

# Part 2: Monitoring Values

## » Recreation

### I. Key Points:

- No national hiking trails in Pennsylvania have been impacted by shale-gas development. Three designated state forest hiking trails have been impacted.
- One state forest scenic vista, the Ramsey Vista in Tiadaghton State Forest, has been directly impacted in the core gas forest districts. It was closed to vehicle access.
- Statewide, since 2006, there has been a 5 percent increase (145 miles) in total snowmobile trail miles across the state forest system. This is the result of a 203-mile decrease in joint-use trails and a 348-mile increase in designated snowmobile trails.
- Snowmobile trail systems have been impacted in each of the core gas forest districts. New snowmobile trails have been created to replace impacted snowmobile trails.
- The need for road access for shale-gas development has resulted in heavier traffic on state forest roads. Upgraded roads may be safer and easier to drive but may have lost some of their “wild character” value.
- There are both gains and losses in access to state forest lands via roads due to shale-gas development. Some roads may be closed or restricted, while newly constructed roads will offer new opportunities for access.
- The impact of shale-gas development on recreational experience and wild character as measured by the Recreation Opportunity Spectrum is a 9,341-acre increase in semi-developed and developed acreage; a 913-acre decrease in semi-primitive acreage; a 8,409-acre decrease in semi-primitive non-motorized acreage; and a 19-acre decrease in primitive acreage.
- Three gas infrastructure features have been constructed within scenic viewshed “Areas of Special Consideration” identified in gas leases. Additional methods to assess viewsheds and aesthetic changes should be identified or developed.
- Initial measurements at six out of the seven operating compressor stations measured on state forest lands were louder than the 55db(A) suggested by the updated *Guidelines for Administering Oil and Gas Activity on State Forest Lands*.
- 46 out of 116 comment card respondents in core gas forest districts indicated that Marcellus activity had changed their visitation experience. 41 out of 116 respondents indicated that Marcellus activity had changed their recreational use of the state forest.



## II. Introduction

The bureau acknowledges the value of recreation within its mission statement and within policies that specifically identify “recreation” as it applies to the state forest system and the value that recreation has for the citizens of Pennsylvania. State forests are able to provide a unique opportunity for dispersed, low-density outdoor recreation that cannot be obtained from small forest areas or from private ownership.

The bureau’s mission statement includes a directive for “managing state forests under sound ecosystem management, to retain their wild character and maintain biological diversity while providing pure water, opportunities for low-density recreation, habitats for forest plants and animals, sustained yields of quality timber, and environmentally sound utilization of mineral resources.”

The Conservation and Natural Resource Act authorizes the establishment of and provides for the use and control of state forest lands. This law states, in part, that one

of the purposes for which the state forests were created is “to furnish opportunities for healthful recreation to the public.”

Recreation on state forest lands can mean many things to many different people. State forest visitors can find a whole host of recreational activities on Pennsylvania’s 2.2-million-acre state forest system. Some of the most common activities include scenic driving, hunting, camping, hiking, and nature watching. Others include hang gliding, dog sledding, kayaking, ATV riding, snowmobiling, horseback riding, mountain biking, fishing, cross-country skiing, birding, nature observing, and geocaching, to name a few.

Gas development includes extensive infrastructure that requires careful siting to minimize impacts. New infrastructure can affect wild character and viewsheds. Noise-generating activities may affect visitor experience. While there are quantitative measurements for factors affecting recreation experience, the qualitative impacts may be more relevant.



The primary management decisions related to shale-gas development and associated with state forest recreation comprise constant efforts to first avoid impacts if at all possible. When avoidance is not a viable option, the efforts switch to minimizing impacts to the greatest extent. For those impacts that are unavoidable, management efforts also are expended on the mitigation of impacts to recreation infrastructure. Finally, the bureau monitors the effects of its management decisions to see if the appropriate outcome was obtained or how the system can be improved.

While there may be an impact to a piece of recreation infrastructure, such as a temporary trail closure, it is the bureau's goal to improve the infrastructure and create a better experience if possible. An example would be the traditional joint-use roads, which are snowmobile trails that are colocated on public use roads in the winter. Many of these joint-use roads have been used for shale-gas development and are not suitable for snowmobiling anymore for safety reasons because they have become

plowed road surfaces. The loss of these trails is an impact, but as pipelines to carry natural gas are installed adjacent to the impacted roads, new snowmobile trails are being established on the pipelines. The moving of snowmobile trails to the pipelines generally will create a better riding experience and provide a trail surface not as likely to be impacted by activities that require plowing. If an impact to the recreation infrastructure cannot be avoided, it is the bureau's goal to work with the operators to enhance the recreational infrastructure and visitor experience when it is replaced or improved. The bureau maintains a fact sheet to provide state forest visitors with the necessary information for a safe, enjoyable experience when visiting areas near natural gas development activities.

The importance of monitoring state forest recreation cannot be understated. A recreational activity is likely the most common reason to bring a person to a state forest. Many constituents have a very personal and lasting bond to their recreational experiences.



### III. Monitoring Efforts/Results

#### Designated State Forest Hiking Trails

Designated State Forest Hiking Trails (SFHT) are 18 hiking-only trails that are located across the state forest system. These premier trails encompass all types of hikes, from a long-distance trail such as the Mid State Trail (310 miles), which traverses the length of the state, to a one-day or hours-long short trail, such as the Rocky Knob Trail (four miles), and everything in between. The 18 SFHTs traverse a combined 1,180 trail miles that cover a variety of terrain and difficulty levels. There are 13 SFHT trails in the core gas forest districts:

- Black Forest Trail (42 miles)
- Chuck Keiper Trail (53 miles)
- John P. Saylor Trail (18 miles)
- Loyalsock Trail (59 miles)
- Old Loggers Path (27 miles)
- Quehanna Trail (75 miles)
- Susquehannock Trail (85 miles)
- Bucktail Path (34 miles)
- Donut Hole Trail (90 miles)
- Golden Eagle Trail (9 miles)
- Lost Turkey Trail (26 miles)
- Mid State Trail (309 miles)
- West Rim Trail (30 miles)

There have been three impacts to state forest hiking trails related to shale-gas development. Limiting the impacts to three trails has been achieved through the strict avoidance of development near SFHTs.

A half-mile section of the Mid State Trail in Tiadaghton State Forest was rerouted in 2010. This reroute was undertaken through cooperation with the Keystone Trails Association (KTA), Mid State Trail Association, and Tiadaghton staff. Through the waiver process, the operator requested that a gas access road be located on an existing old-woods road which had a segment of the Mid-State Trail co-located on it. Rather than create a new road parallel to the existing woods road just outside of

the buffer distance for the trail, the decision was made to allow a well pad access road to be built in the original old-woods road corridor, which served as a section of the Mid State Trail. The trail was relocated to a newly created single-track trail positioned so that little to no visual impacts would be seen from the new trail other than at a road crossing. The location of the new trail also eliminated any visual impact related to a well pad and associated pipelines in the area.

There has been an indirect impact to the Donut Hole SFHT in Sproul State Forest. This trail was impacted because the joint-use snowmobile trail had to be moved off Carrier Road due to Endless Mountain's use of the road for development of private lands in the area. The gas company has to plow the road for access in winter, thereby eliminating the snowmobile trail on Carrier Road. The road is not entirely on state forest lands, and the bureau only has a right-of-way (ROW) for the road across private lands. The ROW corridor is not sufficiently wide to allow for both a snowmobile trail and the road in a parallel manner. In addition, there are obvious safety concerns of having development traffic and snowmobiles on the same road. There are no other alternative routes for the snowmobiles to use to complete the snowmobile system.

With little recourse but to relocate the snowmobile trail from Carrier Road, a new pathway for that trail was sought. The Donut Hole Trail in this area had been co-located onto an old-woods/timber sale access road for approximately 1.1 miles. This section of the Donut Hole Trail is slated to become part of the new Lick Run Snowmobile Trail. District staff are working with members of KTA to locate a new single-track hiking trail corridor for that portion of the Donut Hole Trail in a manner that would remove it from any likely gas development and/or other motorized trails. The potential new trail corridor would cross a section of The Nature Conservancy lands and then go back onto state forest lands on its way into Hyner View State Park. Within

Hyner View State Park, the new proposed trail will then continue on the original Donut Hole Trail route. The new proposed trail route is located on fee simple and nonleased forest lands, which likely will eliminate the need to relocate these sections of trail again in the future.

A 500-foot portion of the Chuck Keiper Trail in Sproul State Forest was relocated an additional 300 yards away from a well pad. The pad was located outside the buffer zone for the trail, as suggested by the *Guidelines for Administering Oil and Gas Activity on State Forest Lands*; however, the bureau took the opportunity to move the trail farther away from the well pad and to close a section of trail that was entrenched. The original trail section was rehabilitated to eliminate erosion and sedimentation issues and was planted. Because the well pad was kept outside the trail buffer, this trail relocation was not completed as a direct result of gas development. This relocation was an effort to correct a poor trail section and also an increase of visual distance away from a well pad location.

#### **Local Forest District Hiking Trails**

Local forest district hiking trails are not part of the purview of this monitoring report; however, future monitoring efforts will attempt to evaluate and quantify the impacts of shale-gas development to local state forest district trails.

#### **National Hiking Trails**

There have been no direct shale-gas related impacts to any national hiking trail in the region.

#### **Vistas**

Ramsey Vista on Ramsey Road in Tiadaghton State Forest has been closed to vehicle access since 2010 due to gas activity. The vista will remain closed to public vehicle traffic until gas development work in the area has been completed. The public still can access this vista by foot. The road to the vista is closed one-fourth mile from the overlook.

There also is potential for new roads to be constructed for gas development to increase access for scenic driving, including vistas. No other vista has been impacted by shale-gas development in any other forest district.

#### **State Forest Picnic Areas**

There have been no direct impacts to any state forest picnic areas due to shale-gas development.

#### **Recreation Agreements (LOAs, CAAs, and SAAs)**

There has been anecdotal evidence of forest users who have changed venues for events that require agreements, from a forest district that is experiencing gas development to another forest district that does not have gas development. In some cases, this is creating a much greater demand for forest services than typically are experienced in the “new” forest district. For example, a snowmobile poker-run/benefit ride that was going to be held in Loyalsock State Forest was moved by its organizers to Bald Eagle State Forest. The move to Bald Eagle State Forest, as communicated to staff, was “due to a number of the snowmobile trails being closed/lost due to heavy flooding damage and in part to get away from heavy gas development in the area of other trails.”

The bureau has since created a new method to capture these instances of recreational activities being moved from one location to another and why. This was an effort to determine whether shale-gas development was impacting various recreation activities. As part of the application for a Letter of Authorization (LOA), a Commercial Activity Agreement (CAA), or a Special Activity Agreement (SAA), a new form is filled out by the person or entity that is applying for the agreement. This form was created and included with all new agreements from September 2012 forward to determine whether the activity has been adjusted due to gas activity. Since introduction of this form, there have not been any impacts noted by groups or individuals applying for agreements.



### **ATV Trails**

There have been no impacts to any of the ATV trails or trail systems due to shale-gas development.

### **Snowmobile Trails**

The snowmobile trails that are located in the north-central state forests have traditionally been some of the most popular snowmobiling destinations in the state. Core gas forest districts happen to correlate with this key snowmobile trail area. Trails located on state forest and state park lands open the day after the last day of Pennsylvania regular or extended deer season and close on April 1.

There are two types of trails available for snowmobile riding: joint-use roads and dedicated snowmobile trails. Joint-use roads are regular state forest roads, either public-use or drivable trails, that are open to both regular motor vehicle traffic and snowmobiles. The joint-use roads do not have any winter maintenance (plowing, cindering, etc.) performed by the bureau. Dedicated snowmobile trails are closed to regular vehicle traffic and only allow snowmobiles and co-located winter ATV/snowmobile trails.

Joint-use roads and designated snowmobile trails traditionally may have been closed or plowed for a variety of reasons as part of regular state forest operations. These closures or plowing schedules may have to be implemented for the entire riding season or at any time during the snowmobiling season. Traditional reasons encountered for a snowmobile trail or joint-use road closure include timber harvesting, access to private lands, water companies, antenna site lessees, shallow-well gas and gas storage operations, or mining operations. However, due to shale-gas development, many additional roads that are traditionally open to snowmobiling are now closed for the safety of the snowmobilers. Joint-use roads and snowmobile trails that are being utilized for gas development now have to be plowed for access to the gas infrastructure, leaving an unfit trail condition for snowmobiles. In addition to trails not being in a suitable condition for riding, there would also be a safety issue if snowmobiles and gas development traffic utilized the same roads and trails. Depending on which road or trail is being used for gas activities, a portion of a trail loop may be lost or a large section of the trail system may be isolated and out of reach by loss of connectivity.

Efforts are underway to reestablish former trails and create new snowmobile trails by making use of the new gas pipeline infrastructure system. Often pipelines are created adjacent to or near the forest roads that are used by the gas companies to access their infrastructure. These pipelines can be ideal for the placement of snowmobile trails. While some pipelines are favorable for placement of snowmobile trails, other pipelines or sections of pipelines may not be favorable. Considerations before planning placement of snowmobile trails onto a pipeline include: steep terrain, crossing private lands, wetlands, stream crossings, historic sites, and numerous others. New trails and loops are likely a favorable outcome of this new gas activity. Unfortunately, there will be a piecemeal approach for a few years until all trail links can be completed.

New trails also have been created that are not associated with gas pipelines. In many cases, these trails were located in areas that already had old-woods roads or timber sale access roads, and these dormant roads needed only to have minimal rehabilitation work done to make them suitable for winter snowmobile traffic. Greater efforts are being made to work with the gas companies to get the snowmobiles onto these new trails, whether on or off a pipeline, as soon as possible.

From the start of shale-gas development, the bureau has worked to communicate to the Pennsylvania State Snowmobilers Association (PSSA) that there would be temporary impacts to snowmobile trails. The PSSA has conveyed this message to its constituents in the snowmobile community. The local state forest districts also have been working with their local snowmobile clubs to inform them of impacts and changes to the snowmobile trail systems yearly. The bureau is working with gas companies as part of the planning and approval process to create an action plan related to impacted snowmobile trails. The goal is to have a plan for the location of replacement snowmobile trails and a concrete timeline for them to be back in service.

Pre-shale-gas development snowmobile riding opportunities can be shown by comparing the trails available for the 2006-07 riding season to later years. Shale-gas development began on state forest lands in 2008. The changes to the trail system related to shale-gas development can be shown through the 2007-08 riding season and continuing on through 2012-13. (Note: State forest roads also are used for timber harvesting operations, an activity that may also cause plowing and temporary impacts to snowmobile trails. For the purposes of this report, only shale-gas related impacts are reported.) What follows are annual summaries of snowmobile trail conditions:

#### ***2006-2007 Snowmobile Trails***

- Joint-use roads open – 2,046 miles (1,984.1 state forest and 61.9 state park)
- Designated snowmobile trails – 703 miles
- No roads designated to be closed in core gas forest districts. There were 61 roads with the possibility that the entire road or sections of the road would be plowed in the core gas forest districts.

#### ***2007-2008 Snowmobile Trails***

- Joint-use roads open – 1,973 miles (1,943 state forest and 29.7 state park)
- Designated snowmobile trails – 714 miles
- No roads designated to be closed in core gas forest districts. There were 86 roads with the possibility that the entire road or sections of the road would be plowed in the core gas forest districts.

#### ***2008-2009 Snowmobile Trails***

- Joint-use roads open – 2,022 miles (1,959.1 state forest and 62.9 state park)
- Designated snowmobile trails – 864 miles

#### ***2009-2010 Snowmobile Trails***

- Joint-use roads open – 1,962 miles (1,898.2 state forest and 63.8 state park)
- Designated snowmobile trails – 871 miles

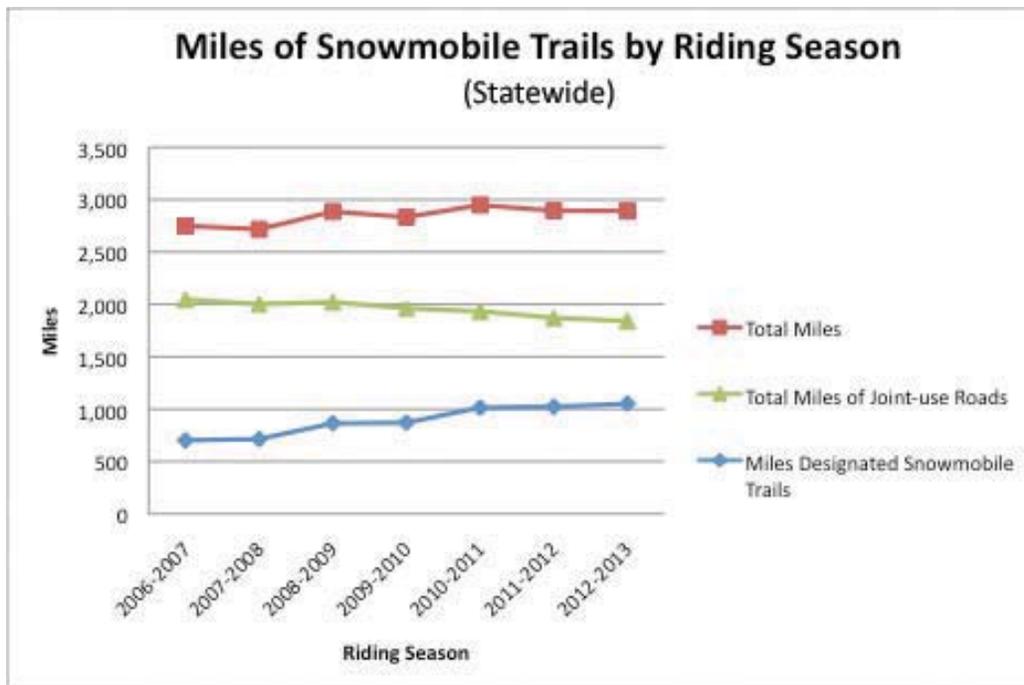


Figure 11.1

**2010-2011 Snowmobile Trails**

- Joint-use roads open – 1,934 miles (1,871.4 state forest and 62.6 state park)
- Designated snowmobile trails – 1,014 miles
- There were 64 roads with the possibility that the entire road or sections of the road would be plowed in the core gas forest districts.

**2011-2012 Snowmobile Trails**

- Joint-use roads open – 1,871 miles (1,808.4 state forest and 62.6 state park)
- Designated snowmobile trails – 1,023 miles

**Moshannon State Forest:**

- Seven roads closed for 16 miles due to shale-gas development
- Seven roads possibly plowed for 14.6 miles due to shale-gas development

**Sproul State Forest:**

- Thirteen roads closed for 49.1 miles due to shale-gas development
- Fourteen roads possibly plowed for 74.9 miles due to shale-gas development

**Tiadaghton State Forest:**

- Seventeen roads closed for 57.5 miles due to shale-gas development

**Elk State Forest:**

- Three roads possibly plowed for 3.2 miles due to shale-gas development

**Susquehannock State Forest:**

- Three roads possibly plowed for 18.4 miles due to shale-gas development

**Tioga State Forest:**

- Three roads closed for 6.1 miles due to shale-gas development

Loyalsock State Forest:

- Five roads closed for 9.3 miles due to shale-gas development
- One road possibly plowed for 5.7 miles due to shale-gas development

Total for all roads in the core gas forest districts that could be plowed due to shale-gas development activities during the 2011-12 season was **28 roads for 116.8 miles**.

Total for all roads in the core gas forest districts closed due to shale-gas development for 2011-12 season was **45 roads for 138 miles**.

**2012-2013 Snowmobile Trails**

- Joint-use roads open – 1,843 miles (1,778.3 state forest and 62.6 state park)
- Designated snowmobile trails – 1,051 miles

Moshannon State Forest:

- Nine roads closed for 23.3 miles due to shale-gas development
- Four roads possibly plowed for 14.5 miles due to shale-gas development

Sproul State Forest:

- Thirteen roads closed for 57.8 miles due to shale-gas development
- Fourteen roads possibly plowed for 74.9 miles due to shale-gas development

Tiadaghton State Forest:

- Seventeen roads closed for 57.5 miles due to shale-gas development

Elk State Forest:

- Four roads possibly plowed for 12.4 miles due to shale-gas development

Susquehannock State Forest:

- Three roads possibly plowed for 18.6 miles due to shale-gas development



Tioga State Forest:

- Three roads possibly plowed for 5.9 miles due to shale-gas development

Loyalsock State Forest:

- Five roads closed for 12 miles due to shale-gas development
- One road possibly plowed for 5.7 miles due to shale-gas development

Total for all roads in the core gas region that could be plowed due to shale-gas development activities during the 2012-13 season was **29 roads for 132 miles**.

Total for all roads in the core gas region closed due to shale-gas development for 2012-13 season was **44 roads for 150.6 miles**.

**New Snowmobile Trails:**

The following is a list of the new trails that were created and opened to replace trails impacted by shale-gas development from 2007 (prior to shale-gas development) through December 2012:

- **Moshannon State Forest:** Five miles of replacement trails created
- **Sproul State Forest:** Three miles of trail placed onto a new pipeline

- **Tiadaghton State Forest:** Five miles of trail placed onto a new pipeline
- **Elk State Forest:** No trails replaced
- **Susquehannock State Forest:** Two miles of trail placed on a new pipeline
- **Tioga State Forest:** Five miles of trail placed on new pipelines
- **Loyalsock State Forest:** No new trails created, primarily due to steep topography and the gas industry's current work on completing pipeline ROWs. Additional new trails may be needed to tie into existing snowmobile trails and new pipelines.

### Scenic Driving

In both past and current visitor use monitoring studies, the single largest recreational use of state forest lands has been scenic driving. Most recreational users participate in this activity coming to and from the state forest, but for many this is the sole purpose of their visit to state forest land. The beauty of the forest, the solitude, tumbling mountain streams, scenic vistas, and ever-changing colors attract great numbers of visitors.

The bureau recognized the need for road access for gas development and co-located gas traffic on state forest roads to minimize new disturbance and ecological impact. This strategy has resulted in state forest roads with heavier traffic. Roads that are upgraded to handle heavier traffic may be safer and easier to drive but lose some wild character. In some cases, new roads have been constructed for gas development, which may reduce traffic impacts on traditional state forest roads while providing new opportunities for scenic driving.

Hauling restrictions are used to manage gas development traffic during high visitor-use periods (see section below). Some gas-related traffic is necessary for essential needs, but traffic can be limited to specific times. The strategy is to decrease the impact of traffic during the highest use periods, at the cost of increased traffic at some other time.

Road conditions, traffic, dust, and noise are common complaints in the bureau's comment cards and in

other public contact. A combination of traffic volume measurements and qualitative impacts may be implemented in the future to monitor impacts on scenic driving.

### Hunting and Fishing

The bureau has received qualitative evidence relating to gas development impacts on hunting and fishing access and experience. Traditional public contact, comment cards, and articles in the media suggest that some hunters and fishermen have been impacted. For future reports, implementation of qualitative and quantitative measures of hunting impacts will be considered.

There may be gains and losses with regard to access for hunting and fishing. Some roads may be closed or restricted, while newly constructed roads will offer new opportunities for access. Traffic related to gas development has the potential to impact access and experience. Traffic can be managed to some degree, which may include trade-offs in the time when the impact occurs. Traffic and hauling restrictions are addressed in the bureau's *Guidelines for Administering Oil and Gas Activity on State Forest Lands*.

During certain holidays and high visitor use periods there should be no heavy hauling during the day (i.e., rig moves, water trucking, sand trucking, etc.) or seismic activity, to protect public safety and prevent conflicts. In addition to these statewide timeframes, the forest districts will provide gas operators with a list of high conflict dates on an annual basis to aid in the planning and scheduling of activities.

### Hunting and Fishing Seasons

- Opening weekend of trout
- Opening weekend of youth spring gobbler season
- Opening weekend of regular spring gobbler season
- Regular bear season
- Portion of regular firearms deer season, including opening day

**Heavy hauling and seismic activity may be restricted during the following dates at the discretion of the district forester:**

- Seismic activity may be restricted during the morning hours of spring turkey season.
- Special activities or events on state forest or adjacent state park lands as identified by the district. Restricted roads and hours of operation will be determined by the district.
- Opening day of deer archery season.
- Opening day of youth/special use hunting.
- Opening day of early muzzleloader season.

The bureau will consider minor truck traffic on state forest roads between the hours of 10 p.m. and 4 a.m. for daily or essential needs only (e.g., cuttings removal, drinking water delivery, sanitation, cement). The management of traffic comes with trade-offs. The impact to hunters may be mitigated, but state forest users between the hours of 10 p.m. and 4 a.m. may be unusually impacted by traffic.

**Leased Campsites**

There are over 4,000 leased campsites on state forest lands across 16 state forest districts. Users who lease state forest land for their cabins have the potential for unique impacts from natural gas development. Other state forest

users may have the option to use a less impacted location, but since cabins are stationary, users’ options may be limited to enduring the impact, transferring the lease, or staying away during periods of impact. Since lessees may visit for extensive periods of time, they might be impacted more than other users by activities such as heavy hauling that are moved to “off hours,” which is a trade-off the bureau uses to reduce the impact to other user groups.

Leased campsites often have water use agreements and could be directly impacted by any change in water quality or quantity. There have been no known impacts to leased campsite water quality or quantity resulting from gas management.

No leased campsites have been removed or leases returned to the bureau due to gas development. Real estate data on lease transfers could be analyzed, but the bureau does not have that information, and it might not reflect gas impacts as much as it does real estate and economic trends. The bureau has received complaints from camp lessees regarding impacts from shale-gas consistent with complaints from other user groups. Qualitative measures, such as surveys and focus groups, may be used to assess impacts to camp lessees in the future.



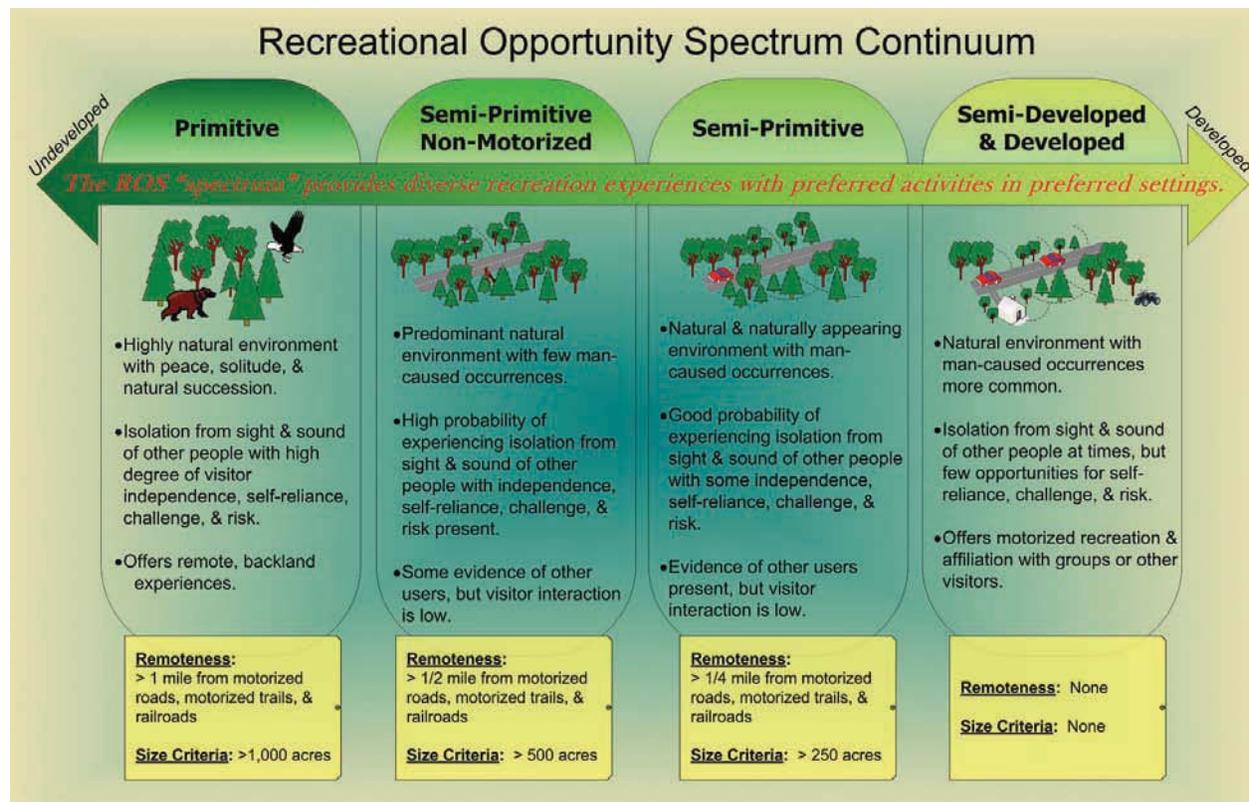


Figure 11.2

### Recreation Opportunity Spectrum

The 2007 State Forest Resource Management Plan Update stated: "Utilize Recreation Opportunity Spectrum (ROS) to make and communicate recreational management decisions that are transparent, credible, and compatible with other state forest management goals." The U.S. Forest Service developed the Recreation Opportunity Spectrum system, which has been adapted by the bureau for application in Pennsylvania.

According to the ROS manual: "Recreation opportunity Spectrum (ROS) is an inventory system built on the premise that people expect certain types of recreational experiences on public land, and that land managers should be able to direct people to appropriate places for those experiences. ROS allows the land manager to provide recreational opportunities across a spectrum, or continuum, of five land-use classes so that the user may find satisfying recreational experiences in a variety of recreational activities."

The ROS land-use classes follow a continuum from "primitive" to "developed" and can be used as a measure of wild character (Figure 11.2). The ROS classes are:

- **Primitive**
  - Remoteness: Greater than one mile from a motorized road/trail/railroad
  - Size: Greater than 1,000 acres
- **Semi-Primitive Non-Motorized**
  - Remoteness: Greater than one half mile from a motorized road/trail/railroad
  - Size: Greater than 500 acres
- **Semi-Primitive**
  - Remoteness: Greater than one fourth mile from a motorized road/trail/railroad
  - Size: Greater than 250 acres
- **Semi-Developed and Developed**
  - Remoteness: None
  - Size: None

ROS is a long-term planning tool that guides management activities. State forests are managed to maintain the conditions that define each ROS land-use class, or increase the primitive acreage, but not to increase developed acreage. According to the *Guidelines for Administering Oil and Gas Activity on State Forest Lands*, “Natural gas activities will be restricted within Primitive and Semi-Primitive Non-Motorized zones as identified through the Recreation Opportunity Spectrum (ROS) inventory and planning tool.”

The bureau has a custom GIS tool that delineates ROS zones from the state forest landbase and motorized road/trail spatial data using the remoteness and size criteria. The bureau maintains a GIS base layer of the ROS classes for pre-shale-gas conditions. As gas development progresses, the bureau will continue to compare current ROS conditions to pre-shale-gas conditions and strive to attain those pre-shale-gas conditions for final restoration. Gas development activities change the condition of state forest acreage to the more developed side of the ROS continuum, although when sites associated with gas development are restored, they should return to their more primitive pre-shale-gas ROS conditions. Mitigation efforts could make other areas more primitive in the interim. Table 11.1 and Figure 11.3 quantify the change in recreational experience and wild character from

pre-shale-gas conditions until 2012, due to shale-gas development as measured by the ROS tool.

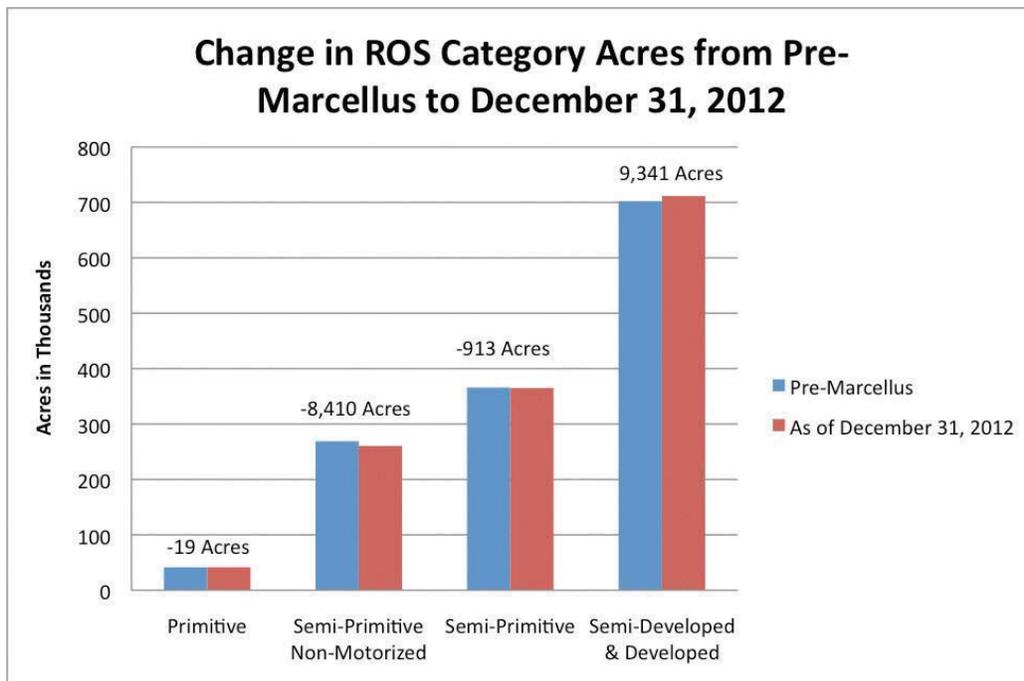
The current impact of gas infrastructure on wild character in core gas districts is: 9,341-acre increase in semi-developed and developed acreage, 913-acre decrease in semi-primitive acreage, 8,409-acre decrease in semi-primitive motorized acreage, and 19-acre decrease in primitive acreage.

Before shale-gas activity, 19.5 percent of the state forest in core gas districts was in the semi-primitive non-motorized land-use class; the effects of shale-gas development as of 2012, resulted in a decrease to 18.9 percent. The semi-developed and developed acreage increased from 50.9 percent to 51.6 percent of the region’s state forest. Semi-primitive and primitive acreages each changed by less than one tenth of one percent.

The changes in ROS land-use classification also can be shown spatially. Currently, the changes in ROS have all been decreases in primitive quality of the land base. As developed gas sites are restored to pre-shale-gas conditions, acreage should return to more primitive character. In future ROS analyses, it will be informative to separate acreage returned to primitive classifications from acreage developed to show that the net result will include both gains and losses.

District	Primitive	Semi-Primitive Non-Motorized	Semi-Primitive	Semi-Developed & Developed
Moshannon	0	-1,164	356	808
Sproul	0	-770	51	719
Tiadaghton	0	-3,259	-72	3,332
Elk	0	0	0	0
Susquehannock	-19	-9	-18	46
Tioga	0	-3,207	-391	3,597
Loyalsock	0	0	-838	838
<b>Total</b>	<b>-19</b>	<b>-8,409</b>	<b>-913</b>	<b>9,341</b>

**Table 11.1** Net ROS Acreage Change (Pre-Shale-Gas vs. 2012).



**Figure 11.3**

### Aesthetics – Viewshed

Since 2008, the bureau’s oil and gas leases have included scenic viewshed “Areas of Special Consideration,” coordinated with the district forester to prevent disruption of scenic viewsheds wherever possible. State forest trails, rivers, and major roads were identified as scenic viewsheds. Incidents of gas development occurring in those scenic viewshed Areas of Special Consideration have been identified and evaluated.

Impacts on viewsheds can be evaluated using a specialized tool in ArcGIS. This tool was utilized prior to the 2008 leases in order to identify the viewsheds that should be protected in the leases.

Viewsheds were identified in 2008 using the following procedure:

1. Each forest district with potential gas leases was asked to identify:
  - a. Roads with high scenic value. These roads are heavily used by the public, and there is an expectation of high scenic value.
  - b. Streams with scenic river designation or which receive heavy use with an expectation of exceptional scenic value.
  - c. Trails with heavy recreation use and an expectation of high scenic value.

The selection of these features was based on local knowledge and was subjective:

2. The ESRI ArcMap viewshed tool was used to estimate viewshed from the features identified in Step 1.
  - a. Road, stream, and trail features from the statewide dataset identified in Step 1 were used as input features.
3. The viewshed tool creates a layer with two symbols:
  - 0- not in viewshed and >0- in viewshed.

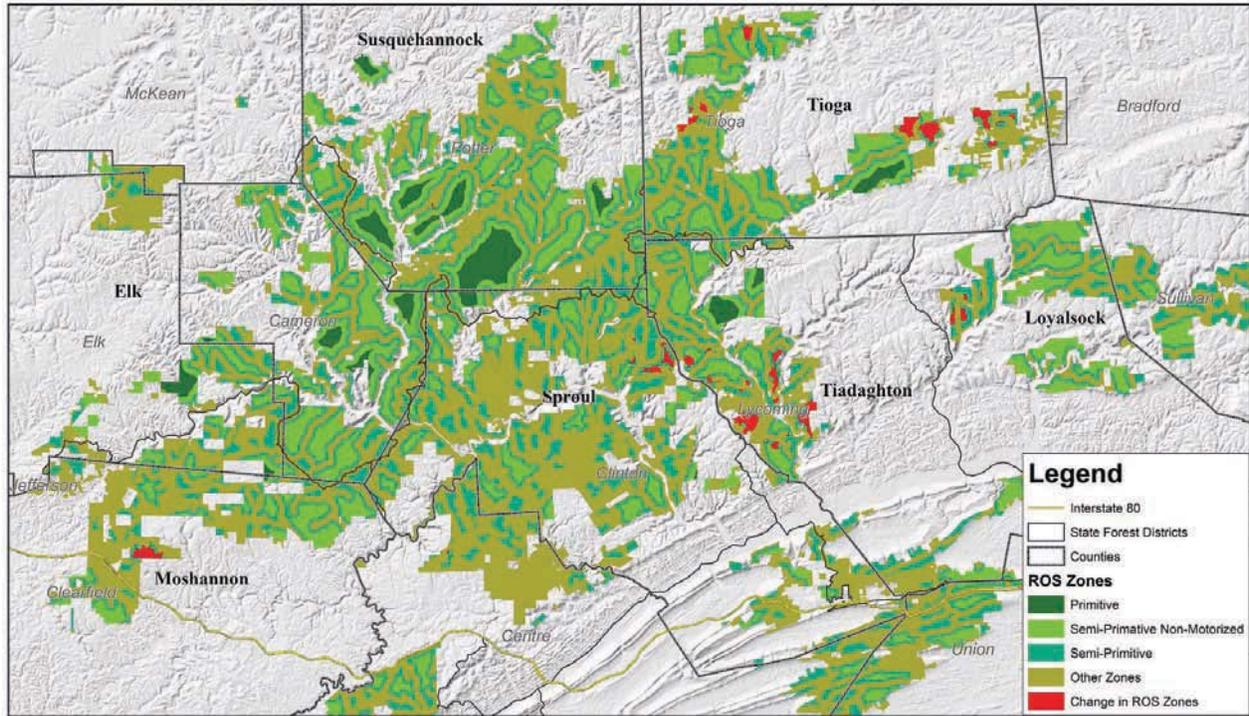
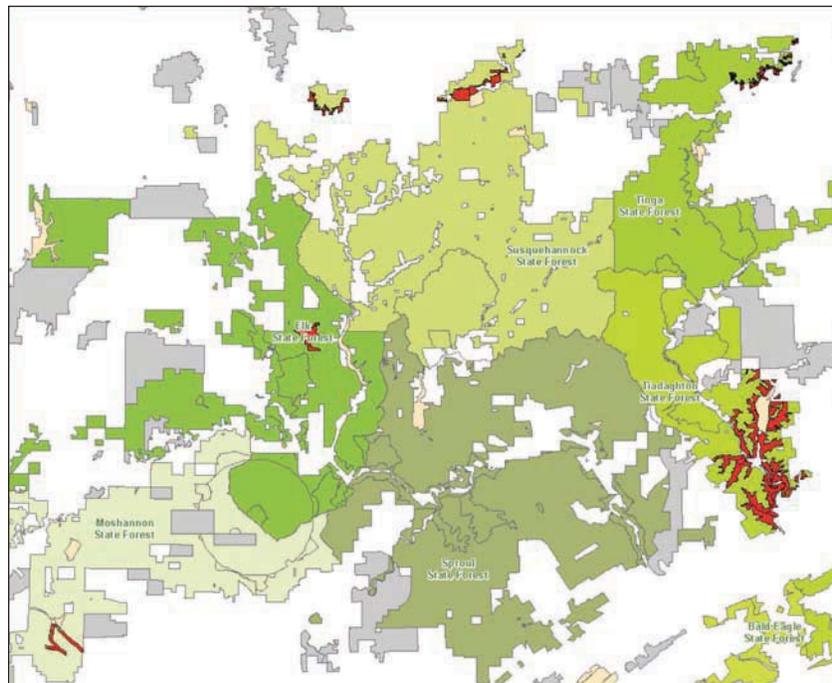


Figure 11.4 Change in ROS zones.



**ASoC Viewshed Specified in Lease**

Tract	Viewshed Acres(lease)
001	2023
007	1283
293	2509
322	789
323	1244
356	1404
357	436
416	796
419	1330
685	1741
727	3885
728	2029
729	1760
731	748

Figure 11.5 Map of scenic viewsheds identified in 2008 and newer leases (scenic viewshed in red).

Impacts from infrastructure were evaluated using the following procedure:

1. Gas infrastructure features are overlaid on the viewshed raster using ArcMap. If gas infrastructure is located within a raster cell with a value greater than 0, it is considered potentially visible from an input feature.
2. The occurrence of gas infrastructure within those scenic viewsheds identified in leases will be identified by type and size.

As a result of gas development, three pieces of gas infrastructure have been constructed within scenic viewshed Areas of Special Consideration identified in gas leases. Development in these areas requires coordination between operators and the bureau to protect specific forest uses and values. At times, development in these areas is necessary to protect other sensitive areas and to take advantage of existing disturbance corridors.

Feature	Size	Viewshed Impacted
Road	724 feet	PA-153
Road	963 feet	Interstate 80
Pipeline	2,960 feet	Little Pine Road

**Table 11.2** Gas infrastructure in scenic viewsheds.

The features identified above were specifically related to gas development. The size given for roads and pipelines is the length of the feature within designated scenic viewsheds. While the size of the feature suggests how much of it could be visible, it is important to recognize the limitations of viewshed software. It might be possible to see more or less of the infringing infrastructure than is actually suggested by the software. There are many variables that the software uses which would need to be further developed to make the tool more reliable. The impact is qualitative and should not be determined by software. Furthermore, the scenic viewsheds identified in the leases are relatively small in acreage compared to the

total acreage affected by gas development and, therefore, a limited quantification of the aesthetic impact.

The 724-foot section of road visible from PA-153 is not an entirely new road. Prior to gas activity, it was a camp site access road. Only a very short portion of the road is visible from PA-153.

The 963-foot section of road visible from I-80 existed prior to gas development as a state forest road and is still used in that capacity. The road has been improved for gas development use. In this case, the road was only slightly widened, similar to normal road maintenance, with minimal aesthetic change. This is unlike some other roads improved for gas development, where improvement has included significant widening and/or additional rights of way.

The 2,960-foot pipeline in the viewshed of Little Pine Road is a new gathering pipeline and rights of way where none existed previously. In this case, no suitable existing pipeline or right of way existed to transport the gas to marketing lines, and the lease gives operators the right to transport their gas from the leased area. Alternate routes were considered, but based on a host of concerns about other sensitive resources, this route was determined to have the least impact. Any route across the valley would have to cross Little Pine Road, impacting the viewshed; thus, this aesthetic impact could not be avoided. The right of way needed to be 100 to 130 feet wide to accommodate safe construction on the steep slope. After construction was completed, reclamation began, narrowing the width to the 40-foot minimum necessary for operation. Instead of the typical long straight line, the forest district requested curves and doglegs to mitigate the aesthetic appearance of the right of way. Even though 2,960 feet of pipeline is within the viewshed, the amount you can see at any given time is significantly less.

The viewshed from vistas may be impacted, both by activities on state forest land and those on private land. The viewshed software tool was found to be limited in its capability to accurately reflect whether a viewshed was actually impacted and needs further development. Qualitative analysis may be more informative than quantitative measures. The bureau may also work to manage vistas to maintain high quality and mitigate impacted sites.

In the future, state forest districts and the state forest system may be examined more holistically for viewshed impacts with ArcMap viewshed software. However, the limitations of the tool may suggest the use of a different method to quantify the value of the impact. For example, photos may also be used to document the change in appearance before and after development.

**Noise**

Because of the size of their land base, state forests provide a unique opportunity for dispersed low-density outdoor recreation that cannot be obtained from small forest areas or from private ownership. The undeveloped wild character of state forests offers peace, solitude, and a feeling of remoteness for many users. Ambient noise can dramatically affect a user’s recreational experience and generate conflict. Most sources of potential noise conflicts on state forest land are temporary in nature; however, gas compressor stations produce continuous noise and thus have the potential to greatly impact the experiences of the recreating public. The bureau’s objective is to maintain and perpetuate a visitor’s anticipated recreational experience on state forest lands and to maintain the wild character of the state forest.

*The Guidelines for Administering Oil and Gas Activity on State Forest Lands* include recommended thresholds for compressor noise levels. It’s important to note that the current noise guideline did not exist when many of the state forest compressor stations were approved. The current guideline reads:

*When no suitable alternatives exist and a compressor station must be sited on state forest lands, the operating noise level of the compressor station should not exceed an Ldn of 55 db(A) at any distance greater than 300 feet from the compressor building.*

The bureau measured noise levels of compressor stations on state forest lands. The operating noise level of compressors was measured at 300 feet or greater. The sound level meter (SLM) was set to collect db(A) data for 24 hours, recording one reading every five seconds. The Ldn, which is a standard weighted average of the noise level, was calculated. The SLM was positioned at human ear level, using a strap to attach the meter to a tree or other suitable object. A GPS point for the location of the meter and a photograph and/or physical description were recorded so the same point can be found for repeat measurements. The same protocol could be used to measure other noise sources.

The SLMs were deployed when weather conditions were appropriate for SLM data collection. Although the SLM is fitted with a windshield under all circumstances, the preferred wind speed limit is 10 mph, with an upper limit of 15 mph. The weather conditions during data collection were recorded. Measurements were avoided in rainy or dense foggy conditions. Objects that generate wind-derived noises were avoided in SLM placement. Table 11.3 provides the results of noise level measurements conducted.

District	Leased Tract	Leq db(A)	Date
Tiadaghton	289	55.61	2/13/2013
Tiadaghton	685	59.15	2/14/2013
Tioga	587	61.85	2/20/2013
Tioga	595	60.47	2/26/2013
Tioga	839	60.2	3/5/2013
Sproul	285	69.63	3/7/2013

**Table 11.3** Sound meter data – operating compressor stations.

Measurements at the six compressor stations monitored on state forest lands were louder than 55db(A). These measurements are only indicative of the noise level on the day of the measurement. The quantity of data is limited to one 24-hour period for each compressor station, and winter conditions only. Each compressor and site is unique. Two sites had high winds on multiple attempts to collect data. The high winds likely contributed to higher db(A) readings. Wind may be a perennial issue at certain sites. One site also had heavy equipment operating nearby, and another site had snowmobile traffic as additional contributing noise sources.

Operators have been working cooperatively with the bureau to address compressor noise and to meet recommended guideline thresholds. The bureau is also working with DCNR's Natural Gas Advisory Committee to better understand compressor noise and mitigate impacts to wildlife, the wild character of the state forest, and the recreating public. With the committee, the bureau is guiding research to better characterize compressor noise, its impacts, and to develop adequate and effective management guidelines.

### Comment Cards

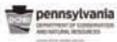
The bureau has cooperated with Penn State University to adapt a Visitor Use Monitoring program (VUM) for state forests and parks and added two shale gas-related questions. This VUM study is scheduled to collect data in select parks and forests each year. Penn State will analyze the data collected.

The National Visitor Use Monitoring program has two concurrent goals: to produce estimates of the volume of recreation visitation to national forests and grasslands and to produce descriptive information about that visitation, including activity participation, demographics, visit duration, measures of satisfaction, and spending connected to the visit.

To begin gathering statewide data in the short term, the bureau duplicated a portion of the VUM survey and shale-gas questions on postage-paid index cards. The cards were placed in boxes in high-use recreation areas. Between July and October 2012, the bureau received 223 completed comment cards. Additional cards continue to be received.

8170-CD-FR0175 03/2012

**COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES  
BUREAU OF FORESTRY**



**COMMENT CARD**

Please give us a minute of your time to help us serve you better. How would you rate our facilities and services in: \_\_\_\_\_ State Forest at: \_\_\_\_\_.

What is the primary reason or activity that brings you to this state forest (hiking, biking, hunting, fishing, boating, horseback riding, ATV riding, etc)? \_\_\_\_\_

Please circle one for each item:	Poor	Fair	Avg.	Good	Very Good
Scenery	1	2	3	4	5
Condition of the natural environment	1	2	3	4	5
Condition of Forest roads	1	2	3	4	5
Condition of Forest trails	1	2	3	4	5
Parking lot\Trailhead condition/appearance	1	2	3	4	5
Condition of developed recreation facilities (latrines, picnic tables, fire rings, campsites, pavilions, etc.)	1	2	3	4	5
Feeling of safety and security	1	2	3	4	5
Adequacy of signage	1	2	3	4	5
Availability of recreation information: (maps, website, etc.)	1	2	3	4	5

Has Marcellus activity changed your recreational use of this state forest? \_\_\_\_\_

Has Marcellus activity changed your visitation experience of this state forest? \_\_\_\_\_

**Figure 11.6** Example of bureau's distributed comment card.

## Summary of Marcellus Comments;

### July to October 2012

The sample size is relatively small for this period, but the summary of the open-ended Marcellus comments is informative.

#### *Has Marcellus activity changed your recreational use of this state forest?*

Following the question, a blank space was provided to answer. “Yes,” “no,” or nothing at all were common responses, and there were additional comments written in the space provided. Not everyone explicitly included a “yes” or “no” answer, but when the answer was implicit, those comments were included in the tally. The data are also presented in Figure 11.7.

All forest districts: 46 yes, 158 no, 19 blank

Core gas forest districts only: 41 yes, 66 no, 9 blank

The following is a summary of the comments received. Similar comments are grouped together, with the number noted in parentheses and “yes” or “no” identified in brackets.

**Not Yet (17) [No]** The most common comment on all cards in this time period other than “yes” or “no” was “not yet;” that comment was written verbatim 11 times. Similar answers were included in this theme. These answers indicate that recreational use has not changed, the user is aware of shale-gas activity, and the user directly or indirectly implies it may affect his or her use at some point in time.

**Emphatic no (8) [No]** Some comments were more emphatic than a simple “no,” for example: “Not at all.”

**Not applicable (7) [No]** “Not applicable,” or “N/A,” was a common response. Similar comments indicate that recreational use has not changed, the user is aware of shale-gas activity, and perhaps the user does not think it will affect his or her use.

**Don’t know (2) [No]** Some comments admitted lack of knowledge.

**Avoidance (11) [Yes]** There were unique comments pertaining to “avoidance” as a change in recreational use. Every comment was unique, but directly addressed the question. Lumped together, avoidance was the most common change in recreational use identified.

**Roads, Traffic, Trucks, Noise, Dust (9) [Yes]** There were a variety of comments identifying road traffic as a specific shale-gas activity affecting their use.

**Some (9) [Yes]** There were understated comments that implied changes had occurred. These comments indicate there is a perceived change, but the users do not want to specify, or do not know what has changed.

**General Opposition (5) [Yes]** There were comments that didn’t specify a change, but generally opposed shale-gas activity. These comments relate to perception of shale-gas activity and its effects on state forests.

**Access (4) [Yes]** Some comments identified access as a change in recreational use. These comments directly identify a change in recreational use.

**Other Environmental Impact (8) [Yes]** There were sparse comments related to environmental quality, including water quantity, water quality, land use, aesthetics, air quality, wildlife populations, and favorite spots.

#### *Has Marcellus activity changed your visitation experience of this state forest?*

Following the question, a blank space was provided to answer. “Yes,” “no,” or nothing at all were common responses, and there were additional comments written in the space provided. Not everyone explicitly included a “yes” or “no” answer, but when the answer was implicit those comments were included in the tally. The data also presented in Figure 11.7.

All forest districts: 53 yes, 152 no, 18 blank

Core gas forest districts only: 46 yes, 62 no, 8 blank

The following is a summary of the comments received. Similar comments are grouped together, with the number noted in parentheses and “yes” or “no” identified in brackets.

**Not Yet (11) [No]** The most common comment on all cards in this time period, other than “yes” or “no,” was “not yet;” that comment was written verbatim nine times. These answers indicate that recreational experience has not changed, the user is aware of shale-gas activity, and the user perhaps thinks it may affect his or her use at some point in time.

**Not applicable (5) [No]** “Not applicable,” or “N/A,” was a common response. Similar comments indicate that recreational experience has not changed, the user is aware of shale-gas activity, and the user perhaps does not think it will affect his or her experience.

**Emphatic no (2) [No]** Some comments were more emphatic than just “no,” for example: “Not at all.”

**Roads, Traffic, Trucks, Noise, Dust (16) [Yes]** There were a variety of comments identifying road traffic as a specific shale-gas activity affecting their experience.

**Unpleasant experience (8) [Yes]** Unique comments related to pleasantness were identified as a change in visitation experience.

**General Opposition (4) [Yes]** There were comments that didn’t specify a change, but generally opposed shale-gas activity. These comments relate to perception of shale-gas activity and its effects on state forests.

**Avoidance (3) [Yes]** There were unique comments pertaining to avoidance as a change in visitation experience. Each comment referred to areas the person uses or does not use due to shale-gas activity.

**Wildlife (3) [Yes]** There were comments relating to wildlife presence and behavior.

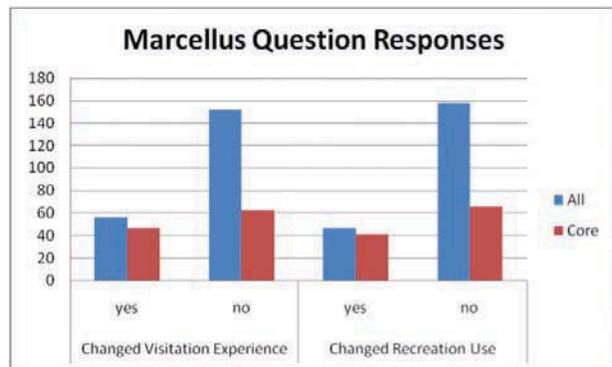
**Some (3) [Yes]** There were understated comments that implied changes had occurred. These comments indicate there is a perceived change but the user does not want to specify, or does not know, what has changed.

**Litter (2) [Yes]** There were comments specifically about litter, and specifically litter related to shale-gas industrial activities.

**Noise (2) [Yes]** Helicopter noise and machinery noise were specifically identified as experience changes. Noise also was identified with traffic.

**Other Environmental Impact (4) [Yes]** There were sparse comments related to environmental quality, including water quantity, water quality, land use, aesthetics, air quality, wildlife populations, and favorite spots.

**Availability of goods (1) [yes]** There was one comment about the lack of availability of kerosene.



**Figure 11.7** Shale-gas comment card responses.

Forty-six out of 116 respondents in core gas districts indicated that shale-gas activity had changed their visitation experience. Forty-one out of 116 respondents in core gas districts indicated that shale-gas activity had changed their recreational use of the state forest. Responses for both questions in non-core districts had significantly more responses that neither visitation experience nor use was changed by shale-gas activity. The combination of road condition, traffic, trucks, noise, and dust was the most common comment included for both questions.

Additional comment cards have been received since October 2012 and will be included in future reporting efforts. Responses could be organized by forest district to provide greater detail. The visitor use monitoring research being done by Penn State will have greater statistical validity and more detailed analysis, but this comment card effort provides immediate and continuous feedback.



#### **IV. Discussion / Conclusion**

While there have been impacts to recreational infrastructure due to shale-gas development, there also have been improvements to that infrastructure that otherwise likely would not have happened. When impacts could not be avoided, they have been considered temporary, and throughout the process the goal has been eventually to improve any impacted recreational infrastructure to a condition better than it was before gas development.

Though it is a small percentage of total acreage, there is significant acreage affected by changes to recreational experience and wild character measured by ROS. State forest visitors looking for a more primitive experience may find fewer appropriate places for those experiences,

while visitors who enjoy semi-developed and developed areas may find more appropriate places for those experiences.

There have been impacts to scenic viewsheds identified as Areas of Special Consideration. Each case was carefully considered and determined the least overall impact to state forest values and uses. Additionally, gas development affects the aesthetics of state forests outside those Areas of Special Consideration, which should be considered in future monitoring efforts. The viewshed tool can be used to measure impacts, but it needs further refinement before it can be applied in a meaningful way. Each type of infrastructure may affect the perception of the person viewing it differently, and each viewer is unique.

Sound level measurements at operating compressor stations on state forest lands were louder than suggested by the current *Guidelines for Administering Oil and Gas Activity on State Forest Lands*. Attenuation has been developed. Repeat measurements and ambient noise level measurements would improve understanding of noise levels as well as additional research and continued refinement of guideline standards.

The comment cards have provided immediate and ongoing insight into changes to use and experience caused by shale-gas activity. The visitor use monitoring research being done by Penn State will have greater statistical validity and more detailed analysis.

Quantitative measures are limited in their ability to measure experience since the effect of the impact on the user's experience only can be determined by the user. Spatial data has similar limitations; if a visitor is using a site unaffected by any of the measures discussed here, but passes through them on the way, he or she may feel the impact nonetheless. Qualitative measures are probably more relevant to the impact on recreation experience than quantitative or spatial measures.

The bureau will continue to focus on avoiding impacts to recreation when possible. When impacts cannot be avoided, the bureau will work towards making the impacts temporary in nature and minimizing the temporary time period to the greatest extent possible. The bureau will continue to work with gas operators, recreation groups, and the visiting public to address potential impacts.

