The Nature Conservancy

Protecting nature. Preserving life.™

West Virginia: Energy Rich and Nature Rich

Michelle McGregor – Sr. Oil and Gas Development Advisor
Beth Wheatley – Director External Affairs
The Nature Conservancy

Agenda

The Nature Conservancy

Overview of The Nature Conservancy's Conservation Approach

- Energy by Design
  - Examples Appalachian Shale Gas Development Products
    - Energy Impacts Assessments
    - LEEP – Shale Infrastructure Siting Tool
- Conserving our Natural Assets

West Virginia's Energy and Natural Assets - Key to Our Economic Future

The Nature Conservancy

Protecting nature. Preserving life.™

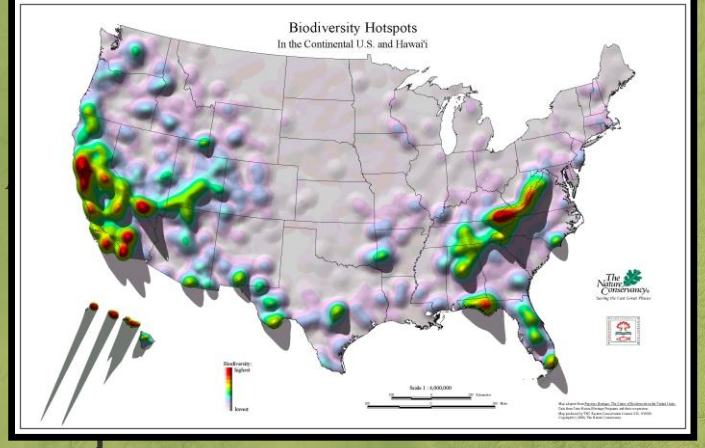
Who We Are

We're working with you to make a positive impact around the world in more than 30 countries, all 50 United States and your backyard.

- ❑ Since 1951
- ❑ 3600+staff, 700+ Scientists
- ❑ >1 million members

We've protected

- ❑ >119 million acres of land
- ❑ >5000 miles of rivers
- ❑ >100 marine conservation projects



PENNSYLVANIA

INDI

Pittsburgh

delphia

NEW JERSEY

MARYLAND

DELAWARE

Delaware Bay

WEST VIRGINIA

Washington D.C.

Annapolis

Frankfort

KENTUCKY

Chesapeake Bay

Richmond

VIRGINIA

Atlantic Ocean

Roanoke

0 25 50

Miles

N

W E

S

Knoxville

NORTH CAROLINA

TENNESSEE

Energy by Design

- **AVOID** conflicts between development impacts and areas of high biodiversity or conservation value

  Where development occurs:

  - **MINIMIZE** impacts as much as possible, using appropriate siting guidelines and Best Management Practices for operations

  - **MITIGATE** impacts as appropriate (most common for wetlands)

Energy Development in N. America

Energy sprawl is (by far) biggest driver of habitat loss in the United States

Energy development is expanding into many areas that previously were not at risk

Significant opportunities for improved siting and mitigation

Source: Fargione et al 2016

Some examples of TNC Science and Technology Based approaches to developing products and solutions for Energy Development.....

The Nature Conservancy
Protecting nature. Preserving life.™

Energy Impacts Assessment Goals

- Using Science and Technology to Develop Products & Solutions for Energy by Design
- Visualize future energy development
- Highlight potential conflicts between energy development and other important values
- Initiate dialogue among industry, policy makers, NGOs, and public

Assessment Steps and Results

Photo: Tamara Gagnolet - TNC

1. **SPATIAL FOOTPRINT** of existing energy development:
   - 8.8 acres of forest directly cleared per well pad, on average (including associated infrastructure)
   - Additional 21.2 acres of new edge habitat per pad

2. **PROJECTIONS**: How much energy infrastructure might be developed by 2030 and where is it likely to occur?
   - **60,000 new wells drilled** by 2030
   - **6,000 to 15,000 new well pads** by 2030
   - **10,000 to 25,000 miles of new gathering pipeline** by 2030

     1.6 miles of gathering pipeline per well pad

3. **NATURAL HABITAT IMPACTS** from development:
   - Forest habitat
   - Forest Fragmentation
   - Pathways for Invasive Species
   - Noise Pollution
   - Artificial Light
   - Brook trout
   - Rare species

Tools to Reduce Impacts

LEEP – Landscape Environmental Energy Planning Tool

The ArcGIS-based tool:

- Generates optimized layouts for shale oil/gas well pads, access roads, and gathering pipelines
- Incorporates existing environmental regulations and encourages exclusions and setbacks beyond regulatory minimums

Photo: Mark Godfrey - TNC

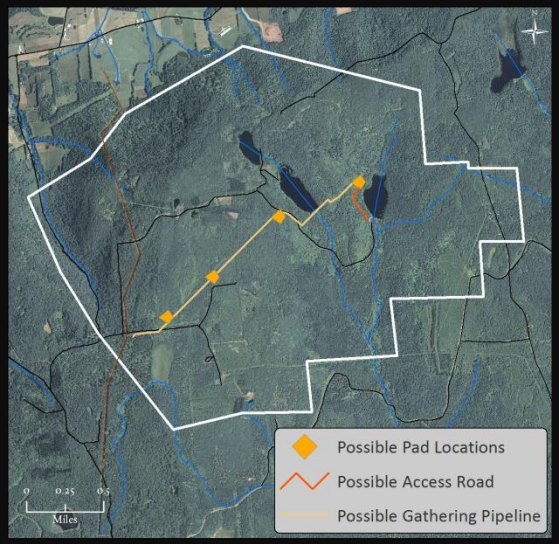
The Nature Conservancy
Protecting nature. Preserving life.™

LEEP Applications

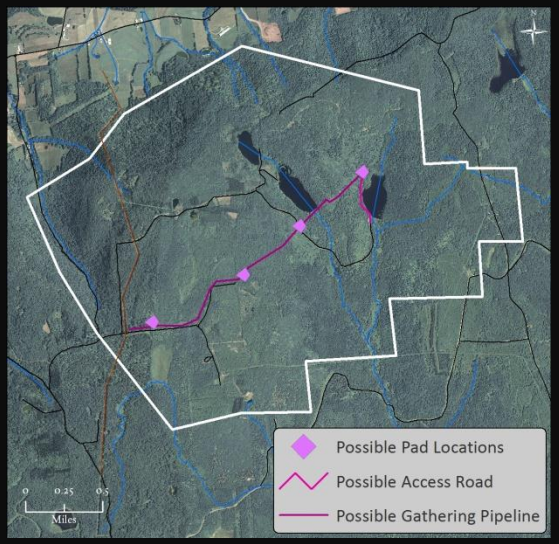
- Reduce surface impacts and minimize risks by going beyond regulatory compliance
- Identify optimized infrastructure layouts for many well pads at the same time
- Compare individual layouts in terms of environmental impacts and financial costs
- Site only linear infrastructure (with known pad locations)

LEEP Outputs: Comparing Layouts

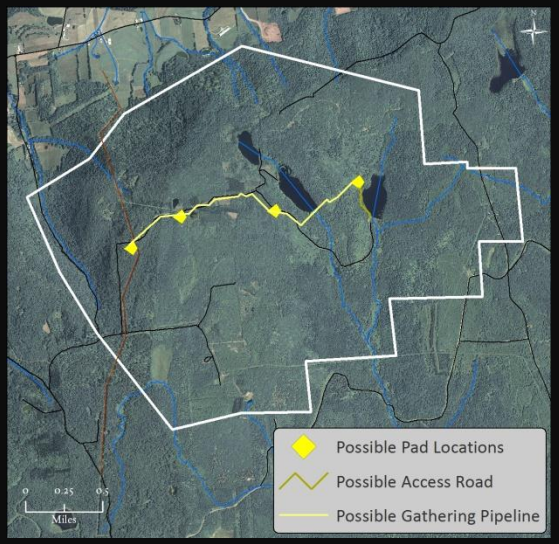
Layout A



Layout B



Layout C

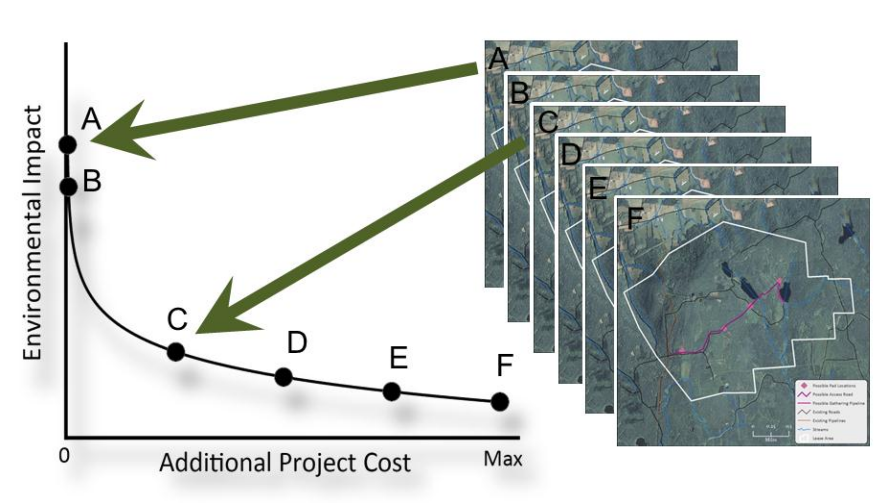


For each proposed infrastructure layout, the tool:

- Calculates environmental impact metrics
- Estimates development costs

LEEP Outputs

- Assesses trade-offs between environmental impacts and infrastructure development costs



TNC-CMU Shale Workshop

Advancing the Next Generation of Environmental Practices for Shale Development

May 2015

Coordinated by:

- **The Nature Conservancy**
- **Carnegie Mellon University**
  - Wilton E. Scott Institute for Energy Innovation
  - Steinbrenner Institute for Environmental Education and Research

Supported by the Colcom Foundation

Workshop Overview

Workshop Goals

- Leverage cross-sector collaboration to tackle complex environmental challenge areas (listed on next slide)
- Increase visibility of available solutions and catalyze new ones

Workshop Report summarizes:

- 'State of the Challenge', in terms of current science, technology, practice, and policy for each challenge area
- Prioritized recommended solutions

Who Participated? 140 Energy Experts

Federal, State, and Local Governments from PA, WV, and OH

Oil & Gas Industry

Consulting Firms

Non-Governmental Organizations

Research Institutions

Foundations

TNC-CMU SHALE WORKSHOP: CROSS CUTTING THEMES

- Environmental challenges are massive in scale and have solutions that depend on multiple stakeholders and multiple disciplines all working in tandem with each other;
- Knowledge gaps between stakeholders regarding current research, regulatory changes, and on-the-ground practices;
- A number of environmental challenges associated with shale development are also relevant with other forms of energy and infrastructure development, with opportunities to learn across sectors; **LANDSCAPE SCALE PLANNING AND SITING**
- Many solutions to a number of challenges already exist.
  - Example: Best-in-Class Operators and their standard operating practices and use of leading innovations. How to get broad adoption across the Industry. CSSD Standards as an Example

Landscape Scale Planning and Siting Roundtable Participants 2016

- Anadarko
- Benedum Foundation
- Chevron
- Center for Sustainable Shale Development
- Clean Air Task Force
- CMU
- Colcom Foundation
- CONSOL
- Dominion
- Eckert Seamans
- Environmental Defense Fund
- EQT
- Local Government Academy
- Pennsylvania Environmental Council
- Range Resources
- Richard King Mellon Foundation
- Shell
- Southwestern Energy
- Tioga County, PA
- TNC
- Triana Energy
- Washington County, PA
- Washington & Jefferson College, Center for Energy Policy & Management
- Williams Energy

Roundtable organized by the Center for Sustainable Shale Development, The Nature Conservancy, and Carnegie Mellon University

Siting Program Goals

(revised during 2nd Roundtable Discussion)

- **Promote responsible siting of shale infrastructure** that minimizes adverse local and landscape impacts to environmental and cultural resources.

- **Reduce the surface footprint of infrastructure development** through such actions as co-locating infrastructure (subject to legal and safety constraints), building cooperative relationships with municipalities and other entities, etc.

- **Integrate ecological and community considerations with geologic and economic factors** at the earliest possible planning stage. Consider a multitude of factors and determine how best to balance them in infrastructure placement decisions, based on regional context and site-specific conditions.

COMMUNITY

LAND

Categories

HABITAT

WATER

Why We're Successful

Everything we do is rooted in good science — aided by our hundreds of staff scientists.

We pursue **non-confrontational, pragmatic solutions** to conservation challenges.

We partner with indigenous communities, businesses, governments, multilateral institutions, and other non-profits.

We have the support of more than 1 million members who enable us to continue working on a scale that matters and implement solutions that endure.

The Nature Conservancy
Protecting nature. Preserving life.™

The Nature Conservancy
Protecting nature. Preserving life.™

The Nature Conservancy
Protecting nature. Preserving life.™

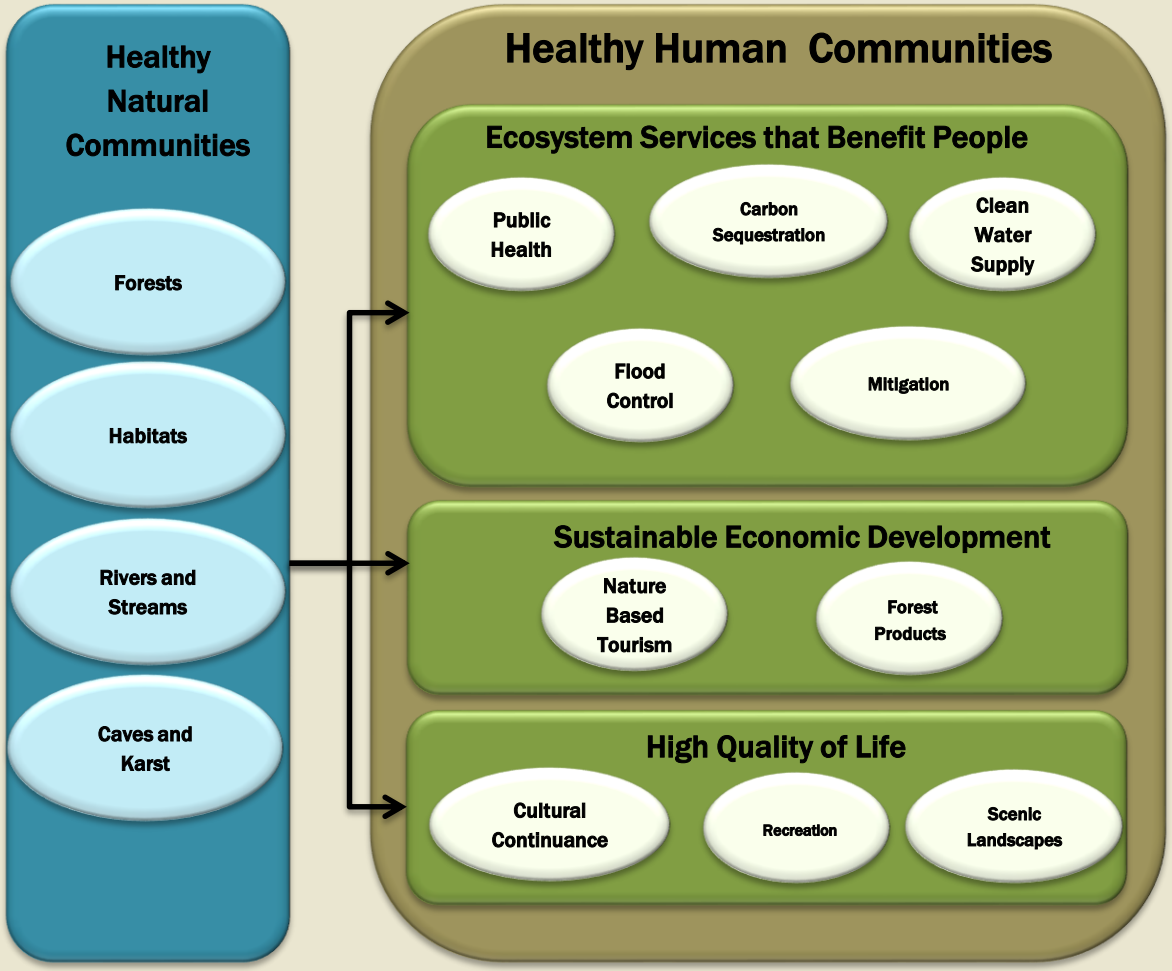
HUNTING, FISHING AND WILDLIFE-WATCHING

1.2 MILLION West Virginia residents and nonresidents fished, hunted or wildlife watched in West Virginia in 2011.

Hunters in West Virginia spent $422 MILLION on retail sales.

Anglers and wildlife participants spent $429 MILLION and $326 MILLION respectively.

The Nature Conservancy
Protecting nature. Preserving life.™


Healthy Natural Communities
Forests
Habitats
Rivers and Streams
Caves and Karst
Healthy Human Communities
Ecosystem Services that Benefit People
Public Health
Carbon Sequestration
Clean Water Supply
Flood Control
Mitigation
Sustainable Economic Development
Nature Based Tourism
Forest Products
High Quality of Life
Cultural Continuance
Recreation
Scenic Landscapes

The Nature Conservancy
Protecting nature. Preserving life.™

The Nature Conservancy in West Virginia

- TNC Preserves Open to the Public
- Other TNC Preserves & Conservation Easements
- Lands Protected with TNC Help
- National Forest Boundaries

Cranesville Swamp

The West Virginia chapter's first preserve now spans across 1774 acres in Preston County, WV and Garrett County, MD. This large wetland has a chilly climate which supports northern species that are easily observed from a boardwalk that traverses through a cranberry bog. Cranesville Swamp is a National Natural Landmark.

Ice Mountain

A National Natural Landmark, this 284-acre preserve along North River in Hampshire County features a rocky mountainside where ice accumulates deep in the rocks. Docents lead tours to the fragile habitat, offering a chance to see an unusual assemblage of wildflowers, ferns, and shrubs.

Eldolon

The 384-acre Eldolon preserve is located atop Sideling Hill Mountain in Morgan County. The Potomac Valley Audubon Society manages the property and encourages its use for quiet contemplation, nature study and education. Oak and maple forests cover the slopes and offer opportunities for birdwatching and wildflower viewing.

Yankauer

This 108-acre preserve in Berkeley County includes high bluffs overlooking the Potomac River. The Potomac Valley Audubon Society manages the property and runs a nature center that offers environmental and educational programs. The preserve's rich woods have spectacular wildflowers and are ideal for birdwatching.

Murphy

With their donation of 276 acres of land in 1967, James and Anna Murphy wanted to ensure there would always be a place where people could quietly study and enjoy nature. This 276-acre preserve is noted for its oak-hickory forests on a rolling topography of hills and coves, making it one of the highest quality natural areas in Pitkin County.

Brooklyn Heights

This 108-acre preserve on McGowan Mountain borders Otter Creek Wilderness in Tucker County. Located along the Black Fork River across from the town of Hendricks and a public water trail access point, the property is covered by rich deciduous forests.

Hungry Beech

Protected with the help of the Garden Clubs of the state, this 121-acre preserve in Roane County has rich forested areas. Historic hay fields along the ridge offer a diverse edge habitat that is good for birdwatching. Ferns and flowering plants make this preserve a spring wilderness garden.

Brush Creek

Scenic throughout all seasons, this 124-acre preserve in Mercer County extends from just below the Falls of Brush Creek, down into a dramatic canyon to the Bluestone River Gorge. A path leads through a forest noted for its diverse flora and superb birdwatching.

Slaty Mountain

This 180-acre preserve in Monroe County is covered by dry oak and pine woods. It supports one of the state's highest quality chalk barrens, which are extremely fragile, hot and dry habitats found only in the Central Appalachians. Hiking is limited to the dirt road and a trail through the preserve.

Upper Shavers Fork

This 46-acre preserve along the Shavers Fork in Randolph County protects swamps and spruce forests adjacent to the historic Cheat Mountain Club. Shavers Fork sits astride Cheat Mountain, noted for its rich mix of Canadian and Appalachian plants and animals.

Mount Porte Crayon

This remote 44-acre preserve in northwest Pendleton County sits on the south slope of Mount Porte Crayon. Reaching above 4400 feet, it is the highest TNC preserve in the state and borders the Roaring Plains Wilderness Area, which provides the only route for public access to the preserve.

Pike Knob

Noted for its remarkable beauty, this 1400-acre preserve rises to 4500 feet in elevation atop North Fork Mountain in Pendleton County and supports native forests of red pine, grass balds, and pine barrens. Pike Knob is the image featured on "Welcome to West Virginia" highway signs along the Interstates.

Greenland Gap

Stunning sandstone cliffs rim this 288-acre preserve where the North Fork of Patterson Creek has dived an 820-foot deep chasm through New Creek Mountain in Grant County. The preserve has hemlock forests, extensive rock fields and dry oak-hickory woods.

Bear Rocks

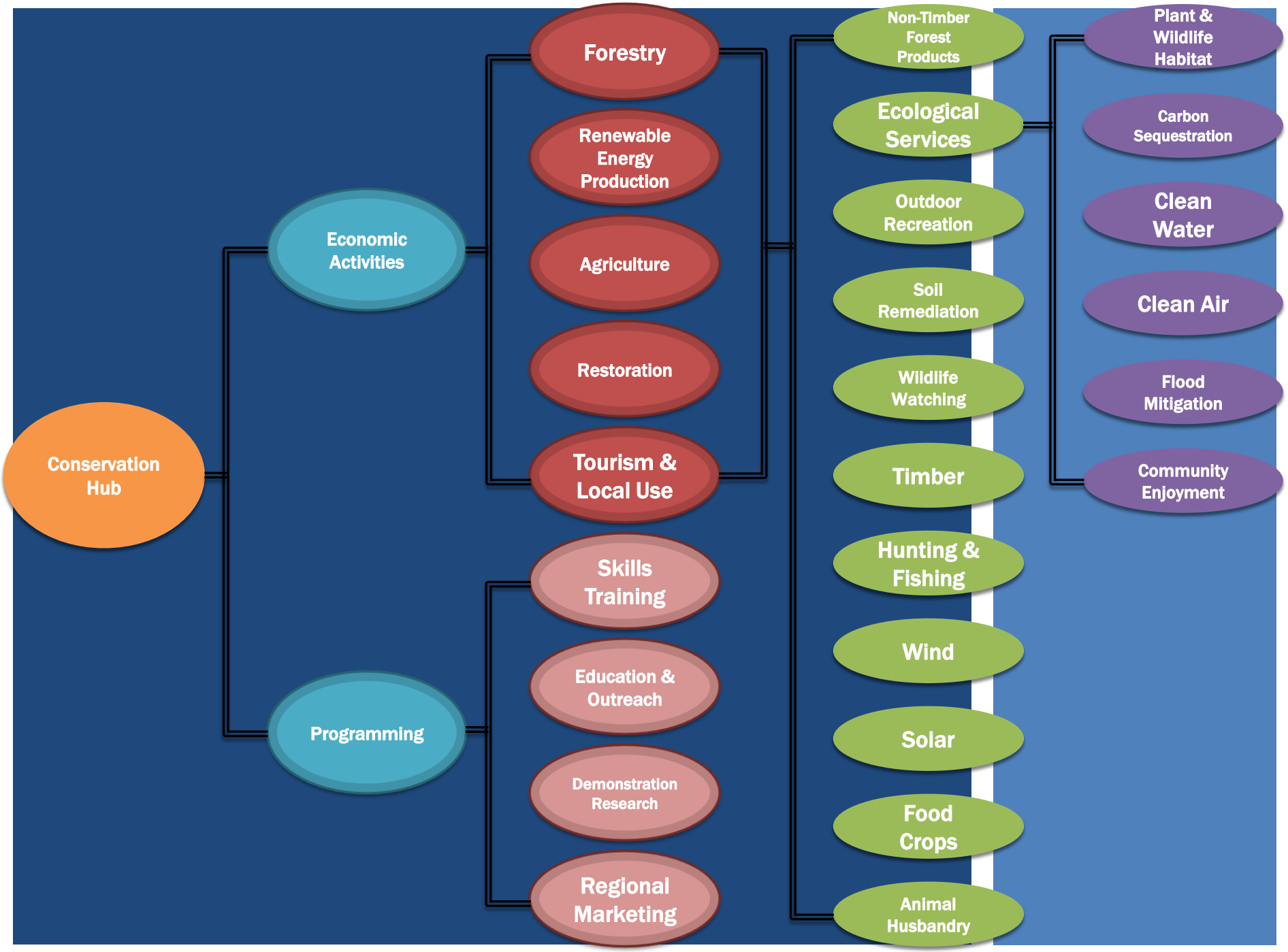
Providing spectacular views of the Allegheny Mountains, this iconic 477-acre preserve in Grant & Tucker Counties supports extensive heathlands, scattered spruce groves and cranberry bogs. The easily accessed scenic outlook provides excellent opportunities for photography.

The Nature Conservancy
Protecting nature. Preserving life.™
www.nature.org

The Nature Conservancy
Protecting nature. Preserving life.™

Tourism to national parks of Southern West Virginia created $64.1 million in economic benefits in 2015

The Nature Conservancy
Protecting nature. Preserving life.™


Conservation Hub
Economic Activities
Programming
Forestry
Renewable Energy Production
Agriculture
Restoration
Tourism & Local Use
Skills Training
Education & Outreach
Demonstration Research
Regional Marketing
Non-Timber Forest Products
Ecological Services
Outdoor Recreation
Soil Remediation
Wildlife Watching
Timber
Hunting & Fishing
Wind
Solar
Food Crops
Animal Husbandry
Plant & Wildlife Habitat
Carbon Sequestration
Clean Water
Clean Air
Flood Mitigation
Community Enjoyment

The Nature Conservancy
Protecting nature. Preserving life.™

Thank you!

michelle.mcgregor@tnc.org
ewheatley@tnc.org

Photo Credit: © Penn State Outreach and Online Education, Marcellus Shale photo album, Gas rig, via Tom Murphy