Pennsylvania Wilds

Design Guide Supplement

for Oil & Gas Best Practices

Source: EQT

Source: Shell Appalachia

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The Pennsylvania Wilds is a six million acre landscape that offers unique experiences, outdoor adventure, and a wealth of environmental assets. The history, character, charm, and natural features found in the region support a strong and successful tourism industry that is vital to the regional economy. Activities include shopping and the arts, bus tours, watersports, camping, wildlife viewing, hunting and fishing, hiking and biking, and so much more. Since the beginning of the 21st century, the "Pennsylvania Wilds" brand has become nationally and internationally recognized and tourism continues to grow.

The link between natural assets and economic activity in the Pennsylvania Wilds is not a new concept. In the late 19th and early 20th centuries, the region experienced widespread timbering that cleared virgin forests. The region also supported oil and gas drilling, farming, mining, and other undertakings. The forest has evolved since then and all of these economic activities still exist, along with growing commitments to welcome tourists, protect the ecosystem, preserve scenic resources, and maintain the authentic characteristics that make the region attractive and unique.

In partnership with stakeholders of the oil and natural gas industry, the Pennsylvania Wilds has yet another opportunity to strengthen and sustain its natural asset-based economy. A goal of the Pennsylvania Wilds Planning Team is for the tourism and resource extraction industries to work cooperatively so that both of these leading economic drivers continue offering benefits to the region while respecting and enhancing the naturally beautiful landscape. The majority of the guidelines contained in this Supplement may be helpful to other industries as well. **Future generations will thank today's property owners, community leaders, and industry representatives for working together and thinking ahead to promote environmental responsibility and stewardship across the region.**

Pennsylvania Wilds Design Guide

Supplement for Oil & Gas Best Practices

Encompassing Cameron, Clarion, Clearfield, Clinton, Elk, Forest, Jefferson, Lycoming, McKean, Potter, Tioga, Warren, and northern Centre counties.

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With assistance from:

T&B Planning, Inc.
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Chapter 1 - Introduction

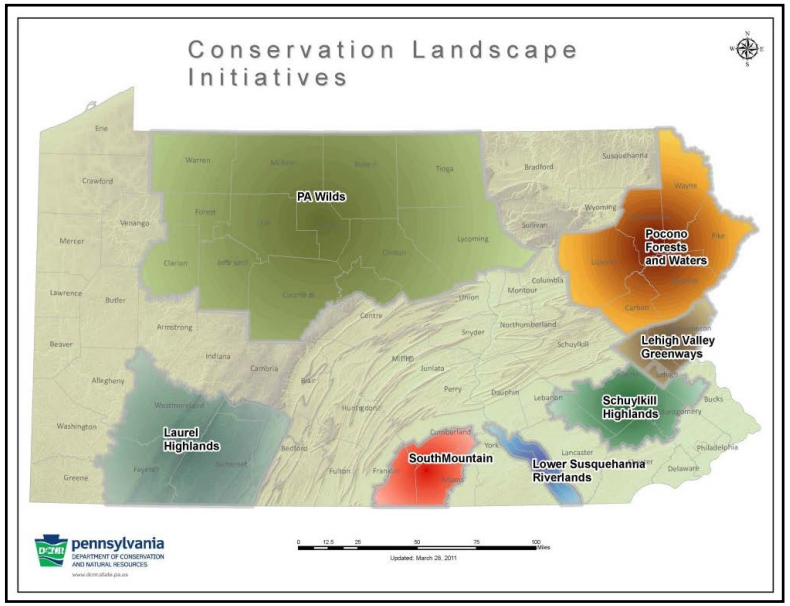
1.A: Conservation Landscape Initiative

In 2004, the Pennsylvania Department of Conservation and Natural Resources (DCNR) began a collaborative process of working in large regions across Pennsylvania to help communities protect their sense of place and the natural assets that make them unique. The approach focuses on value-driven and place-based links between sustainability, conservation, community revitalization, and recreational projects. Known as the Conservation Landscape Initiative (CLI), collaborations of state agencies, local government bodies, community leaders, funders, businesses, non-profits, and philanthropies work strategically in seven CLI regions. All seven CLIs have strong natural assets, local readiness and buy-in, and state-level investment and support.

CLIs look at large areas from regional, rather than local, viewpoints. In doing so, the CLIs bring diverse interests together to collaborate in ways that they have never done before. The results are a more efficient use of time, money, expertise, and other resources.

1.B: Pennsylvania Wilds CLI

The largest of the seven CLIs is the Pennsylvania Wilds, a 12½-county region in north-central Pennsylvania that makes up nearly a quarter of the Commonwealth (over six million acres). A large portion of this area is also part of Pennsylvania's Lumber Heritage Region, one of 12 Heritage Areas in the Commonwealth. The Pennsylvania Wilds is a mostly rural area that includes 29 state parks, eight state forests, 50 state game lands, two National Wild and Scenic Rivers, some of the darkest skies in the nation, the largest free-roaming elk herd in the northeast, and a National Forest. In total, the Pennsylvania Wilds has more than two million acres of public lands. As such, forest products, outdoor recreation, and tourism are significant contributors to the region's character and economy.



1.C: The Pennsylvania Wilds Initiative

The Pennsylvania Wilds Initiative was launched to coordinate the efforts of various state agencies, local government bodies, tourism promotion agencies, economic development leaders, and private sector interests to spur economic development, especially small business development related to nature and heritage tourism. In particular, an important objective of the Pennsylvania Wilds Initiative is to brand the Pennsylvania Wilds region as a distinct entity and world class destination for outdoor recreation experiences, thus attracting tourists, creating jobs, and sustaining communities.

Since its initiation, tourism has significantly increased throughout the Pennsylvania Wilds. Major investments have been made in park, forest, and infrastructure improvements; regional marketing programs; grants, loans, and technical assistance for small business development; and an artisan initiative to help improve the visibility and profitability of artisans and arts-related businesses. To-date, the Pennsylvania Wilds Initiative has met with great success. There is a documented substantial rise in park attendance, overnight leisure travel, tourism employment, state sales tax revenue from tourism categories, and new business development.

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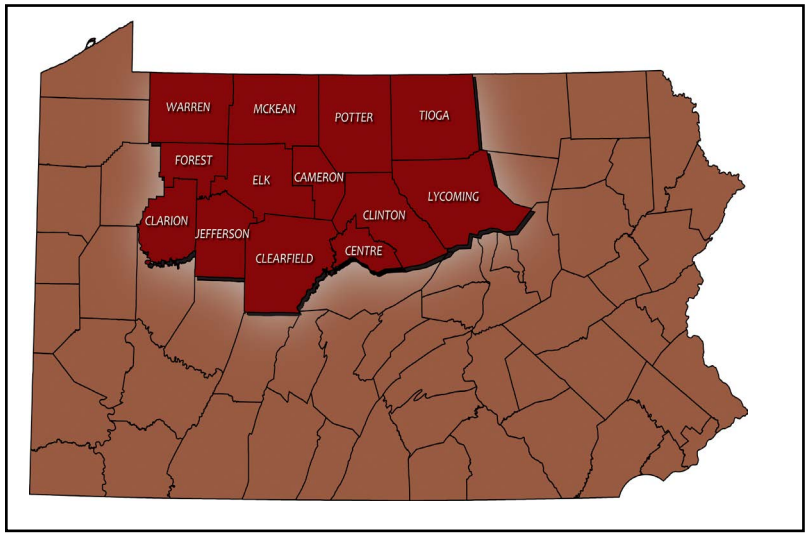
1.D: The Pennsylvania Wilds Planning Team

In response to the establishment of the Pennsylvania Wilds CLI and the Pennsylvania Wilds Initiative, a ground-breaking intergovernmental cooperative agreement was signed by 12 county governments in 2006. The agreement states that the 12 counties of Cameron, Clarion, Clearfield, Clinton, Elk, Forest, Jefferson, Lycoming, McKean, Potter, Tioga, and Warren will work together to address common planning issues and to ensure that the community character of the region does not suffer as a result of increased tourism. Never in the state's history had an agreement like this covered such a large geographic area.

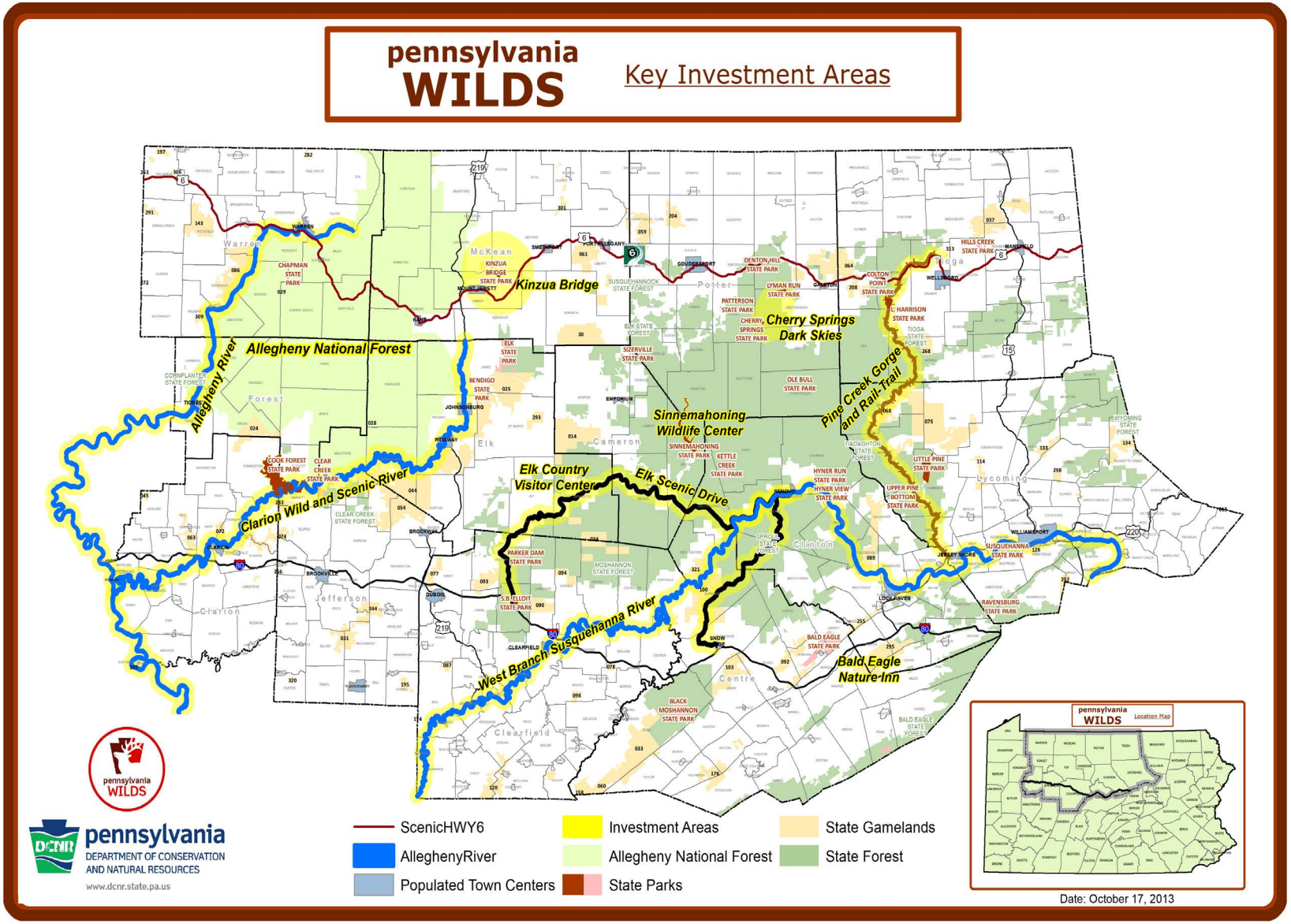
The agreement enabled the formation of the Pennsylvania Wilds Planning Team, a collaborative group of county planners, regional economic development and heritage organizations, local government associations, and other stakeholders that, among other objectives, help communities capitalize on the economic potential of the Pennsylvania Wilds Initiative while keeping the region unique and attractive. Since its inception, the Pennsylvania Wilds Planning Team has undertaken a region-wide planning study to strategically address key infrastructure planning issues. The Planning Team has also tackled regional issues such as developing better signs to direct visitors to state parks and other attractions, planning for increased bus traffic on secondary roads, encouraging cell phone coverage in an area notorious for spotty signals, and addressing increased sewage treatment needs in rural villages.

The Pennsylvania Wilds Planning Study Final Report, prepared by Mackin Engineering (December 2007) identifies investment and infrastructure needs in the region. The Planning Study is available for review at County Planning Offices.



Map of the Pennsylvania Wilds Region in the Commonwealth of Pennsylvania

PA Wilds 2013 Annual Awards Banquet

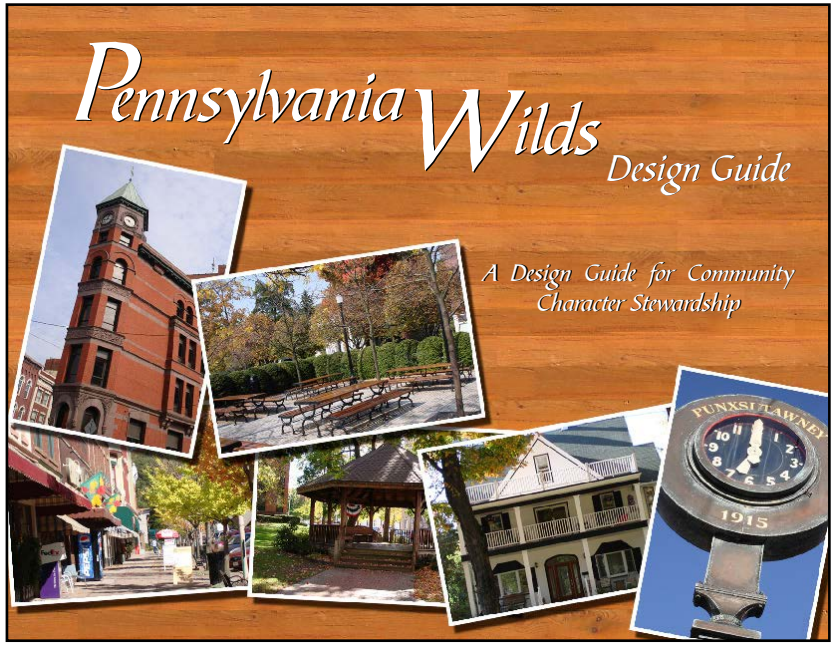


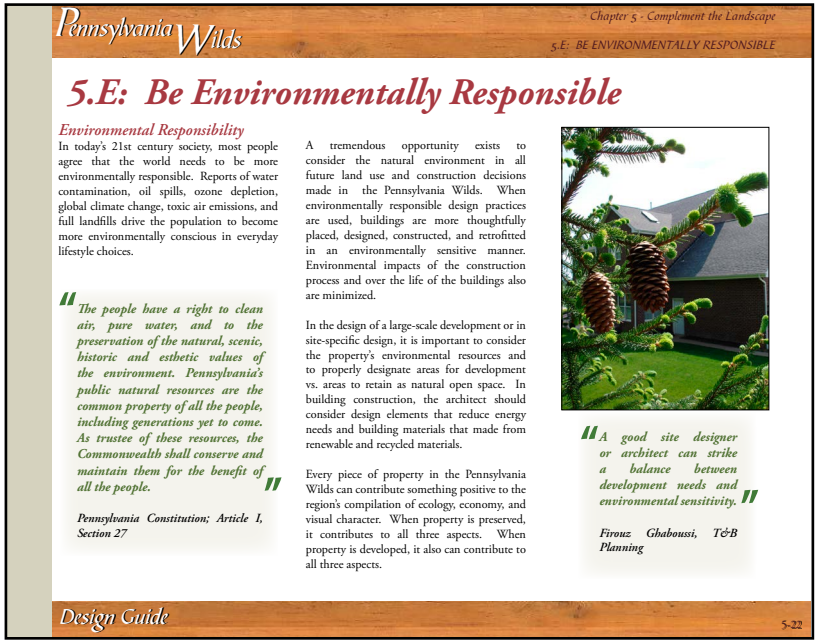
Source: Department of Conservation and Natural Resources (2013)

1.E: The Pennsylvania Wilds Design Guide

In 2007, the Pennsylvania Wilds Planning Team published the *Pennsylvania Wilds Design Guide, a Design Guide for Community Character Stewardship*. The Design Guide contains voluntary recommendations that address community design, architecture, landscaping, signage, lighting, and other topics that help to maintain and enhance the defining characteristics of the Pennsylvania Wilds. It gives advice about how to strengthen regional identity, enrich local community character, and diminish the negative effects that certain development activities could bring if not thoughtfully planned. The *Design Guide* also explains what can be done to preserve the region's vast and beautiful scenic landscape.

The *Pennsylvania Wilds Design Guide* is available for download from www.pawildsresources.org.




Pennsylvania Wilds
Chapter 5 - Complement the Landscape
5.E: BE ENVIRONMENTALLY RESPONSIBLE

5.E: Be Environmentally Responsible

Environmental Responsibility

In today's 21st century society, most people agree that the world needs to be more environmentally responsible. Reports of water contamination, oil spills, ozone depletion, global climate change, toxic air emissions, and full landfills drive the population to become more environmentally conscious in everyday lifestyle choices.

"The people have a right to clean air, pure water, and to the preservation of the natural, scenic, historic and esthetic values of the environment. Pennsylvania's public natural resources are the common property of all the people, including generations yet to come. As trustee of these resources, the Commonwealth shall conserve and maintain them for the benefit of all the people."

Pennsylvania Constitution; Article I, Section 27

A tremendous opportunity exists to consider the natural environment in all future land use and construction decisions made in the Pennsylvania Wilds. When environmentally responsible design practices are used, buildings are more thoughtfully placed, designed, constructed, and retrofitted in an environmentally sensitive manner. Environmental impacts of the construction process and over the life of the buildings also are minimized.

In the design of a large-scale development or in site-specific design, it is important to consider the property's environmental resources and to properly designate areas for development vs. areas to retain as natural open space. In building construction, the architect should consider design elements that reduce energy needs and building materials that made from renewable and recycled materials.

Every piece of property in the Pennsylvania Wilds can contribute something positive to the region's compilation of ecology, economy, and visual character. When property is preserved, it contributes to all three aspects. When property is developed, it also can contribute to all three aspects.

"A good site designer or architect can strike a balance between development needs and environmental sensitivity."

Firouz Ghaboussi, T&B Planning

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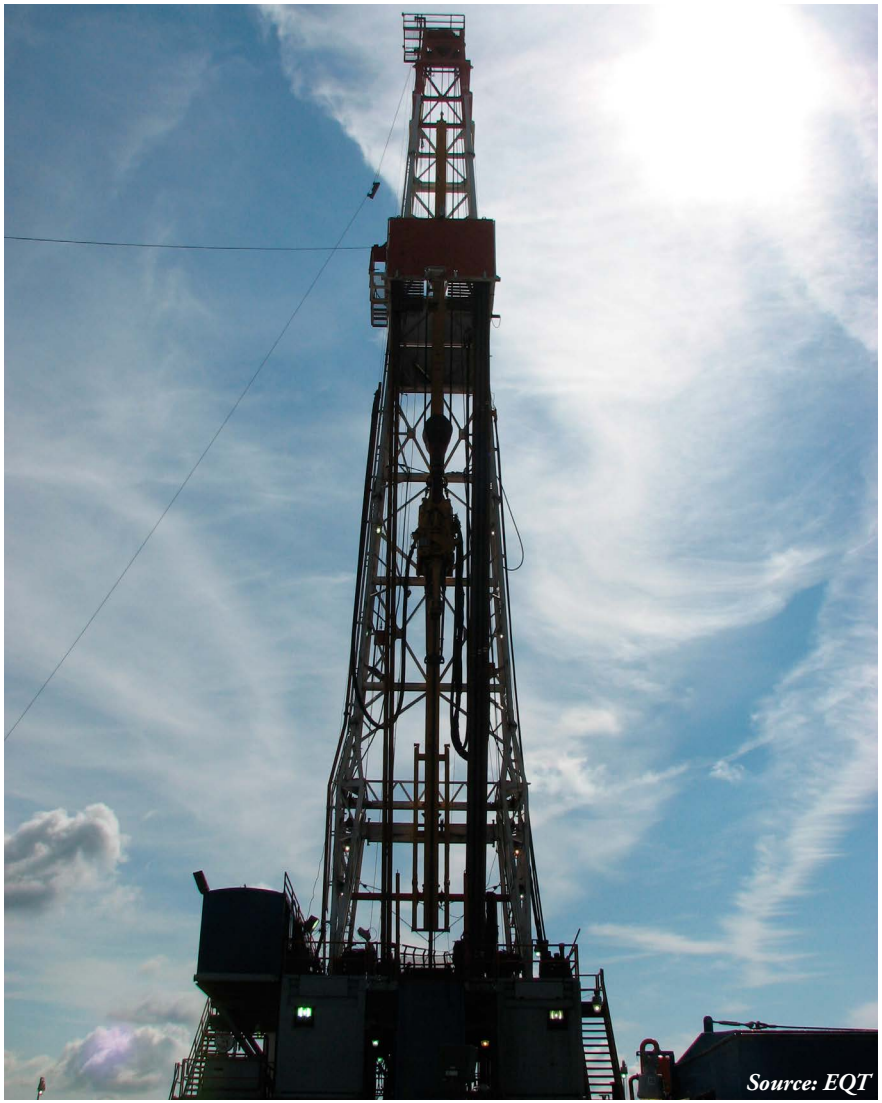
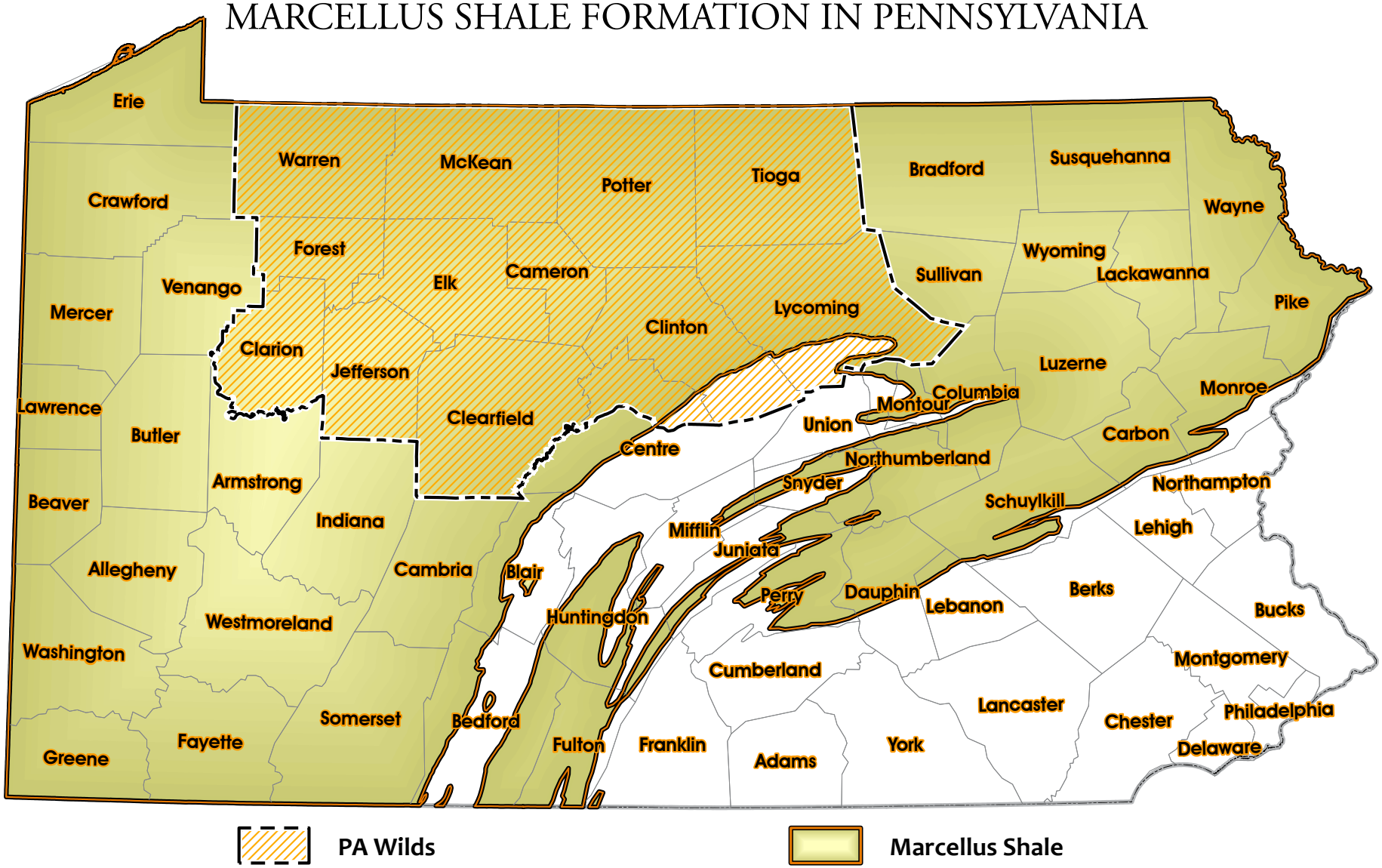
1.F: Why a Design Guide Supplement for Oil & Natural Gas Activities?

Resource extraction activity was not thoroughly addressed in the original publication of the *Pennsylvania Wilds Design Guide.* Nevertheless, timbering of trees, mining of coal and non-fuel minerals, and drilling for oil and natural gas have occurred across Pennsylvania and in the Pennsylvania Wilds for over 150 years. In the 21st century, technological advancements and fuel price increases have enabled economical extraction from shale gas reserves found in the Appalachian Basin. The Pennsylvania Wilds is located in the heart of this reserve. As a result, the region has seen a fast-paced increase in natural gas exploration, extraction, processing, and distribution activities since about 2008. The trend is expected to continue for at least the next 20-40 years. That said, community leaders recognized that a supplement to the *Design Guide* to address the activities of this important industry would be beneficial to property owners, communities, industry representatives, and others. In addition, the majority of the guidelines contained in this Supplement may be helpful to other industries as well.

The increase of natural gas activities brings new opportunities to align with the Pennsylvania Wilds CLI and efforts of the Pennsylvania Wilds Planning Team. Future generations will thank today's property owners, community leaders, and industry representatives for working together and thinking ahead to promote environmental responsibility and stewardship across the region.

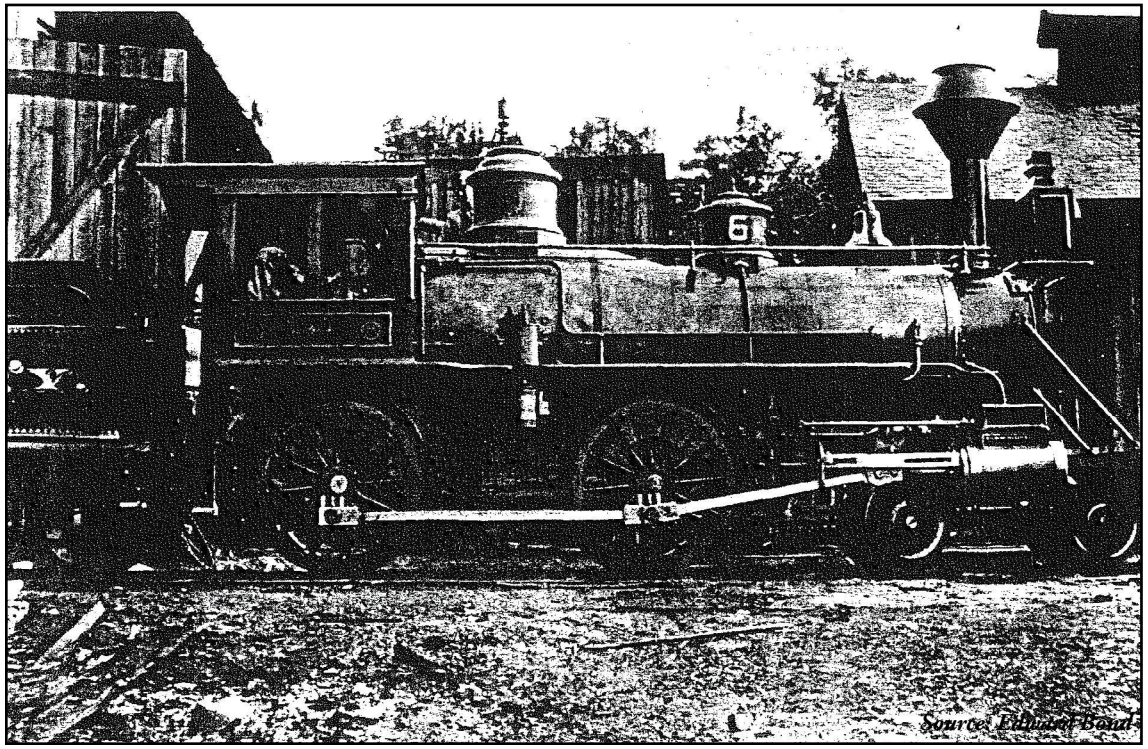

Source: EQT

MARCELLUS SHALE FORMATION IN PENNSYLVANIA



1.G: History of Oil & Gas in the Pennsylvania Wilds

Before European settlement, Pennsylvania was blanketed in virgin timber. Around the early 1800's, people began to clear the timber to make way for farming and settlement, which set the Pennsylvania Wilds region on a path to see a vast majority of its virgin timber cut, logged, and used domestically or exported by the 1920's. Also located in the middle of the Appalachian basin oil field, north-central Pennsylvania was at one time referred to as "the cradle of the petroleum industry." This is where the petroleum industry began when oil was first discovered in Titusville, Pennsylvania in 1859 and where natural gas production flourishes today. Drilling in the Pennsylvania Wilds was initiated in Clarion, Elk, Forest, McKean, and Warren Counties as early as 1860. Many towns rose and grew in population due to these activities. For example, communities such as Tidioute and West Hickory located along the Allegheny River experienced measurable population increases from oil industry development in the mid 1800's. This early phase of oil exploration continued until about 1874.



Warren & Farnsworth Valley No. 6 leaving her stall in the engine house at Clarendon, Warren County

The region's oil production rapidly increased in the late 19th century as discoveries of significant oil fields continued and industry equipment advanced to allow access to deeper formations. As a result, areas like Bradford in McKean County and Warren in Warren County flourished between 1875 and 1881.

The increase in production led to widespread oil market speculation between 1882 and 1885. Nonetheless, new fields continued to open in locations across the Pennsylvania Wilds.

Notable locations included Cherry Grove in Warren County, Balltown in Forest County, and Kane in McKean County. From 1885 to 1902, the Pennsylvania oil industry stabilized but then decelerated in about 1903 when the Appalachian basin started experiencing a decline in production due to an overshadowing by extraction activity occurring in the American southwest. Exploration and production in Pennsylvania continued, but at a much slower pace. It was also during this time of the late 19th and early 20th century that widespread timbering occurred throughout the Pennsylvania Wilds, which cleared much of the virgin forest and positioned the area for future designation as the "Lumber Heritage Region" under Pennsylvania's Heritage Park Program.

The first successful oil well was drilled in Titusville, PA.

Oil production has had a continued presence in the Pennsylvania Wilds ever since it first began in the 1800's. Pennsylvania grade crude oil has the highest lubricating properties of anywhere in the world. This oil fueled equipment and machinery used in World War I and World War II and is still a prized lubricant in the contemporary oil market.

Beginning in about 2008, new technology and advances in science enabled the economical drilling of natural gas in the Marcellus shale formation. The formation underlies much of the Pennsylvania Wilds and is one of the largest shale reserves in the United States. As such, the region is again experiencing a surge of gas production activity that is projected to continue into the foreseeable future.

Shallow gas well development (2013), Potter County.

1.H: Decision-Making for Oil & Natural Gas Activities

In order to extract natural gas from subsurface geologic formations and deliver it to end-users, a complex infrastructure system is needed. Primary components of a typical system include well pads, wells, access roads, water and gas pipelines, gas compression, metering, processing facilities, transmission lines, secondary support services, and many other facilities.

Installation and maintenance of such an extensive infrastructure system involves a multi-layered decision-making process. Many parties are involved, including surface land owners, subsurface owners, regulatory authorities, industry representatives, and others. Decisions include determining where to locate well pads and pipelines, how to position the facilities, which roads to use, how to transport water and drilling materials, how to dispose of waste, where to install the gathering lines, compressor stations, and processing facilities, and how to effectively deliver the gas to consumers. Additionally, there are a number of secondary support services that support the oil and gas industry and the persons it employs.

The establishment and operation of a gas infrastructure system is a phased process during which many opportunities arise to benefit the Pennsylvania Wilds. To establish well pads, pipelines, and their associated infrastructure, necessary activities include but are not limited to vegetation clearing, grading (landform alteration), and soil compaction. Some effects like increased traffic, noise, water usage, wastewater treatment demand, and lighting are temporary. After drilling, pipeline installation, and well completion, gas companies must reclaim disturbed sites in accordance with regulatory requirements and as specified in lease agreements. The terms of reclamation are usually prescribed in state and federal permit documents and in property owner lease agreements that are signed before any ground disturbance begins. It is during this time that the greatest opportunity exists to ensure long-term improvements to the Pennsylvania Wilds landscape. Years later, when the lifecycles of wells and pipelines are complete, final reclamation activities typically return the surface of disturbed sites to their pre-disturbance condition, or to an end-use desired by the property owner(s).

Chapter 2 of this Supplement focuses on the direct and indirect surface effects of oil and gas industry operations in the Pennsylvania Wilds and available opportunities to align with the Pennsylvania Wilds CLI, to the extent that these effects can be addressed in the context of design recommendations and in light of regulatory requirements. The goal of the guidelines presented in Chapter 2 is to promote cooperation between the Pennsylvania Wilds Planning Team, surface and subsurface owners, regulatory authorities, oil and gas industry representatives, and others, particularly regarding resource conservation opportunities that have strong connections to the Pennsylvania Wilds Initiative.

1.I: Acknowledgement of Regulatory Requirements

This Supplement acknowledges that oil and natural gas production is a heavily regulated industry. The Pennsylvania Department of Environmental Protection (DEP) is the primary agency responsible for permitting and monitoring operations in the Commonwealth. In addition, other federal, state, and local agencies have permitting and approval authority when resources under their purview are affected. This Supplement also recognizes that some oil and gas operators go above and beyond regulatory requirements by implementing their own best management practices and/or recommendations promoted by industry associations. Regardless, even by meeting the basic regulatory requirements, a lot is already being done to protect health, safety, and welfare in the Pennsylvania Wilds. **The guidelines contained in this Pennsylvania Wilds Design Guide Oil & Gas Supplement do not replace regulatory requirements.** They are presented to educate stakeholders about the important natural and cultural resources found in the Pennsylvania Wilds and to set forth recommendations for surface and subsurface owners, industry representatives, regulatory authorities, and others to seriously consider when making decisions that affect the surface of the land.

List of Regulatory Agencies

State

- Pennsylvania Department of Environmental Protection (DEP)
- Pennsylvania Department of Conservation and Natural Resources (DCNR)
- DCNR Bureau of Forestry
- Pennsylvania Historical and Museum Commission (PHMC)
- Pennsylvania Department of Transportation (PennDOT)
- Pennsylvania Fish & Boat Commission (PFBC)
- Pennsylvania Game Commission (PGC)
- Pennsylvania Public Utility Commission (PUC)
- Pennsylvania Emergency Management Agency (PEMA)

Federal

- U.S. Department of Labor, Occupational Safety & Health Administration (OSHA)
- U.S. Department of Commerce (DOC)
- U.S. Department of the Interior, Bureau of Land Management (BLM)
- U.S. Army Corps of Engineers (ACOE)
- U.S. Environmental Protection Agency (EPA)
- U.S. Fish and Wildlife Service (USFWS)
- U.S. Department of Energy (DOE)
- Federal Energy Regulatory Commission (FERC)
- American Petroleum Institute (API)

Regional and Local

- County Conservation Districts
- County Planning Offices
- Delaware River Basin Commission
- Susquehanna River Basin Commission
- Local Municipalities

NOTE: This list may not be all inclusive. Contact the agencies and organizations listed above for more information about their requirements and best management practices.

Chapter 2 - Guidelines

2.A: Introduction to the Guidelines

As a public service, use of the *Pennsylvania Wilds Design Guide* and this Supplement is voluntary. The guidelines in this Supplement showcase how federal and state agencies, local governments, community leaders, businesses, surface and subsurface owners, non-profits and philanthropies can partner with the Pennsylvania Wilds Planning Team and support the Pennsylvania Wilds Initiative by avoiding, minimizing, mitigating, and monitoring impacts, advancing environmental resource conservation, and achieving other mutual goals.

Guidelines are numbered "OG" in the remainder of this document. The guidelines presented herein were compiled and adapted from a variety of sources to provide recommendations tailored to the Pennsylvania Wilds landscape. Refer to the References portion of this Supplement for a list of those sources. The recommendations were scrutinized by industry representatives and have realistic application, as many are already in use.

It may not be practical to apply every guideline listed in this document in every circumstance. Additionally, certain guidelines are a higher priority in some locations than others and the guidelines should be appropriately applied depending on the situation at hand. The Pennsylvania Wilds Planning Team requests that individuals involved in oil and gas decision-making processes employ these suggestions to meet and surpass regulatory requirements in the Pennsylvania Wilds whenever possible.


Source: Marcellus Shale Coalition

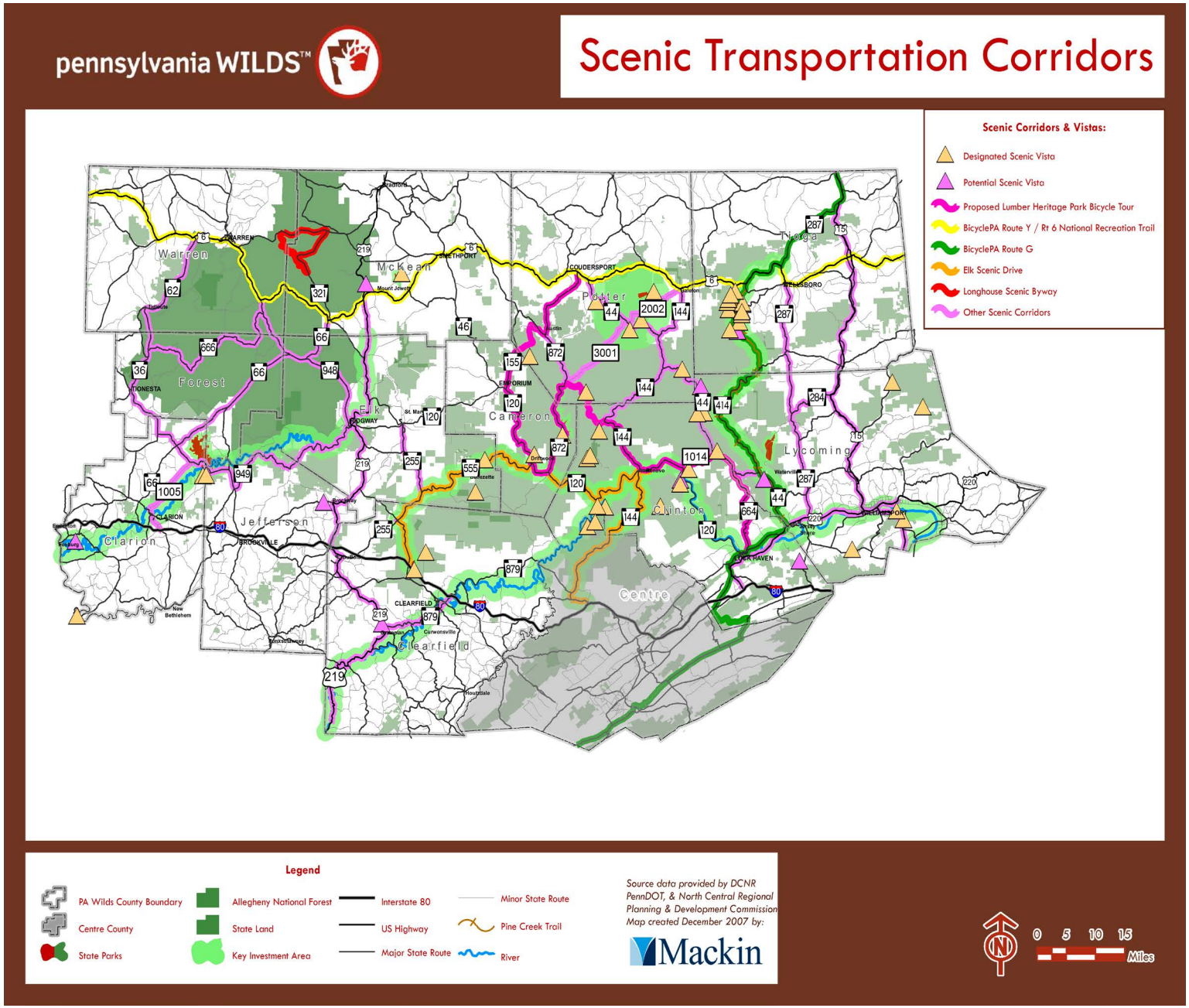
Most importantly, this Supplement is intended to promote collaboration. The region is a special place and has a natural ambiance that is unparalleled in other parts of the nation. By working together, the landscape's natural beauty, environmental assets, recreational opportunities, and charming communities will continue to be admired for generations to come.

2.B: Protect Scenic Viewsheds and Vistas

The Pennsylvania Wilds boasts some of the most spectacular wild lands east of the Mississippi. The preservation of scenic viewsheds and vistas is vital to maintaining the region's natural beauty and leaving a memorable mark in the minds and eyes of visitors and residents. As presented in the *Pennsylvania Wilds Design Guide*, scenic viewsheds and vistas in the region include, but are not strictly limited to, public views of:

- Scenic landforms, including canyons, ridges, and peaks;
- Lakes, rivers, streams, and their shorelines;
- Significant bedrock outcroppings and other unique geologic features;
- Forests and large stands of mature trees;
- Open expanses of agricultural landscape;
- Town centers from long-distance vantage points; and
- Visually prominent historic sites and resources.

A map of scenic transportation corridors found in the region is shown on the next page. In addition, individuals should consult Comprehensive Plans, Open Space and Greenway Plans, and other planning documents available from the Planning Commission of each Pennsylvania Wilds county to identify the locations of other important viewsheds and vistas. Some cities, boroughs, townships, and municipalities also have their own Comprehensive Plan. Maintaining scenic views from public use areas is highly important to the Pennsylvania Wilds Initiative because people most frequently experience the visual quality of an area from public roads, parks, trails, navigable waterways, historic landmark sites, and other visitor destinations. For this reason, scenic beauty as experienced from public viewing areas should be considered with every decision that could have an effect on the landscape.



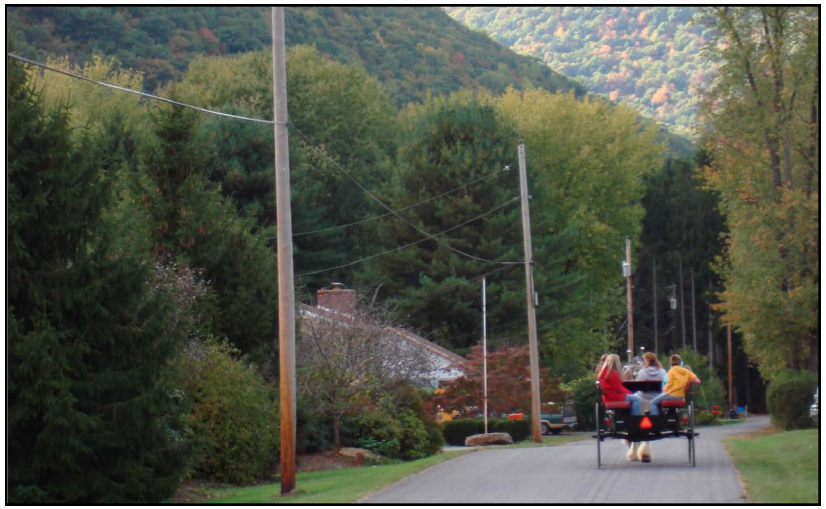
Source: Pennsylvania Wilds Planning Study (2007)

GUIDELINES

The Pennsylvania Wilds landscape is bursting with scenic views. Many regulatory programs dictate the siting of oil and gas facilities and infrastructure. Also, surface and subsurface owners can influence siting decisions. The Pennsylvania Wilds Planning Team requests that whenever possible, adverse impacts on scenic views be avoided, or minimized and mitigated, particularly when the effect would be long term rather than temporary and/or when the effect would be visible from a scenic travel route or visitor destination. Resource extraction operations can support the Pennsylvania Wilds Initiative by respecting scenic views and viewsheds and by enhancing view opportunities where possible.

#	GUIDELINES
OG-1.	Reach out to the applicable county planning office, local government body, and local stakeholder groups to identify the locations of scenic views as experienced from highways, roads, public trails, visitor destinations, historic landmarks, waterways, and shorelines. Please make a sincere effort to protect scenic views by avoiding or carefully managing the siting and design of industry operations in scenic viewsheds.
OG-2.	Views of unspoiled ridgelines and hilltops are characteristic of the Pennsylvania Wilds. Wherever possible, avoid siting facilities on the outer edges of ridgelines and hilltops if the facility could be perceived as visually intrusive to the natural landscape.
OG-3.	Scenic views are treasured from public roadways, public trails, waterways, parks, picnic grounds, campgrounds, tourist destinations, historic landmarks, and town centers that cater to visitors. If a facility that could be perceived as visually intrusive or disruptive to people using or visiting these areas, either: a) select a site location that is out of public view; b) maintain a few rows of trees (enough for visual screening) between the facility and the public viewing area; or c) if screening cannot be accomplished with existing trees, establish a landscaped buffer around the facility's perimeter.
OG-4.	Hillsides are more visible than flat areas. When it is necessary to install horizontal infrastructure on a hillside that can be seen by people using or visiting public roadways, public trails, waterways, parks, picnic grounds, campgrounds, tourist destinations, historic landmarks, and/or town centers that cater to visitors, work with the local government body and local stakeholders to determine if their priority is to limit disturbance area (which would result in the alignment running straight up the slope) or limit visual impact (which would likely result in the alignment running roughly parallel with natural topographic contours).
OG-5.	Where new roads and easements are needed, consider if the alignments can be designed to serve as new trails (hiking, mountain biking, waterfront access, snowmobiling, etc.) or public accesses with opportunities to offer scenic views after industry uses for the alignments cease.

Preserve the natural appearance of hilltops and ridgelines by positioning facilities away from the edge.



Strive to protect views of unspoiled hillsides and hilltops, particularly from visitor routes and destinations.

Consider public views when determining locations and developing reclamation plans for temporary and permanent infrastructure alignments.

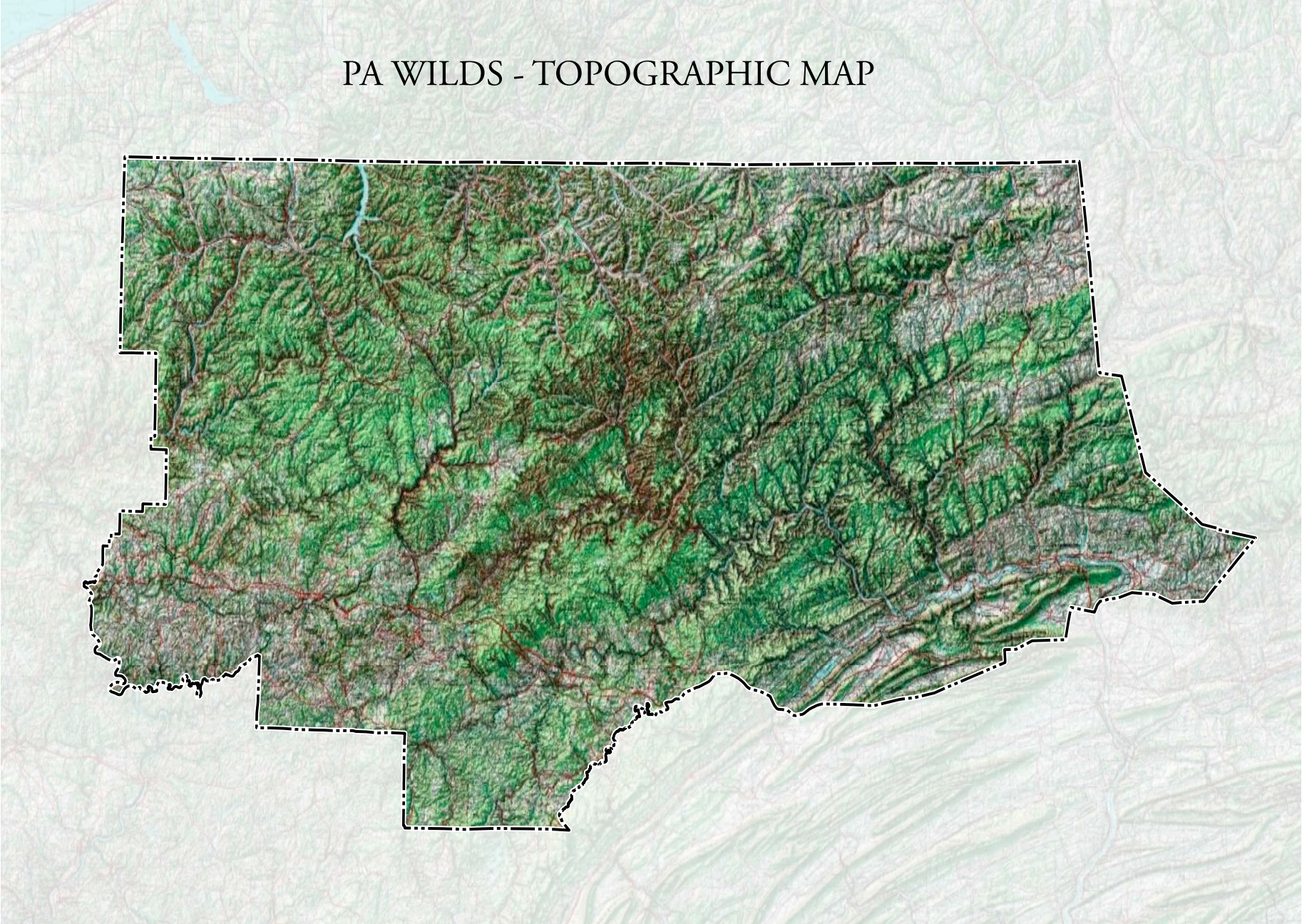
Work with local stakeholders to identify their priorities for the protection of scenic views.

2.C: Be Sensitive to Natural Landforms

The region's topography is visually striking, consisting of a series of steep landforms with high slopes, plateaus, and ridges interspersed with rolling hills and valleys. Rivers and streams carve deep paths through the landscape and accentuate the geography. The Pine Creek Gorge in Tioga County, often called the "Grand Canyon of Pennsylvania" is 50 miles in length, and over 1,000 feet deep in places. A topographic relief map found on the next page depicts the general landform characteristics.

The *Pennsylvania Wilds Design Guide* promotes the retention of natural landforms and the use of sensitive grading and building techniques. Protecting landform features such as peaks, ridgelines, hillsides, steep slopes, and canyons strengthens visual experiences and creates a higher quality image of the region.

An objective of the Pennsylvania Wilds Planning Team is to protect the region's natural landform character and reduce environmental and visual damage. This is important because if scenic hillsides and canyon slopes become compromised, or if undulating topography is replaced with manufactured slopes that look engineered and artificial, a defining element of the Pennsylvania Wilds natural backdrop will be lost.



Source: T&B Planning, Inc.

GUIDELINES

The Pennsylvania Wilds is hilly and mountainous, so the establishment and reclamation of temporary and permanent resource extraction facilities and secondary support services can affect the natural landform. Many regulatory programs dictate siting and grading requirements for oil and gas facilities and associated infrastructure. Also, surface and subsurface owners play roles in siting and grading decisions. The Pennsylvania Wilds Planning Team requests that modifications to natural landforms be minimized and mitigated, particularly when the effect would result in an unnatural appearance and be visible from public views. Resource extraction operations can support the Pennsylvania Wilds Initiative by respecting natural landforms and by reclaiming disturbed sites to conditions that blend in with the natural topography.

#	GUIDELINES
OG-6.	When selecting locations for facilities that require a flat pad, favor naturally flat areas or gently sloping areas over steep hillsides; except, avoid the outer edges of flat ridgelines and hilltops that are visible from lower elevations.
OG-7.	Consider the immediately surrounding topography and use site-sensitive grading techniques that mimic the appearance of natural contours, particularly during site reclamation activities. Round the tops and toes of manufactured slopes to blend into the natural topography.
OG-8.	Where feasible, centralize facilities on single sites to decrease physical disturbances to the natural landscape caused by developing multiple sites.
OG-9.	For infrastructure that will be used in the short-term (such as temporary water lines), favor above-ground alignments that create little land disturbance and can be removed after use.
OG-10.	In locations where physical obstacles do not exist or can be worked around, use existing infrastructure alignments (roadway rights-of-way, power and communication line corridors, sewer and water easements, railways, snowmobile trails, etc.) when selecting locations for temporary or permanent horizontal infrastructure (roads, pipelines, etc.). In most cases, avoid constructing new roadways and other horizontal infrastructure in close proximity to existing, established alignments that could be used instead, unless there are overriding regulatory requirements, physical obstacles, or other circumstances present. Work collaboratively with the local government body and local stakeholders to identify the advantages and disadvantages of using existing alignments and co-locating water distribution lines with gas gathering lines.

Favor above-ground alignments for temporary lines to reduce ground disturbance.

Consider locating pipelines in shared easements.

Limit land disturbance to the minimum amount necessary.

Use grading techniques that blend into natural topographic contours.

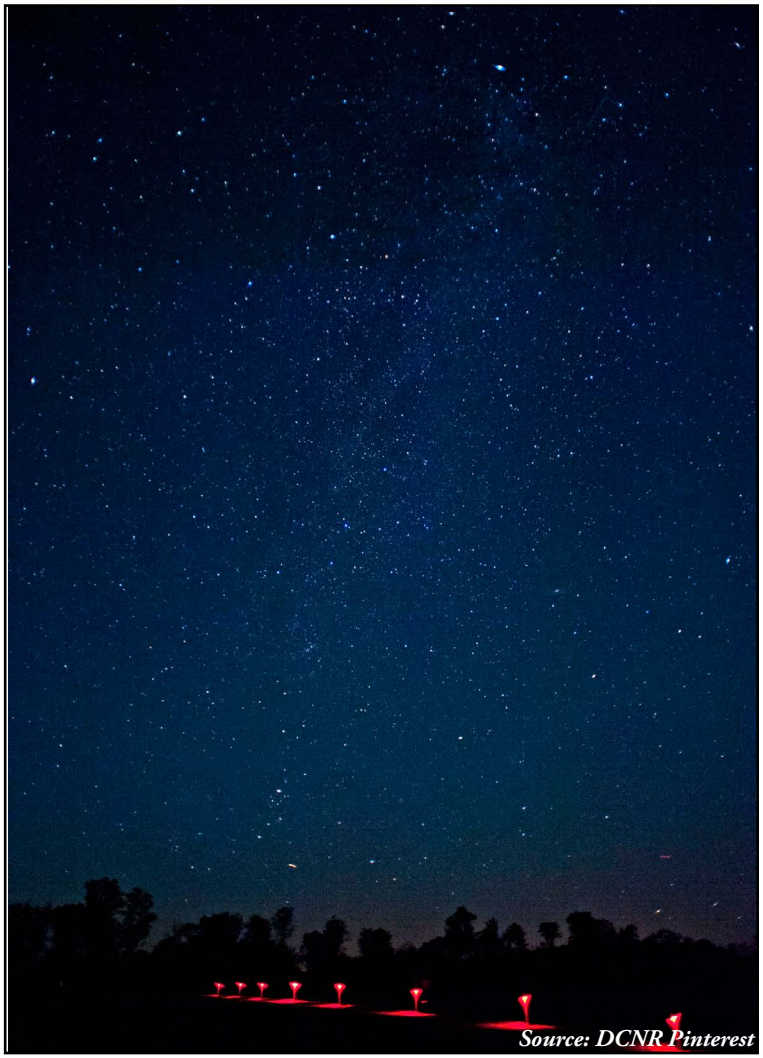
GUIDELINES

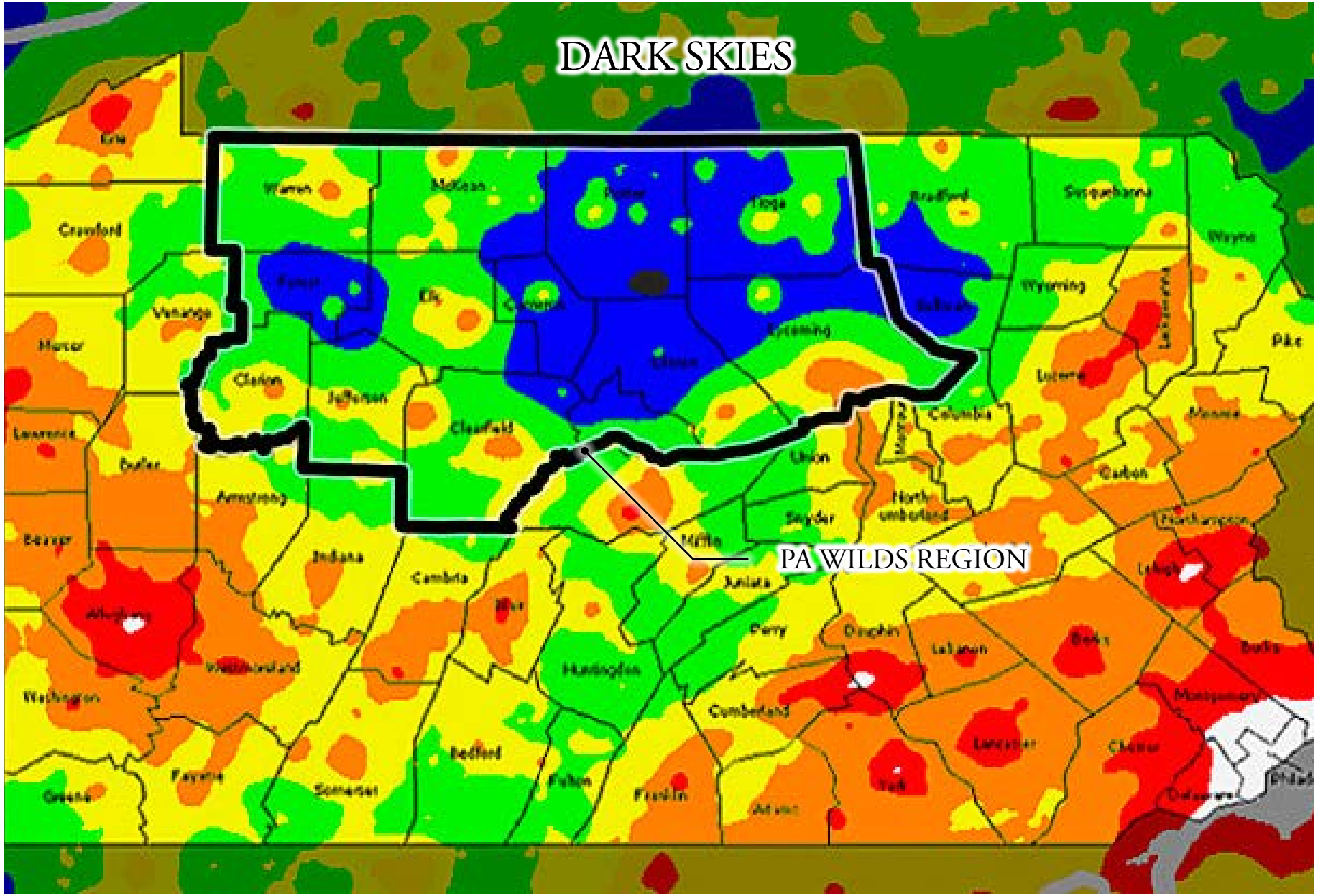
2.D: Preserve Dark Skies

The Pennsylvania Wilds region offers some of the darkest night skies in the nation, which attract astronomers, stargazers, and visitors. A dark night sky is also beneficial for human sleep and nesting birds and animals that move nocturnally. The most popular dark sky area in the eastern United States is Cherry Springs State Park, located in Potter County south of Route 6 and north of Route 44 surrounded by the Susquehannock State Forest. Cherry Springs is an "International Dark Sky Park" designated by the International Dark-Sky Association. It has also received national press coverage for its spectacular dark sky.

A map of the Pennsylvania Wilds dark skies is included on the next page. Cherry Springs is the black dot on the map in Potter County. The black, blue, and green areas indicate where the sky is darkest. The yellow, orange, red, and white areas show the progression of light pollution across the Commonwealth.

Light pollution causes a glow in the nighttime sky, often called "sky glow." Sky glow is produced by glare, light trespass, and uplighting caused by excessive over-lighting and by lights that are misplaced, misdirected, and/or not properly shielded. Too much artificial lighting can overcome the night sky and reduce the visibility of stars and other astronomical features. Light pollution is an increasing problem in the region. A goal of the Pennsylvania Wilds Initiative is to maintain the dark sky and continue to be internationally admired as having one of the darkest skies in the United States.


Source: DCNR Pinterest



Source: Light Pollution Science and Technology Institute - World Atlas of Artificial Sky Brightness.

GUIDELINES

The methods used to light temporary and permanent resource extraction facilities and secondary support services can affect the Pennsylvania Wilds dark sky. Short-term flaring of gas wells, which is subject to numerous regulatory requirements, can temporarily affect the dark sky. Additionally, although regulatory programs including but not limited to OSHA requirements and applicable zoning ordinances address short- and long-term artificial light sources, most lighting decisions are made by facility operators. The Pennsylvania Wilds Planning Team requests that whenever possible, artificial lighting be minimized to protect the dark sky. Resource extraction operations can support the Pennsylvania Wilds Initiative by minimizing light pollution.

#	GUIDELINES
OG-11.	Where exterior lights are needed, use downward-directed fixtures, advanced lighting technologies, and on/off switches or motion detectors that activate light only when needed.
OG-12.	When non-emergency flaring of a well is necessary, time the flaring activity to occur during daylight hours and/or during overcast sky conditions when possible to limit visibility of the flare.
OG-13.	Stargazing is a popular activity in the Pennsylvania Wilds between approximately April 1 and October 31. When non-emergency flaring of a well must occur during nighttime hours, please make every attempt to not flare during the dark of the moon lunar phase (new moon) to avoid interference with astronomy activities.
OG-14.	Reach out to local event organizers and obtain a schedule of their dark sky events (stargazing, astronomy, etc). Please make a sincere effort to suspend flaring during dark sky events.
OG-15.	Consider the use of enclosed combustors (flares in an enclosure) to reduce light pollution associated with flaring.

Use downward-directed lighting fixtures.

Use the minimum amount of artificial lighting necessary.

Make a sincere effort to flare only when necessary and to avoid interference with dark sky astronomy activities.

2.E: Value Trees and Landscaping

Once virgin forest that was extensively clear cut in the late 19th and early 20th centuries for domestic goods and export, today's Pennsylvania Wilds forest areas have renewed themselves as a predominately hardwood forest. Responsible forest management is strongly supported by the *Pennsylvania Wilds Design Guide,* including practices that involve selective cutting and reforestation. The region's forests, trees, wetlands, and diversity of plant life that cover the landscape are important ecological and scenic features. Vegetation not only contributes to the medley of visual pattern, but also provides environmental benefits such as retention and absorption of storm water, filtration of pollutants from water, production of oxygen, protection from wind and rain, reduction of erosion and sedimentation, and provision of habitat and food for wildlife species.

In the Pennsylvania Wilds, retention of a healthy and mature forest supported by responsible forest management practices is a primary goal. Trees are visual symbols of the region's lumber heritage and reinforce thematic elements of the native landscape. The *Pennsylvania Wilds Design Guide* discourages the unnecessary removal of trees and encourages the preparation of forest management plans for tree removal as an economic resource.

GUIDELINES

A large portion of the Pennsylvania Wilds is covered in forest, so it is likely that resource extraction activities and support services will affect trees and other vegetation. Many federal and state regulatory programs address and ensure mitigation for impacts to sensitive plant and wildlife species and require reclamation of disturbed sites as phased operations complete. For example, before receiving any permits from the PA Department of Environmental Protection to construct a road, well pad or pipeline, drill a well, or cross a stream, operators are required to use the PA Natural Diversity Inventory (PNDI) Environmental Review Tool, which alerts operators if their proposed project will impact endangered or threatened species, other species of concern, or their habitat. If there is a conflict, the operator must take avoidance measures or agree to mitigation. Also, lease agreements with surface property owners may specify the types of plant materials that are to be established during reclamation. The Pennsylvania Wilds Planning Team requests that whenever possible, measures be taken to avoid unnecessary tree cutting and forest fragmentation and ensure ongoing habitat diversity and a healthy and mature forest. Resource extraction operations can support the Pennsylvania Wilds Initiative by enhancing the value of the region's forests and vegetation communities.

#	GUIDELINES
OG-16.	When selecting sites for pad and pipeline placement, favor previously disturbed areas, such as areas that have been previously mined, farmed, or timbered.
OG-17.	When undertaking an activity that involves land clearing, favor open lands instead of densely forested areas wherever feasible.
OG-18.	When undertaking an activity that involves land clearing in a forested area, favor locations that would clear non-native species instead of native pines and hardwoods.
OG-19.	Make productive use of cleared trees for timber, mulch, or other use.
OG-20.	In addition to mandatory compliance with the Migratory Bird Treaty Act, which protects migratory birds and their active nests during breading seasons, consider nesting activities of local songbirds when scheduling tree cutting. If active bird nests are present in trees to be cleared, wait until after birds have fledged the nests.

The following guidelines relate specifically to tree planting and revegetation during remediation of disturbed sites.

OG-21.	When replanting, reintroduce historic native plant species such as blight resistant hybrid varieties of the American Chestnut tree in appropriate locations. Work with local stakeholders to determine appropriateness.

GUIDELINES

OG-22. In most locations, plant trees and vegetation in random, natural patterns to mimic a natural appearance. Avoid uniformly spaced plantings except where uniform patterns would be expected, such as on working timber farms or in manicured streetscapes.

OG-23. Establish partnerships with organizations invested in native species and wildlife protection and enhancement in the Pennsylvania Wilds (e.g., the Pennsylvania Department of Conservation and Natural Resources, The Ruffed Grouse Society, Keystone Elk Country Alliance, National Wild Turkey Federation, Appalachian Regional Reforestation Initiative, The American Chestnut Foundation, etc.) to identify opportunities to replant with species that benefit local wildlife. For example:

i. In forested areas, "soft edges" can be created along tree lines by planting smaller trees and shrubs 30-50 feet around the cleared area to increase wildlife benefits on the edges of reclaimed sites.

ii. Small forest openings, herbaceous openings, successional openings, food plots, and wetlands can be created to enhance natural habitats of local and regional wildlife species.

OG-24. Consider the Forest Reclamation Approach (FRA) developed by the Appalachian Regional Reforestation Initiative for tree planting. This approach involves creating a suitable rooting medium for good tree growth by loosely grading the topsoil to create a non-compacted growth medium and using appropriate planting techniques. This approach has been found to be essential for successful reforestation efforts.

OG-25. When planting in forested areas on sites that do not require quick revegetation stabilization for erosion control, favor native herbaceous and woody ground cover to enhance tree survival and growth rates.

Revegetate in ways that enhance wildlife habitat.

Make productive use of cut trees for timber, mulch, and other purposes.

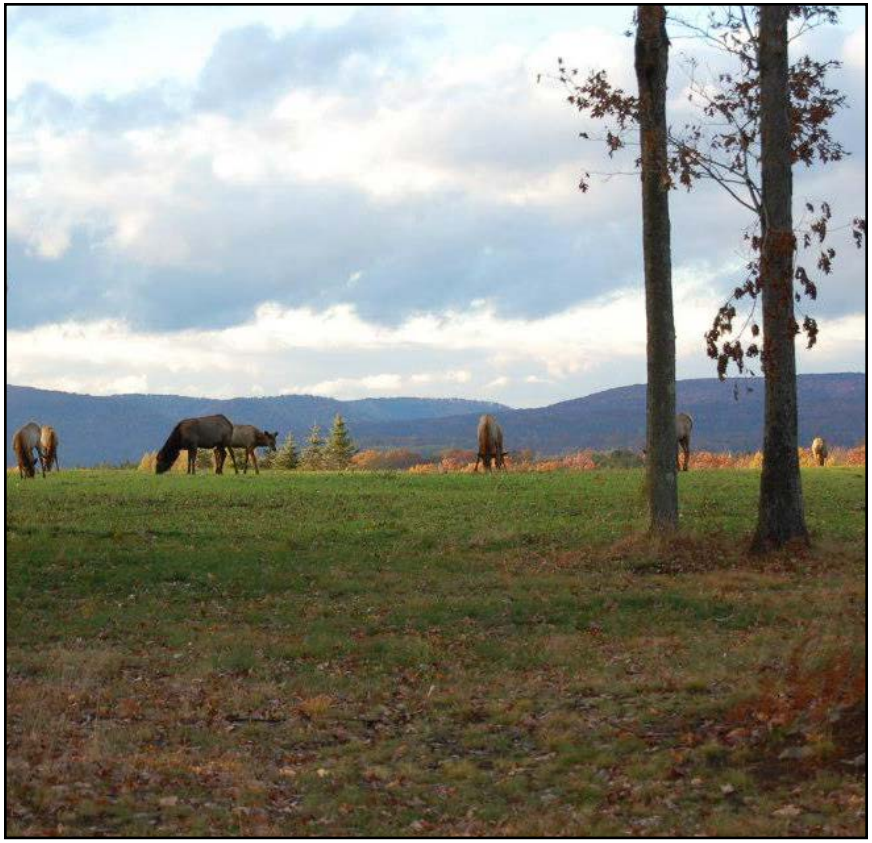
Commit to successful reforestation.

Reintroduce native tree species such as the American Chestnut.

2.F: Be Environmentally Responsible

A healthy natural ecosystem in the Pennsylvania Wilds four-season climate is geographically wide and varied. As such, the surrounding local and regional context should be considered when determining the environmental sensitivities of a particular property.

The region is home to the largest free roaming elk herd in the eastern United States, large and small game that are pursued during hunting seasons, fish that populate streams, rivers, lakes, and ponds, and avian species that bird watchers adore. To name just a few, there are bobcats, river otters, minks, falcons, hawks, snakes, bear, deer, 375 species of songbirds and plenty of other wild creatures. There are 83,000 miles of rivers and streams including two Wild and Scenic Rivers (the Clarion and Allegheny Rivers) and the west branch of the Susquehanna River. All of this and much more is reason enough for development activities in the Pennsylvania Wilds to be environmentally responsible.



GUIDELINES

Effects to the natural environment can be compounded when a series of activities occur across a region. Therefore, it is important to think and act cumulatively and collaboratively in the Pennsylvania Wilds. The methods used to site and reclaim temporary and permanent resource extraction facilities and secondary support services can affect the natural environment both positively and negatively. Many regulatory programs are in place to identify potential adverse impacts and require avoidance and mitigation. Also, property owners play a role when devising the terms of lease agreements, particularly related to the end use of disturbed sites upon their reclamation. The Pennsylvania Wilds Planning Team requests that all available opportunities be taken to avoid, minimize, and mitigate impacts and improve the region's natural environment. After a well, pipeline, or other facility becomes operational or is decommissioned from use, the goal is to make the change on the Pennsylvania Wilds landscape as unnoticeable as possible, or improved. There are many opportunities to leave disturbed sites in better ecological condition than before the disturbance. This offers an unprecedented opportunity to gain environmental benefits across the region. Resource extraction operations can support the Pennsylvania Wilds Initiative by protecting and enhancing the natural environment and making wise decisions when preparing mitigation and reclamation plans.

#	GUIDELINES
OG-26.	When stream crossings or water withdrawal sites are needed, design the crossings and withdrawal sites to minimize waterway disturbance and to allow fish passage, via culverts or other means. Schedule construction of stream crossings to occur outside of spawning seasons.
OG-27.	If locating facilities near rivers, streams, and other water bodies, preserve as much native riparian canopy and waterside vegetation as possible. If it is not possible to maintain native waterside vegetation, crush or trim back the foliage instead of clearing it off the property. The goal is to keep shade on the water and waterside habitat and promote efficient revegetation.
OG-28.	Work with local stakeholder groups to identify and implement opportunities to provide enhanced habitat for wildlife species and enhance hunting and fishing areas.
OG-29.	Invasive plants threaten the health of Pennsylvania Wilds' natural ecosystem. When opportunities arise on sites to be disturbed, in mitigation areas, and on sites to be reclaimed with vegetation, eradicate invasive plant species.
OG-30.	Minimize the spread and growth of invasive plant species by implementing techniques that reduce the transportation of seed and aquatic alga from one site to another. Effective techniques include but are not

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limited to washing mobile equipment before moving it to another site and following PA Fish and Boat Commission recommendations to clean equipment and gear used to work in streams and other water bodies.

OG-31. The Pennsylvania Wilds is home to many sensitive plant and wildlife species. Be trained to identify sensitive wildlife species and take appropriate action to properly handle their presence and prevent harm.

OG-32. Where applicable and necessary, provide wildlife enclosures and/or fencing to prevent animal injury or loss.

OG-33. Unless mowing is needed for fire fuel management or utility line maintenance, refrain from mowing infrastructure rights-of-way during bird nesting and breeding seasons.

OG-34. During grading, stockpile native soil for later use during interim and final reclamation to promote effective revegetation. Reseed the stockpile for erosion control and appearance.

OG-35. Consider the four-season climate of the Pennsylvania Wilds region when making operating decisions. For example, properly plan for heavy rainfall events, wet periods, snow, ice, and snow and ice melt when designing storm water and erosion control measures. Ideally, vegetation should be planted before July and well pad construction should be completed before November.

OG-36. On sites where there is no threat of contaminated runoff and where regulatory requirements do not require impervious liners, help to preserve water tables by using pervious surfaces during construction processes (such as limestone and geotextile reinforced grids to maintain permeability).

OG-37. If loose gravel is used or stockpiled adjacent to steams or sensitive natural areas, stabilize or contain the material to prevent it from being washed into adjacent areas.

OG-38. Use stormwater management techniques that are visually and ecologically compatible with the setting. For example, use of vegetated swales and infiltration berms fit better into forested settings than large retention or detention basins.

OG-39. To reduce fresh water usage and demand on wastewater treatment facilities, take all reasonable means to recycle and reuse 100% of produced and flowback water.

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OG-40. When siting horizontal infrastructure, apply foresight to future horizontal infrastructure and gas-related transportation needs to avoid the need for future retrofits that would cause sequential ground disturbances.

OG-41. Use dust suppression techniques, such as wetting soil surfaces with non-potable water, to reduce nuisance effects associated with dust. Use of chemical additives for dust suppression is discouraged.

Use pervious surfaces on sites where there is no threat of contaminated runoff.

Stockpile native soil to use during reclamation.

Quickly revegetate easements. Limit mowing during bird nesting and breeding seasons.

Train workers to recognize and appropriately handle the presence of wildlife species.

Favor site locations on properties that have been previously disturbed.

Minimize waterway disturbance and enhance stream corridors as mitigation.

Implement erosion control techniques that complement the natural ecosystem.

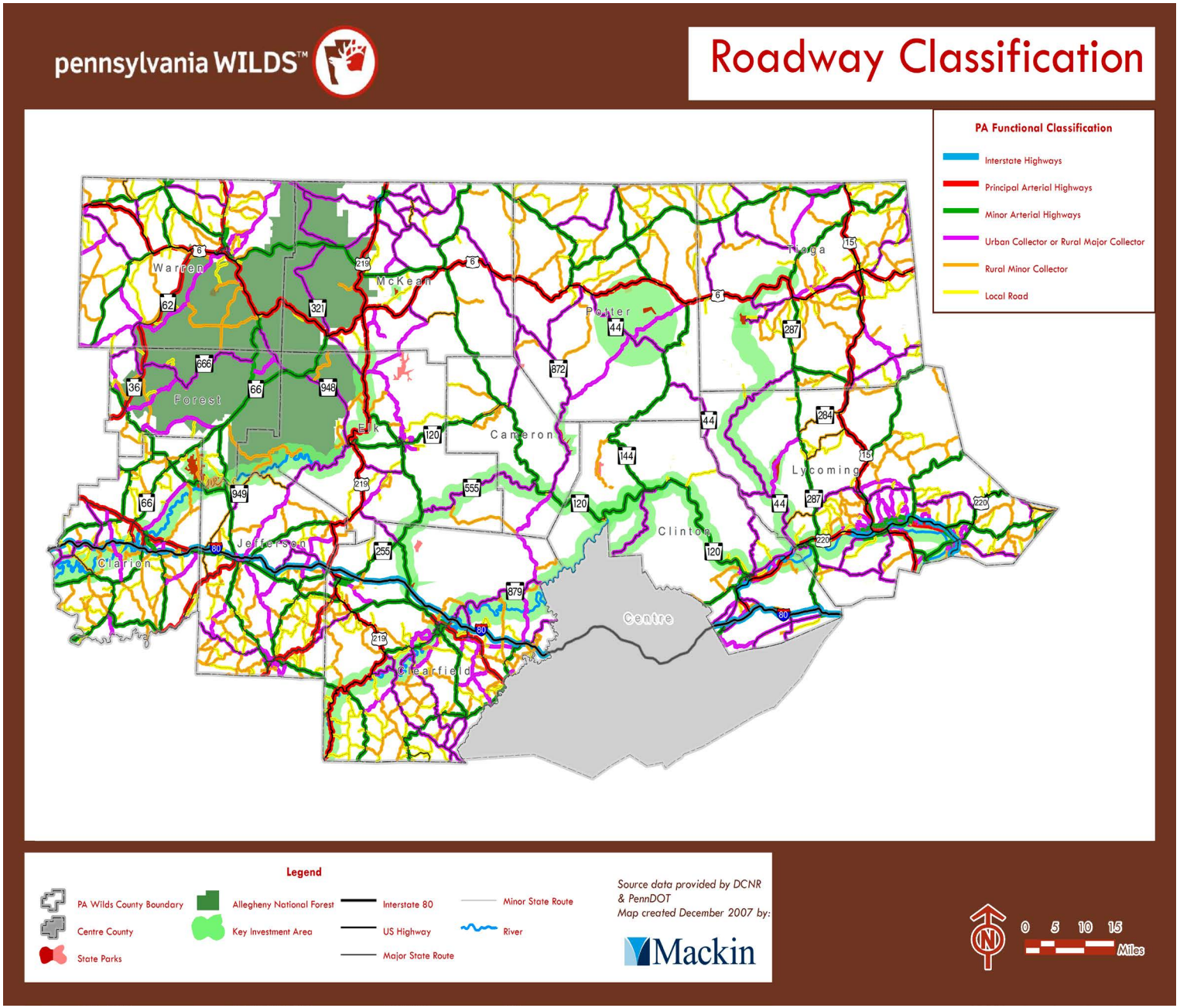
Consider the four season climate when making siting and operating decisions.

2.G: Protect Roadway Corridors

The Pennsylvania Wilds roadway system consists of Interstate 80 (I-80) that cuts east/west across the southern portion of the region, along with several principal arterials (US 15, US 219, US 119, US 62, US 220, US 322, US 6, and State Route 28) and a network of minor arterials, collector roads, and local roadways under the control of various entities. A map of the main roadway network is shown on the next page.

Many of the region's roadways attract people out for a scenic drive, bike ride, or other excursion. US Route 6 is a designated National Recreation Trail that extends through the northern portion of the Pennsylvania Wilds and traverses the entire way across the country from Massachusetts to California. The popular "Elk Scenic Drive" is not one road, but a 127-mile route on series of roadways through Clearfield, Elk, Cameron, Clinton and Centre Counties. Additionally, there are scenic byways, bicycle routes, and formal and informal scenic view pull-offs along the way. Except for I-80 and the few principal arterials, most of the region's roadways are two lanes wide, wind through scenic terrain and local town centers, and are shared by cars, trucks, motorcycles, school busses, farm equipment, buggies, bicycles, pedestrians, and other motorized and non-motorized vehicles.

The *Pennsylvania Wilds Design Guide* promotes the protection of roadway corridors from view blockage, homogenized design, and unnecessary visual clutter. Public safety for all roadway users is a key consideration in the Pennsylvania Wilds.



Source: Pennsylvania Wilds Planning Study (2007)

GUIDELINES

Most effects to the roadway network as a result of oil and natural gas operations occur during the temporary drilling and pipeline installation stages of the operation. While a majority of the increased traffic is short-term, roads and bridges that are improved to accommodate haul trucks and other industry-related vehicles remain for resident and visitor use long after oil and gas traffic diminishes. Road and bridge improvements are considered a longer-term, positive opportunity in the Pennsylvania Wilds. As part of state and federal permitting and approval processes, operators are required to meet roadway safety requirements and often implement specified road and bridge improvements. Additionally, many companies have rules that their drivers and sub-contractors must follow while on the road. The Pennsylvania Wilds Planning Team requests that circulation facilities be maintained and improved and that traffic conflicts be avoided, minimized, and mitigated whenever possible. Resource extraction operations can support the Pennsylvania Wilds Initiative by continuing to assist in making road and bridge improvements, minimizing traffic conflicts particularly during tourist seasons, and ensuring that the region's roads are safe for motorized and non-motorized travel.

#	GUIDELINES
OG-42.	Reduce the queuing of trucks on public roadways, particularly on designated bicycle routes and scenic routes used by residents and visitors. If queuing is frequent, consider designating/implementing a staging area in an appropriate and permitted location where trucks can pull off the road while waiting for access to the well pad or facility site.
OG-43.	If haul trucks use a public road that has a bicycle lane or is posted as a bicycle route, keep the edges and shoulders of the roadway clear of debris by using street sweepers or other cleaning methods to maintain bicycle safety.
OG-44.	Reach out to local communities and event organizers and obtain a schedule of their events. Please make a sincere effort to temporarily suspend or limit truck traffic to avoid conflicts with major outdoor sportsman and visitor attraction events in the region (opening weekends of hunting and fishing seasons, holiday weekends, local festivals, County fairs, etc.).
OG-45.	Reach out to local school districts and obtain a schedule of their bus routes and hours. Please make a sincere effort to temporarily suspend or limit truck traffic to avoid conflicts with school buses.
OG-46.	Mud, dirt, and gravel located on travel ways presents a safety hazard. Limit the carrying of dirt, mud, and gravel onto public roads, bicycle lanes, and sidewalks to the greatest extent possible.
OG-47.	Take all feasible measures to reduce unnecessary truck traffic on public roadways. For example: a) use temporary fresh water transmission lines instead of transporting fresh water by truck; and b) use field gas to power operational vehicle fleets on well pad sites to reduce trips to fueling stations, etc.

Use truck staging areas to prevent queuing on public roads.

Keep roadway shoulders clear of debris to maintain bicycle safety.

Temporarily suspend or limit truck traffic to avoid conflict with major tourist events.

2.H: Fit Into Local Community Character

The developed portions of the Pennsylvania Wilds primarily consist of agricultural and working lands, rural communities, quaint residential neighborhoods, and small towns with distinct historic characteristics. Many of these places are the "front doors" to visitor destinations in the Pennsylvania Wilds and have been in place for centuries.

The cultural and physical character of local communities is vital to maintaining and attracting residents and providing an enjoyable visitor experience. Additionally, many town centers act as gathering places for local events. Concerts in the park, parades, festivals, fairs, and other activities occur annually in almost every population center over the Pennsylvania Wilds region. With many communities focusing their energy and resources to build upon the traditional characteristics of their towns, it is imperative that the authenticity of Pennsylvania Wilds' special places remain intact. Threats to local community character include disinvestment in historic buildings, new construction that is out of character with established architectural styles, excessive signage, bright lighting, and other man-made elements that are not tailored to the context. One of the primary premises of the *Pennsylvania Wilds Design Guide* is ensure that new construction, building renovations, and redevelopment efforts are well-designed and fit in with regional and local character.

GUIDELINES

The Pennsylvania Wilds contains a vast landscape of wildlands where most oil and natural gas activity occurs. However, support functions often occur in populated areas where people live, work, visit, and spend their time. The Pennsylvania Wilds Planning Team requests that industry operations do their best to fit into the established character and fabric of local communities. Resource extraction operations can support the Pennsylvania Wilds Initiative by investing in local communities and embracing the authentic characteristics that make them attractive to residents and visitors.

#	GUIDELINES
OG-48.	When siting facilities in an agricultural area, select sites on the edges, rather than center, of farm fields to preserve the character and productivity of agricultural landscapes. Also, preserve barns, silos, and other character-defining agricultural structures and facilities. Design structural enclosures for compressor stations and other facilities to resemble barns and other agricultural landscape features.
OG-49.	When temporary housing and other staging functions are necessary for oil and gas industry workers and operations, investigate opportunities to rent space at local fairgrounds in their off-seasons to maximize year-round use of these spaces.
OG-50.	Campgrounds are primarily intended for outdoor enthusiasts and tourists to the Pennsylvania Wilds. Although the use of local campgrounds for temporary oil and gas industry worker housing may be appropriate in the off-season, please work with campground owners to ensure that campsites are available to tourists in the high travel season (approximately April 1 to October 31).
OG-51.	Help communities to bring communication (internet and cellular) services to underserved areas.
OG-52.	Collaborate with county planners and municipal officials to explore the establishment of multi-use corridors for natural gas, communications, and other types of infrastructure.
OG-53.	If space is needed for offices or other facilities, consider occupying or renovating a vacant or for-sale existing building before undergoing new construction.
OG-54.	If considering the construction of a new building in the Pennsylvania Wilds, consult the *Pennsylvania Wilds Design Guide* for recommendations on architectural style, signage, lighting, landscaping, and other aspects of new construction.

GUIDELINES

OG-55. The Pennsylvania Wilds has a welcoming atmosphere. If fencing is required in locations with public visibility, do not use barbed wire unless there is no feasible alternative. Consider using woven-wire fencing, which is more aesthetically appealing, or consider vinyl-coating on chain link to minimize rusting.

OG-56. Choose exterior surface colors for enclosures, buildings, and equipment to complement the natural color palette. In most cases, paint or coat structures, equipment, and well heads a color that complements the surrounding natural landscape, and a shade or two darker than colors found in the surrounding landscape to decrease visual presence. Avoid bright, fluorescent, or glare-producing colors or coatings.

OG-57. Be a good neighbor to sensitive receptors by favoring electric powered pumps and/or enclosures with high noise attenuation capabilities at compressor stations. Refer to local and county noise ordinances for additional guidance.

Select sites on edges, rather than in the middle of farm fields.

Use neutral colors on operational equipment and enclosures.

Consider the use of county fair grounds for temporary worker housing.

When possible, site chain link and barbed wire fencing out of pubic view.

2.I: Collaborate and Educate

As mentioned numerous times throughout this Supplement, collaboration among representatives of the oil and gas industry, secondary businesses that support this industry, county planners, and the many state and local governments, community leaders, non-profits, grassroots organizations, surface and subsurface owners, and other individuals that interact with the oil and gas industry is a vital component to further advancing the Pennsylvania Wilds Initiative.

For more information about a particular county, contact the following government offices:

County Government:

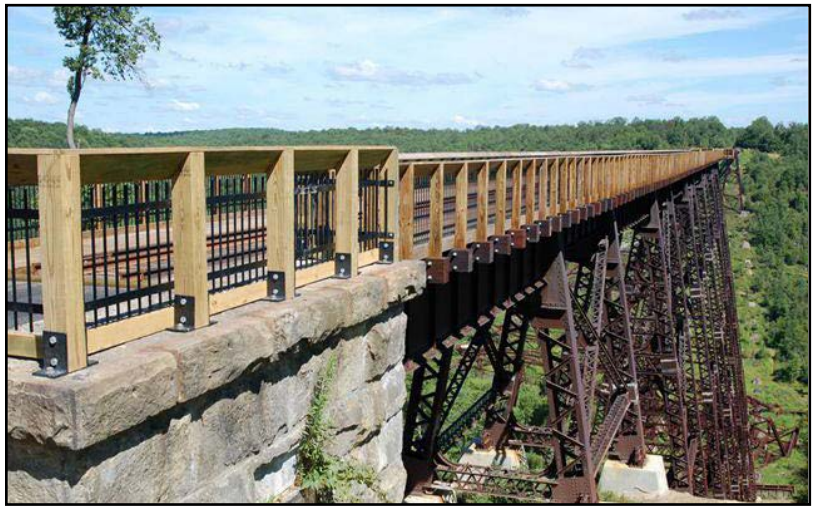
- Cameron County
- Centre County Planning and Community Development
- Clarion County Department of Planning and Development
- Clearfield County Planning Office
- Clinton County Planning Office
- Elk County Planning Office
- Forest County Planning Office
- Jefferson County Department of Development
- Lycoming County Planning Office
- McKean County Planning Office
- Potter County Planning Office
- Tioga County Planning Office
- Warren County Planning Office

GUIDELINES

#	GUIDELINES
OG-58.	Foster and maintain positive working relationships with local and regional stakeholders including but not limited to county planners, local community leaders, non-profits, grassroots organizations, etc. Communicate and collaborate with stakeholders about key decisions, regulatory requirements, alternative possibilities/options, and mitigation opportunities that can be employed that will advance the Pennsylvania Wilds Initiative.
OG-59.	Establish partnerships with organizations invested in the natural landscape of the Pennsylvania Wilds (watershed organizations, The Ruffed Grouse Society, Keystone Elk Country Alliance, National Wild Turkey Federation, Appalachian Regional Reforestation Initiative, The American Chestnut Foundation, Headwaters Charitable Trust, Lumber Heritage Region of Pennsylvania, Susquehanna Greenway Partnership, etc.).
OG-60.	Seek and incorporate input from local non-regulatory bodies such as hunting and fishing clubs, tourism businesses, and outdoorsmen groups, etc.
OG-61.	Where new roads and easements are needed, work with surface owners, local government bodies, railway owners, and non-government stakeholder groups to identify if the alignments can be designed to serve as new trails (hiking, mountain biking, waterfront access, snowmobiling, etc.) or accesses for timbering or other productive use after oil and gas operation uses for the alignments cease.
OG-62.	Sign or post environmental mitigation and restoration sites in public view with "what is happening here" messages to educate the public about restoration activities.
OG-63.	Work collectively to establish an oil and gas public education/demonstration site in the Pennsylvania Wilds.

Take opportunities to post educational information about oil and gas production.

Establish partnerships with organizations invested in the Pennsylvania Wilds landscape.



Participate in and support projects that promote the industrial heritage of the PA Wilds.

Maintain positive working relationships with local and regional stakeholders.

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Chapter 3 - Case Studies

This section includes case studies submitted to the Pennsylvania Wilds Planning Team that demonstrate successful implementation of the guidelines contained in this Supplement. For information about how to submit a case study, go to www.pawildsresources.org.

3.A: Environmental Mitigation

Location: Larrys Creek Watershed; Lycoming County

Credit: Anadarko Petroleum Company

For many years, the Larrys Creek Watershed group and the Lycoming County Conservation District pursued funding sources to mitigate damages that high water events caused in Larryville. This very visible location was the perfect spot for Anadarko Petroleum Company to perform a mitigation project and to work with a number of stakeholders to create positive environmental enhancements. Through Anadarko's commitment to the environment, a portion of Larrys Creek was realigned and stabilized with horizontally placed tree roots, wetland grasses, and trees. This buffer was designed to shade the stream, enhance aquatic life, and provide other environmental benefits. The project also made positive changes to an adjacent field by protecting crops during flooding or high stream flow periods. This area was stocked with trout in the spring of 2013 and the local community is now allowed to fish from the banks of the stream.

3.B: Stream Crossing

Location: Second Fork Larrys Creek; Lycoming County

Credit: Anadarko Petroleum Company

Habitat fragmentation caused by barriers resulting from road-stream intersections reduces the ecological function of the stream. Fish and other aquatic organisms require passage through structures placed at these intersections for a variety of reasons, including foraging, spawning, thermal refuge and genetic diversity. Fish passage through culverts can be inhibited by high flow velocities, shallow water depths, and perched outlets. Installing new or replacing existing culverts with structures that do not drastically alter the existing stream characteristics such as width, depth, and bed form can reduce the potential for habitat fragmentation as well as long term maintenance costs. Although culverts are often more cost-effective than bridges, bridges often have little or no direct impact on the stream channel being crossed.

Anadarko Petroleum Company chose to install a bridge across Second Fork Larrys Creek for access to their development operations on the adjoining mountain. The installation of a bridge at this site yielded no adverse conditions that could impede fish and other aquatic organisms from passage at this road-stream intersection. Because the structure did not alter the bank full width, grade, and substrate within the stream bed there was no reduction in the capacity for the stream to naturally transport material including sediment, cobble, and woody debris thereby reducing long-term maintenance costs.

Before

After

3.C: Vehicle Staging Area

Location: Pine Creek Valley; Lycoming County (McHenry Township – SR 414)

Credit: Pennsylvania General Energy Company, L.L.C. (PGE)

The purpose and need for this Vehicle Staging Area came with the challenges of Marcellus shale development in the Tiadaghton State Forest. The high terrain where PGE's main operations would take place was accessible only by local roads too narrow for industrial truck traffic both ways. Secondly, there was no area at the base of the local road for trucks to chain up in order to safely ascend the mountain during winter weather.

PGE found a landowner less than a mile south of Truman Run Road amenable to the construction of a staging area in a field where PGE could safely coordinate traffic year round and allow for chaining up to prepare for the ascent of Truman Run Road. Along with meeting all requirements set forth by DEP for erosion and sediment control and PennDOT for ingress and egress, PGE worked closely with the Lycoming County Planning Department to accommodate land use requirements and anticipated neighborhood concerns. Site construction was finalized in December 2012/January 2013; remaining landscaping was planted in the spring of 2013.

PGE continues to utilize the staging area and believes that this site has successfully reduced the industry's impact on local and regional traffic patterns.

3.D: Easement Maintenance

Location: Pine Creek Watershed, Tioga County

Credit: Endless Mountain RC&D

The WINGS Project (Wildlife Incentives for Non-Game and Game Species) is to enhance wildlife habitat within natural gas rights-of-way. With help from technical service providers, a wildlife management plan is created for each individual landowner on how to maintain their rights-of-ways. This could include: mowing, nesting sites, permanent wildlife plantings or annual wildlife plantings. Within the Pine Creek Watershed in Tioga County, the land located within the temporary right-of-way is being replanted with trees and shrubs to decrease the fragmentation. While the permanent right-of-way is reestablished as food plots or other herbaceous plants that will not interfere with the delivery of product. Also a wetland buffer is being established due to the overflow of a wetland across the right-of-way. Once the plants are reestablished it will create food sources, habitat, and breeding sites within the pipeline Right of Way.

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