

Wind Energy and Wildlife

MWWG May 30, 2007



Wind and Wildlife

- What's happening with birds?
- Threats to birds – habitat loss, climate change & fossil fuel use
- Mass Audubon's involvement
- Wind and Wildlife – research needs and challenges

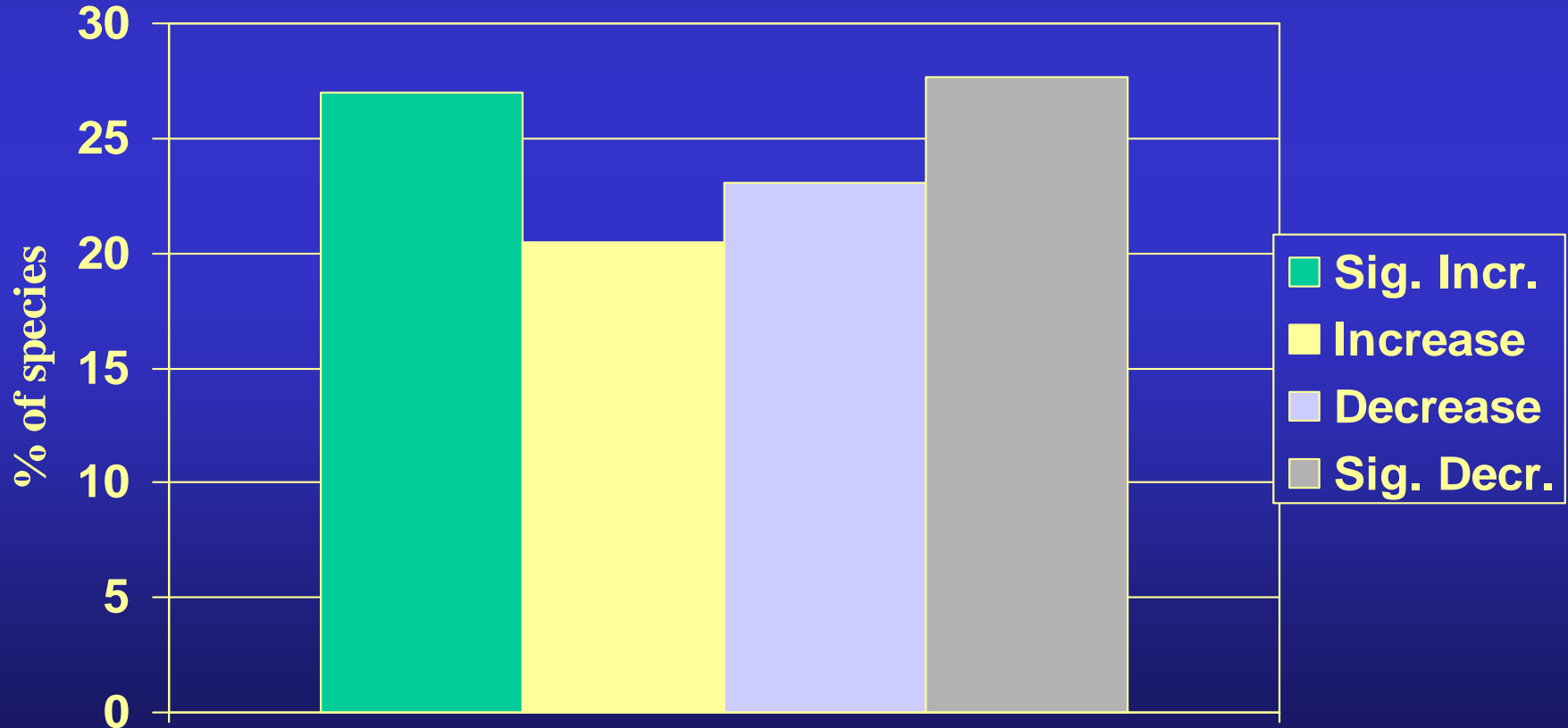
Birds Are Declining

(NAS State of the Birds 2004)



Population trends of U.S. breeding species

Data are from the 415 native species
with adequate BBS sample sizes for analysis



From: Greg Butcher, National Audubon, State of the Birds USA presentation 2004

Habitat Loss and Fragmentation

“Thirty-one acres of forest per day”
(MAS, Losing Ground 2004)



“Seventy-eight acres per day when hidden impact is considered”

What Can Happen in 50 Years?

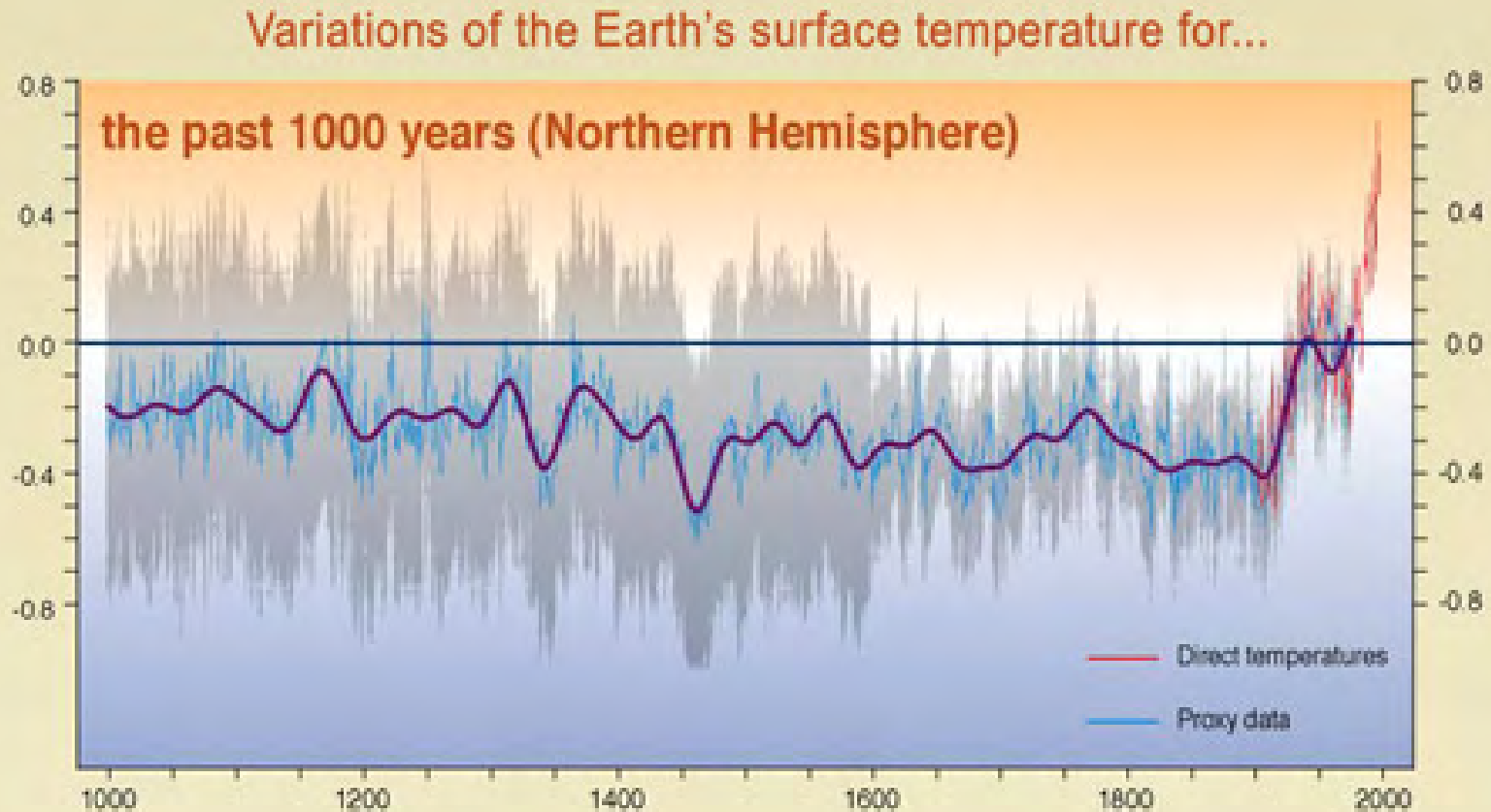


1943



1996

Rapid Climate Warming



IPCC3 Third Assessment Report



Warming is already occurring!

- Atmospheric CO₂ levels are the highest in 600,000 years
- 1° F rise in temperature in MA since 1900.
- Sea level has risen about 0.2 m since 1900.
- Arctic ice is thinning by about 15% per decade
- Glaciers melting all over the world.
- Changes in the ranges of birds and other biota

Over the next 100 years in MA

- 3-6°C (6-10°F) rise in temperature
- Boston's climate will resemble Richmond or Atlanta's
- Slight increase in precipitation
- Sea level will rise 50 cm (range of 13-94 cm)
- Storms will be more intense
- Unknowns - possible shifts in ocean currents or collapse of ice sheets causing much more radical changes.

Bird Atlas Gateway

Welcome

[Breeding Bird Atlas 1](#)

[Breeding Bird Atlas 2](#)

[Donations](#)

[Birds & Beyond](#)

[Mass Audubon Home](#)

Mass Audubon's Bird Atlas Gateway





Breeding Bird Atlas projects enlist the skills and enthusiasm of hundreds of volunteers to record changes in breeding bird populations for the purpose of conserving our native birdlife. In 1974 Mass Audubon organized [Breeding Bird Atlas 1](#), the first attempt in North America to systematically map the status of breeding birds on a statewide scale. We invite you to view the [results](#) of this pioneering effort – including distribution maps and full species accounts with color illustrations of all of the birds that nested in Massachusetts at that time.



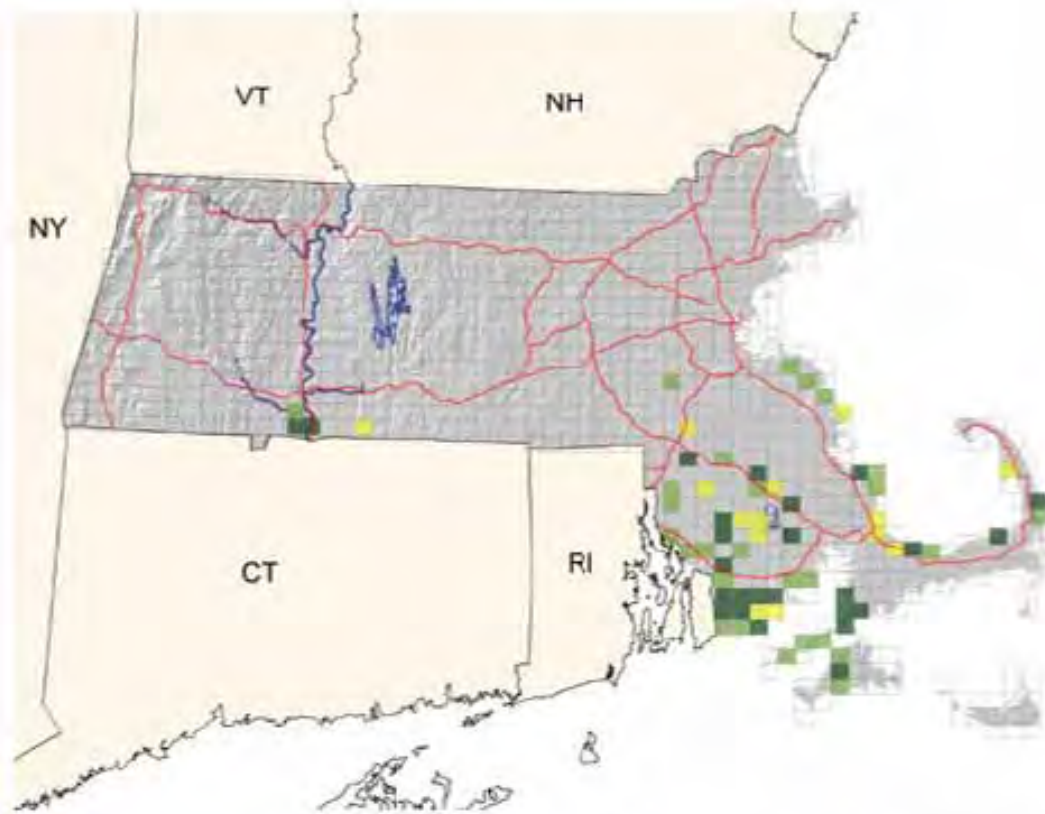
Jim Feinton

Since this first effort, Breeding Bird Atlas projects have been completed in every state east of the Mississippi, in many western states and Canadian provinces, and in other countries around the world. To be effective conservation tools, atlases need to be repeated after appropriate intervals in order to discover how bird populations may have changed. More than 25 years have now passed since the data for [Atlas 1](#) were collected and it is now time to tackle [Atlas 2](#).

In April 2007, we start fieldwork for Atlas 2 and [we need your help for this ambitious undertaking](#). Breeding Bird Atlas fieldwork is completed by volunteers – people who have a passion for birds and birding, people who want to sharpen their skills and enrich their lives by learning about natural history – people like you! With your help, the results of Atlas 2 will become the scientific basis for bird conservation in the Commonwealth,

| Legend | Carolina Wren | # Blocks | Blocks |
|---|----------------------|----------|--------|
|  | Not Found | 903 | 93.2% |
|  | Possible | 14 | 1.4% |
|  | Probable | 27 | 2.8% |
|  | Confirmed | 25 | 2.6% |
| | Total # Blocks Found | 66 | 6.8% |

Carolina Wren Atlas 1 1974-1979



Note: fairly common in thickets of southeastern Massachusetts; steadily increasing in

Fossil Fuel Production Also Causes Habitat Loss



Wyoming's Green River Valley SkyTruth/Ecoflight

Powder River Basin, Wyoming

Pre Coal Bed Methane Development

1996



Powder River Basin, Wyoming

2001 Coal Bed Methane Development

2001



Mountain Top Mining – West Virginia



Vivian Stockman, May 30, 2003



Whitesville, WV

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Maps

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BCA Cerulean Warbler Appeal

- Alliance members have chosen the Cerulean Warbler as the flag ship species for the 2007 BCA International Project, *Saving the Cerulean Warbler*.
- 80% decline since 1963



2003 Buzzard's Bay Oil Spill





Mass Audubon Premises

- Climate change is a major threat
- All energy use has an impact
- Increase energy conservation and energy efficiency – reduce fossil fuel use
- Increase use of renewable energy including wind
- Site wind projects to minimize environmental impact
- Aesthetics not a consideration

Mass Audubon Actions

Energy and Climate Change

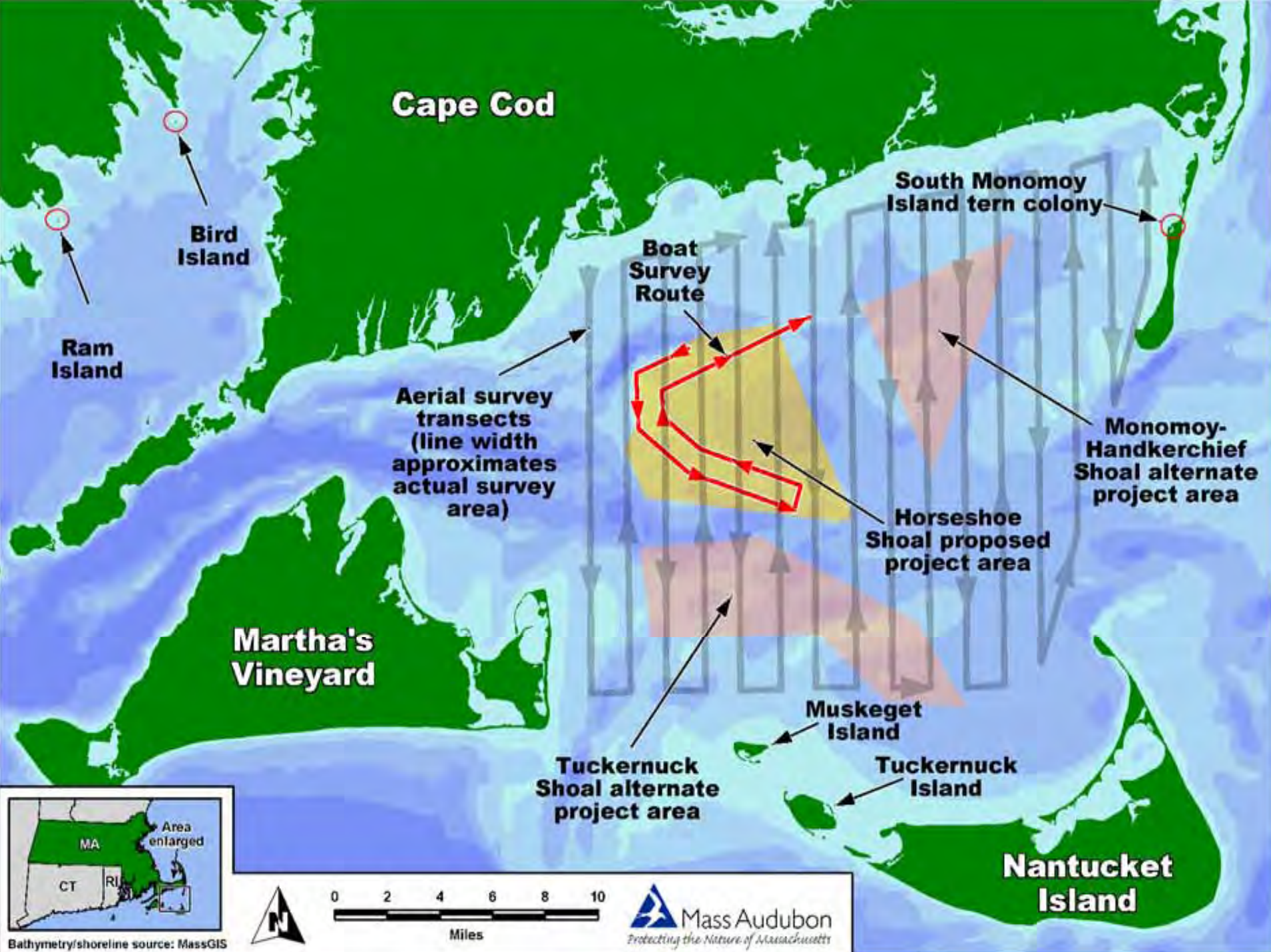
- Green Buildings (Joppa, BNC, Wellfleet)
- Energy Audits (compact inflorescents, new refrigerators, insulation, windows)
- PV Arrays (Joppa, BNC, Wellfleet, Broadmoor, Ipswich River)
- Wind (Wellfleet feasibility study)
- CO₂ production down substantially in 3 years!
- www.massaudubon.org/cleanenergy

Mass Audubon and Wind Energy

- Project Review
 - TAG (Hoosac Project)
 - Cape Wind
 - Wellfleet Wildlife Sanctuary (MAS)
- Policy
 - Wind Energy & Birds/Bats Workshop (2004)
 - Offshore Wind Energy Collaborative (OWEC)
 - New England Conservation Community
 - EOEA Wildlife Assessment Working Group

U. S. Offshore Wind Development











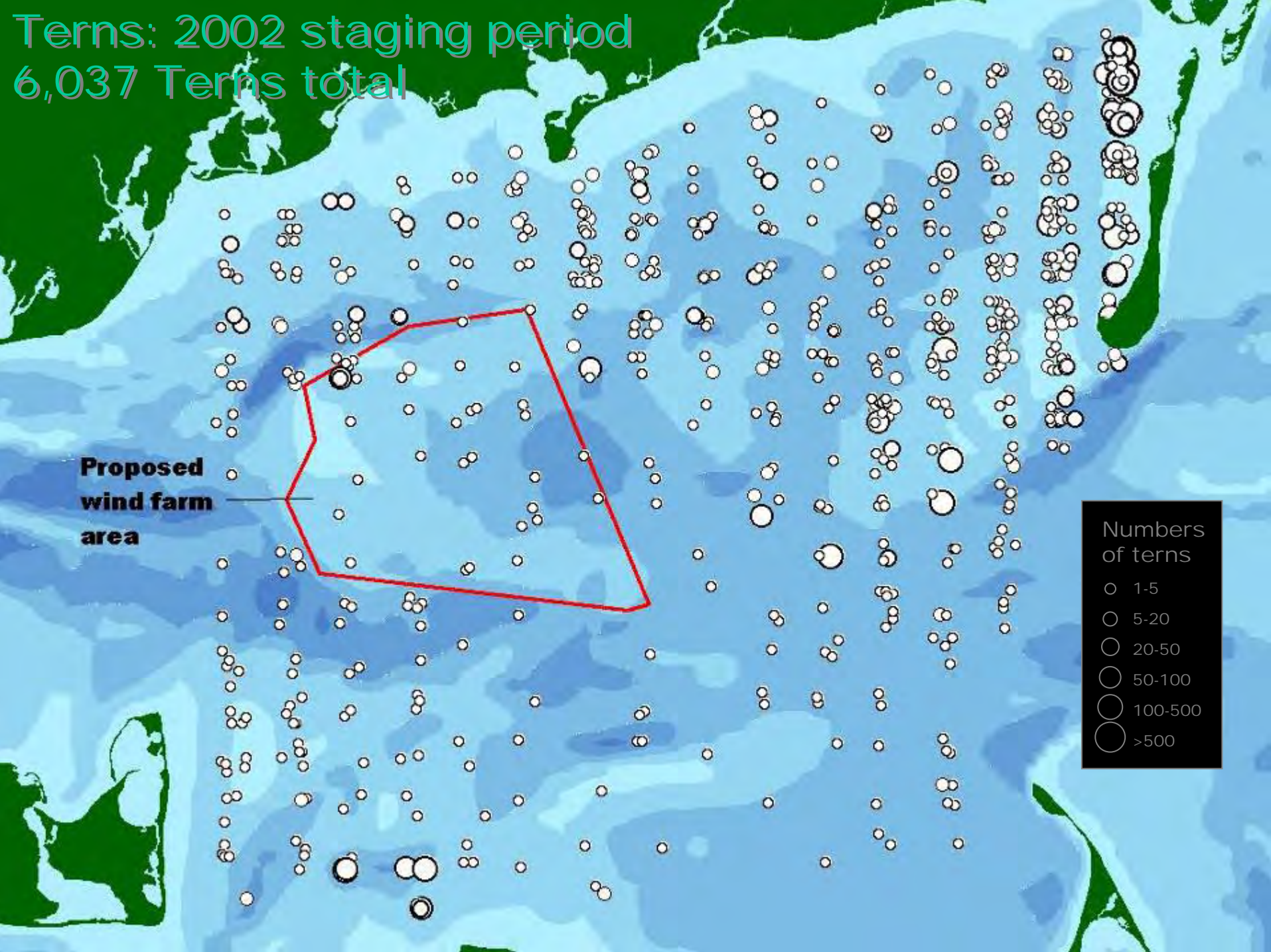






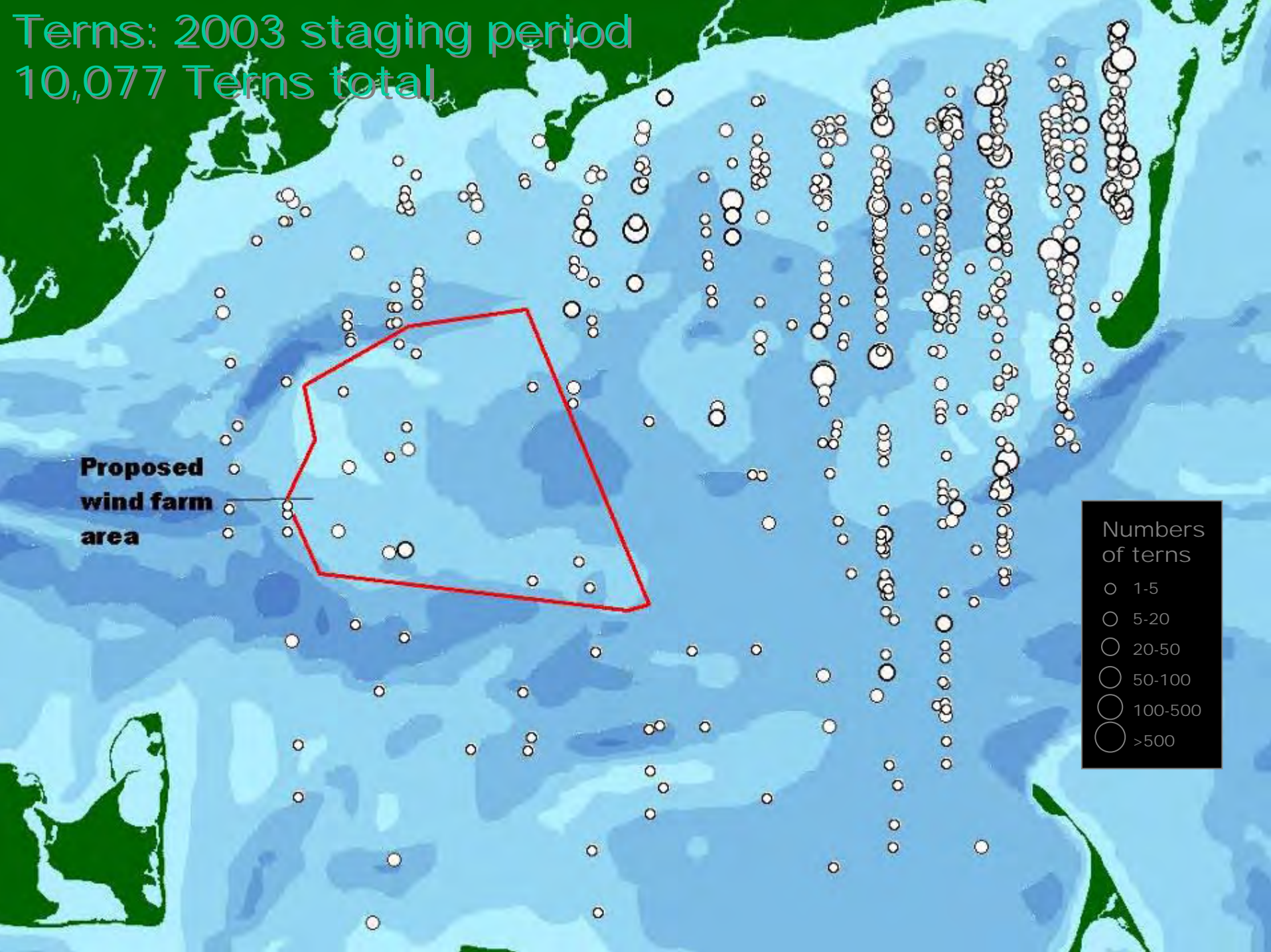
Terns: 2002 staging period

6,037 Terns total



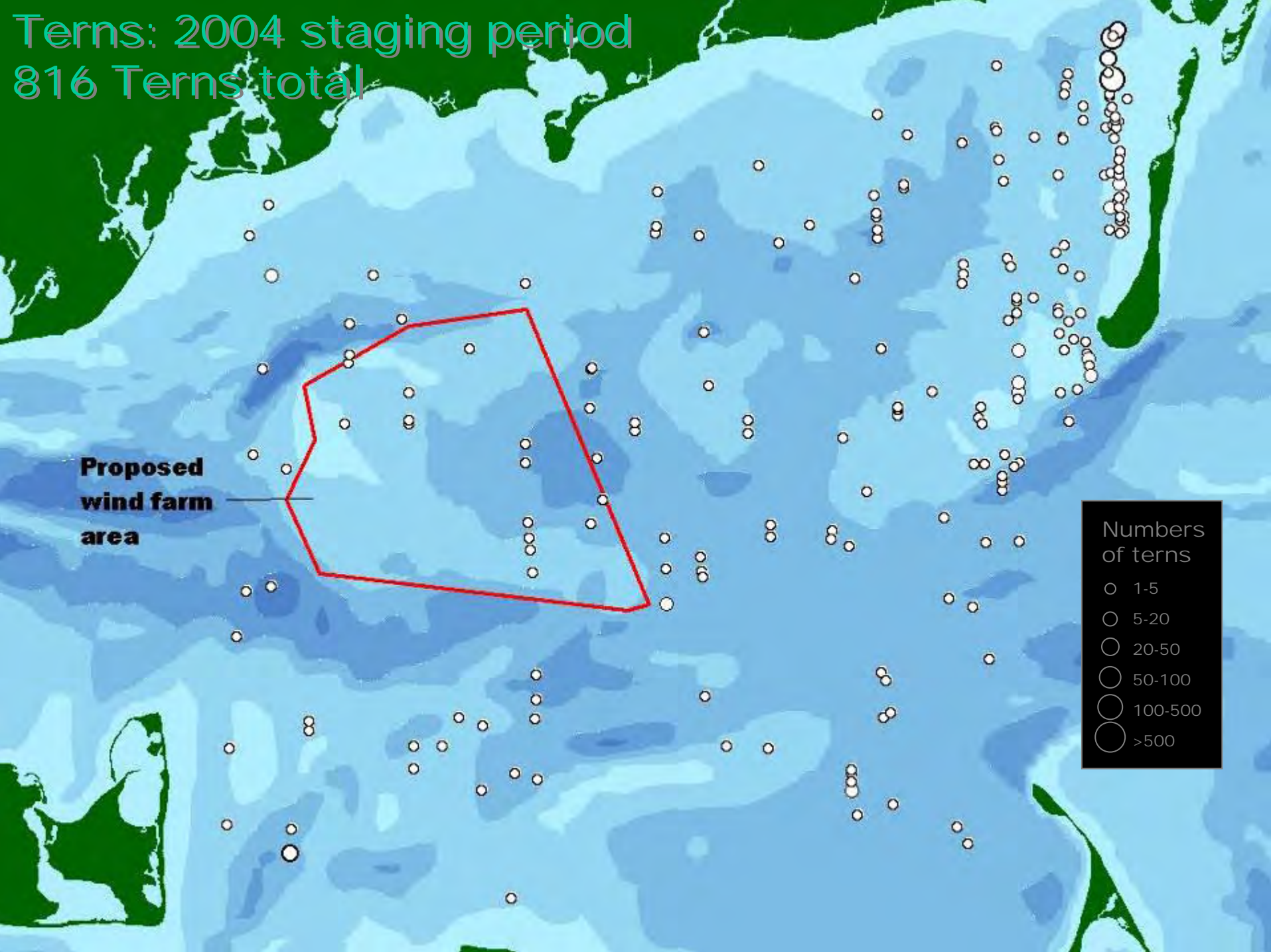
Terns: 2003 staging period

10,077 Terns total



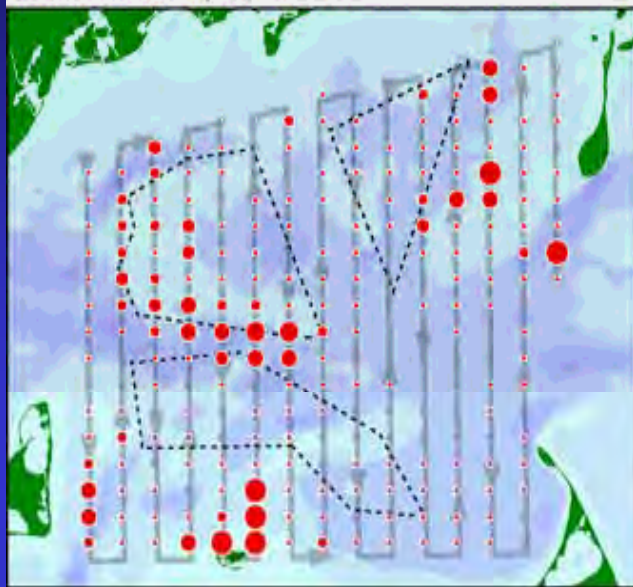
Terns: 2004 staging period

816 Terns total

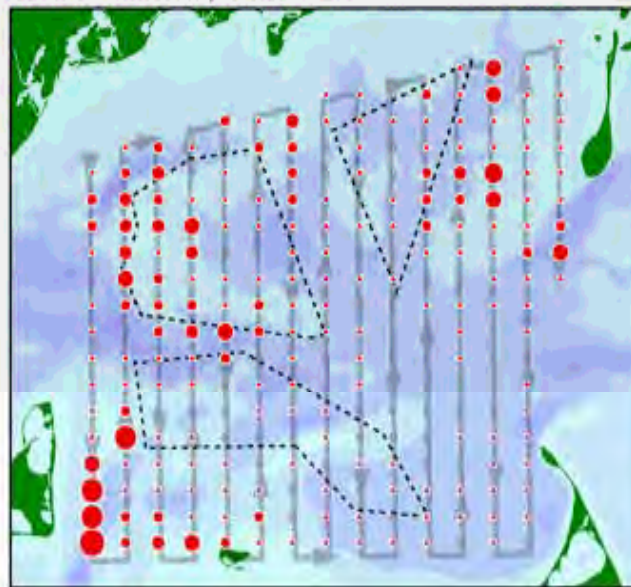


2004 vs 2005 Waterfowl Distribution

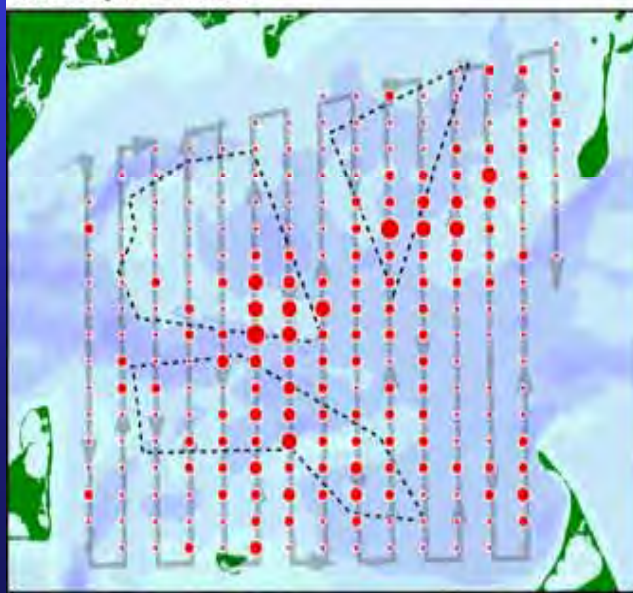
Common Eiders, 2003-2004



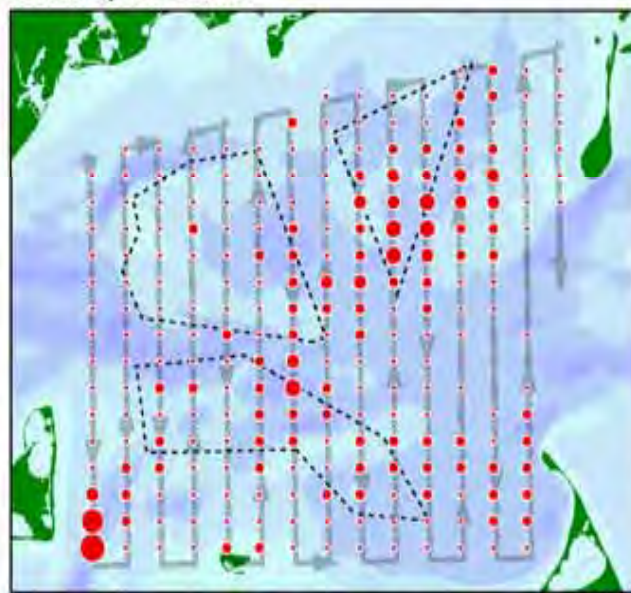
Common Eiders, 2004-2005



Scoters, 2003-2004



Scoters, 2004-2005



Legend

Average number of birds observed per mile surveyed

- 0
- >0 - 10
- >10 - 50
- >50 - 100
- >100 - 500
- >500 - 1,000
- >1,000 - 5,000
- over 5,000

□ Proposed wind project areas

→ Aerial survey route

Bathymetry

- less than 5 meters
- 5 to 10 meters
- 10 to 15 meters
- 15 to 20 meters
- 20 to 30 meters

Bathymetry/shoreline source: MassGIS and Town of Chatham



A Challenge Proposal Regarding The Cape Wind Energy Project



Spring 2006



Mass Audubon Challenge

- If Data Gaps Addressed &
- Adaptive Management Plan Adopted, then
- Mass Audubon will support Cape Wind

Data Gaps

1. Nighttime distribution & behavior of 100,000's of long-tailed ducks in & around Horseshoe Shoal
2. Movement of endangered terns & threatened plovers during the late summer to early fall migration
3. Abundance and distribution of migrating songbirds during fall migration
4. Finding no significant ecological threat, i.e., reduction in population size

Challenge (continued)

- Adaptive Management Plan – rigorous 3-year construction/post-construction monitoring
- Mitigation - for unavoidable and ecological significant environmental impacts
- Compensation for use of public lands and waters
- Procedures for decommissioning

Mass Audubon Avian Risk Assessment Protocol

- Limited to small (1-3 turbine) projects
- One to Two Day Rapid Ecological Assessment
- Transect Spot Mapping – three surveys per season
- Nocturnal Migration Surveys – based on audio and visual sightings
- Post-construction Carcass Searches – no minimum until question answered

A Model?

Denmark's Approach





Horns Rev Wind Park





Pre- and Post-Construction Environmental Assessment (5 years total)

Figure 12. Radar registrations of 508 waterbird flocks determined visually migrating at Rødsand during autumn 2003.

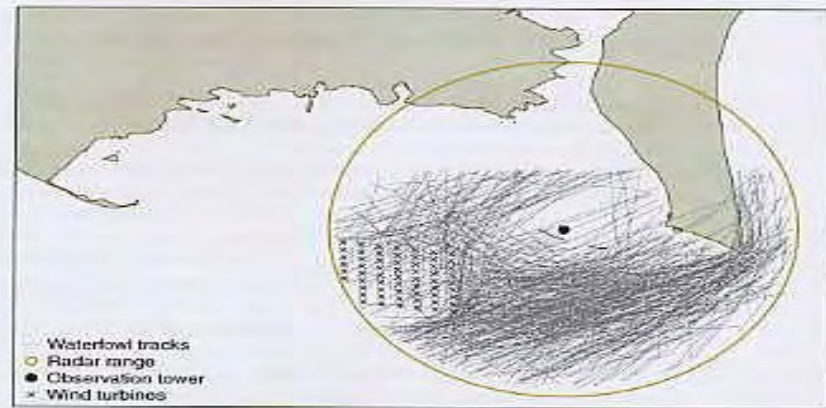


Figure 13. Radar registrations of 84 flocks of migrating eiders determined visually at Rødsand during autumn 2003.

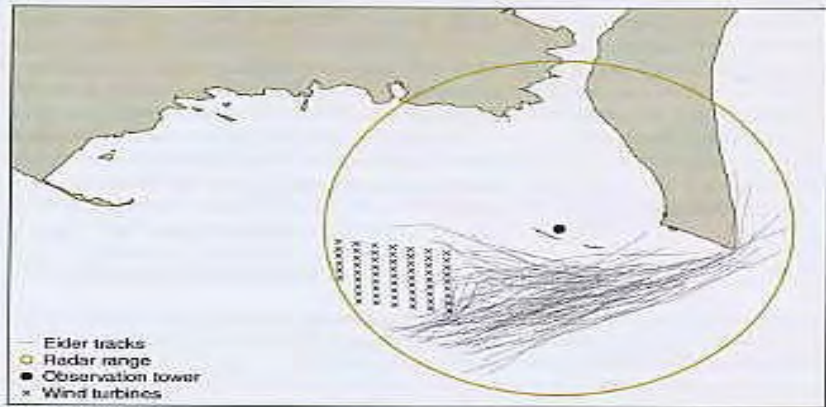
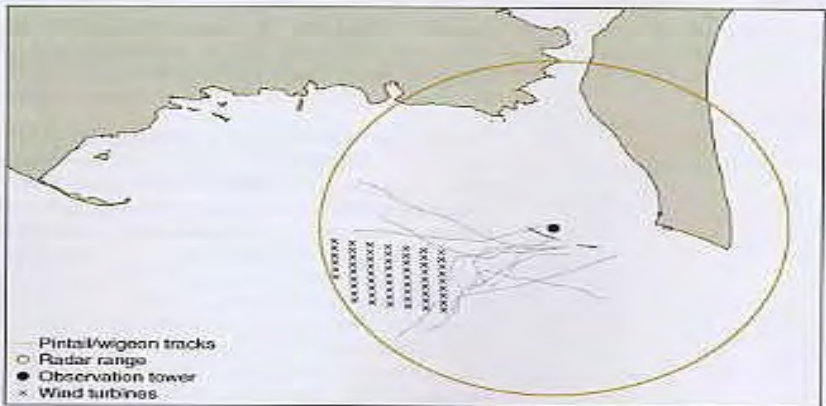


Figure 14. Radar registrations of 9 flocks of migrating pintail or wigeon determined visually at Rødsand during autumn 2003.



Wind Energy Birds (and Bats) Possible Impacts (NAS 2007)

- Habitat destruction and fragmentation
- Habitat displacement
- Collision mortality
- None of these are unique to wind, but differ by degree, perhaps

Wind and Wildlife

Research Needs and Challenges

- Defining preconstruction site assessments – identify risk factors
 - Mapping sensitive areas (nesting colonies) and migration routes (?)
 - Passage rates?
 - USFWS guidelines (3 years radar, regardless)
 - Weather and visibility
- Collision mortality
 - Ecological significance
 - Methods to reduce collision mortality (new designs, lighting)

Wind and Wildlife

Research Needs and Challenges

- Project Size – do 50 single turbine projects have lower risk than one 50 turbine project?
 - Post-construction monitoring
 - BACI (before-after control investigations)
- Bats – test several hypotheses explaining high bat mortality and attraction (?)

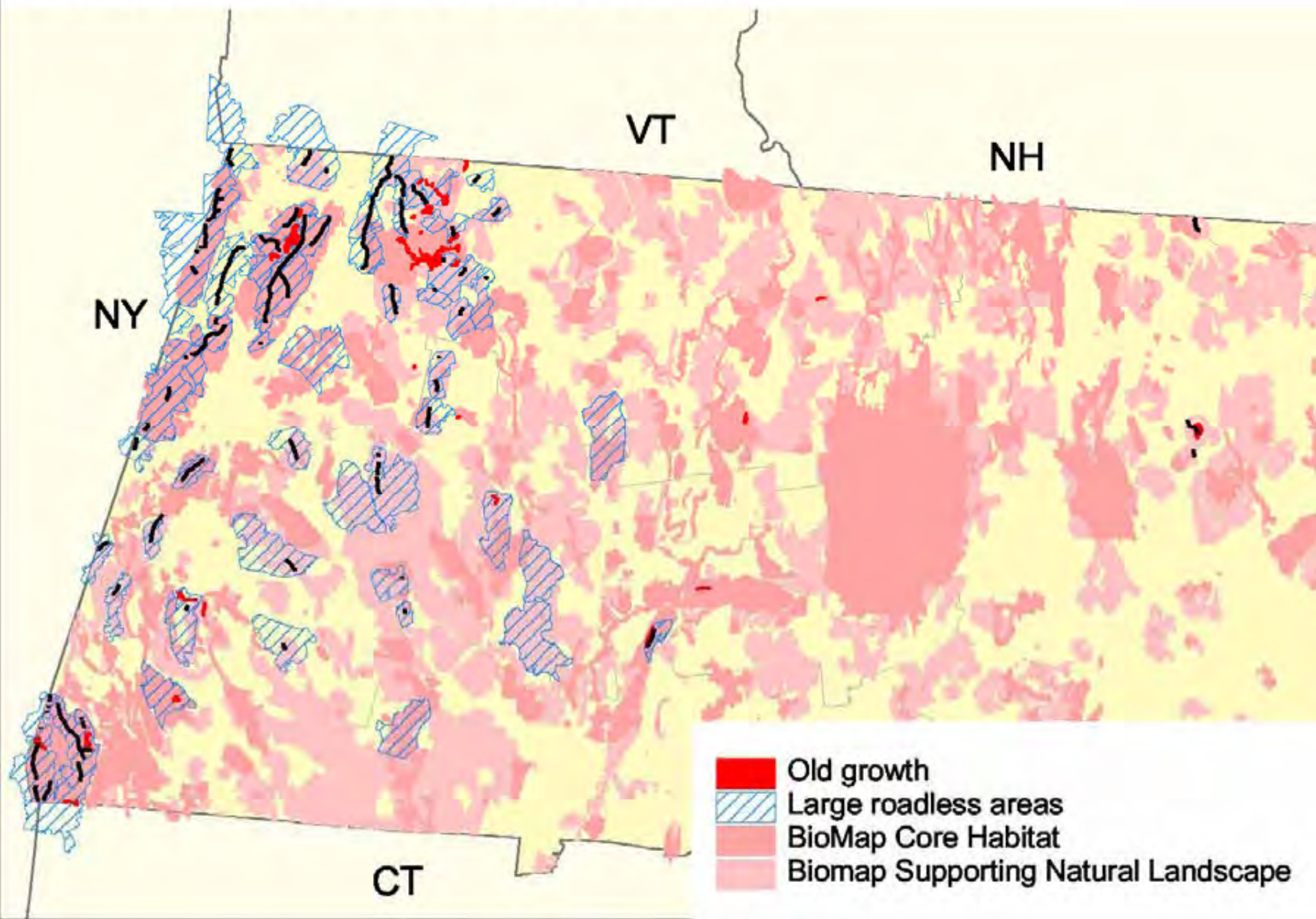
Bird Fatalities at Wind Turbines

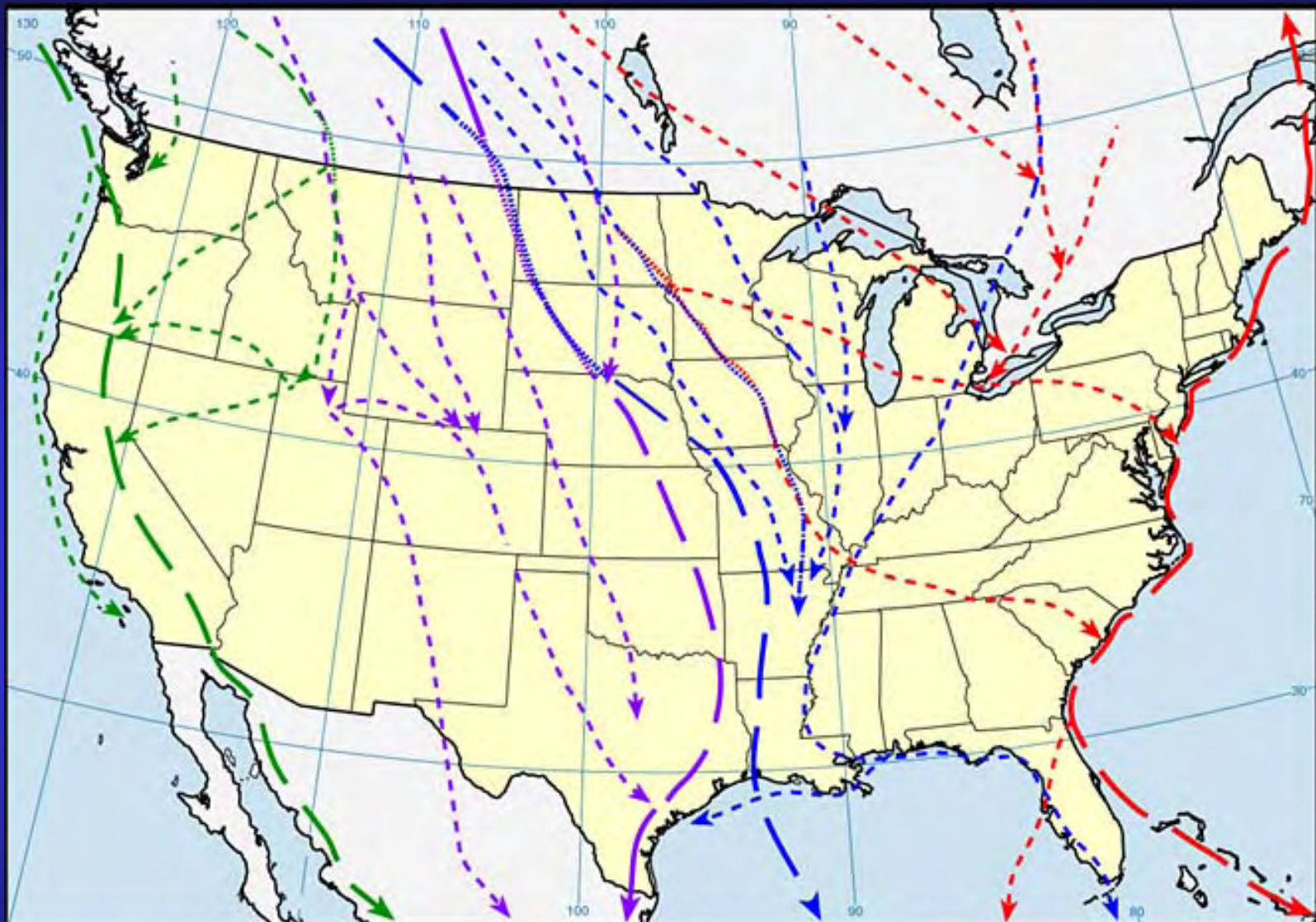
(GAO-05-906 Wind Power)

| Region | Number of Turbines | Fatalities per turbine per year |
|-------------------|--------------------|---------------------------------|
| Altamont, CA | 5,400 | 0.19-0.87 (0.025-0.058 raptors) |
| Buffalo Ridge, MN | 73-143 | 0.33-4.45 |
| Searsburg, VT | 11 | 0 |
| Mountaineer, WV | 44 | 4.04 |
| Top of Iowa | 89 | 0.12 |
| Oregon | 16-181 | 0.63-3.59 |

Examples of factors considered in analysis

Courtesy of AMC



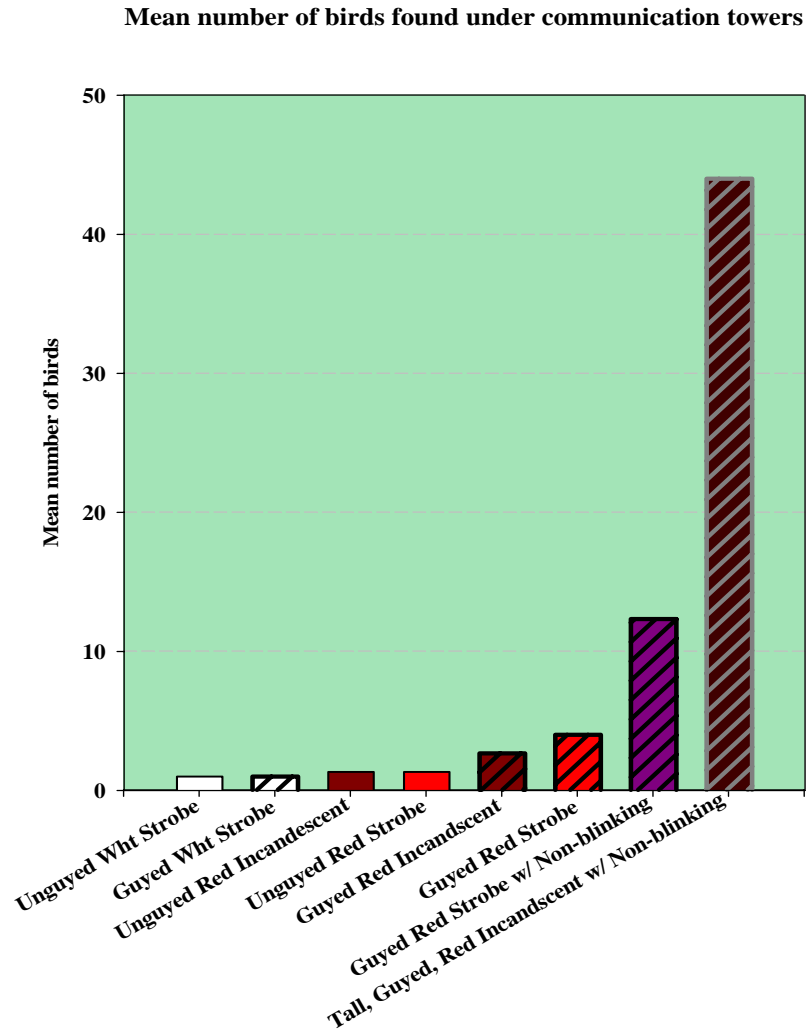


***North American Migration Flyways
(with Principal Routes)***

| | |
|--------------------|--|
| Atlantic Flyway | |
| Mississippi Flyway | |
| Central Flyway | |
| Pacific Flyway | |

Bird Mortality And Communication Towers

Michigan
Spring 2005
Joelle Gehring



Bird Aggregation and Light

(Evans, et al. 2007)

- Birds use point sources of light to navigate during migration, and light dependent, magnetic field mechanisms on cloudy nights
- Bird aggregation occurred in response to white, blue, and green light
- Aggregation not recorded for red light or flashing white light

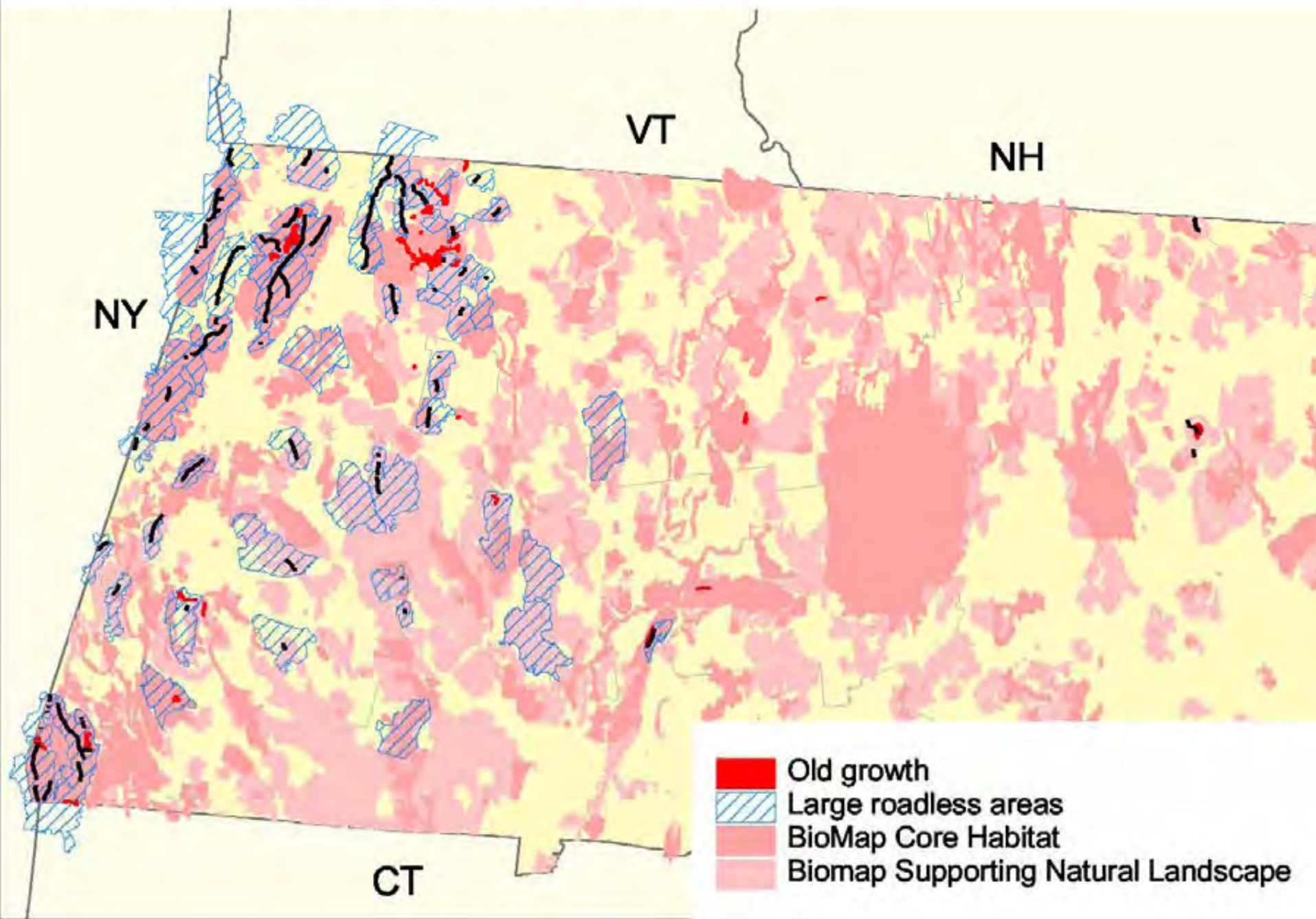
Wind and Wildlife

Research Needs and Challenges

- Climate Change or Habitat Loss – which is the greater threat?
- Cumulative Impacts
- Cost/Benefit Comparisons – environmental benefits either global or off-site
 - Sea Duck collision mortality and winter habitat loss versus habitat loss on breeding grounds
 - Different avian species at risk versus mitigation benefit

Examples of factors considered in analysis

Courtesy of AMC









JULY/AUGUST 19

SANCTUARY

THE JOURNAL OF THE MASSACHUSETTS AUDUBON SOCIETY



Image MassGIS, Commonwealth of Massachusetts



Sources of Bird Mortality

(Erickson, et al. 2001; NRC 2007)

- Communications Towers – 4 million to 50 million
- Buildings and Windows – 98 million to 980 million
- Vehicles – 60 million to 80 million
- Cats – 8 million to 220 million (rural cats)
- Wind Turbines – 10,000 to 40,000 (3.1 birds per MW installed capacity; 0.003% of all sources of human-caused avian mortality)

Potential Bird Mortality

- Current estimate = 3.1 birds per MW installed capacity
- 1 MW installed generates 2.4 – 3 million kWh (AWEA)
- Massachusetts 2000 electricity = 52, 663 million kWh (U. S. Census Bureau)
- If 100% from wind, ~54,000 birds/year
- Mostly passerines – significance depends on species, e.g., raptors, state-listed species

A Common Avian
Currency?

Ridge Top Mining?



Coal Bed Methane?



Cape Wind?



West Virginia



Vivian Stockman, May 30, 2003

Ridge Top Mining



Mountaineer Wind Farm



Closing

- Need to act quickly and responsibly
- To act responsibly, we need information
- To get the information, we need collaboration and partnerships

