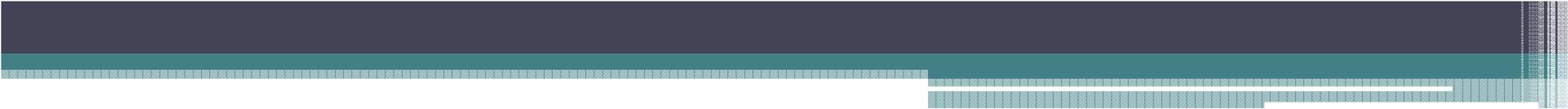


Wind Energy and Zoning

Virginia Association of Zoning Officials
Fall Conference 2009
Roanoke, VA

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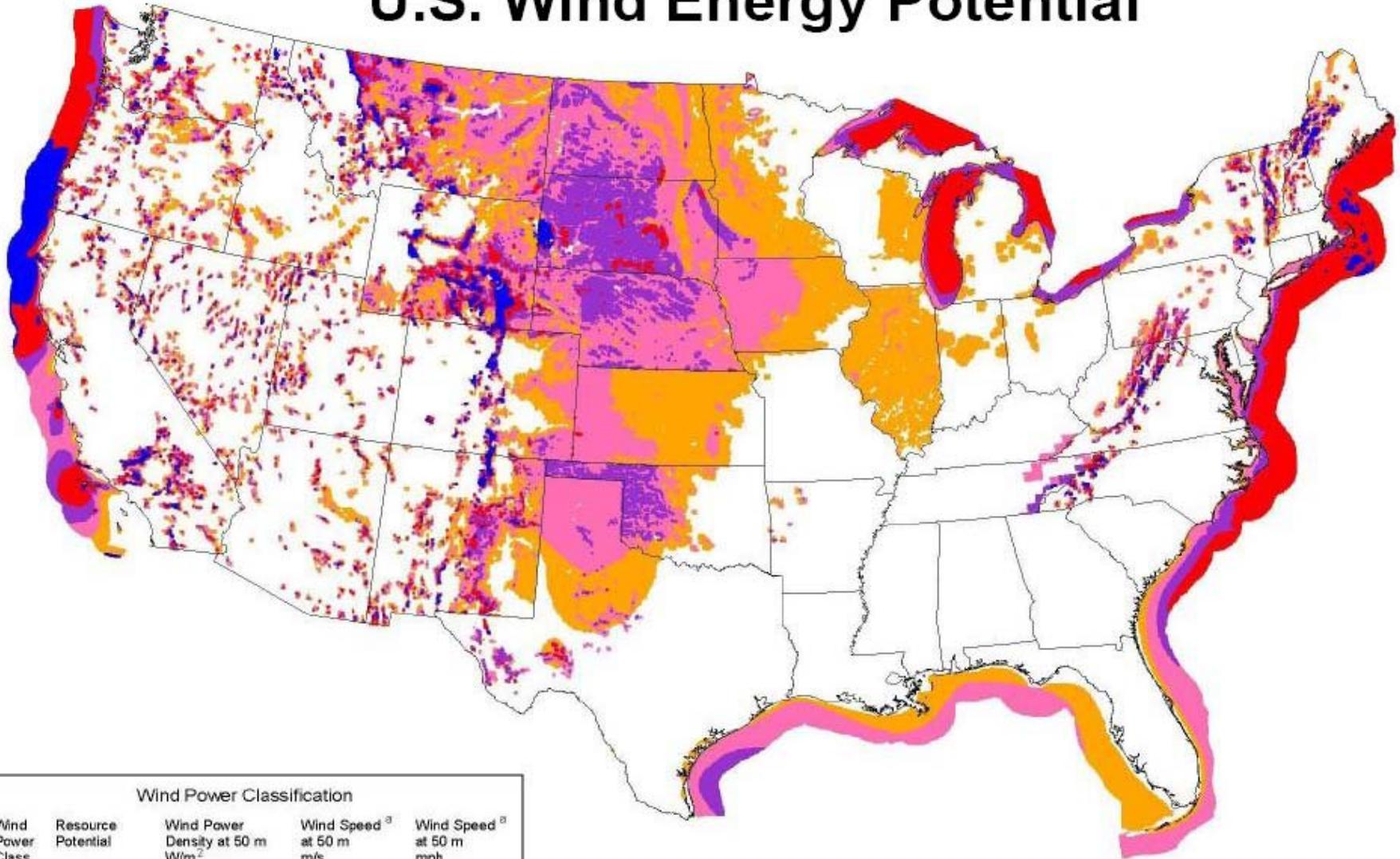
Overview

1. Wind resources and scales of wind power
2. Do You Need A Wind Ordinance? (Yes)
3. Small Wind Zoning and Ordinances
4. Vertical Axis and Rooftop Turbines
5. Does Virginia Need A Model Wind Ordinance?
6. New Developments in Commonwealth Regulation
7. The VRS3

1. Wind Resources & Scales of Wind Power

- The wind resource in your area determines what scale of turbines you can install
- At JMU, we distinguish between 3 scales of wind energy systems:
 1. Small wind
 2. Community wind
 3. Utility/commercial wind
- Communities have different degrees of sensitivity to each of these 3 scales

U.S. Wind Energy Potential



Wind Power Classification

Wind Power Class	Resource Potential	Wind Power Density at 50 m W/m^2	Wind Speed ^a at 50 m m/s	Wind Speed ^a at 50 m mph
3	Fair	300 - 400	6.4 - 7.0	14.3 - 15.7
4	Good	400 - 500	7.0 - 7.5	15.7 - 16.8
5	Excellent	500 - 600	7.5 - 8.0	16.8 - 17.9
6	Outstanding	600 - 800	8.0 - 8.8	17.9 - 19.7
7	Superb	900 - 1600	8.8 - 11.1	19.7 - 24.8

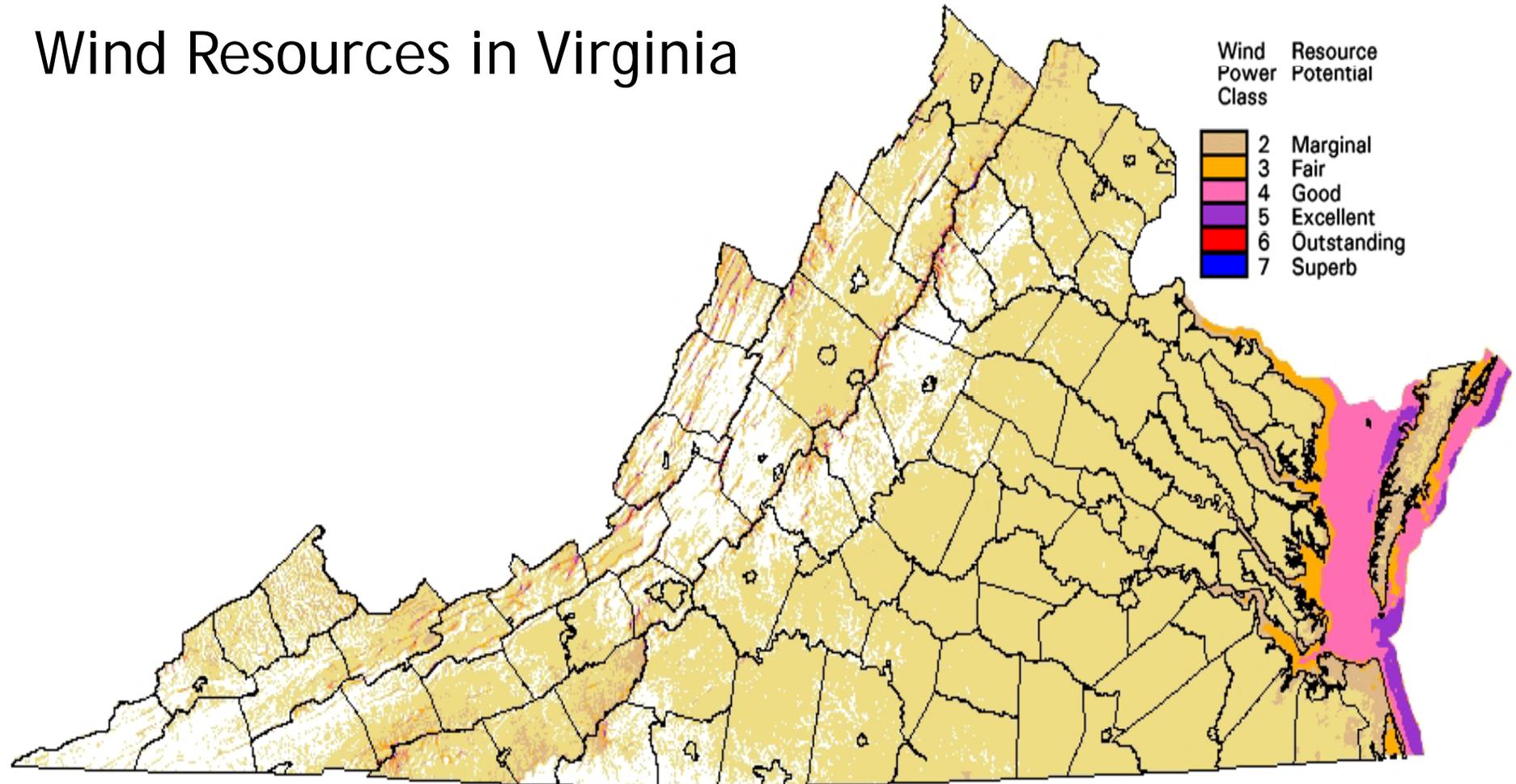
^a Wind speeds are based on a Weibull k value of 2.0

This map shows the wind resource data used by the WinDS model in Oct. 2006. It is a combination of high resolution and low resolution datasets produced by NREL and other organizations. The data has been screened to eliminate areas unlikely to be developed onshore.

U.S. Department of Energy
National Renewable Energy Laboratory

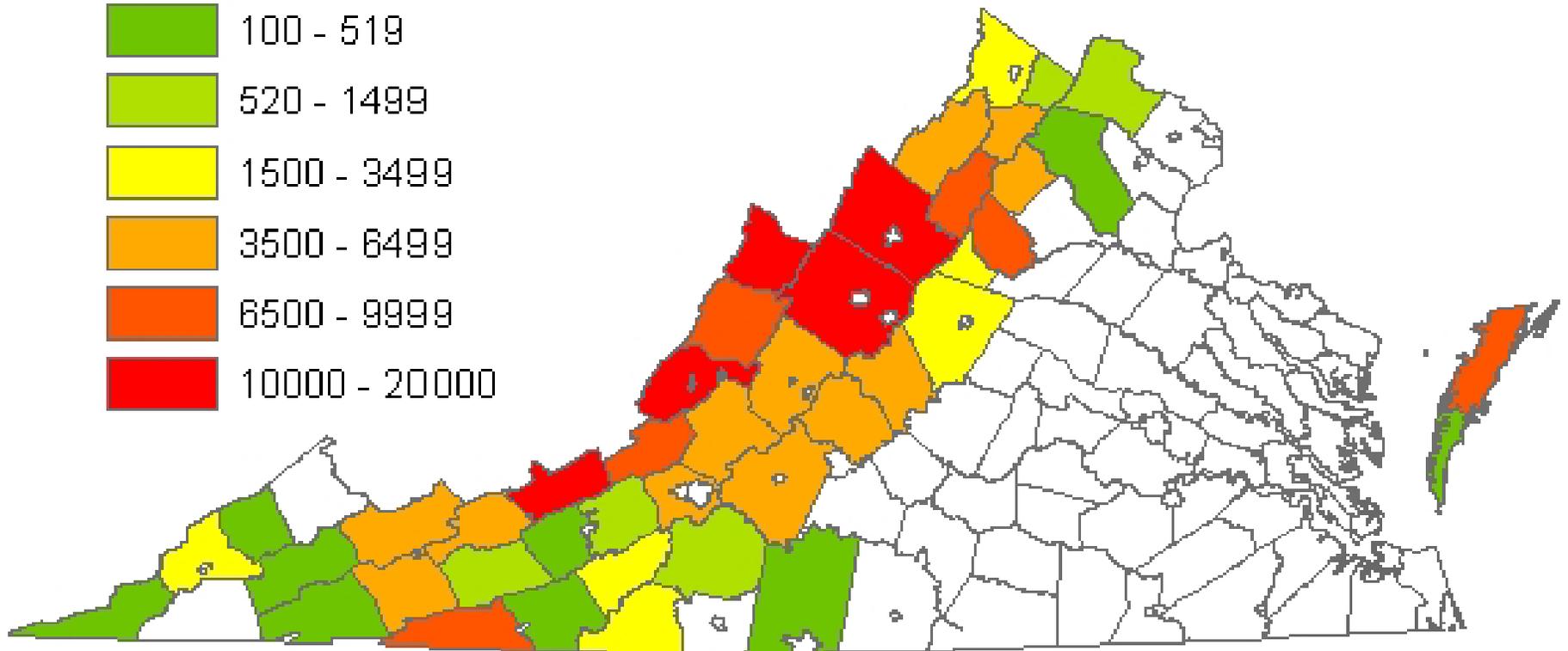
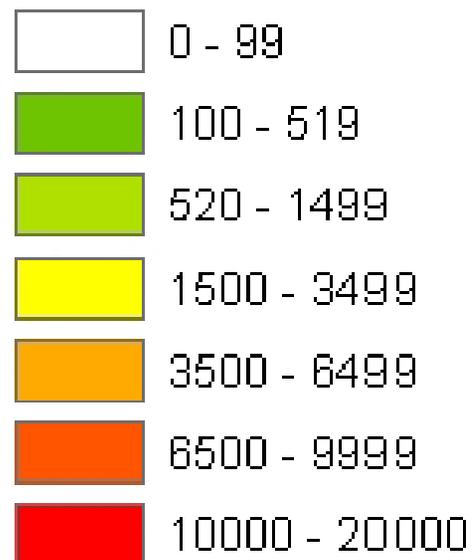


Wind Resources in Virginia



Counties Land Boundary

Acreeage of Wind Class 4 or Greater



1.A. Small Wind

- What is small?
- Industry: turbines rated 100 kW or less
- Net metering regulations: 500 kW business/commercial, 10 kW residential
- Localities: height, number of turbines
- Localities: intended use of turbine (power used on site)
- Smaller wind turbines may be stand alone or connected to distribution grid; note used for commercial electric power production

5. Small Wind Systems

- Class 1: 1-kw, 6-kw, 10-kw
- Class 2: 3.7-kw, 10-kw, ~20-kw



A 1-KW Bergey in Floyd, VA
Height: ~ 45 feet



A 20-KW Westwind in Ireland
Height: ~ 60 feet

- Larger than 20-kw typically requires at least Class 3 or higher wind



**A 100-KW Northwind in MA
Height: ~ 120 ft.**



**A 50-KW Atlantic Orient in VT
Height: ~ 80-90 feet**

1.B. Community Wind

- A JMU Category
- Is a “tweener” scale that reflects a different community sensitivity
- Viable for Class 3 wind and higher
- Big turbines, but not many of them (less than 5)
- Benefits accrue to the local community
 - Local electricity use
 - Local ownership
 - Important facilities (schools, waste water plants, etc.)

Community Wind



A 660-kW community system in Hull, MA, less than 10 miles from Boston.

1.C. Utility Scale Wind

- Electricity production for wholesale market
- Ties to distribution & transmission system
- Big turbines, and many of them
- In Virginia, currently requires Class 4 wind to be economically viable
- Ridgelines and coastal areas the most geographically viable locations
- A linear mile of ridgeline can support 6-12 turbines, depending on their size

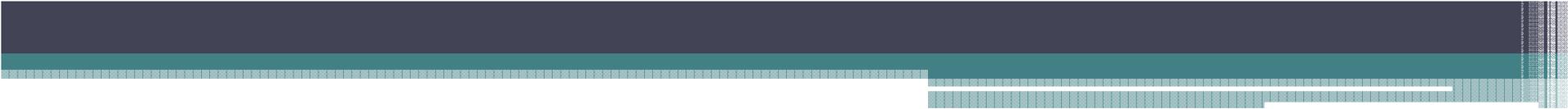
Utility Scale Wind



Bear Creek Wind Power Project near Wilkes-Barre, PA, as seen from the PA Turnpike. These are 2.0 MW Gamesa Turbines.

2. Do You Need A Wind Ordinance? (Yes)

- Growing interest in turbines
 - Tax credits, rebates, cost of energy, being green
- Regulatory change at state level: streamlining
- Inclusive and other zoning
 - Inability to permit a desired land use
 - Mandatory permitting of an undesired land use
- More politically painful to avoid the issue
- Have an ordinance that corresponds to all of your wind resources; address it in your comp plan
- Strategies:
 - Know your wind resources (what class, where) with the VRS₃
 - Start small?
 - Copy other localities



3. Small Wind Zoning & Ordinances

- Many such ordinances in Virginia, and many under development. Examples:
 - Pulaski, Rockingham, Rockbridge
 - Suffolk City (modeled after Currituck, NC)
 - Shenandoah Co.
- Model ordinances in key states:
 - Pennsylvania
 - New York
 - Massachusetts

3.A. What Should Be In A Small Wind Ordinance?

At A Minimum:

- Purpose
- Definition
- Permitted districts
- Safety setback
- Noise limits
 - Setback v. measured
- Type of permit
 - Conditional/special use
 - By right/accessory

At A Minimum:

- Height restrictions
- Abandonment/
Decommissioning
- Application requirements
- Restrictions on appearance (signage, color, lights, etc.)
- MET tower permits
- Shadow flicker for larger systems

3.B. Special Concerns

- Problems of national and global concern fundamentally controlled at local level
- Environmental impacts
 - Small wind considered “de minimus”
- Neighborliness
 - Noise
 - Visual impact: property rights v. restrictions
 - Several creative ways of exploring visual impacts
- Special/conditional use v. by right/accessory

3.B. Special Concerns, con't

- Height restrictions
 - Taller turbines are more productive
 - Limits affect economic payback
 - ***120 feet should be minimum restriction
- Application/permit fee
 - Significantly affects payback of small wind
 - Payback periods are 15-50 years
 - A \$600 fee can be the equivalent of 5 years to pay back
- Meteorological (MET) towers

4. Vertical Axis & Rooftop Turbines

- Very limited machines in terms of electricity output
- Questionable quality
- Buyer beware
- Should you address in an ordinance?
 - Do you regulate satellite dishes?
 - Do you regulate height of rooftop TV antennas?
 - Do you regulate height of structures?
 - Zoning designation may make a difference

5. Does Virginia Need A Model Wind Ordinance?

- Yes for small
- Yes for other scales, too
- Cost of reinventing the wheel in 100+ localities
- Most of Virginia is only Class 1 and 2 wind
- We have several localities with years of experience with wind ordinances
- Would foster common treatment of common problems across the state
- Would not preempt local decision making

6. New Developments in Commonwealth Regulation

- HB 2175 (passed General Assembly in spring 2009)
- NOIRA published Aug. 31, 2009; end of comment period is Sept. 30, 2009.
- Establishes a permit-by-rule (PBR) for renewable energy systems < 100 MW
- DEQ handles PBR
- “Adverse environmental impacts” and impacts on cultural/historical resources
- Requires certification that local zoning body has approved the system
- De minimus exemption being explored now
- Wind PBR expected 2010

7. The VRS3

- Virginia Renewables Siting Scoring System
- Facilitates land use planning for wind
- A prescreening/land use suitability tool
 - Comprehensive planning
 - Wind overlay zones
 - Evaluates wind resources relative to existing land uses
- Mandated by the State Energy Plan
- GIS based
- Works seamlessly with your local GIS resources (adjusted for state plane)

7.A. VRS3 Scoring Criteria

Land Use

Considerations

1. Consistency With the Local Comprehensive Plan
2. Compatibility With Existing Land Use and Zoning Ordinances
3. Forest Value
4. Watershed Integrity
5. Parcel Fragmentation

Natural

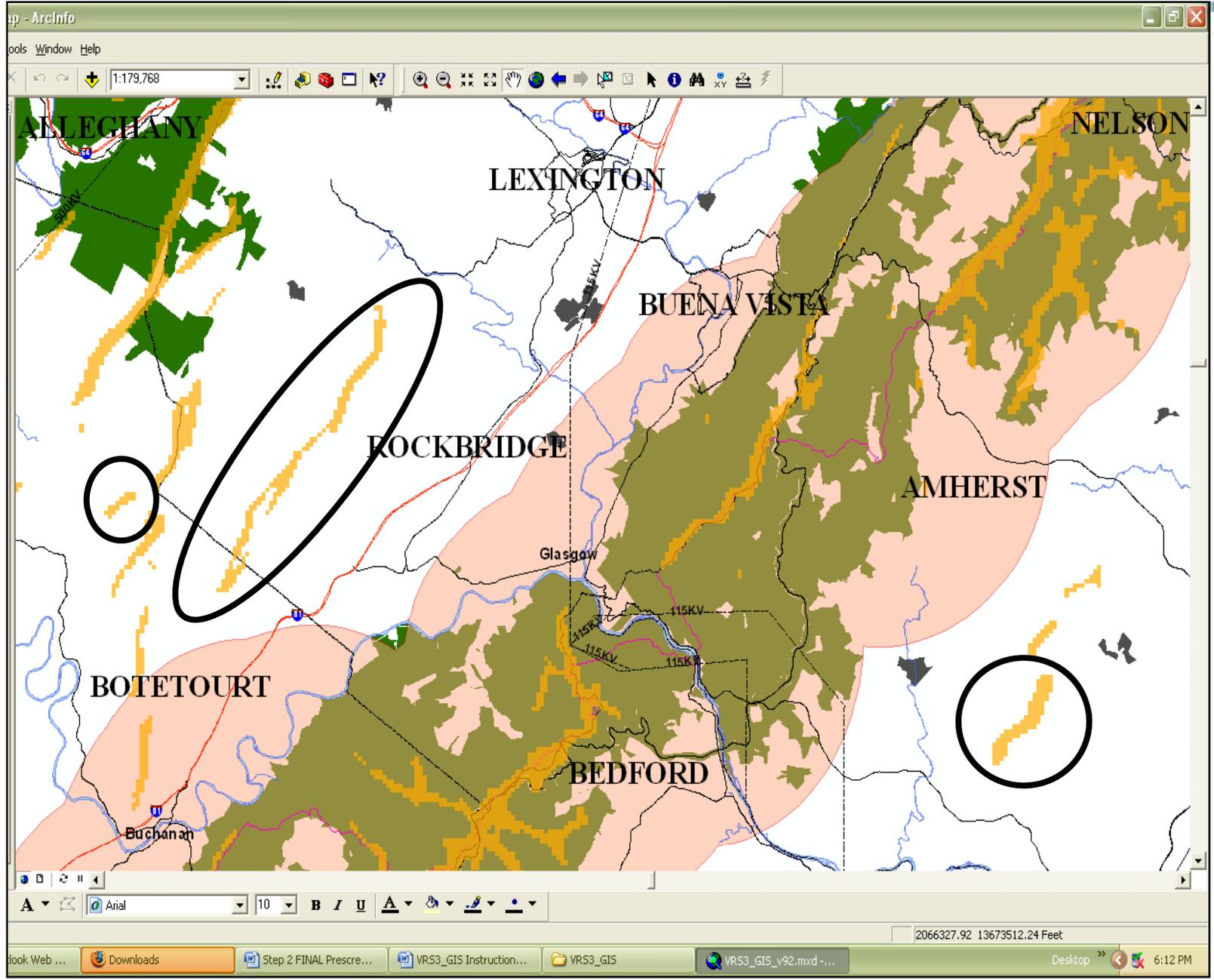
Resource Factors

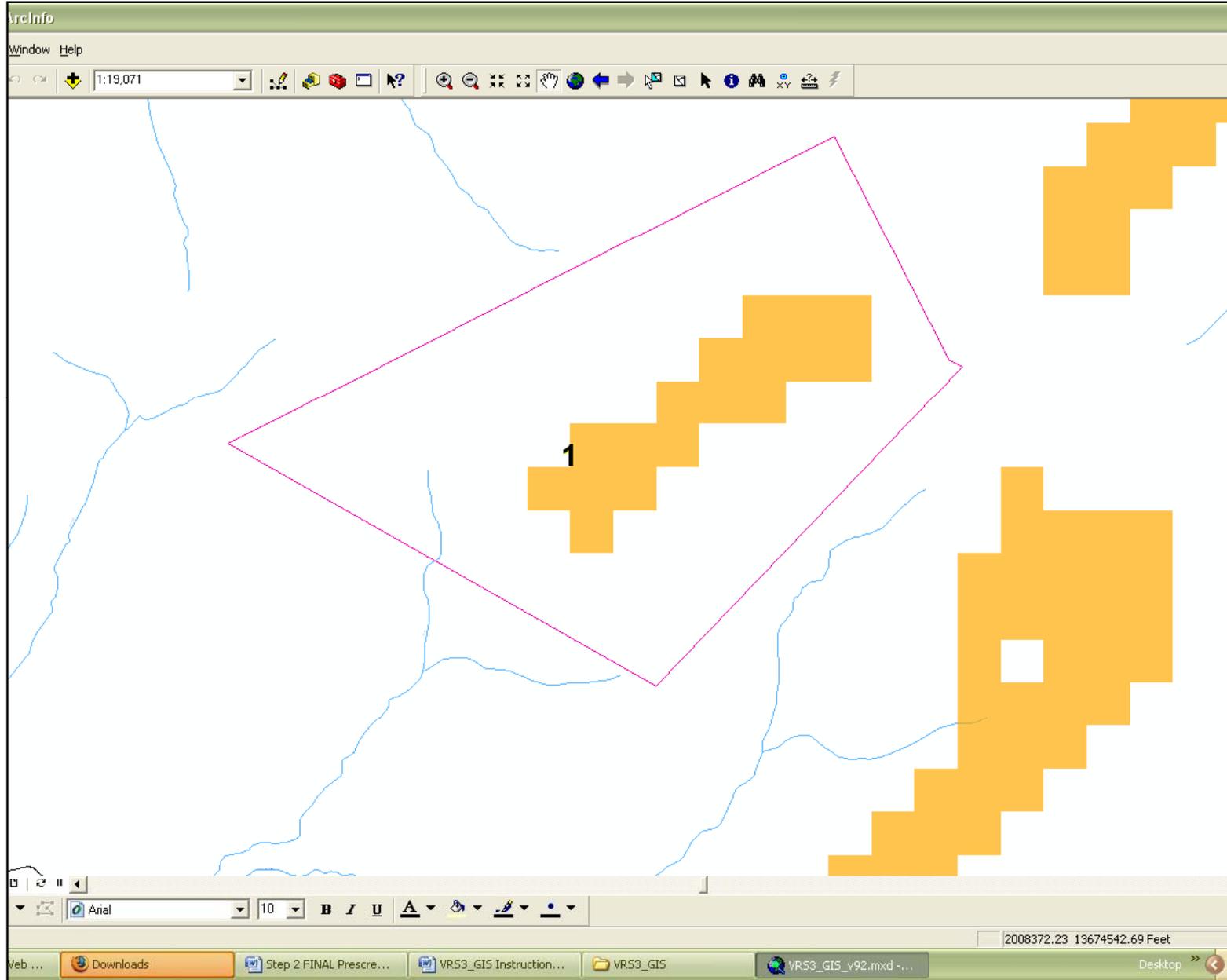
6. Potential Fish and Wildlife Impacts
7. Potential Plant, Insect, and Natural Heritage Resource Impacts
8. Potential Cold Water Stream Impacts
9. Recreational Value
10. Special Scenic Vistas
11. Degree of Multiparty Consultation

Community

Development

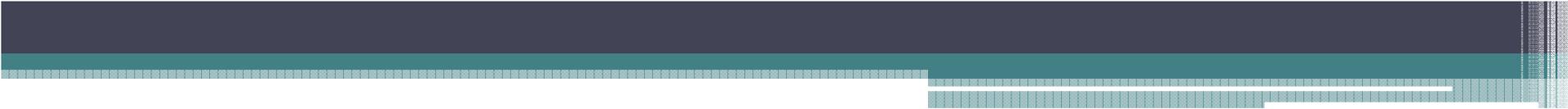
12. Presence of Economically Disadvantaged Communities
 13. Preferential Land Uses
 14. Environmental Justice Considerations
 15. Potential Impacts on Cultural Resources
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7.B. VRS3 Resources

- A detailed workbook
- DVD with GIS layers
- Available for download at:
 - <http://vrs3.cisat.jmu.edu>
 - Also available by mail; please contact Papadakis
- The Virginia Wind Energy Collaborative
 - <http://VWEC.cisat.jmu.edu>



The End; Thank You