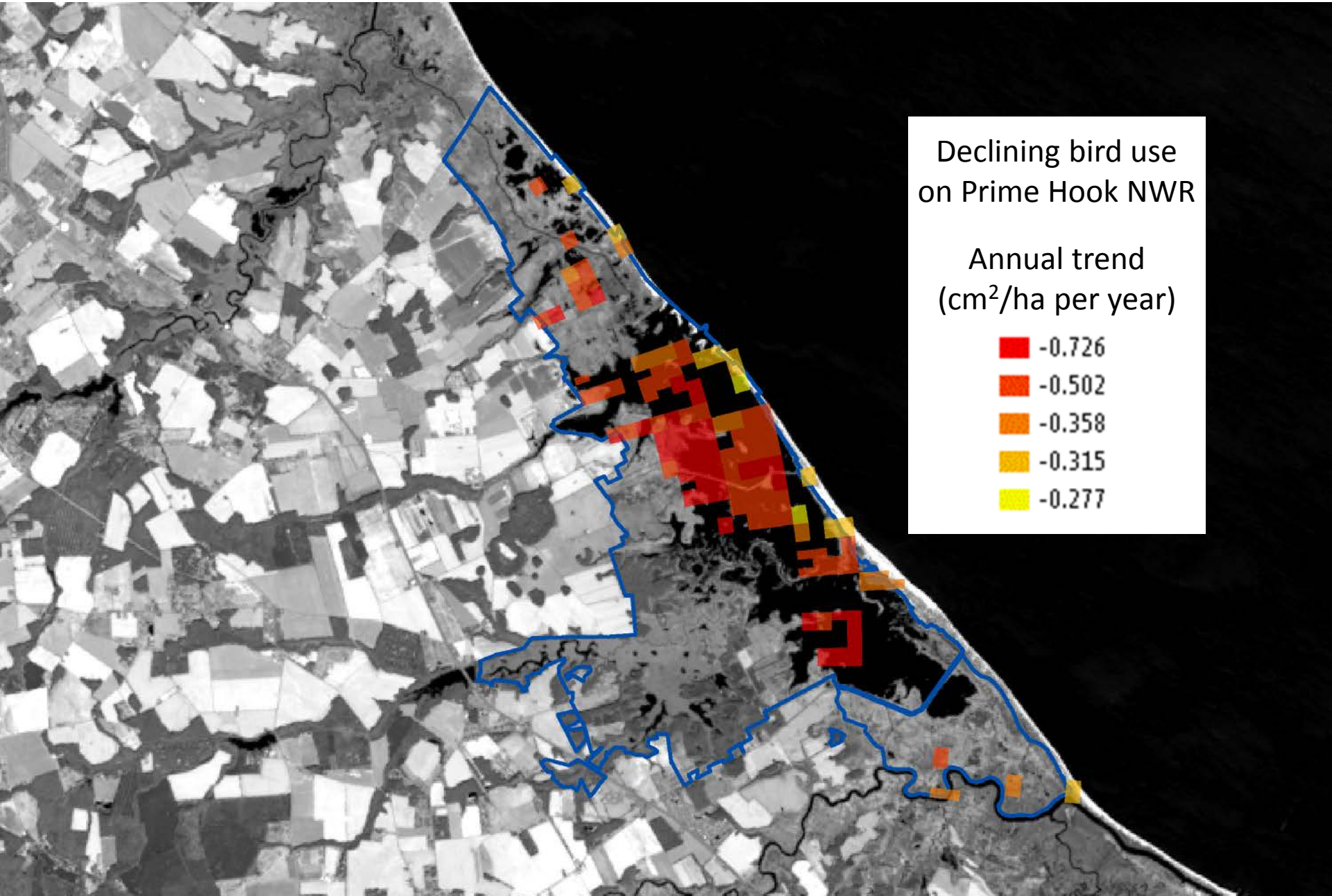
Trend in migrant use from 2008 - 2014



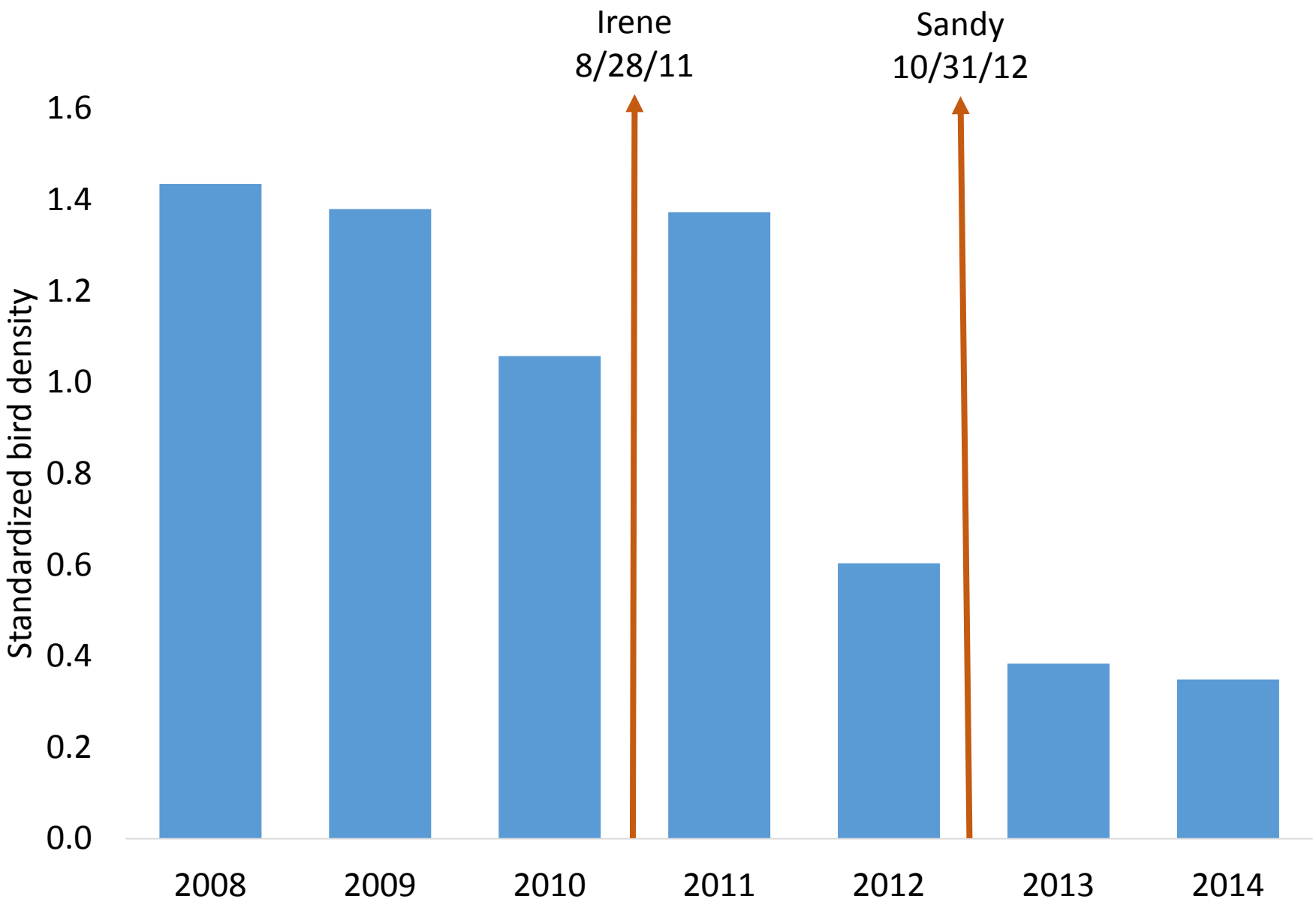
Trend in migrant use from 2008 - 2014



LANDSAT SWIR Band 2008 → 2012 → 2014



Areas of declining bird use at Prime Hook NWR



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PLoS one

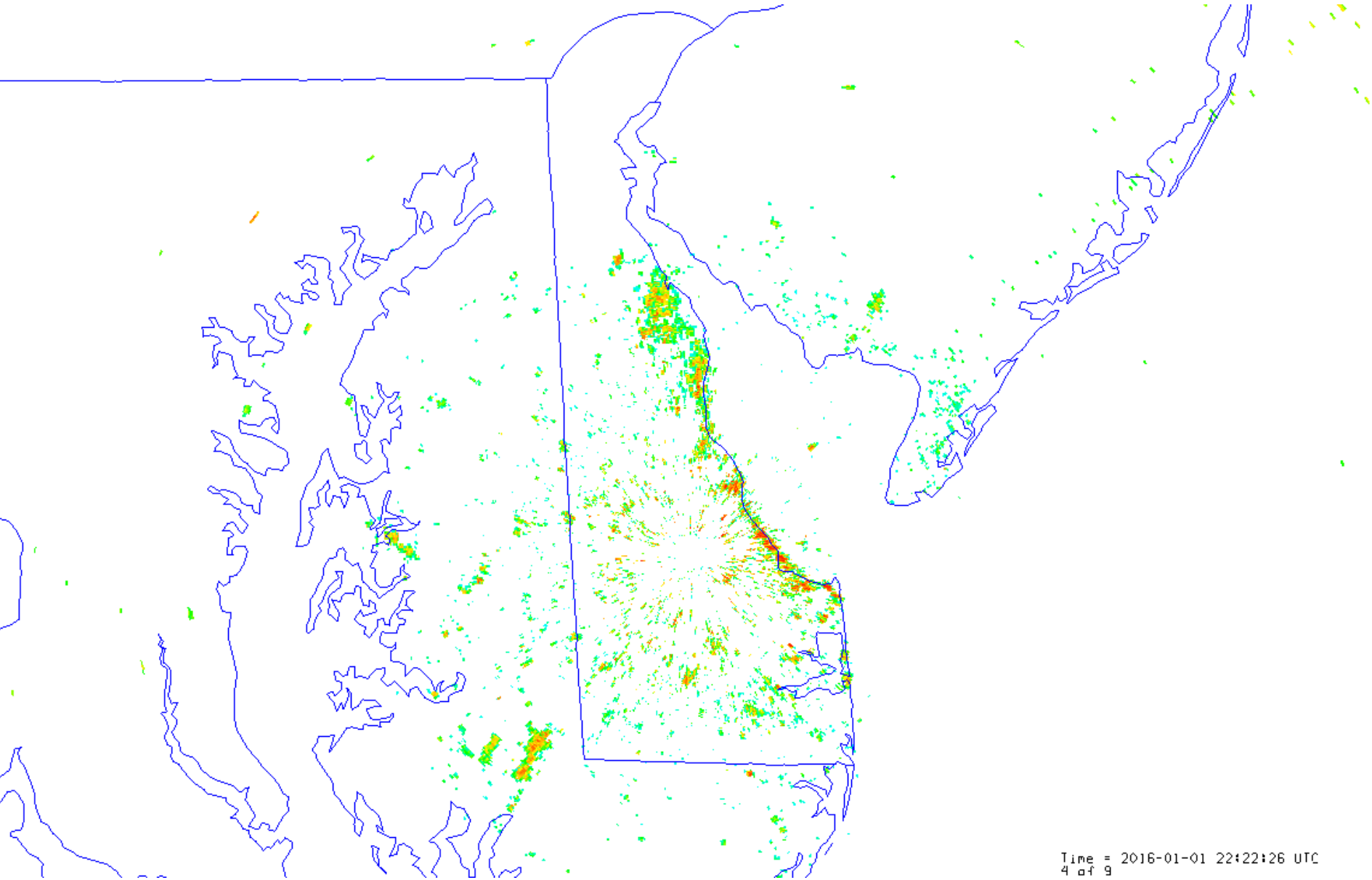
Mapping Wintering Waterfowl Distributions Using Weather Surveillance Radar

Jeffrey J. Buler[1]*, Lori A. Randall[2], Joseph P. Fleskes[3], Wylie C. Barrow Jr.[2], Tianna Bogart[4], Daria Kluver[4¤]

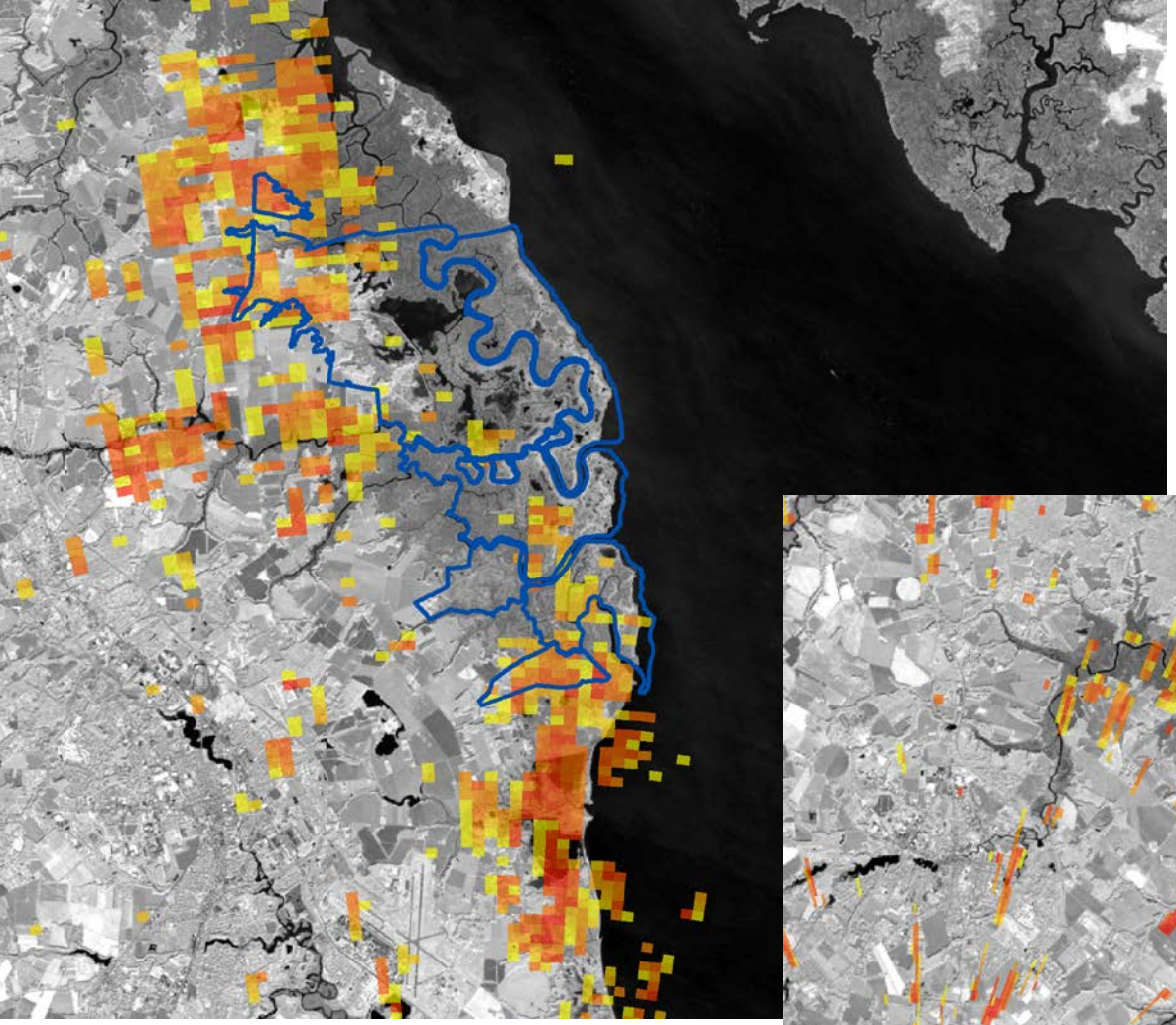
1 Department of Entomology and Wildlife Ecology, University of Delaware, Newark, Delaware, United States of America, 2 National Wetlands Research Center, United States Geological Survey, Lafayette, Louisiana, United States of America, 3 Western Ecological Research Center, United States Geological Survey, Dixon, California, United States of America, 4 Department of Geography, University of Delaware, Newark, Delaware, United States of America

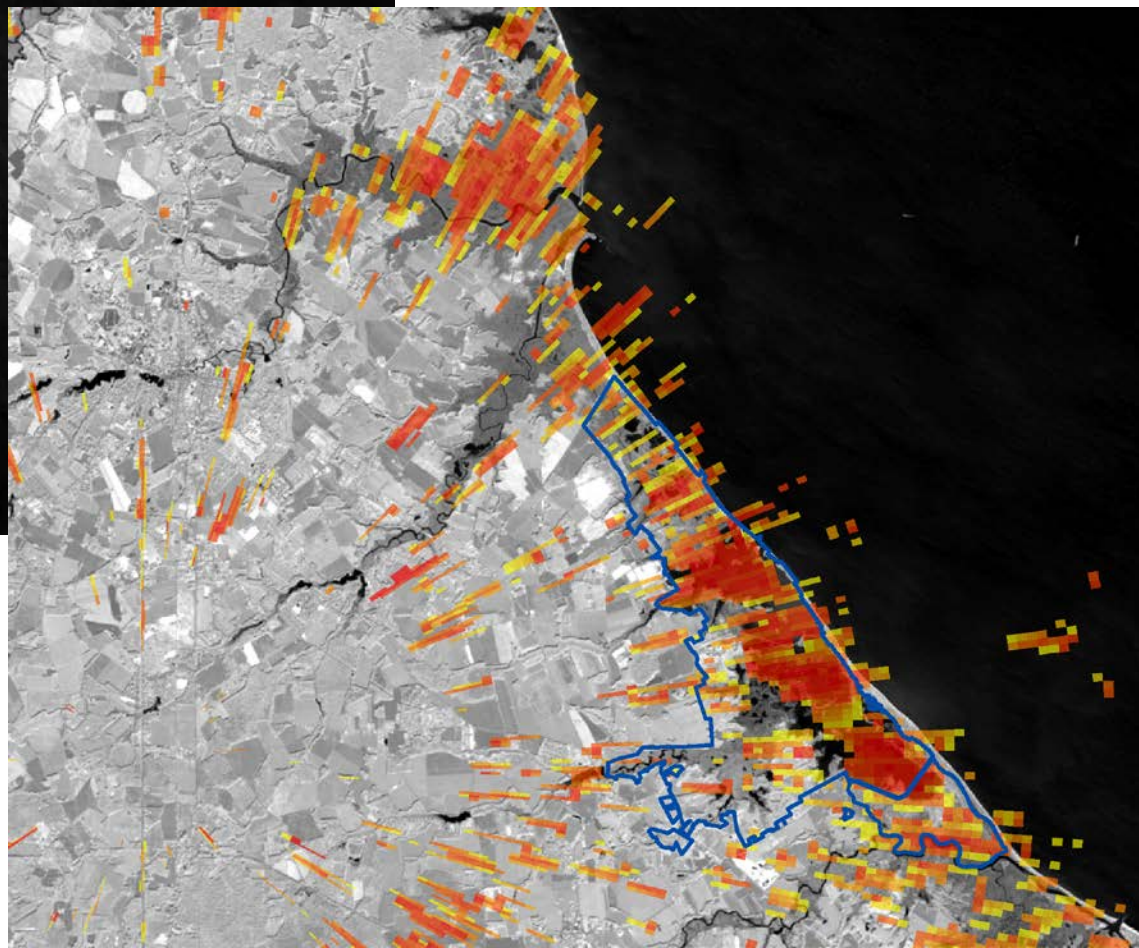
Photo: Michael Menefee

Wintering waterfowl feeding flight



“Raw” waterfowl exodus 1/1/2016



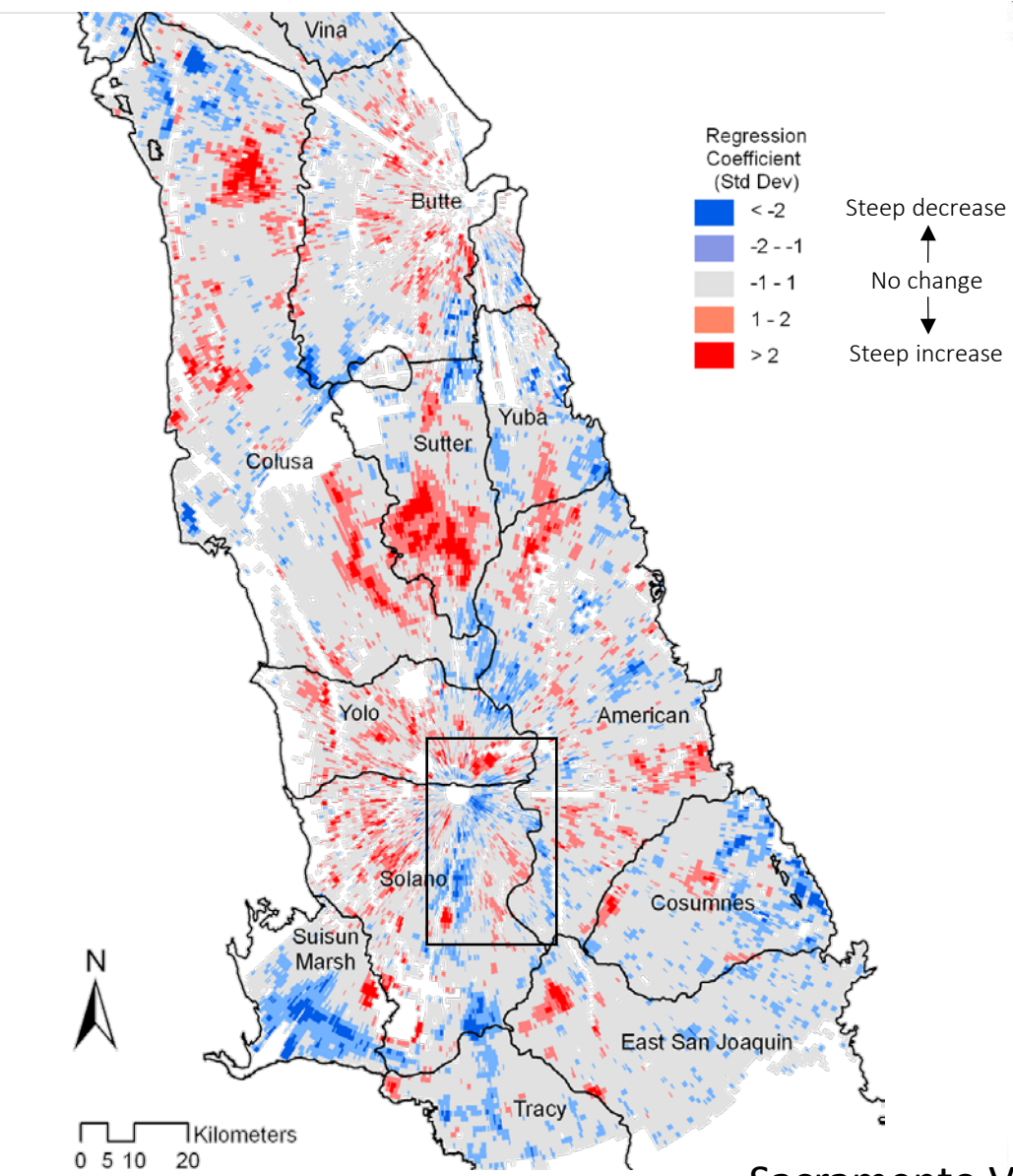


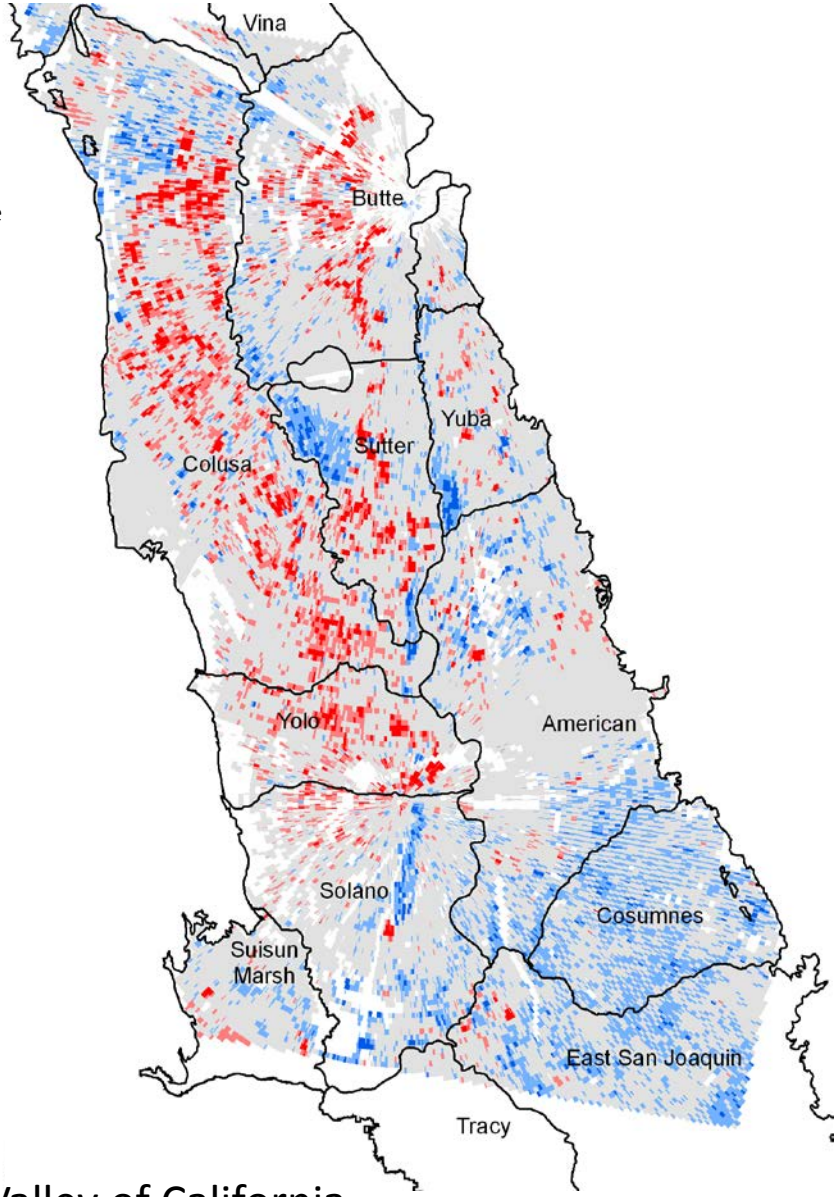
Reflectivity (dbZ)

- 4.50 - 6.49
- 6.50 - 7.88
- 7.89 - 8.85
- 8.86 - 10.25
- 10.26 - 12.24
- 12.25 - 15.09
- 15.10 - 19.19
- 19.20 - 25.05
- 25.06 - 33.46
- 33.47 - 45.50

Change in bird density over 13 year period (1995 – 2007)

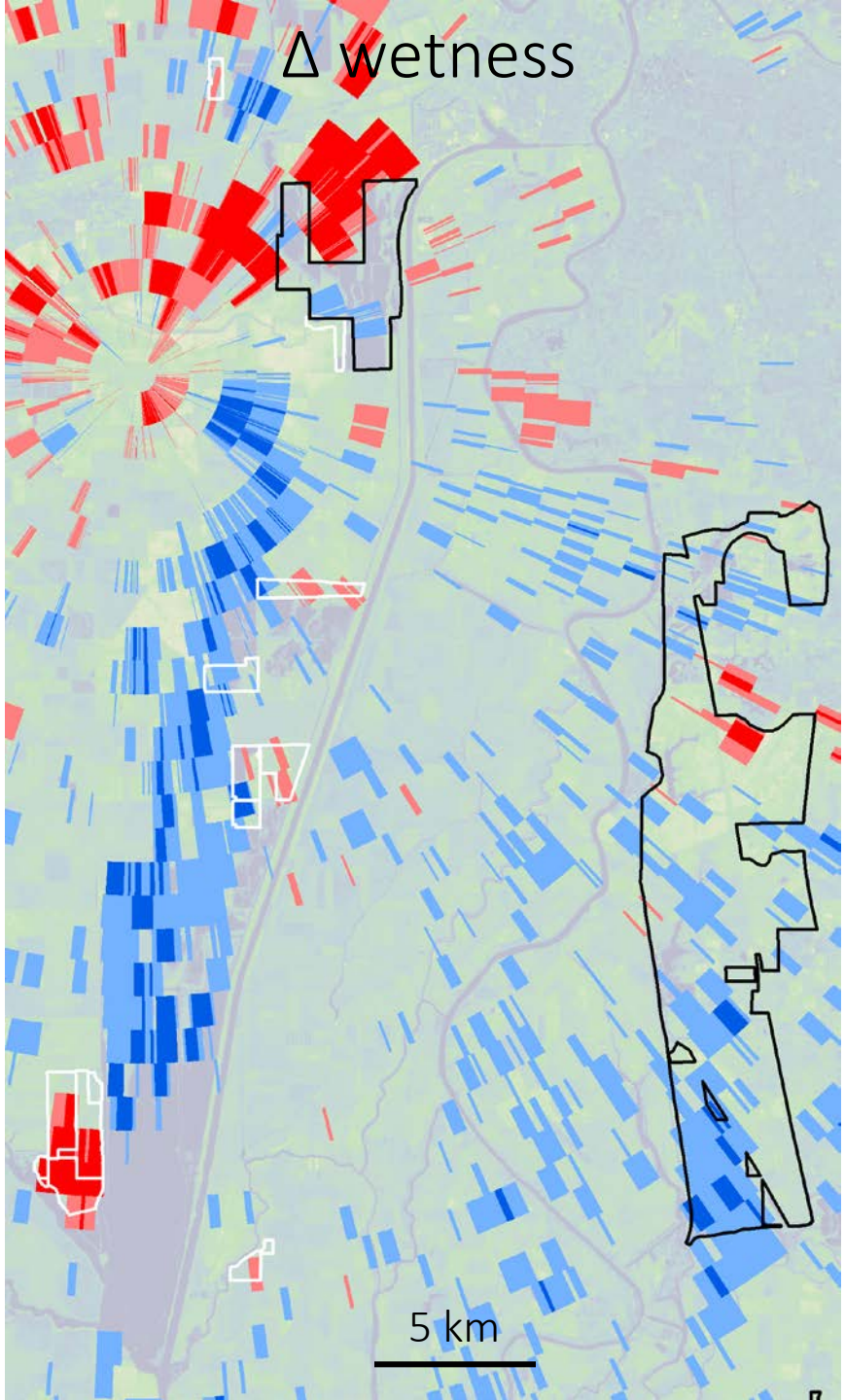
Change in wetness index over years

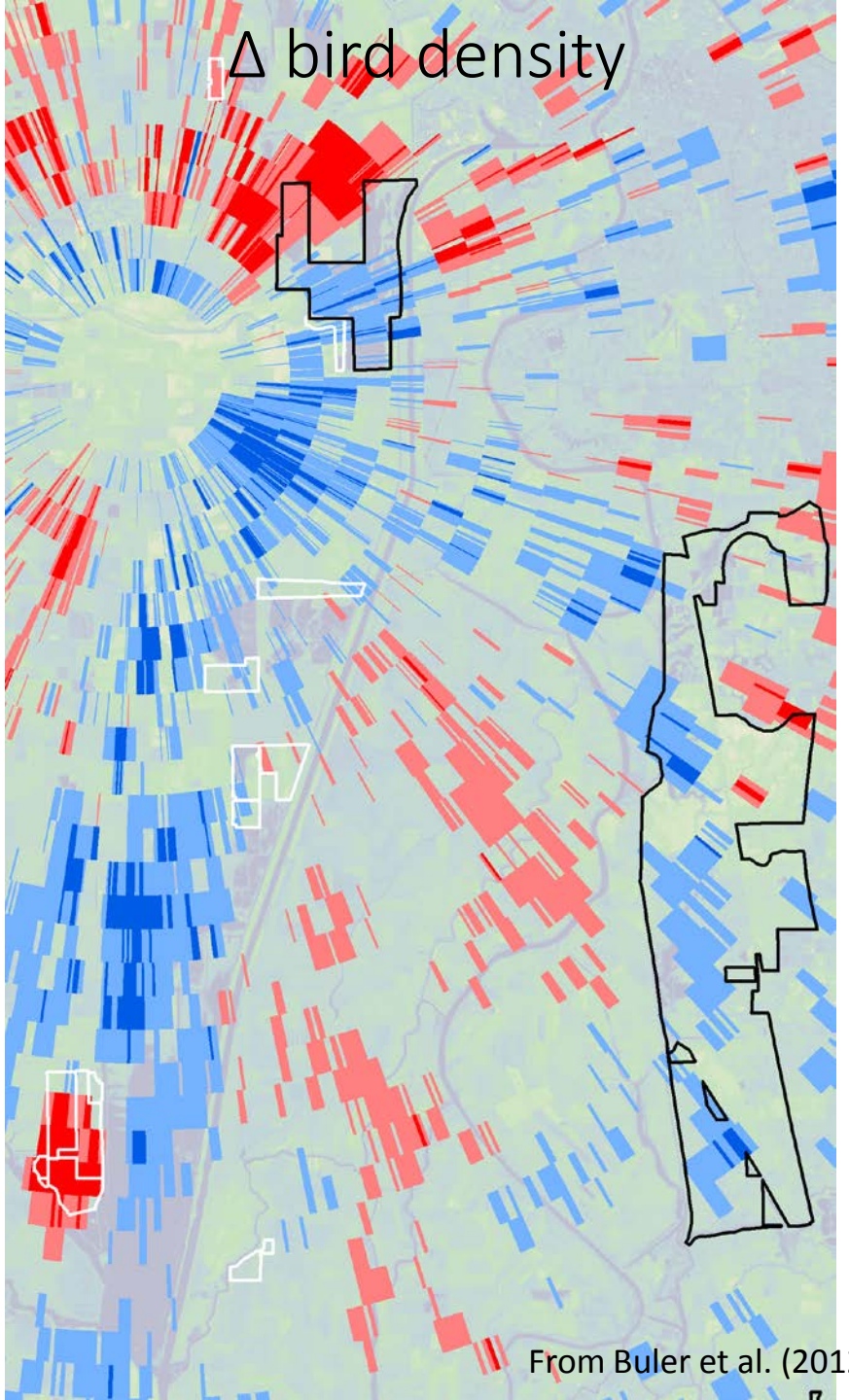




Sacramento Valley of California

From Buler et al. (2012)





From Buler et al. (2012)

Acknowledgements

- Barry Truitt, The Nature Conservancy

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Janine Antalffy
Lauren Cruz
Laura Young

Virginia Coastal Zone Management Program

State of Maryland Department of Natural Resources

U.S. Fish & Wildlife Service Department of the Interior

Virginia Department of Game & Inland Fisheries

The Nature Conservancy