

APPALACHIAN
LANDSCAPE CONSERVATION COOPERATIVE



Future Energy Development across the Appalachian Region:

Appalachian Landscape Conservation Cooperative (LCC)

Appalachian LCC

- 15 States
- 14 National Forests
- 9 National Park Areas
- 6 Wildlife Refuges
- 3 FWS Regions
- 3 NPS Regions
- 1 OSM Region
- 2 USFS Areas
- 2 USGS Areas
- 3 EPA Regions
- 3 (regional) NGOs


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The Appalachian LCC is a broad partnership effort


- *to serve as the forum* to bring people, organizations, and society together and help craft a balanced way forward, and
- *to ensure the future* of natural and cultural resources in the Appalachian region.

The energy tool developed by TNC through a grant from the LCC

- *will help deliver the best available science* to key decision-makers and stakeholders,
- *to lead productive and proactive discussions* to plan how best to achieve the balance necessary, and
- *to accommodate the Nation's needs* for energy, sustainable natural resources, and healthy people and communities.




<http://www.applcc.org/energy-forecast-model>




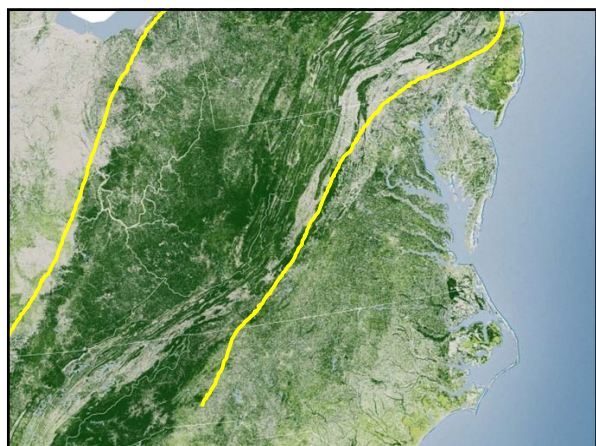
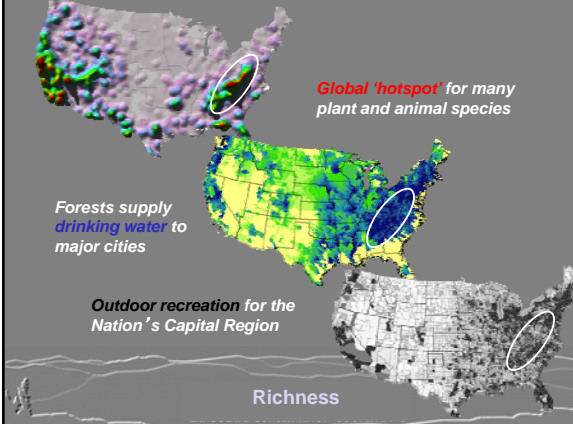
Outline:

1. Appalachian Region: Rich Nature and Energy and the Conservation Challenge
2. Overview of the Project and Deliverables
 - Deliverables
 - Partner Support
 - Cutting-Edge Science / Modeling
 - Future Modeling Projections
 - Delivering Science and Information
3. How to Find Info/Who to Contact



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Global 'hotspot' for many plant and animal species

Forests supply drinking water to major cities

Outdoor recreation for the Nation's Capital Region

Richness

... and Richness as Source Domestic Energy

coal **shale gas** **wind energy** **infrastructure & transmission**

Energy Potential

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Major Products

Report **Models**

Web-based mapping tool

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The Nature Conservancy

Research Team

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(Development by Design, Program)

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Sr. Conservation Scientist (+Modeling Grant Project Manager)

Brad Kreps
Director Clinch Valley Program (+Coal Study Project Manager)

Technical Advisory Team

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Previous Research by The Nature Conservancy

Pennsylvania Energy Impacts Assessment
2010

Development by design: blending landscape-level planning with the mitigation hierarchy
2012

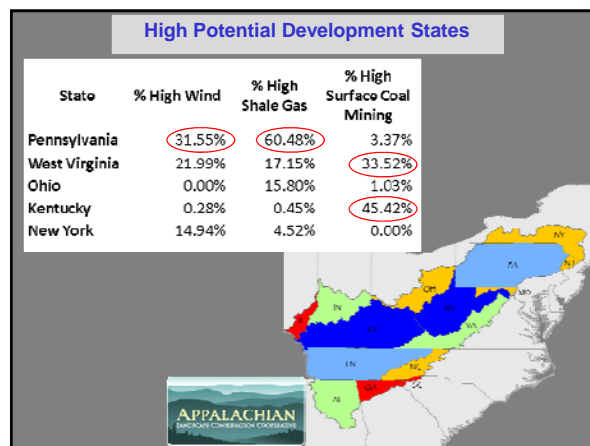
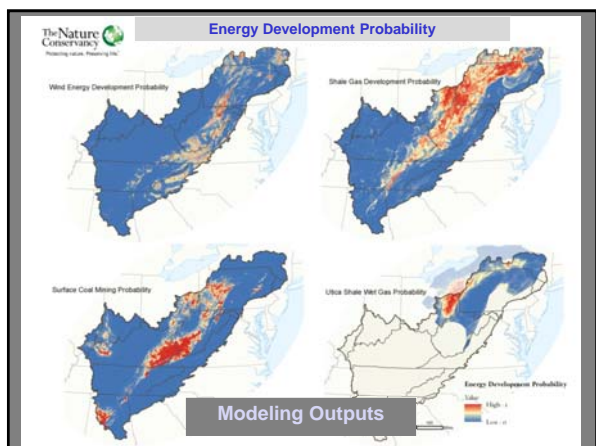
Shale Gas, Wind and Water: Assessing the Potential Cumulative Impacts of Energy Development on Ecosystem Services within the Marcellus Play
2014

The Nature Conservancy's Shale Sting Tool
2014

Model Variables

| Coal Model | Utica & Shale Gas Model | Wind Model |
|--|--|---|
| <ul style="list-style-type: none"> ash content BTU content geological type distance to intermodal distance to power plants distance to rail Energy Information Agency coal region Mountain-top-mining region population density sulfur content | <ul style="list-style-type: none"> surface geology topographic variation shale depth shale thickness surface dissection (3x3) <p>*anomalies = corrections for gravity effects (estimated v observed)</p> <ul style="list-style-type: none"> magnetic (capillary) "isogravitric" (terrain) "Bourguer" | <ul style="list-style-type: none"> wind production class distance to transmission line surface dissection (3x3) surface roughness (9x9) |

Legal and Regulatory Framework Not a Part of the Model Drivers

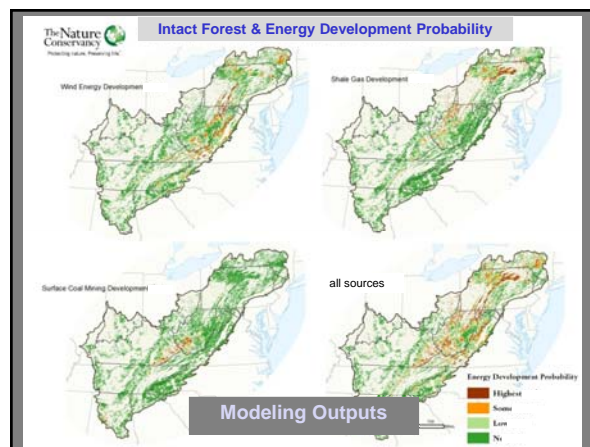


Energy Development Potential - Conserved Lands

Highest Probability of Energy Development of Protected Forest Core Areas by Ownership

| Protected Landowner | Total Acres in protected cores in LCC | Protected core areas at highest probability for Energy Development | % of Ownership at highest probability |
|---------------------|---------------------------------------|--|---------------------------------------|
| State | 10,872,230 | 1,565,586 | 14% |
| Federal | 11,440,396 | 540,121 | 5% |
| Private | 2,034,116 | 240,260 | 12% |
| Local Gov't | 323,300 | 37,241 | 12% |
| Unknown | 861,795 | 35,171 | 4% |
| Native Land | 494,159 | 9,971 | 2% |
| NGO | 335,990 | 8,123 | 2% |
| Grand Total | 26,361,986 | 2,436,474 | 9% |

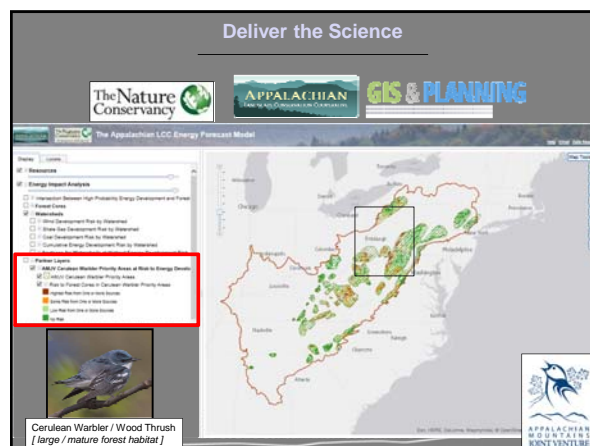
Data Analysis



Major Findings

- Nearly 7.6 million acres within the Appalachians LCC have a high probability of energy development.
- Much (70%) of the area where development may occur is forested.
- The region could see impacts to more than 5 million acres of forest land – an area the size of Massachusetts.
- High potential development covers only 6% of the total area of the Appalachians LCC
- However, the areas where development will occur are concentrated giving some areas much higher potential for impacts .
- More than 150 of watersheds within the study area that have the most intact forest cover are at risk from fragmentation and deforestation. These watersheds are important because they produce clean drinking water for many in the Appalachians and nearby urban centers.

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This study is intended to provide the data and information needed to start productive and proactive discussions about how best to sustain healthy natural systems, meet the region's energy needs, and meet the needs of people.

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The App LCC is a forum to bring together priorities, science and people to ensure the future of natural and cultural resources in the Appalachian region

This study and energy tool will help start productive and proactive discussions about how best to sustain healthy natural systems, meet the region's energy needs, and meet the needs of people.

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Where to find out more:
<http://applec.org/assessing-future-energy-development>

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WORKSHOP MATERIALS

Advancing the Next Generation of Environmental Practices for Shale Development
May 27, 28, & 29, 2015
Cohon University Center, Carnegie Mellon University
5000 Forbes Avenue, Pittsburgh, PA

Funded by the Calcom Foundation and coordinated by:
The Nature Conservancy
and
Carnegie Mellon University
Wilton E. Scott Institute for Energy Innovation
Steinbrenner Institute for Environmental Education and Research

140 expert participants from 4 key stakeholder areas:

- Oil and Gas
- Regulatory Agencies
- Academia
- NGOs

Workshop Goal

*Through interdisciplinary research and collaboration, this workshop seeks to catalyze enhanced solutions and to advance the next generation of environmental practices and policies for reducing the impacts of shale development to meet conservation goals in the Appalachian region.**

Specific workshop objectives included:

- Establishing the current state regarding regulatory framework and operational practices;
- Evaluation of the effectiveness of voluntary standards and associated protocols for transparency and compliance;
- Identification and confirmation of research gaps with agreed upon strategies for closing those gaps;
- Influence policy to meet conservation goals by clearly identifying priority actions and associated costs;
- Outline technological possibilities and other measures for reducing impacts and on-going operational options for their implementation.

9 key topics were addressed through working groups:

- Landscape Scale Planning
- Pipelines and Co-Location of Linear Infrastructure
- Air Quality
- Methane and Climate Change
- Water Sourcing: Origin, Use & Disposal
- Water: Pathways and Related Risks for Surface and Groundwater Contamination
- Erosion and Sedimentation and Site Reclamation
- Noise & Light and Operational Timing
- Roll up that focused on Cumulative Impacts.

Workshop products

The workshop product will be a synthesized report published by The Nature Conservancy and Carnegie Mellon University that draws from working group discussions to:

- Comprehensively define the 'State of the Challenge' for each topic area
- Prioritize existing or emerging solutions that could make strides in addressing this Challenge
- Outline short- and long-term strategies necessary to more fully understand the challenge or efficacy of solutions

The report will be reviewed by experts and written for target audiences that include federal, state, and local governments, oil and gas operators, research institutions, and land owners. The individual comments and suggestions of workshop participants will not be attributed in the report.

