

Overview of Potential Wildlife Impacts Due to Wind Power Facilities

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What will be covered:

- Context
- Terrestrial wind power plants
- Off-shore wind power plants
- Recommendation

People are expressing concerns about smog...

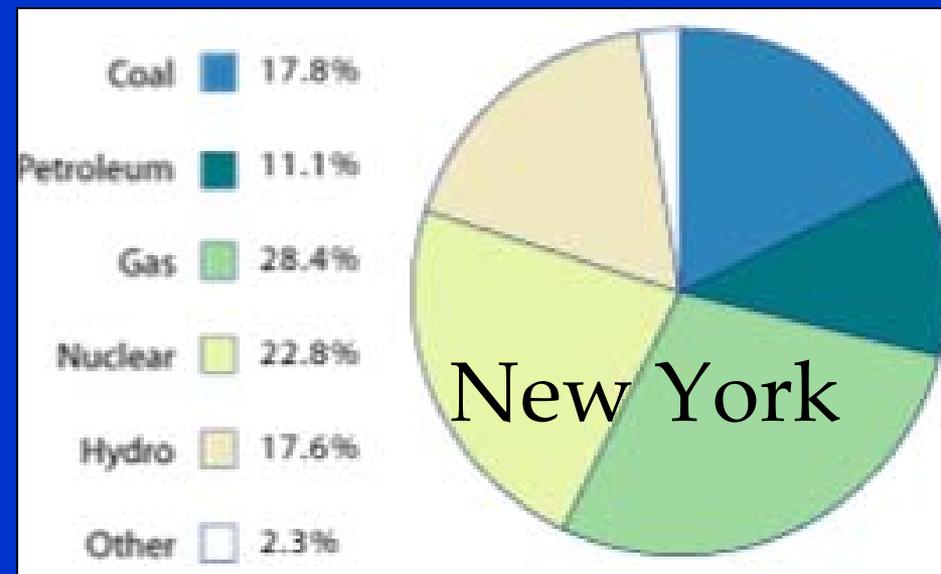
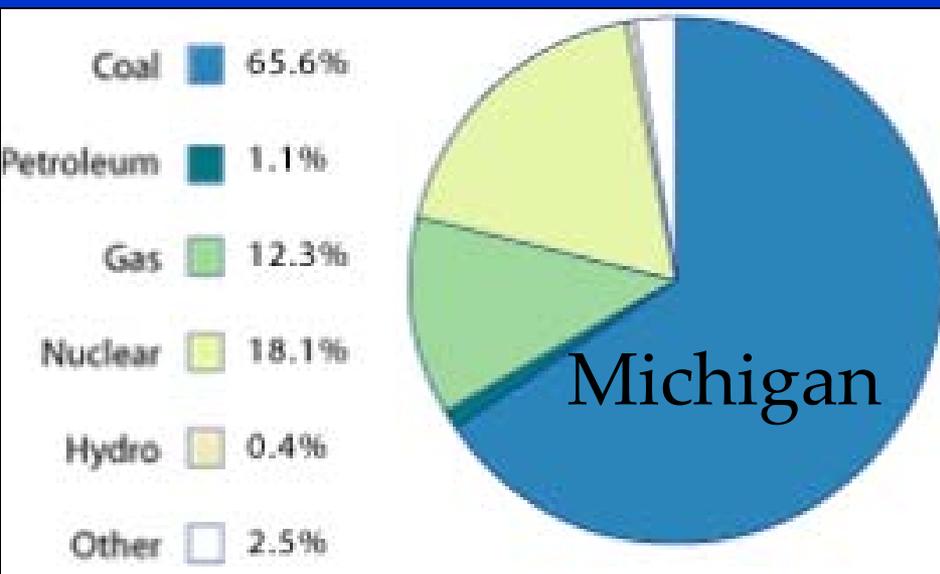
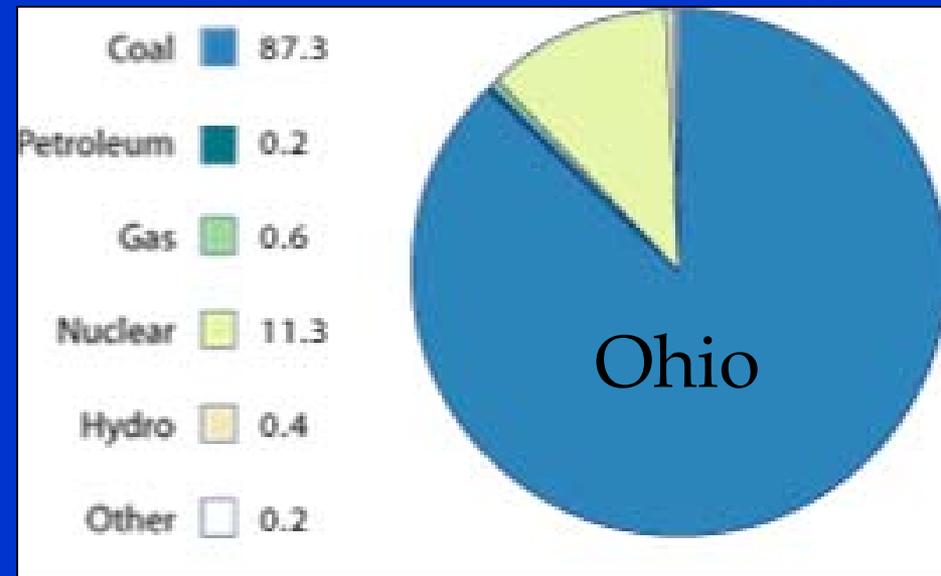
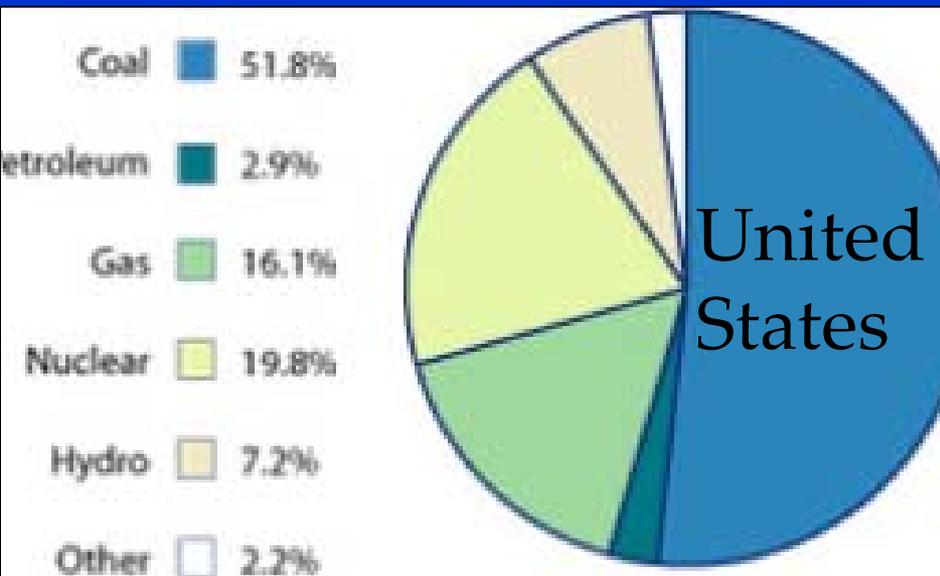


and...

global warming...



Fuel Profiles Vary for Production of Electricity



And



Effects of Land-based Wind Projects Should be Assessed in Three Areas

- **Water Quality**
- **Terrestrial Habitat**
- **Aerial Habitat** - air as habitat is a new concept

**Goal:
Do No Harm**

Impact Types, Factors, and Significance

- Four impact types – habitat loss, displacement, barrier effects, collision mortality
- Seven impact factors: magnitude, type, extent, duration, intensity, timing, and probability.
- Significance of impacts – cumulatively with other projects and overall effect of all four impact types

Potential Wildlife Resource Concerns for Terrestrial Wind Projects

- **Direct Effects**
 - Mortality
 - Habitat loss/modification
 - Interior forest loss
 - Habitat fragmentation
- **Indirect Effects**
 - Reduced nesting density
 - Habitat abandonment
 - Loss of refugia
 - Attraction to modified habitat
- **Cumulative Effects**



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Wind power projects have been documented to kill birds and bats



Table 1: Bat mortality estimates at U.S. wind plants

Location	Year	Mean annual mortality	Bat mortalities per turbine	Notes
Buffalo Ridge, MN P1	1999	5	0.07	Adjusted for search biases
Buffalo Ridge, MN P2	1998-2001	289	2.02	Adjusted for search biases
Buffalo Ridge, MN P3	1999-2001	319	2.32	Adjusted for search biases
Wisconsin	1999	34	1.10	Not adjusted for search biases
Foote Creek Rim, WY	1998-2001	138	1.04	Adjusted for search biases
Buffalo Mtn., TN	2001	30	10.0	Not adjusted for search biases
Vansycle, OR	1999	28	0.40	Adjusted for search biases

Note: Studies not necessarily designed with bats in mind; data may be incidental to another study.

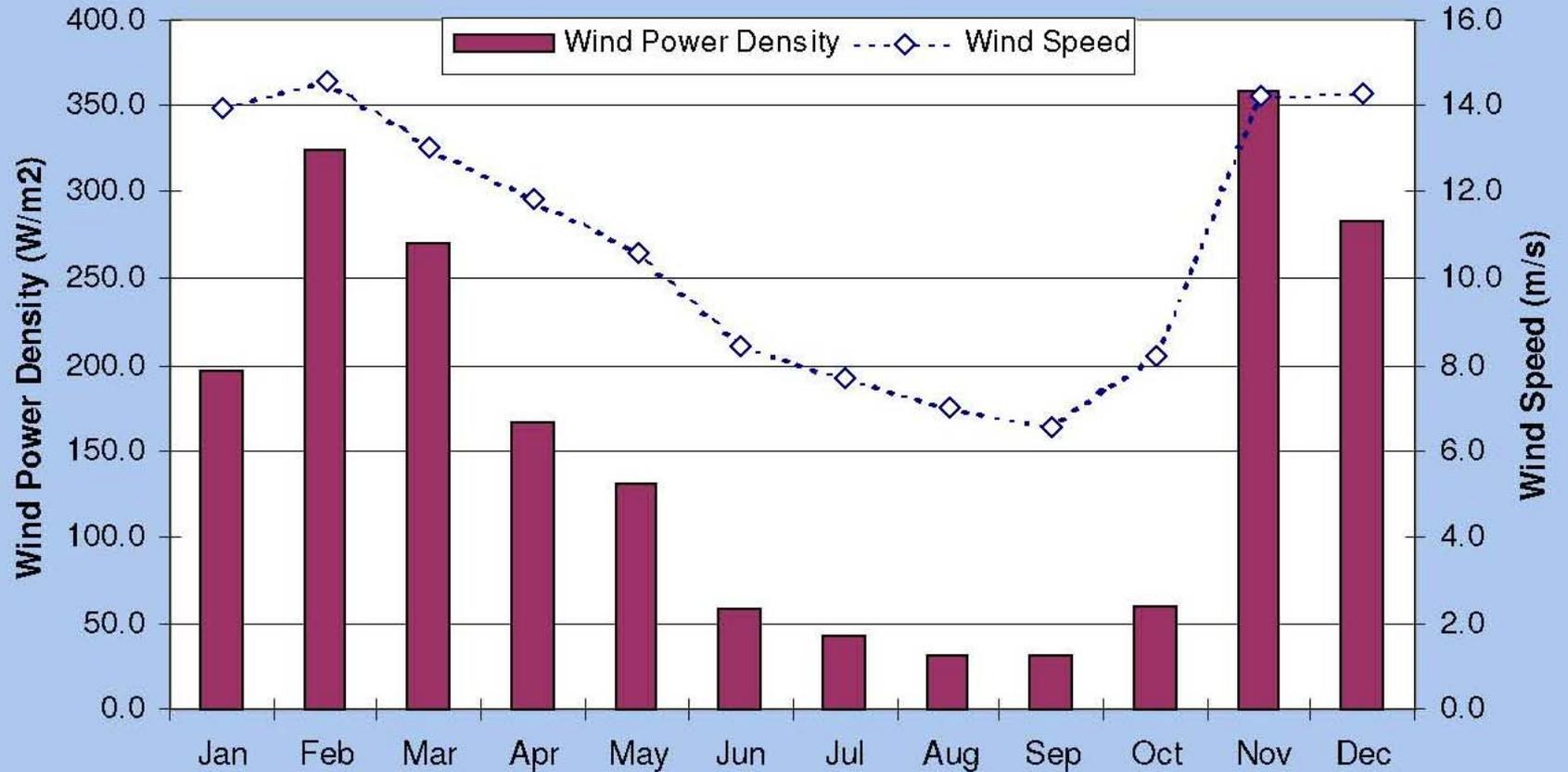
Table 2. Timing of bat collision mortality at U.S. wind plants

Date	Buffalo Ridge, MN	Vansycle, OR	Buffalo Mtn., TN	Stateline, OR/WA	Foote Creek Rim, WY	TOTAL	Percent
May 1-15	0	0	0	-	0	0	0
May 16-31	1	0	0	-	1	2	0.4
June 1-15	0	0	0	-	1	1	0.2
June 16-30	3	0	0	-	2	5	0.9
July 1-15	9	0	9	0	2	15	2.8
July 16-31	88	0		0	26	119	22.2
Aug 1-15	127	0	10	0	19	151	28.2
Aug 16-31	75	4		11	33	128	23.9
Sep 1-15	52	4	8	0	21	81	15.1
Sep 16-30	4	2		10	0	20	3.7
Oct 1-15	1	0	0	8	2	11	2.1
Oct 16-31	2	0	0	0	0	2	0.4
Nov 1-15	0	0	0	1	0	1	0.2

Note: Studies not necessarily designed with bats in mind; data may be incidental to another study.

Monthly Averages

Monthly Averages



Most bats are killed during the August-September period of low energy production.

Table 3. Composition of bat collision fatalities at U.S. wind plants

Location	n	Hoary bat	Red Bat	Silver-haired bat	Big brown bat	Little brown bat	Eastern pipistrell	Unid
Buffalo Ridge, MN	362	229	64	19	12	7	7	24
Buffalo Mtn., TN	32	1	21	1	1	0	8	0
Wisconsin	34	8	20	2	4	0	0	0
Vansycle, OR	10	5	0	3	0	1	0	1
Ponnequin, CO	~18	~14	0	0	0	0	0	~4
Foot Creek Rim, WY	123	107	0	5	2	6	0	3
Stateline, OR/WA	30	14	0	14	0	2	0	0
Green Mtn., PA	1	0	0	0	0	1	0	0
California	6	2	1	0	0	0	0	3
Total	616	380	106	44	19	17	15	35
Percent(%)		61.7%	17.2%	7.1%	3.1%	2.8%	2.4%	5.7%

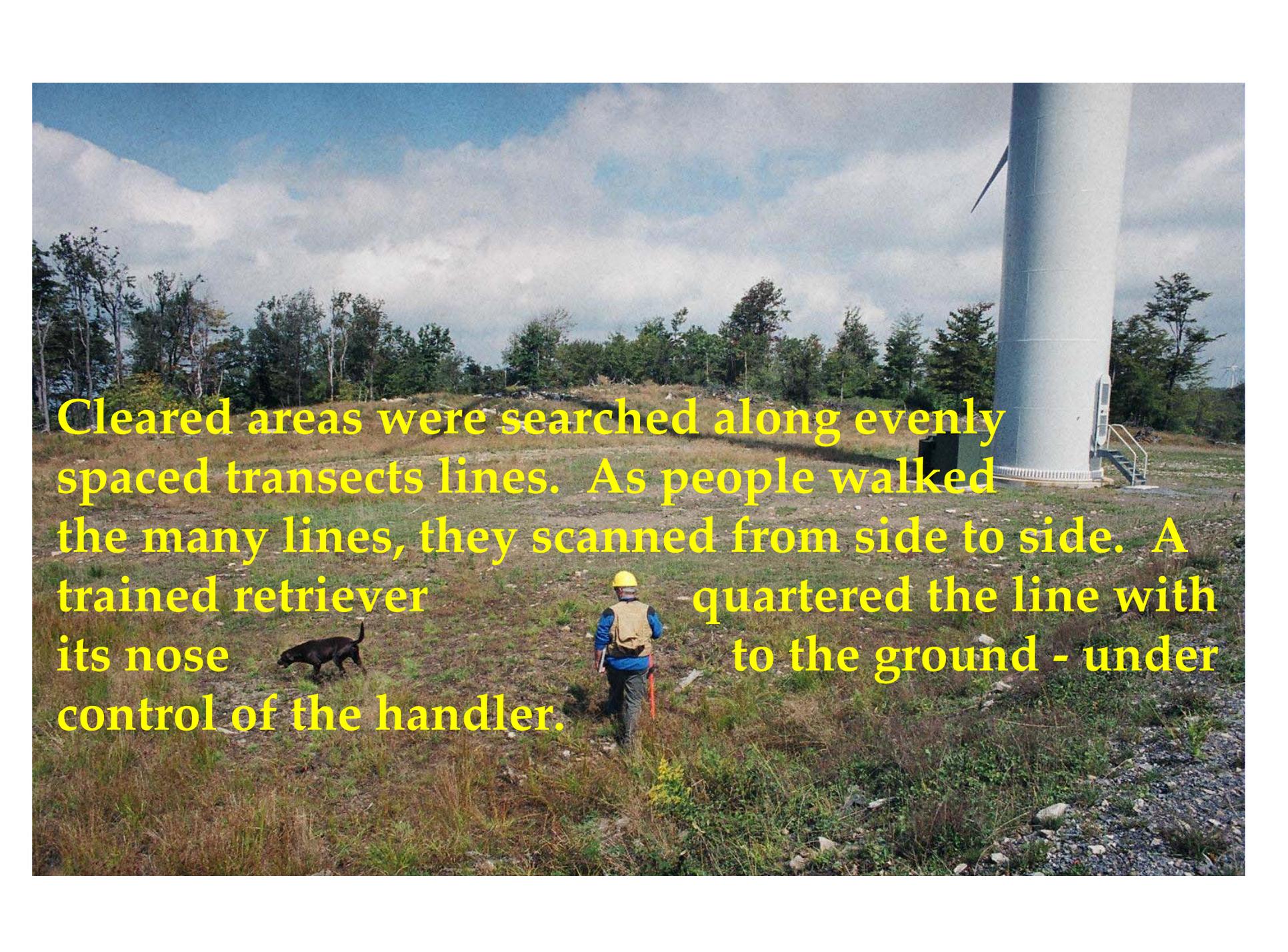
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World Record Kill Continues - Unabated

- World's largest kill of wildlife by wind turbines was discovered in 2003 during the first year of operation of the Mountaineer project in West Virginia.
- Between 1,400 and 4,000 bats are estimated to be killed each year - a rate of 47.5 per turbine.
- This contrasts with previous estimates of <2 bats killed per turbine, particularly in the West.
- Owner: Florida Power and Light
Developer: Atlantic Renewable (bought by PPM)
Consultant: Curry and Kerlinger

One of many red bats found dead at the Mountaineer Wind Energy Plant during the 6-week, late summer study in 2004 by the Bats and Wind Energy Cooperative.



A photograph showing a person wearing a yellow hard hat and a blue shirt with a tan vest, walking a black dog in a cleared field. The person is walking away from the camera, and the dog is walking alongside them. In the background, there is a large white wind turbine tower. The field is covered with dry grass and some green plants. The sky is blue with some white clouds. The text is overlaid on the image in yellow.

Cleared areas were searched along evenly spaced transects lines. As people walked the many lines, they scanned from side to side. A trained retriever quartered the line with its nose to the ground - under control of the handler.



Across all habitats, dogs found 73% of the dead animals - humans 37%. In dense cover, the results favored dogs more as the dog's nose can easily find what people cannot see.



Bats are small and hard to see, even on bare ground.

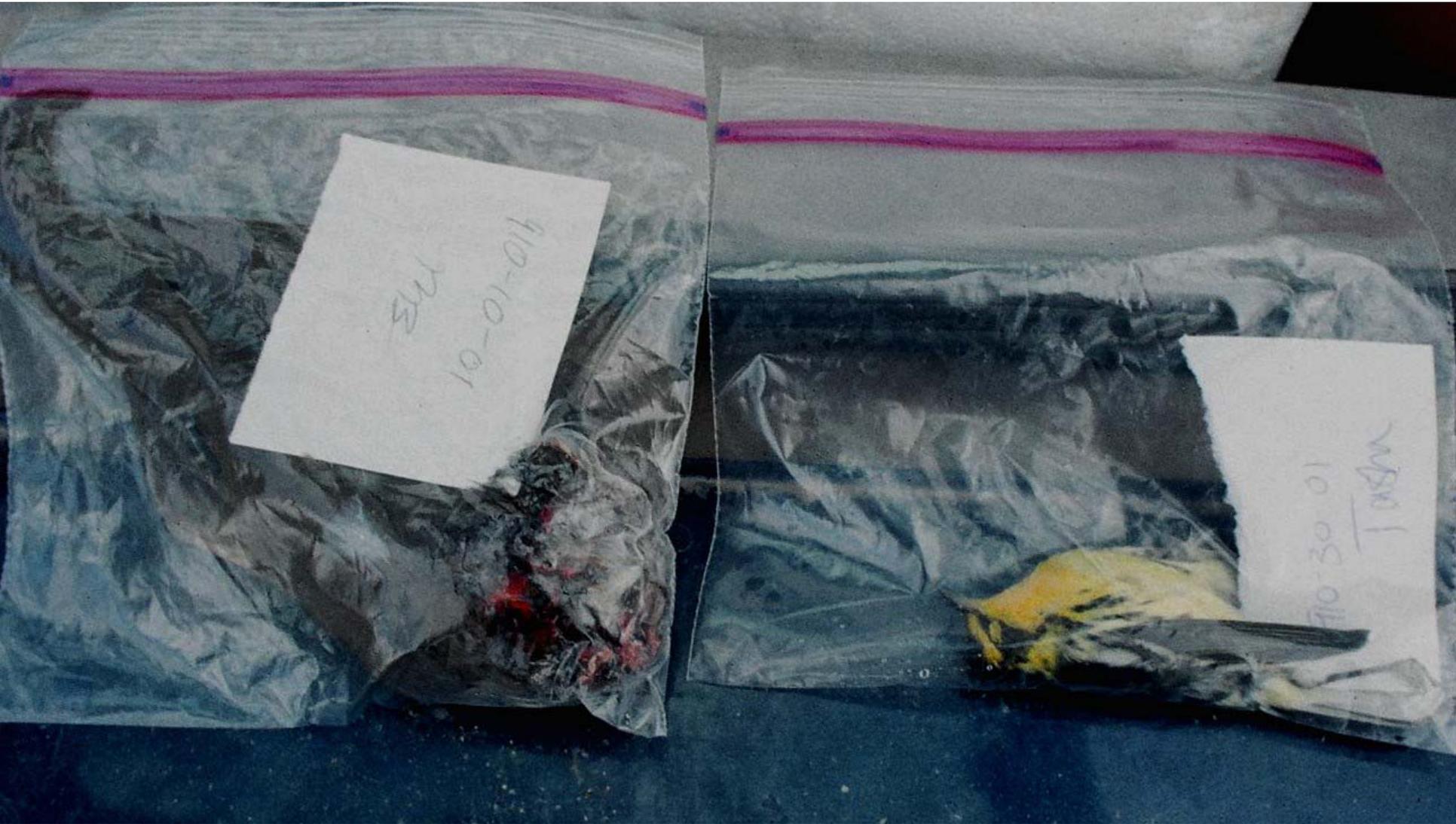
Some areas not reclaimed after construction are virtually impossible for a person to search effectively without a dog.



A spike in mortality often occurred within two days after a front went through. Bats and birds found dead were catalogued, bagged, and placed in cold storage. Shown here are some found on the morning of September 12, 2004, at the Mountaineer Wind Power Plant, two days after a hurricane went through.



cuckoo and warbler



A few of the birds found on September 12, 2004
Mountaineer Wind Energy Plant, West Virginia



Are you sure there's
a dead bird in that grass



People searching could not see this bird in the grass. The dog located it by scent.



The scent of this
by the dog in dense
line a considerable
turbine. The person
along this transect that morning did not have time to
part the grass and passed it by unnoticed.

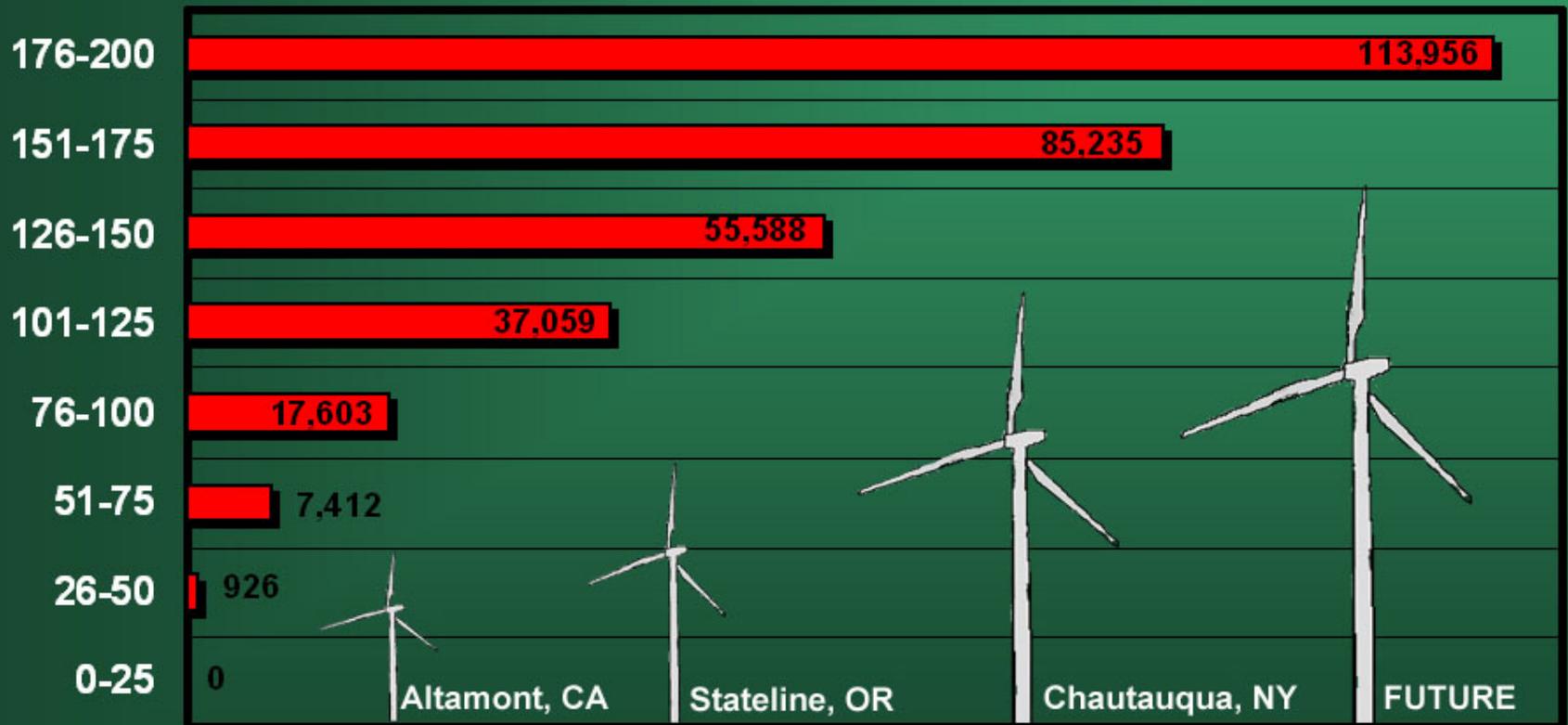
warbler was found
grass on a transect
distance from the
who visually searched

There has not been a full season bird study
at an operating wind plant in East.



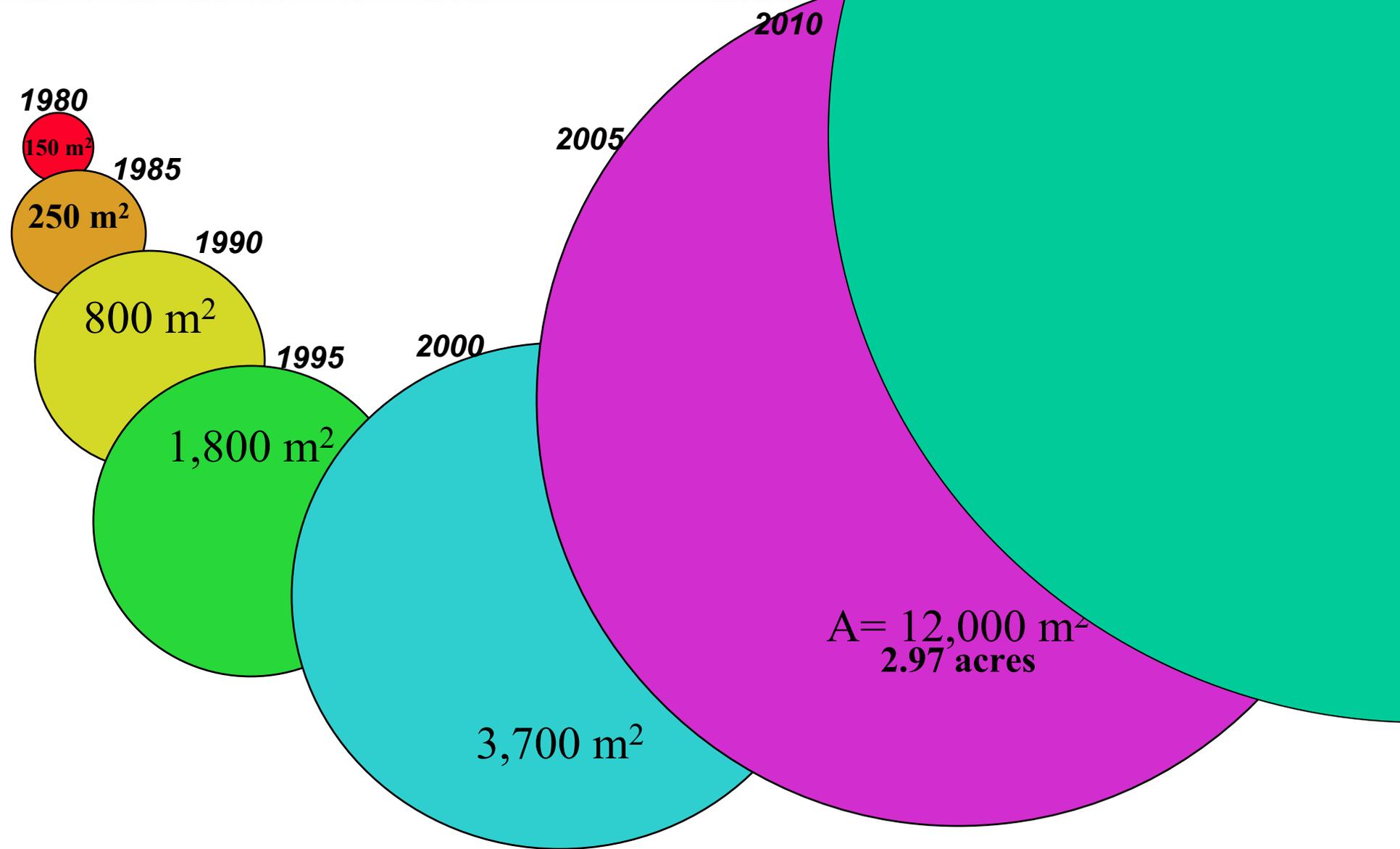
Numbers of nocturnal migrants determined via radar to fly below 200 meters over proposed Chautauqua, NY windplant - by 25 meter altitude zones (Fall 2003)

Altitude of Nocturnal Migrants
(meters above ground level)



■ estimated number of birds and bats flying within each 25 meter altitude zone (source: ABR, Inc. - Fall Radar Study Final Report, April 2004)

How big will wind turbine



Larger Turbines Predicted

- GE is predicting that 5-7 MW turbines with 120-160 m rotor diameters may soon be available ("next generation").
- Also, 20 MW turbines with 200 m rotor diameters are a future possibility (rising 700 or 800 feet above water).

An Assessment of the Impacts of Green Mountain Power Corporation's Wind Power Facility on Breeding and Migrating Birds in Searsburg, Vermont

July 1996–July 1998



Prepared for the
Vermont Department of Public Service
Montpelier, Vermont

By
Paul Kerlinger, Ph.D.
Curry & Kerlinger, L.L.C.
Cape May Point, New Jersey

“The Searsburg wind power station is the first such facility in the heavily forested eastern part of North America. Other projects will follow and the experience at Searsburg should be noted.

Fragmentation of forests via wind turbine erection can impact interior nesting birds in a adverse manner. The size and number of wind power developments in the future are also of concern with respect to habitat loss and fragmentation. This may become the primary ecological consideration in future wind power developments in these habitats.”



Fragmentation: what AWEA says

“Wind energy can negatively impact birds and other wildlife by fragmenting habitat, both through installation and operation of wind turbines themselves and through the roads and power lines that may be needed. This has been raised as an issue in areas with unbroken stretches of prairie grassland or of forests. More research is needed to better understand these impacts.”

(See: Frequently Asked Questions, American Wind Energy Association’s web site.)

**Buffalo Mountain Wind Energy Project
Tennessee Valley Authority
Tennessee**



TOWN OF MEYERSDALE, PA

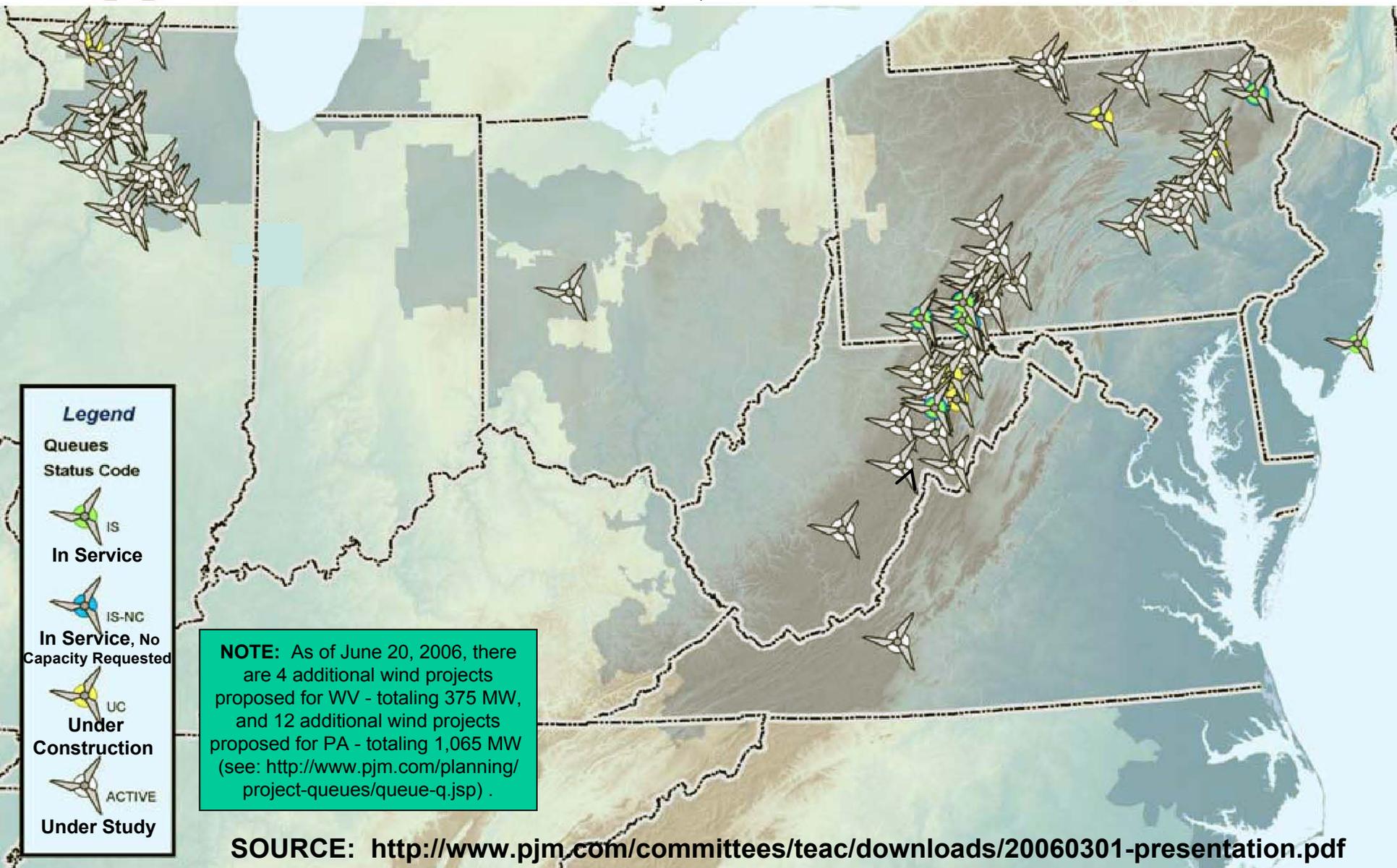
350 acres of forest-interior habitat was lost due to clearing and fragmentation of forest to construct the Meyersdale wind plant

Forest-interior habitat occurs 100-m distant from non-forest edges

Over 80 acres of forest habitat was lost due to clearing for 20 wind turbines and access road

Extensive loss of forest and forest-interior habitat due to construction of Meyersdale wind plant in late 2003

(20 turbines with 75-m radius clearings)



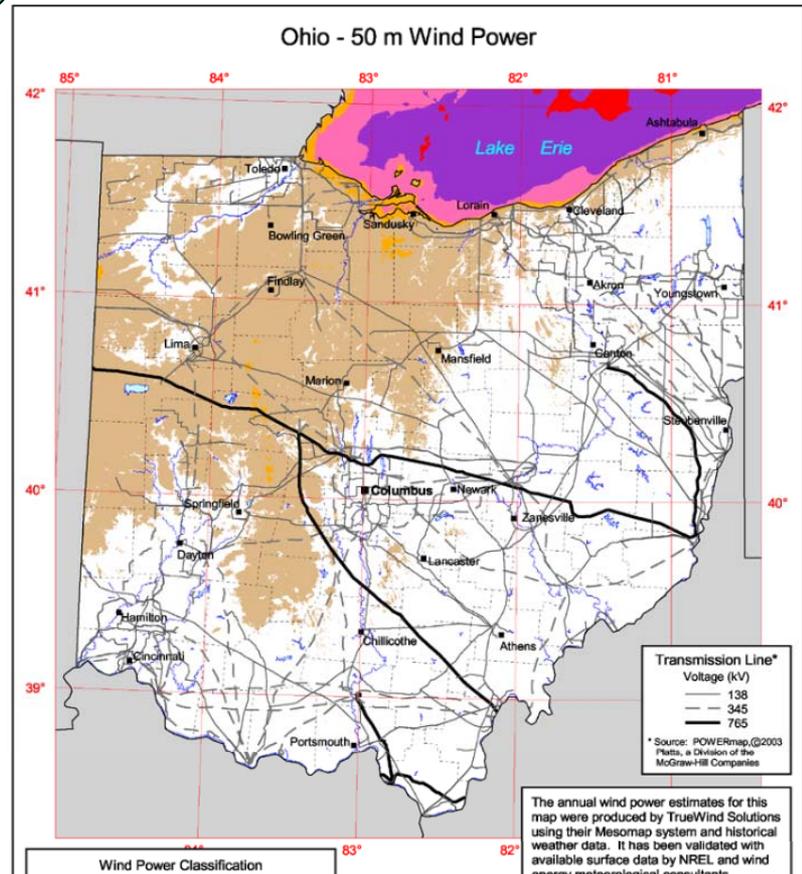
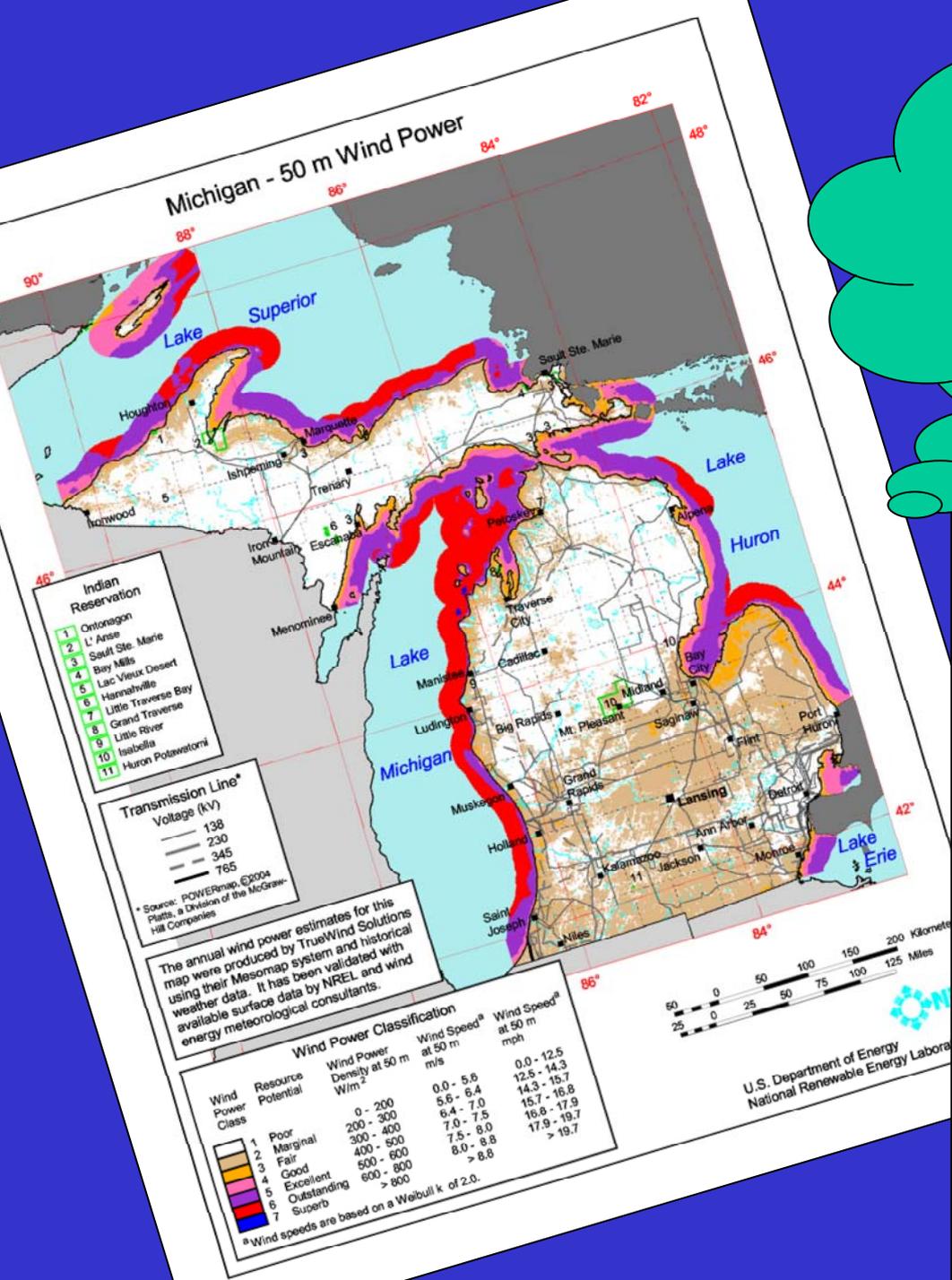
PJM Interconnection for Illinois

- application for grid connection is the first public appearance of a project; describes projects in process that may not have otherwise been made public; a small sample is shown in this table -

See: <http://www.pjm.com/planning/project-queues/queues.html>

Queue	Queue Date	PJM Substation	MW	In Service
K 07	5/16/03	Benson Wind Farm	158	2007
L 13	1/18/04	Heartland Grand Ridge	175	2006
N 15	12/02/04	LaSalle 138 kV	150	2006
N 23	1/18/05	West Brooklyn Wind 3	11	2006
O 09	3/07/05	Normandy	212	2006
P 11	9/26/05	Kewanee 138kV	200	2006

The Great Lakes have good to outstanding wind resource.

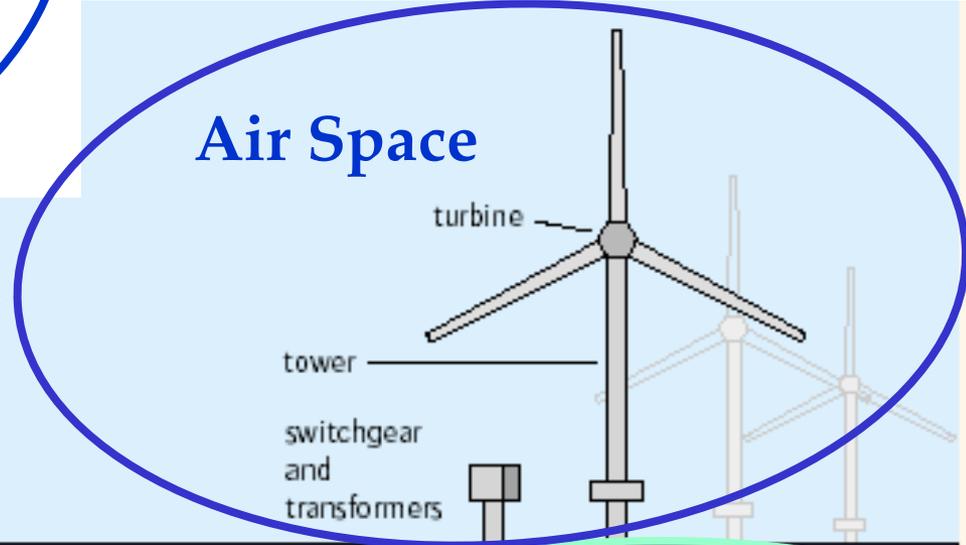
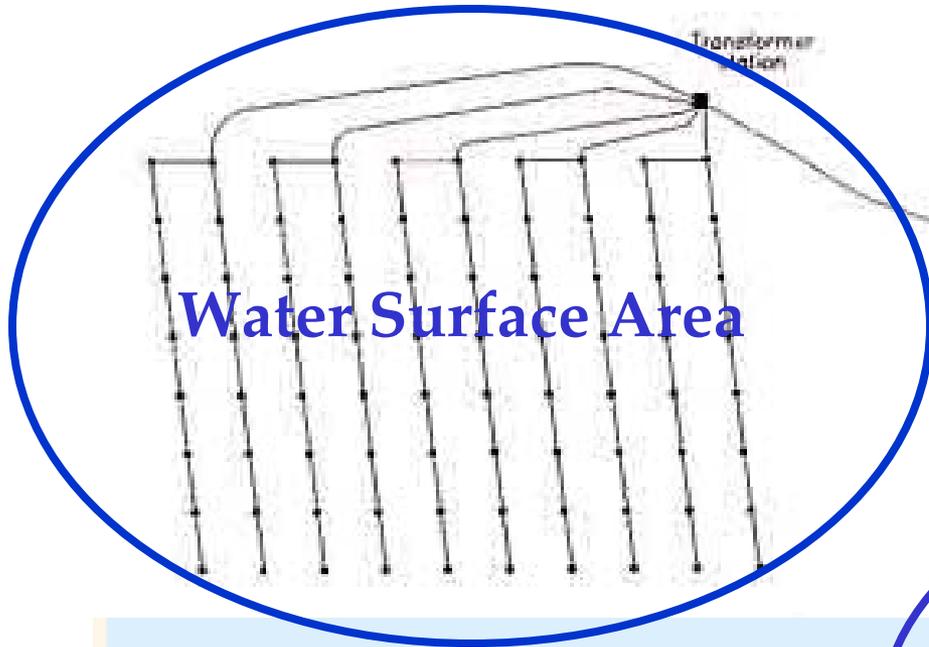


Offshore Environmental and Fish & Wildlife Concerns

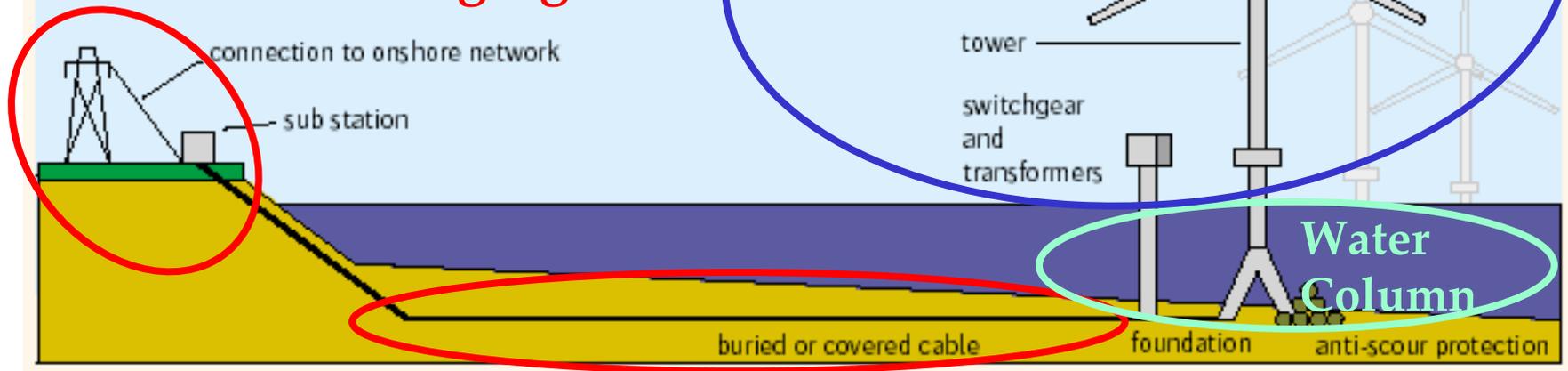
- Lake Ice
- Vessel traffic
- Port Availability
- Fisheries
- Migratory Birds/Bats
- Benthos
- Staging and Construction Effects
- Sediment Structure
- Noise/Vibrations
- Hydrology
- Transmission lines/Grid connections
- Submerged cables
- Electromagnetic fields
- Logistics and maintenance traffic
- View shed
- Coastal Effects
- Lake ecosystem
- Navigation safety
- Air Traffic Safety
- Archaeology
- Cumulative



Offshore Wind Energy – Use Areas of Concern



On and near shore staging areas



Benthic habitat and fauna

The Desholms and Kahlert Study

- Looked at migrating eiders and geese, not ducks undertaking daily flights; e.g., feeding or roosting.
- Did not sample dusk or dawn.
- Did not sample inclement weather.
- Did not sample bird behavior when horizontal and/or vertical visibility was poor.

Recommend completing a three-phase consultation process before binding land or power purchase agreements are made.

The three phases are:

1. Scoping – of wildlife issues.
2. Studies – of issues identified during scoping.
3. Recommendations – to resolve issues.

Studies

- Recommending studies on temporal and spatial use by birds and bats of project area, including air space, over several seasons – often 3 years.
- Recommending use of radar, thermal imaging, and acoustic monitoring.
- Many birds and bats migrate at night and cannot be studied by normal field methods.
- Working to help site projects in low impacts areas and identify and avoid high risk areas.

Study Duration

Three years pre-construction is recommended to give some indication of natural variation in bird and bats numbers and distribution from year to year, unless no important concentrations of their use in the area are subject to significant annual variation in numbers and distribution.

Questions and Answers

1. Is there a model for the 3-stage process?

Yes. For licensing hydro projects.

2. What will the 3-stage process provide?

Consistency and predictability.

3. Will it delay the process?

Not likely if started during early project planning.

4. Can project planning continue during the review.

Yes.

Identify low risk sites
and separate them from
moderate and high risk sites –
from the standpoint of wildlife.

Call them **green, amber, red.**

Set criteria and standards.

The Service favors:

- Conservation of wildlife that is in the public trust - for the enjoyment of people now and in the future.
- Development of renewable energy, including from wind, that is friendly to birds, bats, other wildlife.
- Informed decisions based on adequate environmental assessment, including:
 - use of the affected air space by birds and bats over time,
 - impacts to wildlife - direct, indirect, and cumulative.



Adequate, credible information is needed for siting decisions.

