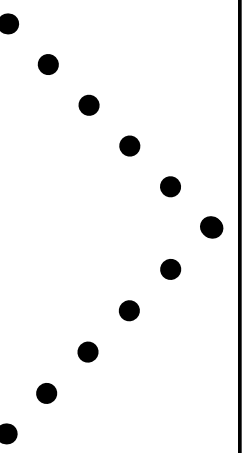
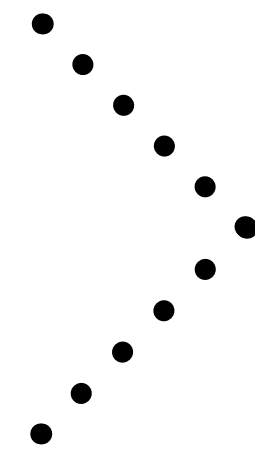


Marcellus by Design



HISTORIC ROUTE 6

SENSE OF PLACE

HABITATS AND CORRIDORS

RECREATION

HISTORIC SITES AND LANDSCAPES

WATER

FOOD AND ENERGY FUTURES

Recreation



Goals

This project aims to protect the recreational resources of Tioga County, Pennsylvania while allowing for economic expansion through the gas industry.

Issues

Based on future well projection data, it is unlikely that gas development would directly impact recreation. But, it is possible that it will indirectly impact it through increased traffic, noise pollution, and viewshed disturbance.

Community Effects

By providing the public with Best Management Practices, suggestions of areas that need the most protection to maintain current recreation, and other design strategies applicable to places effected by drilling, communities can evaluate their options.

Historic Sites &
Landscapes

Historic Route 6

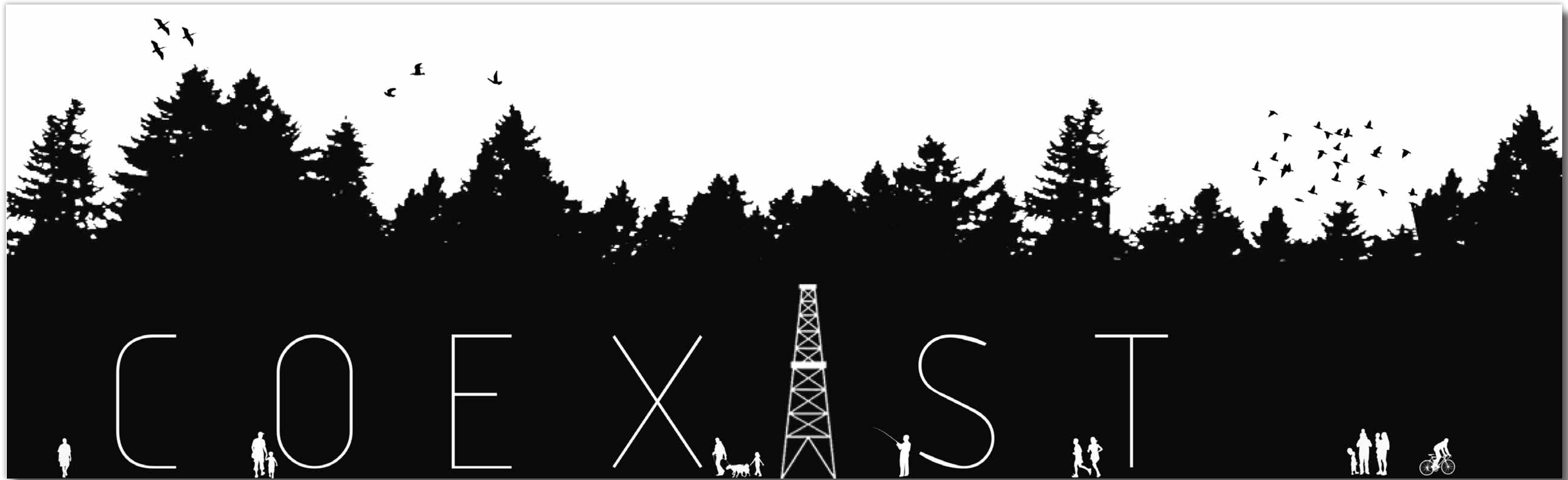
Water Dynamics

Food, Water &
Energy Futures

Habitat & Corridors

Sense of Place

Recreation



Tioga county is characterized by its rich natural landscape. Outdoor recreational opportunities are a vital part of its character, and as Marcellus drilling increases, conflicts may occur between the gas industry and the community's experience of nature.



Fig. 0.1 Photo by Alia Horvath

Recreational Riches

Tioga County has an abundance of natural recreaitonal resources, such as the Pennsylvania Grand Canyon pictured above.

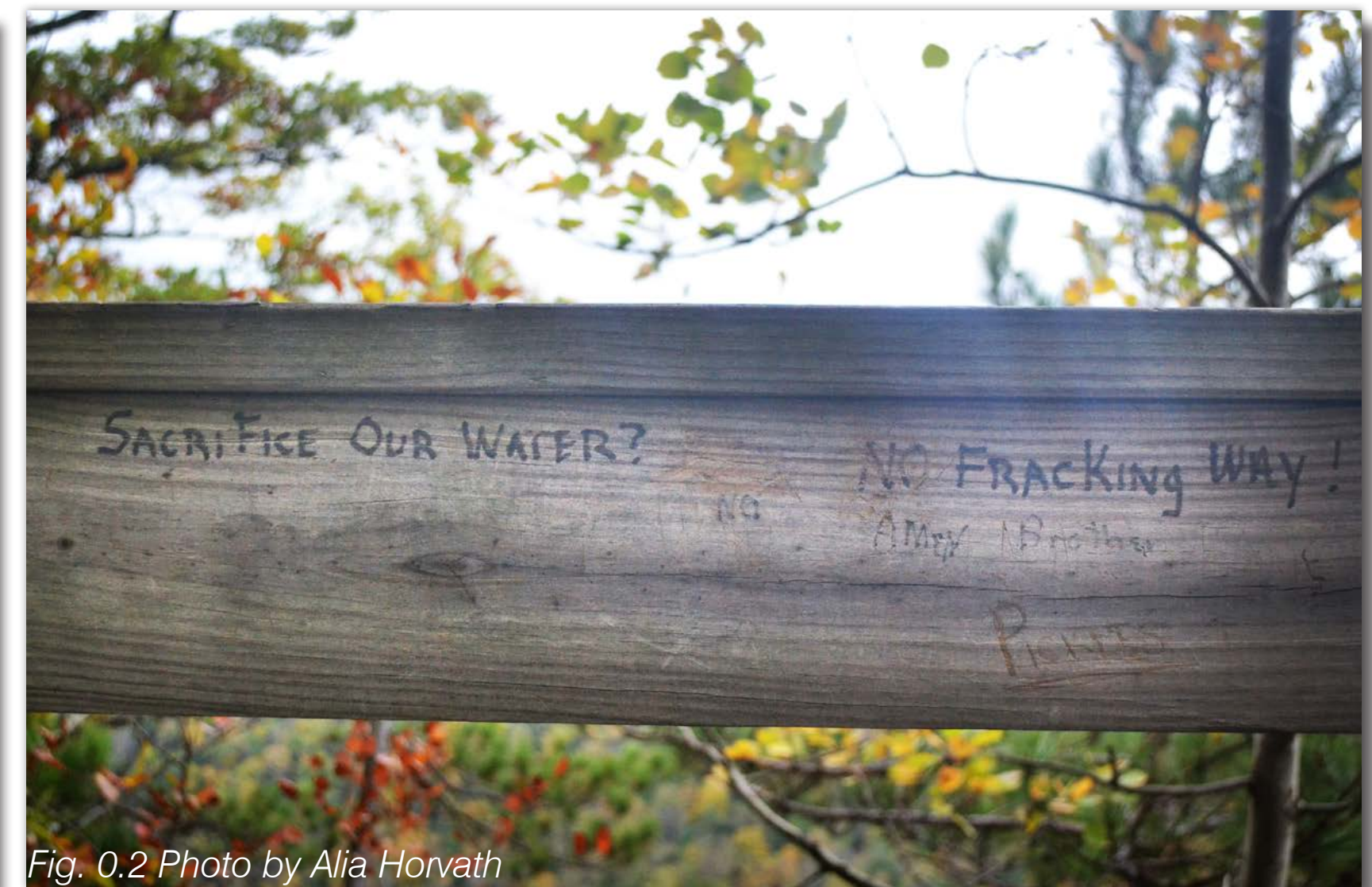
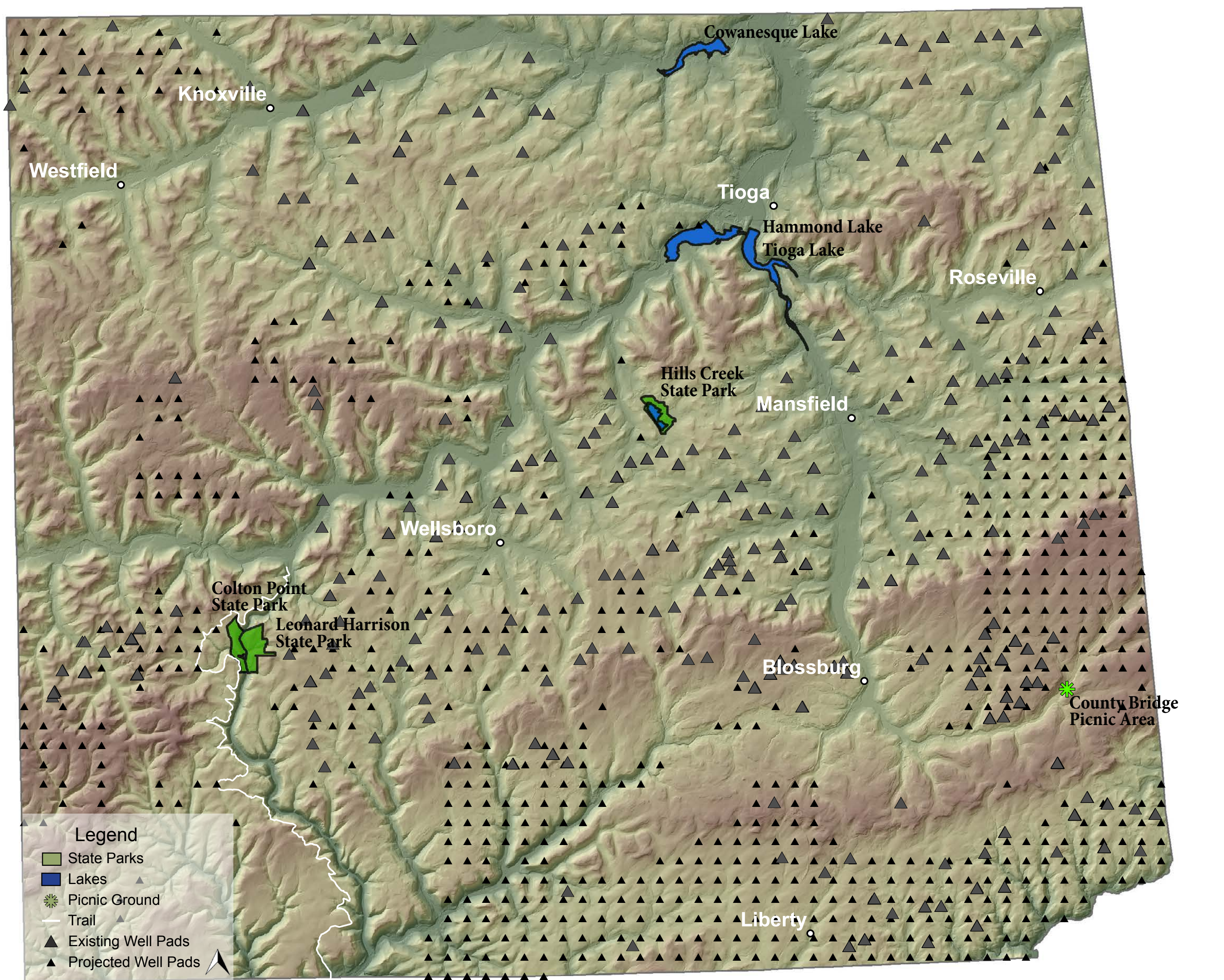


Fig. 0.2 Photo by Alia Horvath

Possible Conflicts

With the gas industry moving in to take advantage of the Marcellus Shale formation, it is possible there will be conflicts between gas and recreation.



Site Locations

- ① **County Bridge Picnic Area**
Traffic passing the picnic grounds creates a lot of dust. Noise from the trucks is also a problem that could deter guests.
- ② **West Rim Trail**
Gas wells near trails could impact hiker's and biker's experiences, especially those looking for a sense of remoteness.
- ③ **Leonard Harrison Approach**
While it is unlikely that well pads will turn up within a state park, the arrival experience is also important for scenic drivers.
- ④ **Ives Run Campground**
Noise from gas industry traffic near the lake, as well as possible well pads, could disturb campers and other visitors.



Recreation and the Gas Industry

We chose four locations based on different kinds of recreation where projections of drilling were the highest, thus creating the most likely conflicts.

Recreation: Context

Recreation: Analysis

Research and Analysis

The project began with an in-depth analysis of Tioga County and its recreation resources. We compared the amount of recreation the county currently has with recommended sports activities and park space and discovered creation of new spaces is not a priority.

Therefore, preserving current recreation is the top priority. After mapping recreation amenities, we chose locations that had the highest amount of well projections.



Fig. 0.7

Background information on Tioga County



Fig. 0.8

Analysis of Gas-Related Issues in Tioga County

Recreation: Background

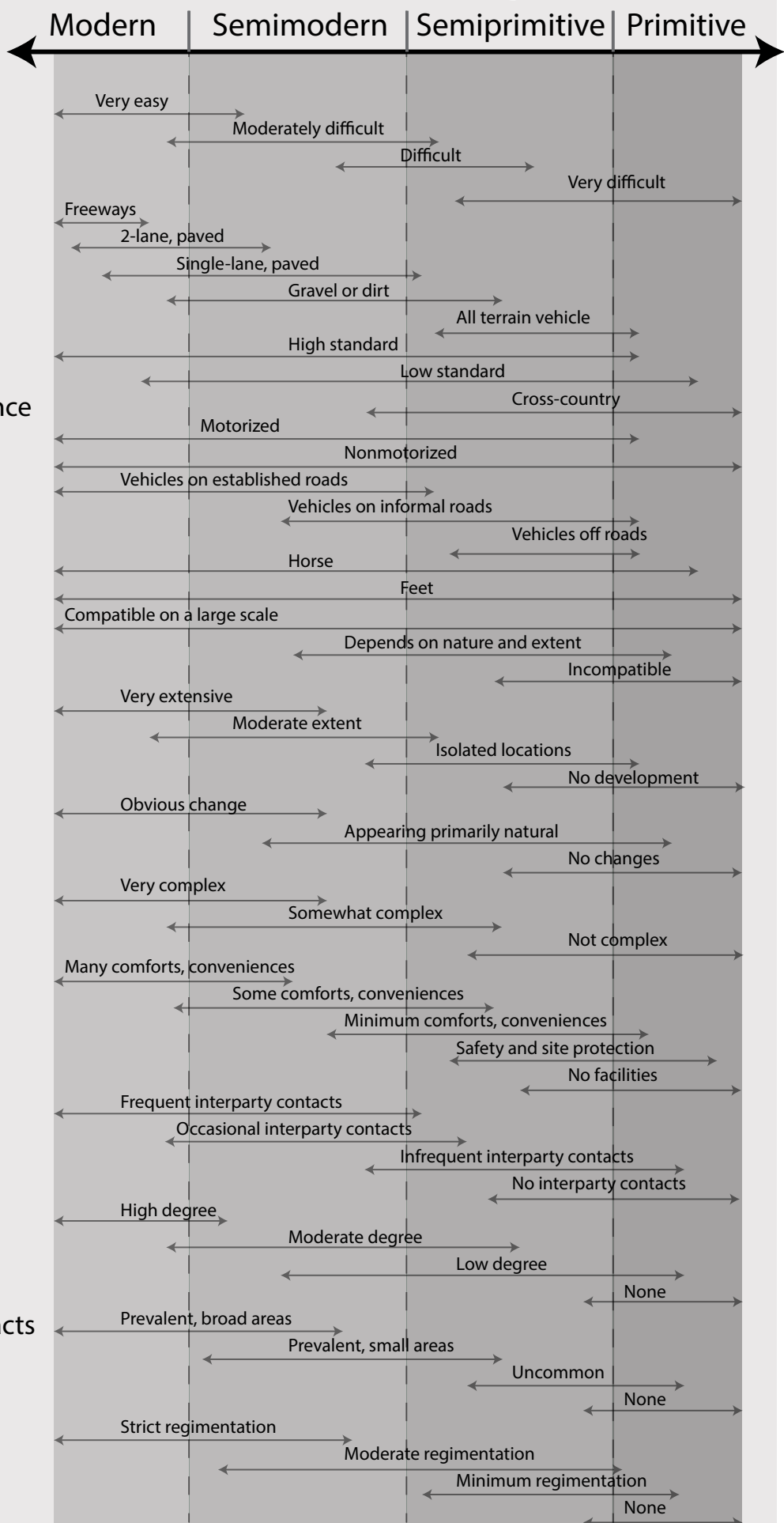
Importance of Parks & Recreation

The Recreation Opportunity Spectrum (ROS) is a framework to ensure different kinds of experiences are provided, dependent on the audience's level of immersion into nature. The most remote sites are considered primitive while the most human interaction occurs in modern sites. Providing a gradient of opportunities will incorporate different kinds of users into the landscape.

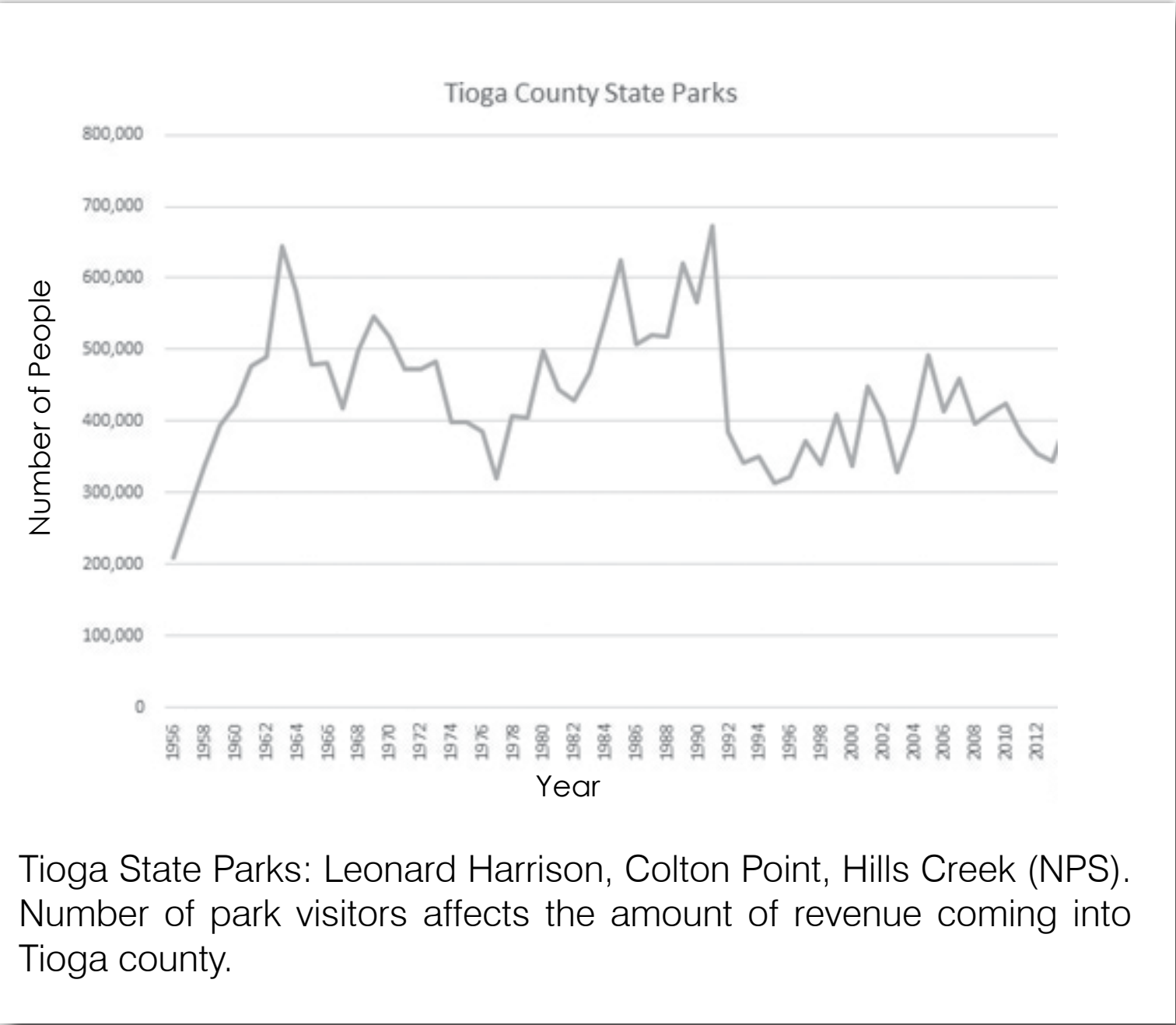
For more on the ROS

Management Factors Recreation Opportunity Spectrum

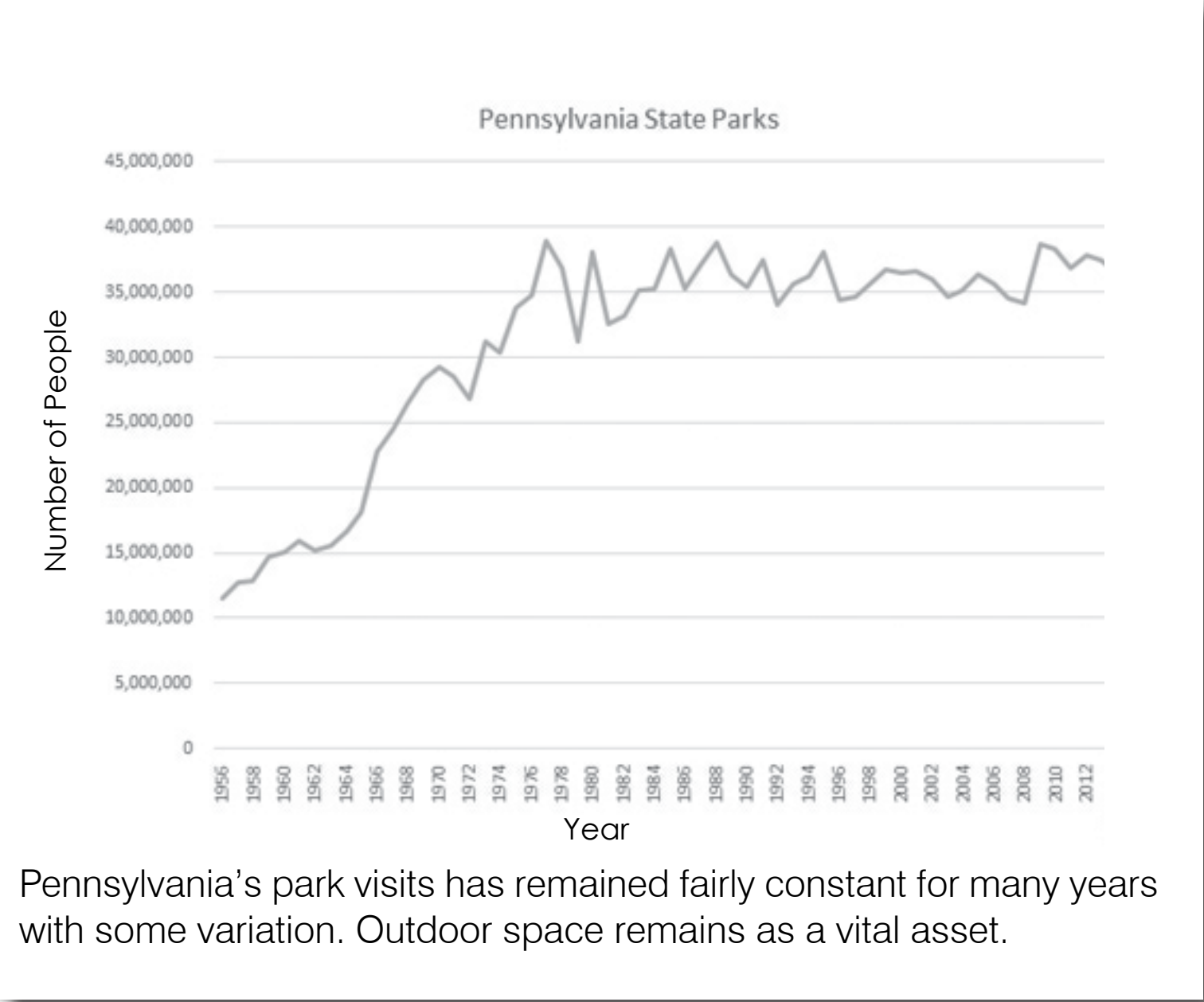
- 1. Access
 - a. Difficulty
 - b. Access system
 - i. Roads
 - ii. Trails
 - c. Means of conveyance
- 2. Nonrecreational Resource uses
- 3. Onsite management (modification)
 - a. Extent
 - b. Apparentness
 - c. Complexity
 - d. Facilities
- 4. Social interaction
- 5. Acceptability of visitor impacts
 - a. Degree of impact
 - b. Prevalence of impacts
- 6. Acceptable regimentation



Park Attendance: Tioga



Park Attendance: PA



Statistics

Places with Parks:
Residents had on average:
Household income **+\$5,000**
Home value **+23,000**

Places with Parks:
On average are **15%** more racially diverse.

Places with Parks:
Poverty and **crime** rates decreases.

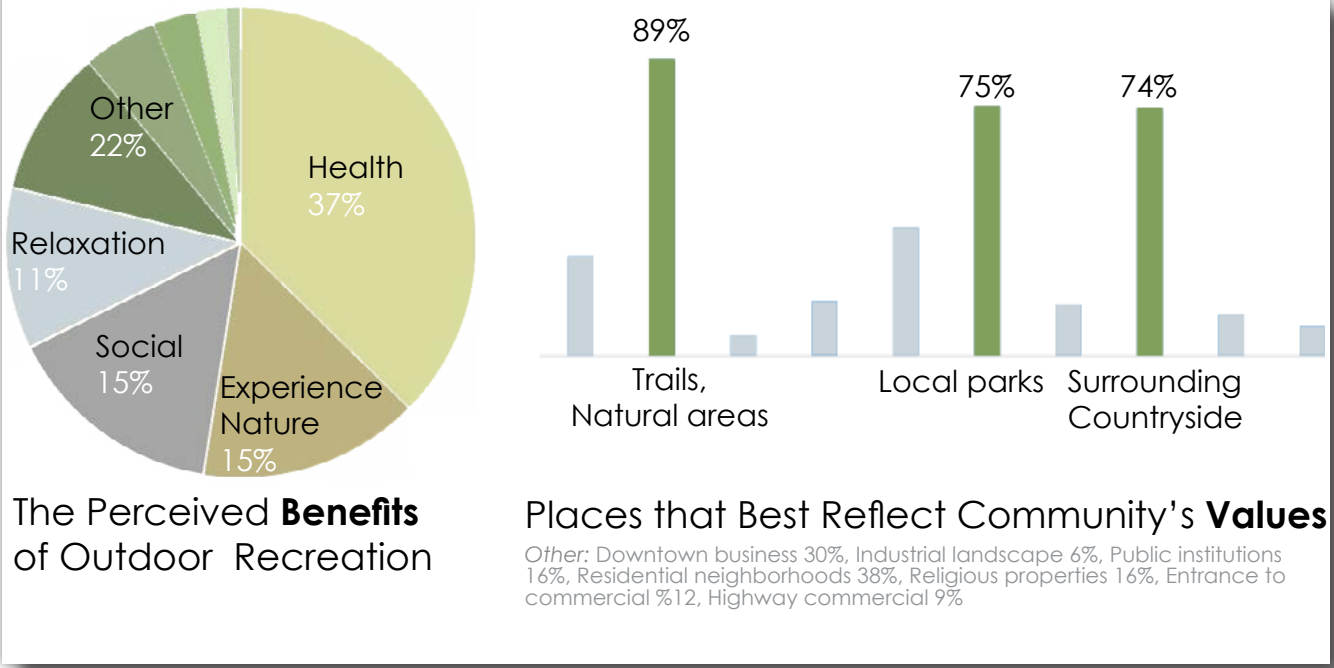
Places with Parks:
Less suburban sprawl.
Houses **20%** more people.

Parks and recreation strenthens the community's image, improves overall quality of life, and creates a strong sense of place. In addition to ecological services like clean air, clean water, soil stabilization, etc. outdoor spaces are valuable for their habitat quality, natural resources, food production, and the overall value of green space.

For more Pennsylvania Statistics

For more Personal Surveys

Personal Surveys



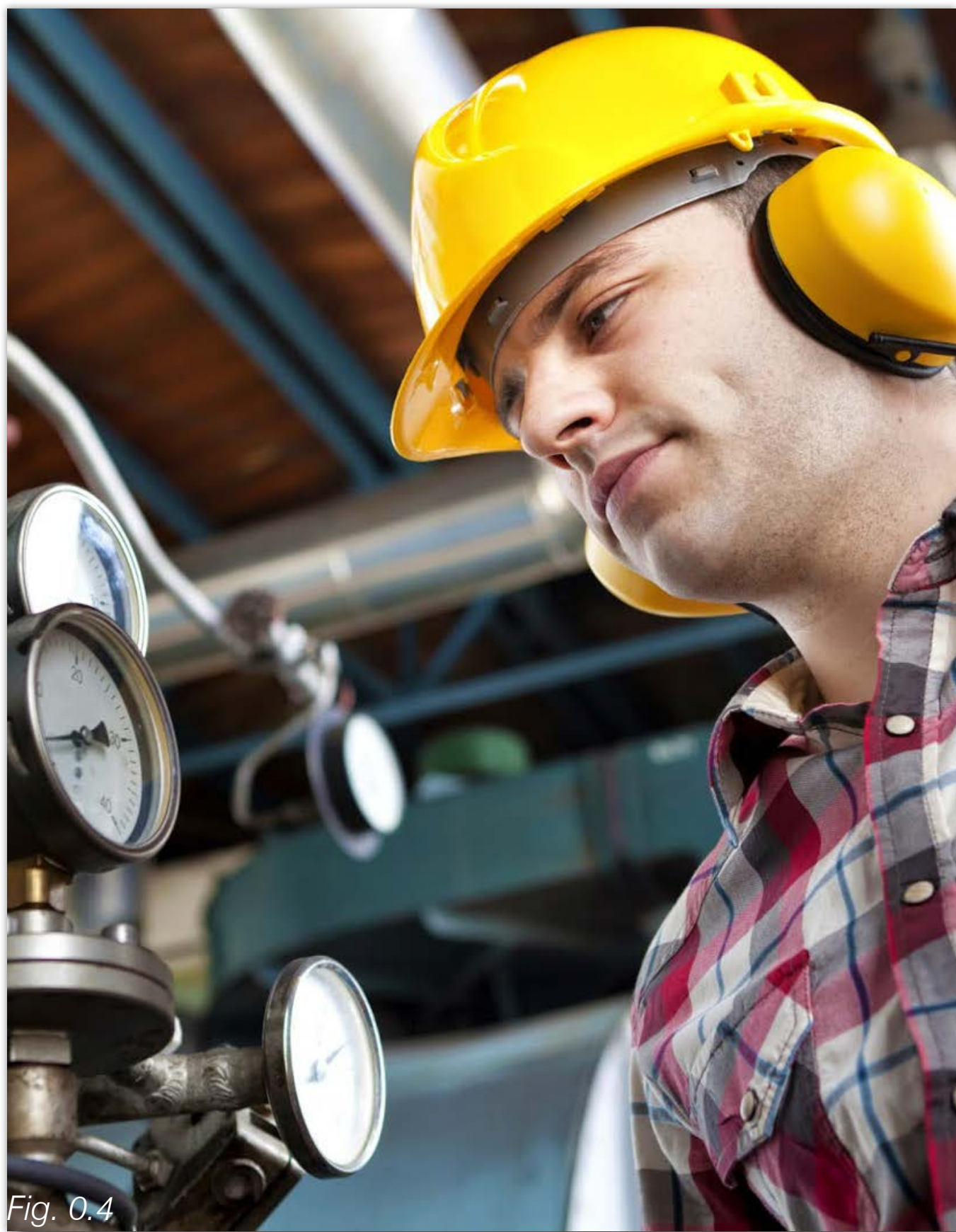


Fig. 0.4



Fig. 0.5 Photo by Katie Moffatt



Fig. 0.6 Viewshed disturbance

Noise

Gas drilling is responsible for large amounts of noise pollution. A quiet, rural region like Tioga County could be significantly impacted by the increase in noise from drilling activities.

Some of the sound impacts of gas development are as follows:

Typical compressor station	50 dBA (375' away)
Pumping units	50 dBA (325' away)
Fuel and water trucks	68 dBA (500' away)
Crane for hoisting rigs	68 dBA (500' away)
Concrete pump used during drilling	62 dBA (500' away)
Average well construction site	65 dBA (500' away)

Traffic

Traffic is another major concern during gas drilling. It takes about 1,300 truck trips on average to complete one well. This causes traffic congestion, strains on road conditions, air pollution, and other negative impacts.

The numbers of trucks are caused by:

Drill Pad & Road Construction Equipment	10 to 45 truckloads
Drilling Rig	30 truckloads
Drilling Fluid & Materials	25 to 50 truckloads
Drilling Equipment (casing, drill pipe, etc.)	25 to 50 truckloads
Completion Rig	15 truckloads
Completion Fluid & Materials	10 to 20 truckloads
Completion Equipment (pipe, wellhead)	5 truckloads
Fracture Stimulation Fluids & Materials	100 to 1000 truckloads
Fracture Stimulation Equipment	100 to 150 truckloads

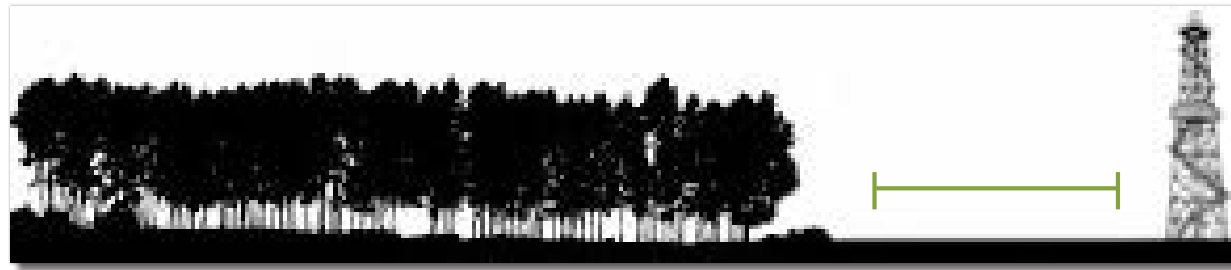
Viewsheds

Viewsheds are a vital asset for a scenic county like Tioga, but they are being threatened by the increasing gas development. Because of this, it is important to identify, protect, and enhance viewsheds whenever possible.

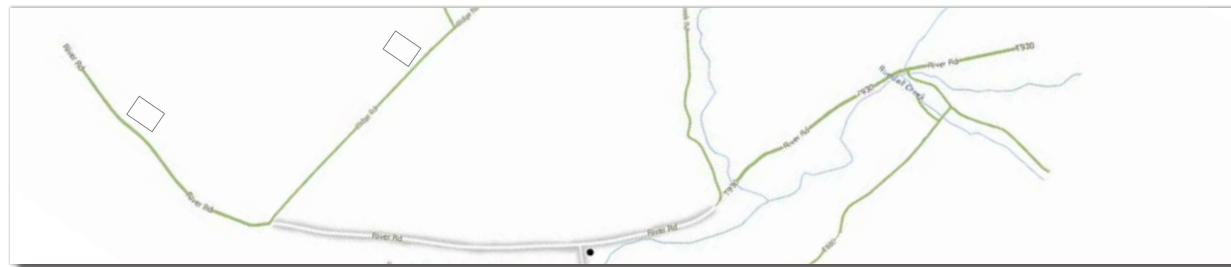
Some possible disturbances to viewsheds include:

- Visible drill rigs
- Pipeline corridors
- Acces roads
- Well pads
- Infrastructure that contrasts the surrounding landscape
- Large amounts of cut and fill in the landscape
- Disruption of natural contours

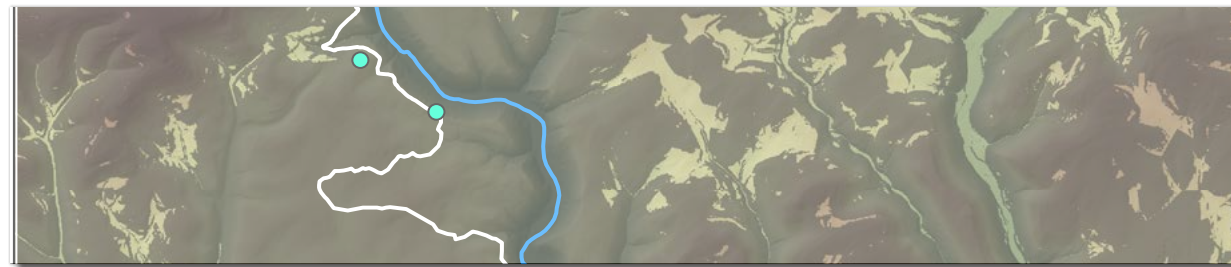
Recreation: Design Responses



Best Management Practices



Design Response #1: County Bridge Picnic Area



Design Response #2: West Rim Trail



Design Response #3: Leonard Harrison State Park Approach

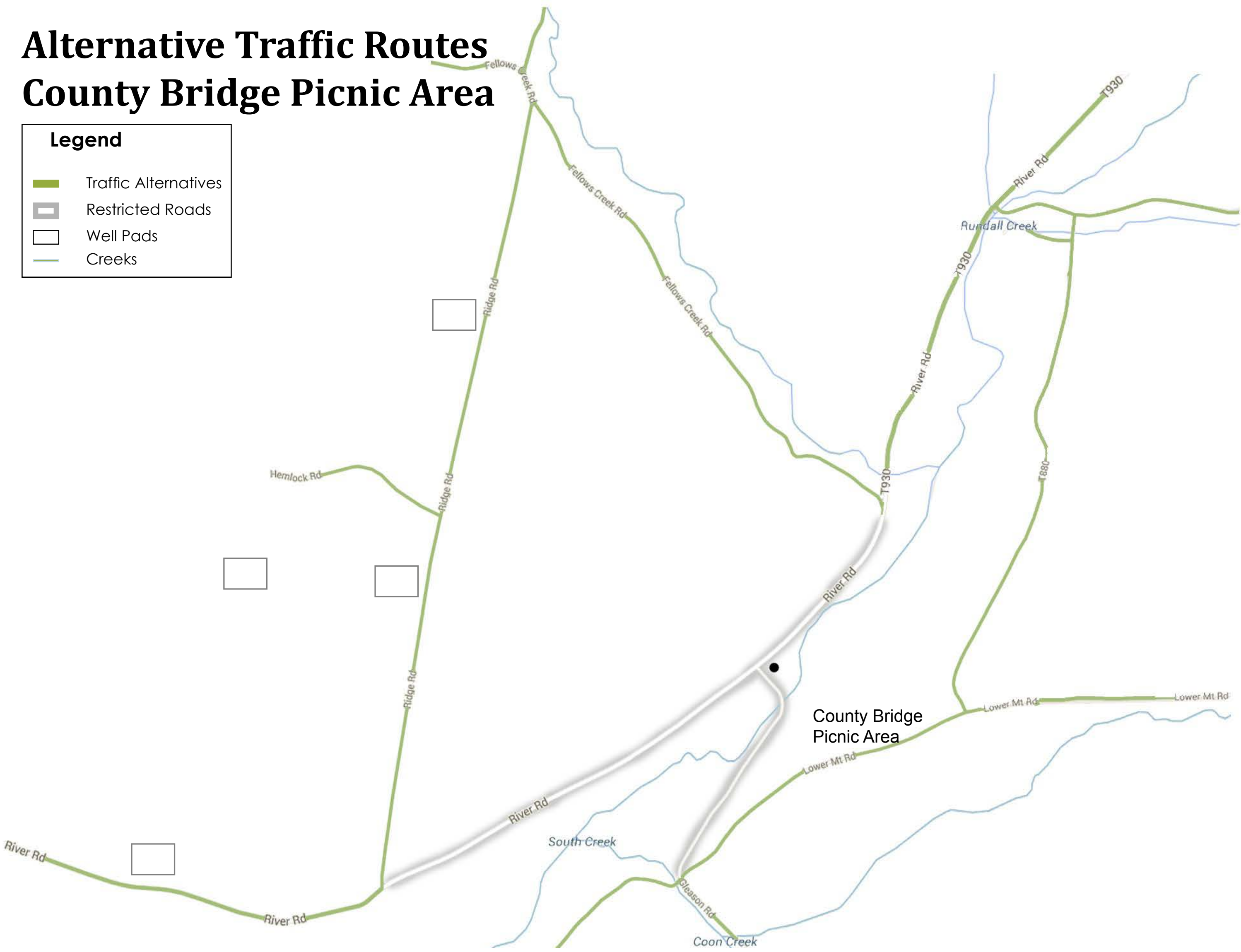


Design Response #4: Ives Run

Alternative Traffic Routes County Bridge Picnic Area

Legend

- Traffic Alternatives
- Restricted Roads
- Well Pads
- Creeks



Story

Grandma Ruthe sits at the picnic shelter and reminisces on the memories she's had here, her grandkids splashing in the creek and family sharing meals. As a truck drives past, she reflects on the importance of parks and natural areas for the environment and community. She hopes this will be a place her grandkids will come with their own grandchildren.



To preserve the experinece within the picnic grounds, an alternative traffic route is proposed for truck traffic. Local traffic can still have access, but restricting trucks will reduce noise and dust.

For more Best Management Practices



Best Management Practices

- Reroute traffic away from picnic grounds
- Decrease speeds to reduce kicked up dust (a health hazard)
- Dust suppressants can reduce dust 30-80%
- Limit traffic during heavy recreational times (hunting seasons, holidays, etc.)



Fig. 1.1 Photo by Katie Nguyen

Recreation: 2. West Rim Trail

Story

Outdoor enthusiast Tyler visits the West Rim Trail to satisfy his need to get away from it all. His favorite campsite is a secluded spot not far from the Pine Creek Gorge. He prefers a more primitive experience with scenic views, so he seeks quiet and natural places. Seeing or hearing drilling near the trail would compromise his hiking trips.

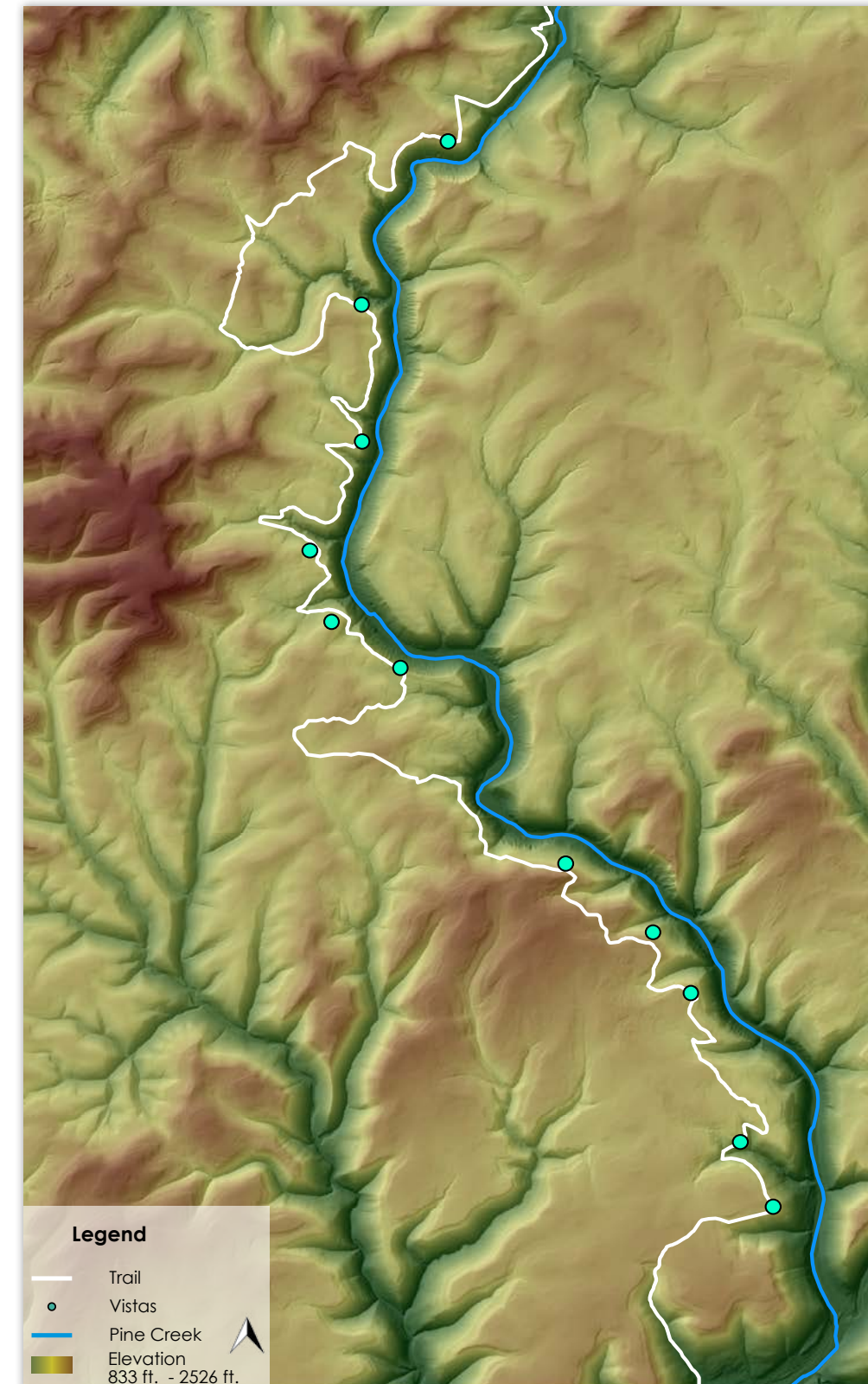


Fig. 2.1 West Rim Trail



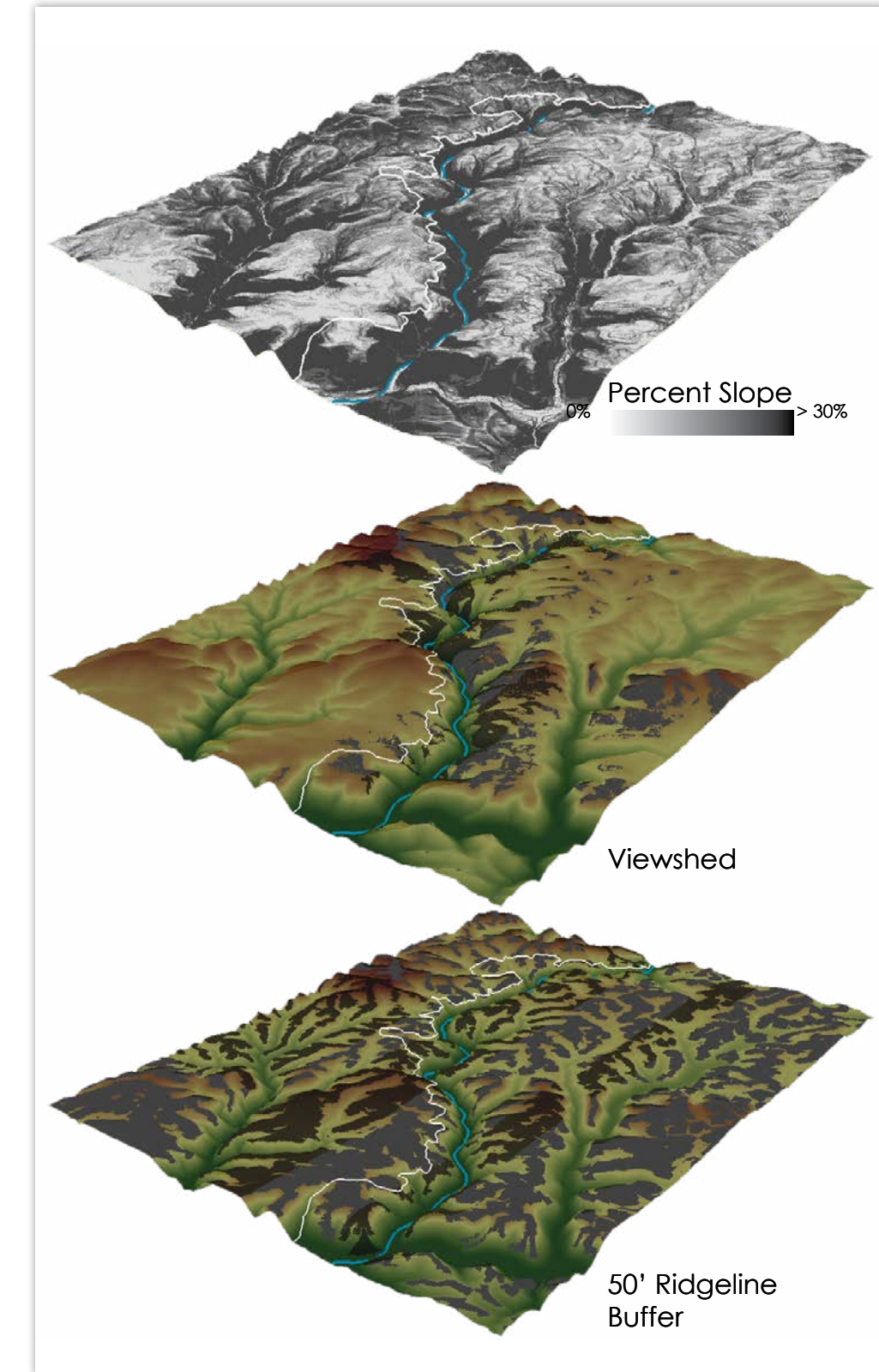
Fig. 2.2 Tyler's primitive campsite

Context Map



Running along the Pennsylvania Grand Canyon is the West Rim Trail, where outdoor enthusiasts can find secluded natural areas far away from development. Gas drilling can disturb the primitive experience that people expect along the trail.

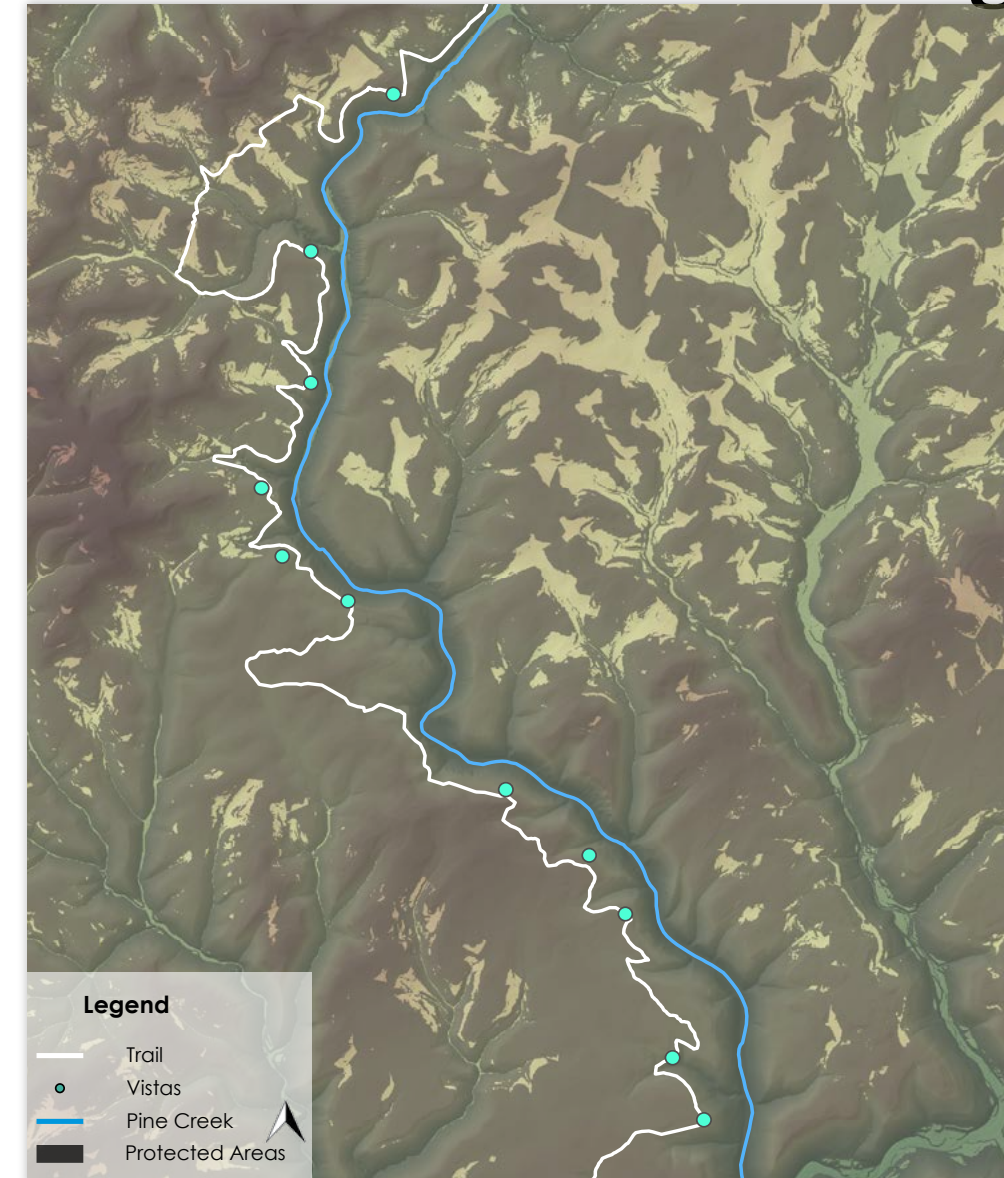
Analysis



The landscape surrounding the trail was analyzed in accordance with the BMP's.

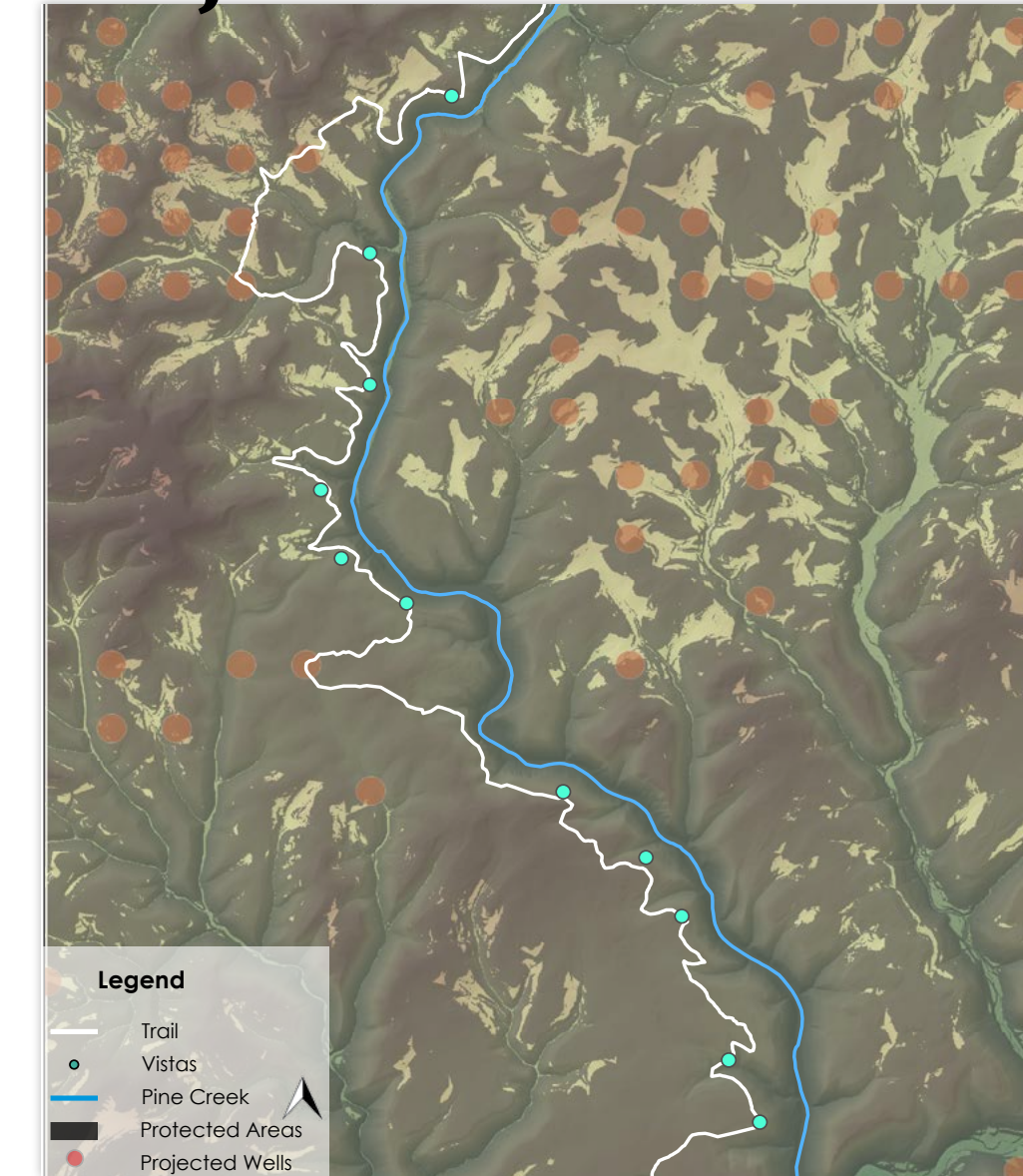
The slopes, viewsheds, and ridgeline buffers were all identified and mapped out.

Areas to Avoid Drilling



The masked areas are suggested places to protect from drilling activities. Maintaining these areas would reduce the visual impacts of drilling and can help preserve the primitive experience.

Projected Gas Wells



The economy can still benefit from gas drilling because there is still a sufficient amount of land for new well pads.

Recreation: 3. Leonard Harrison Approach

Story



Leaf peeper tourists from NY, the Jones family has made it a tradition to visit Tioga every year to view the fall leaf color. However, their scenic drive of the rural landscape has been seeing increasingly more truck traffic, making them consider staying home next year.

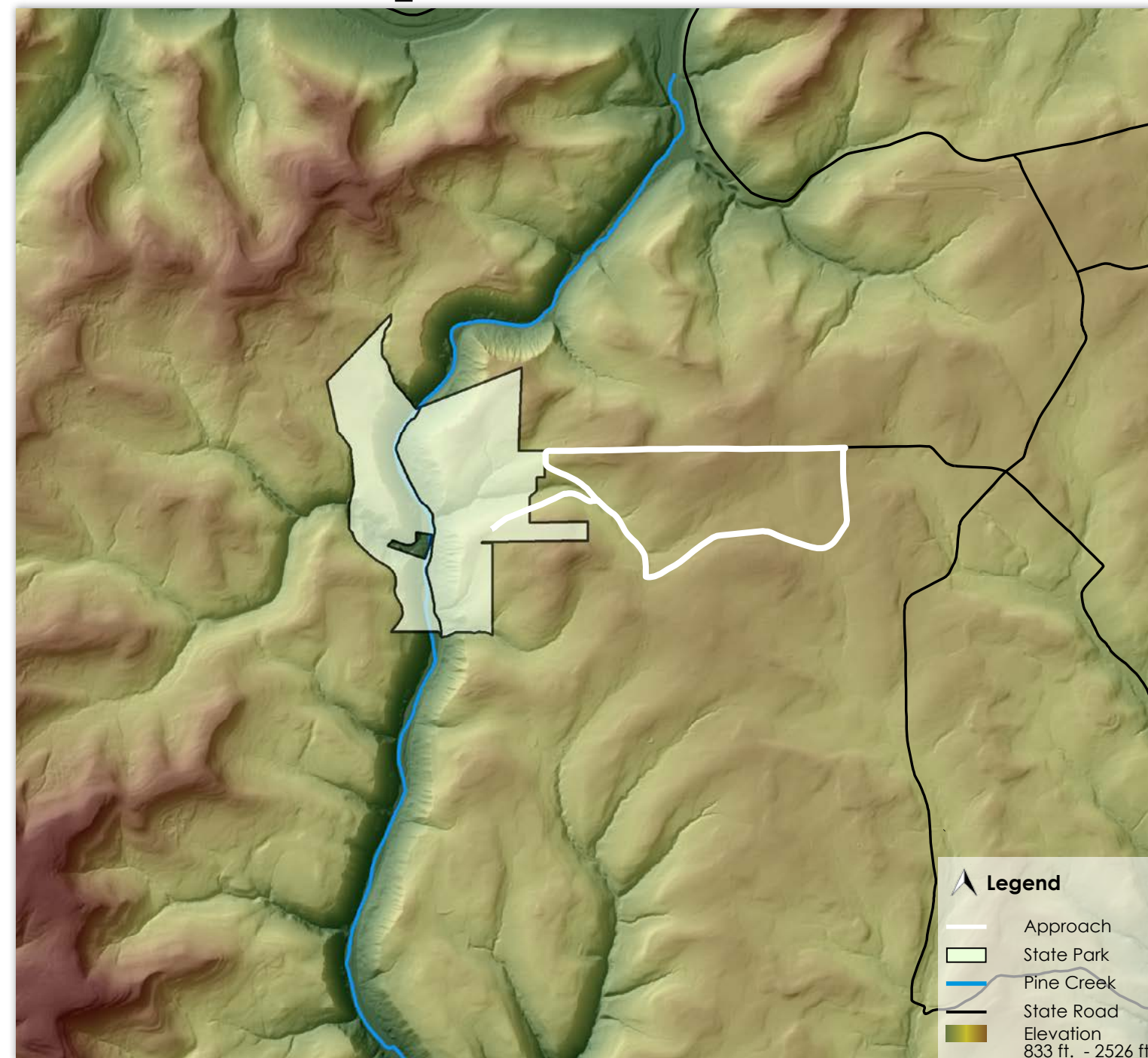


Fig. 3.1 Leonard Harrison State Park Sign



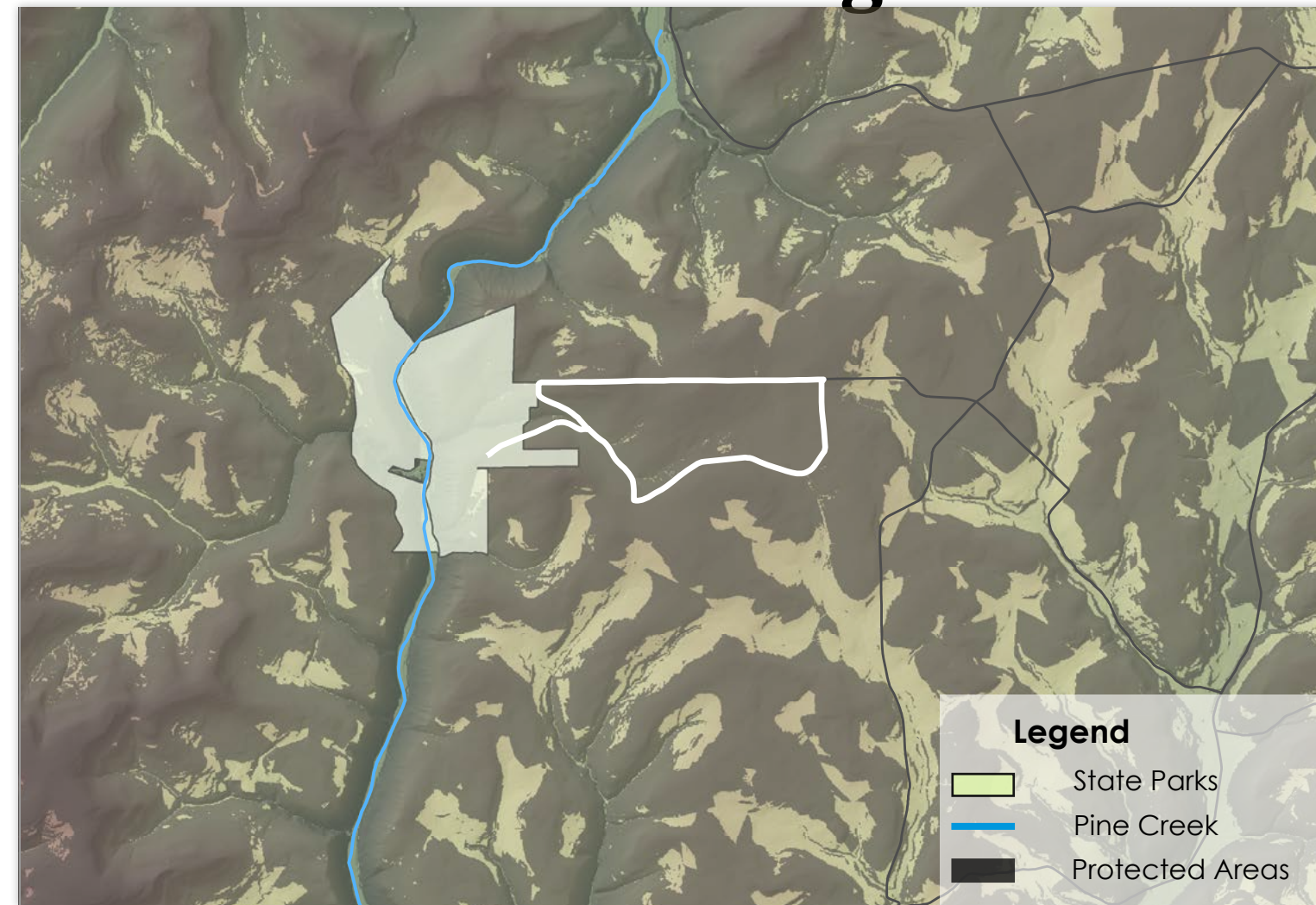
Fig. 3.2 Jones family scenic drive

Context Map



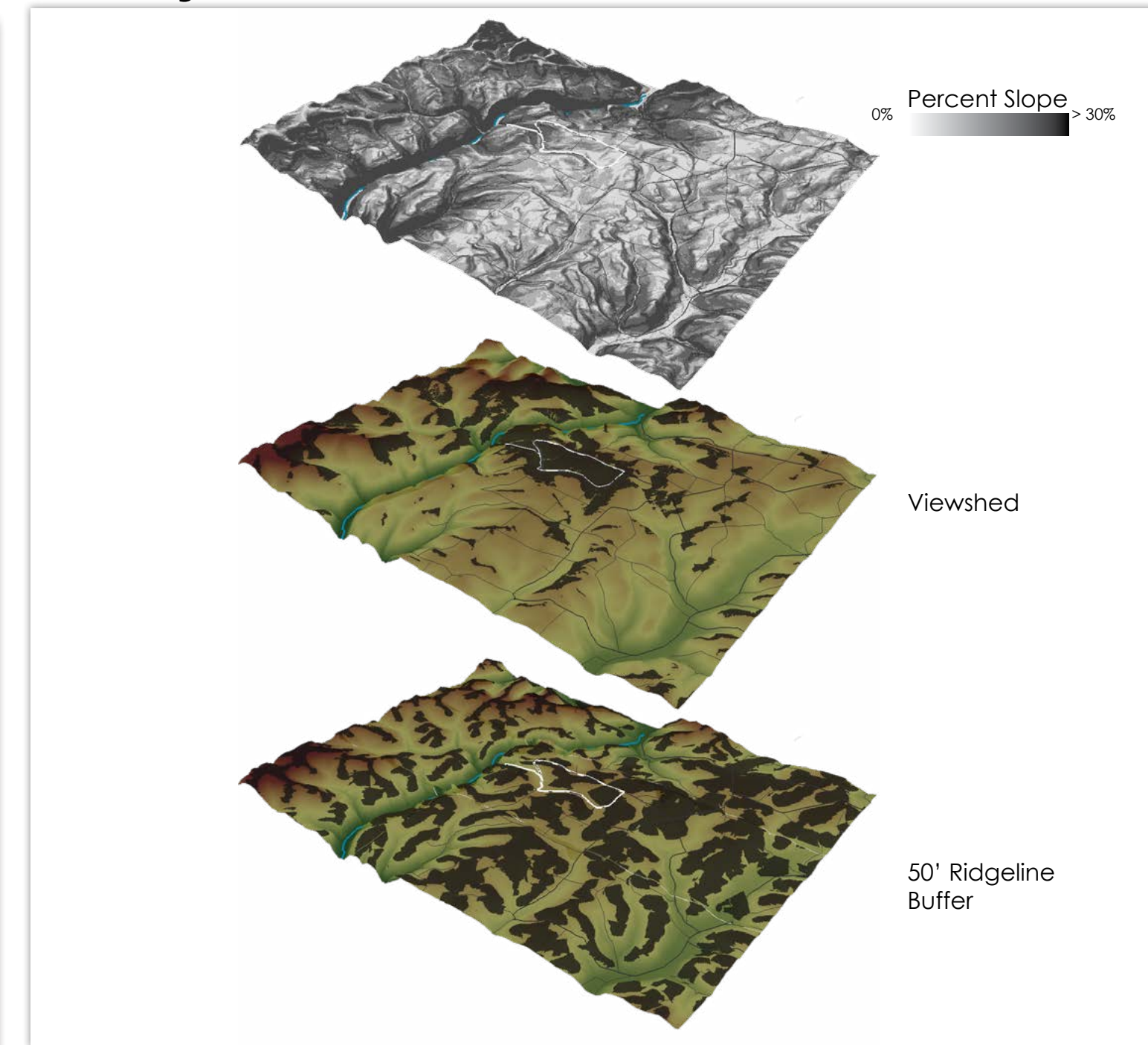
Leonard Harrison State Park is a prime location for leaf peepers to experience the brilliant fall color. Tioga County relies heavily on this tourism industry.

Areas to Avoid Drilling



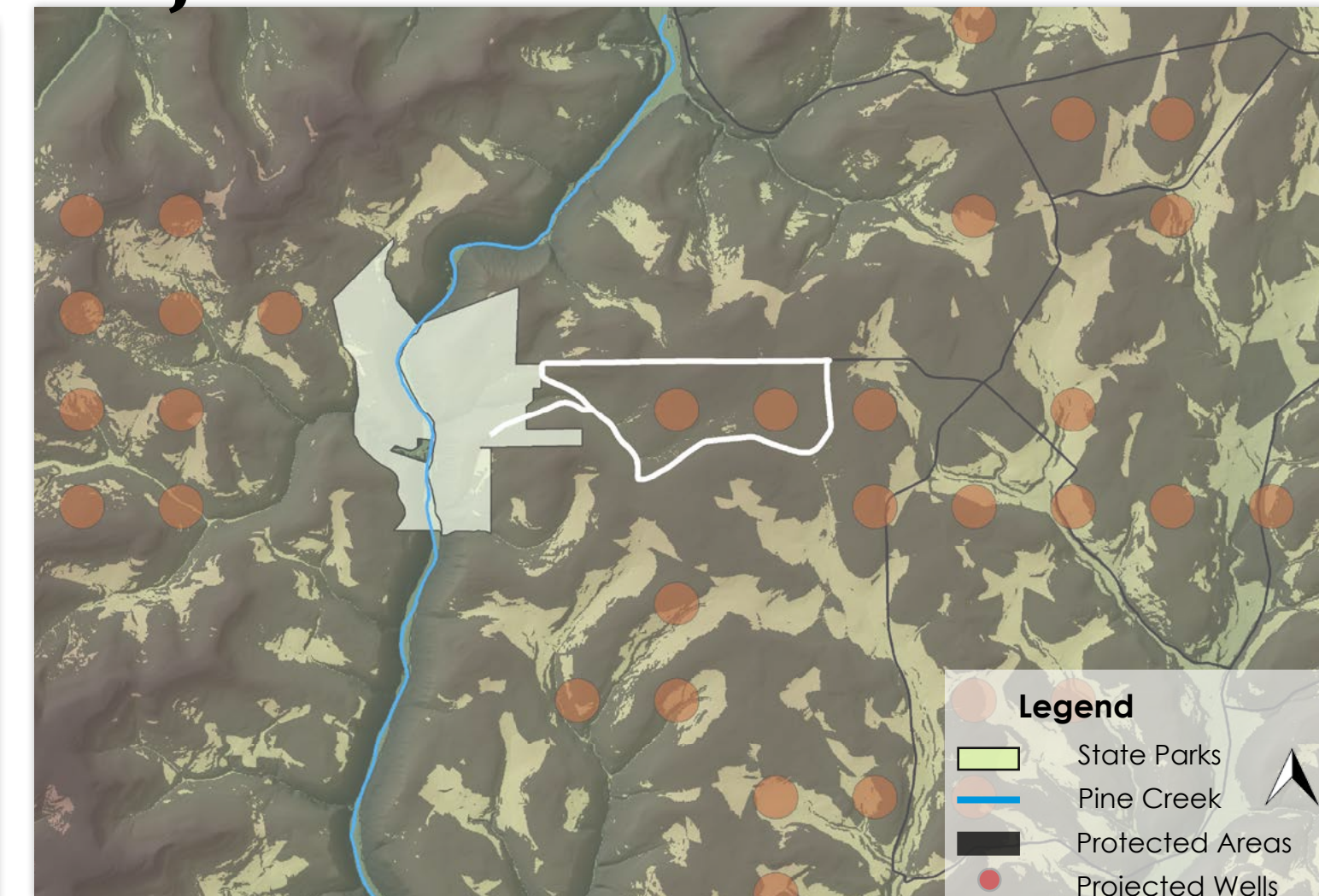
Protecting these areas will ensure that the fall color tourism industry will remain a strong part of Tioga County's economy.

Analysis



The park itself will most likely not be directly impacted by gas drilling, but the approach may be, and so we applied the same techniques as were used in the West Rim Trail.

Projected Gas Wells



Even with the highest number of projected wells, it is still possible to benefit from the economic gains of gas drilling, even with a large portion of the landscape being protected.

Recreation: 4. Ives Run Campground

Story

Enjoying their family reunion camping trip, the Becker family listens to the sounds of water rippling along the shore and birds chirping. Uncle Bill, a gas industry worker says drilling is expected to move into the area. Noise from drilling or increased truck traffic could disrupt sleeping patterns at the campsites and hinder visitors' overall outdoor experience.

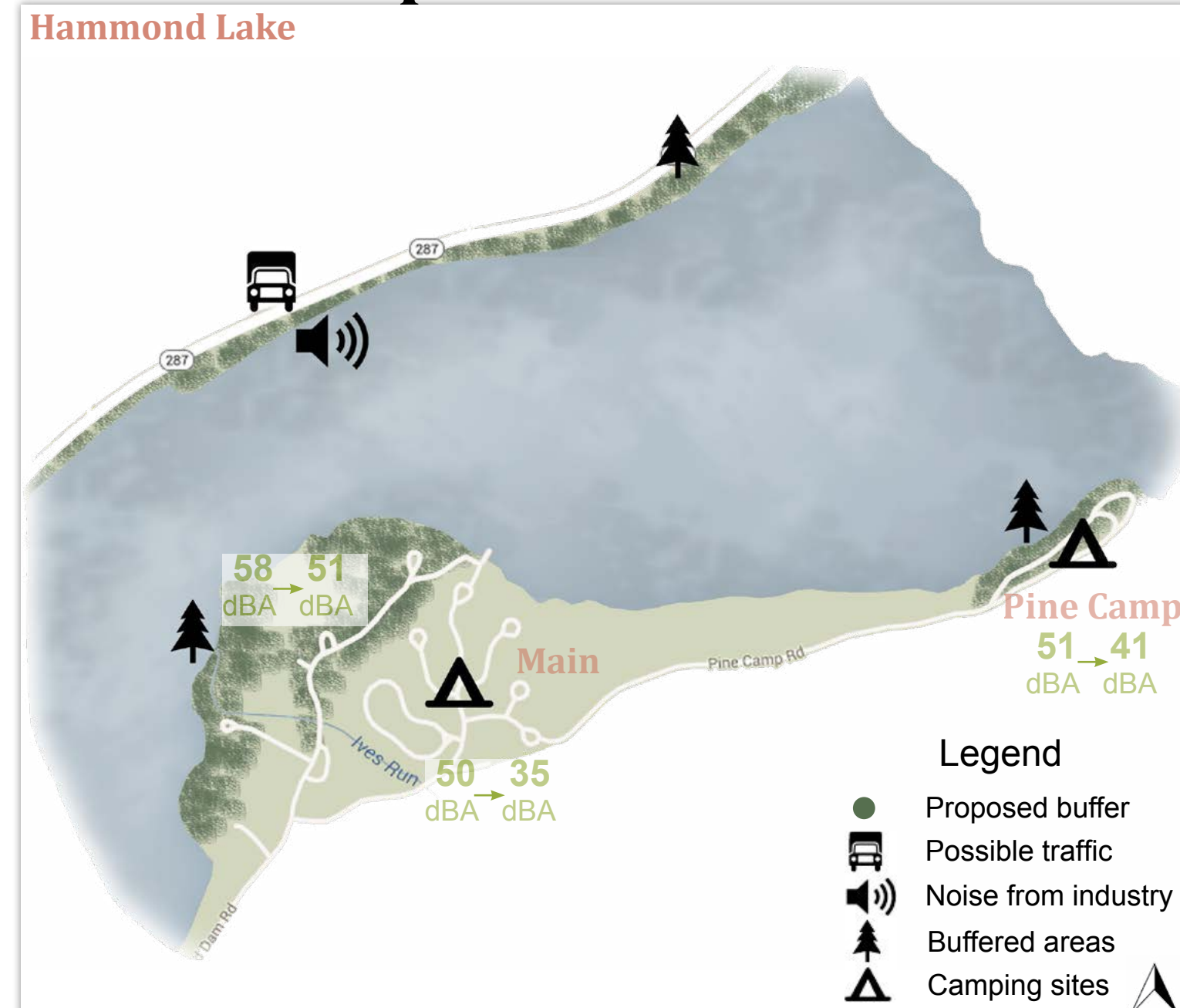


Fig. 4.1 Hammond Lake Shoreline Landform is one of the best techniques to reduce noise pollution, however since this site is along the shore, vegetation is used instead.



Fig. 4.2 Becker family bonfire The soundscape should be preserved in recreational areas. Along with gas industries following noise regulations, other Best Management Practices can be used. Limiting truck traffic at night will allow campers to enjoy the quiet of the night.

Context Map



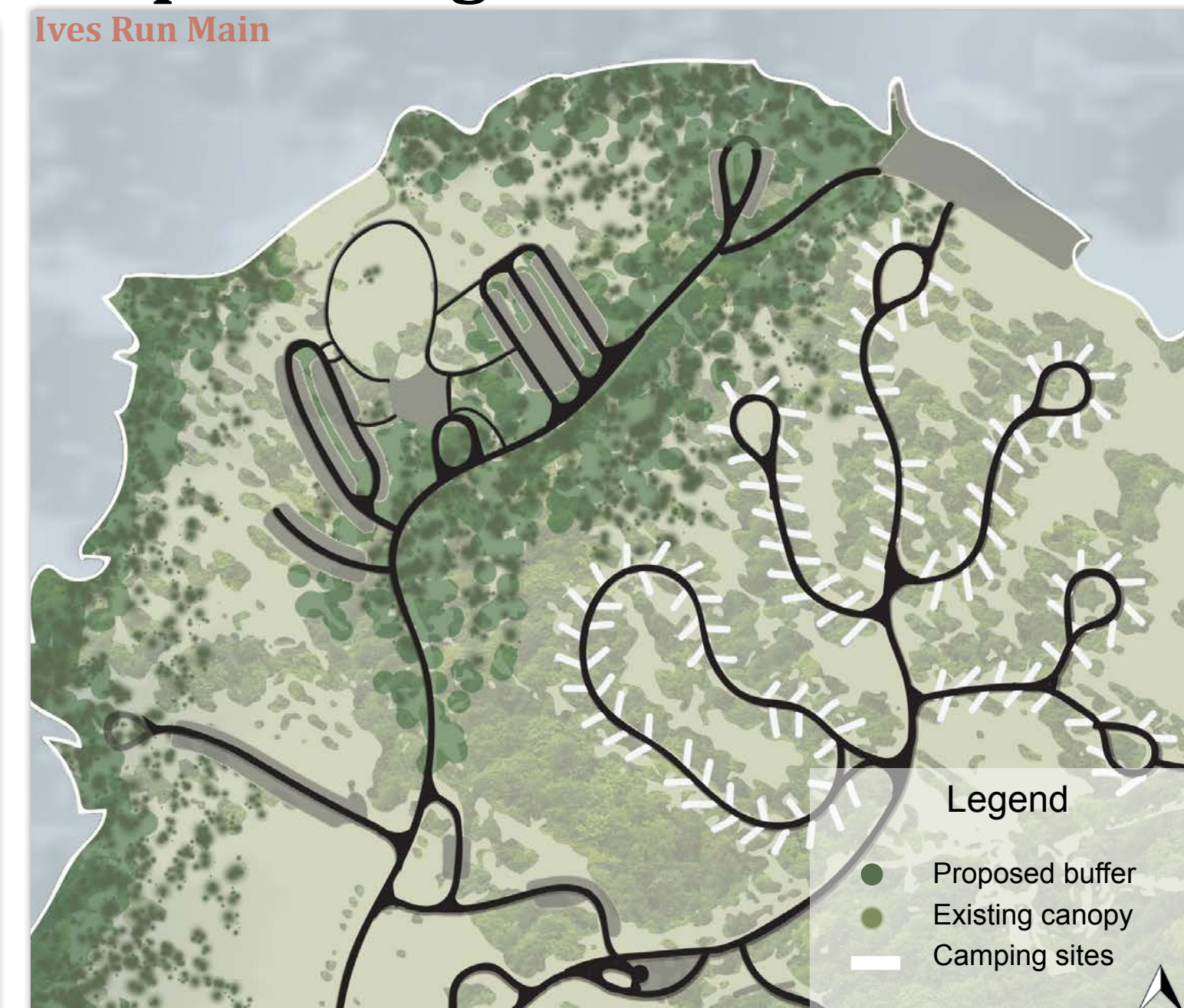
100' of vegetation can reduce noise by 5-8 dBA. With buffers these two camping areas change 7-15 dBA with 100-400' of vegetation. At the higher range this is equivalent to the reduction of a city suburb to the level of a quiet room.

Existing Shoreline



Currently there is little vegetation along the North shore, causing the campsites to be more susceptible to a changing soundscape. While many campers enjoy the lakeside locations, limiting their number will help reduce noise traveling across the lake.

Proposed Vegetative Buffer



Trees can be planted North of the campsites along the road and parking lots to improve the soundscape.

Proposed Vegetative Buffer



While maintaining the same number of campsites, many sites can be moved elsewhere in the campground. Increased vegetation will preserve visitor's sense of privacy where campsites are moved closer together, but some areas should be left open for views of the lake.



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