pennsylvania
DEPARTMENT OF CONSERVATION
AND NATURAL RESOURCES

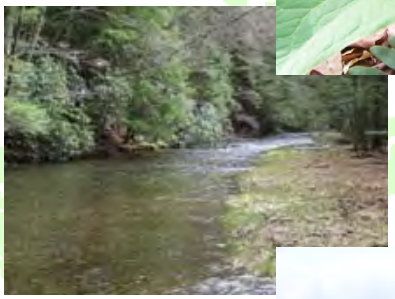
Impacts of Leasing Additional State Forest for Natural Gas Development

pennsylvania
DEPARTMENT OF CONSERVATION
AND NATURAL RESOURCES

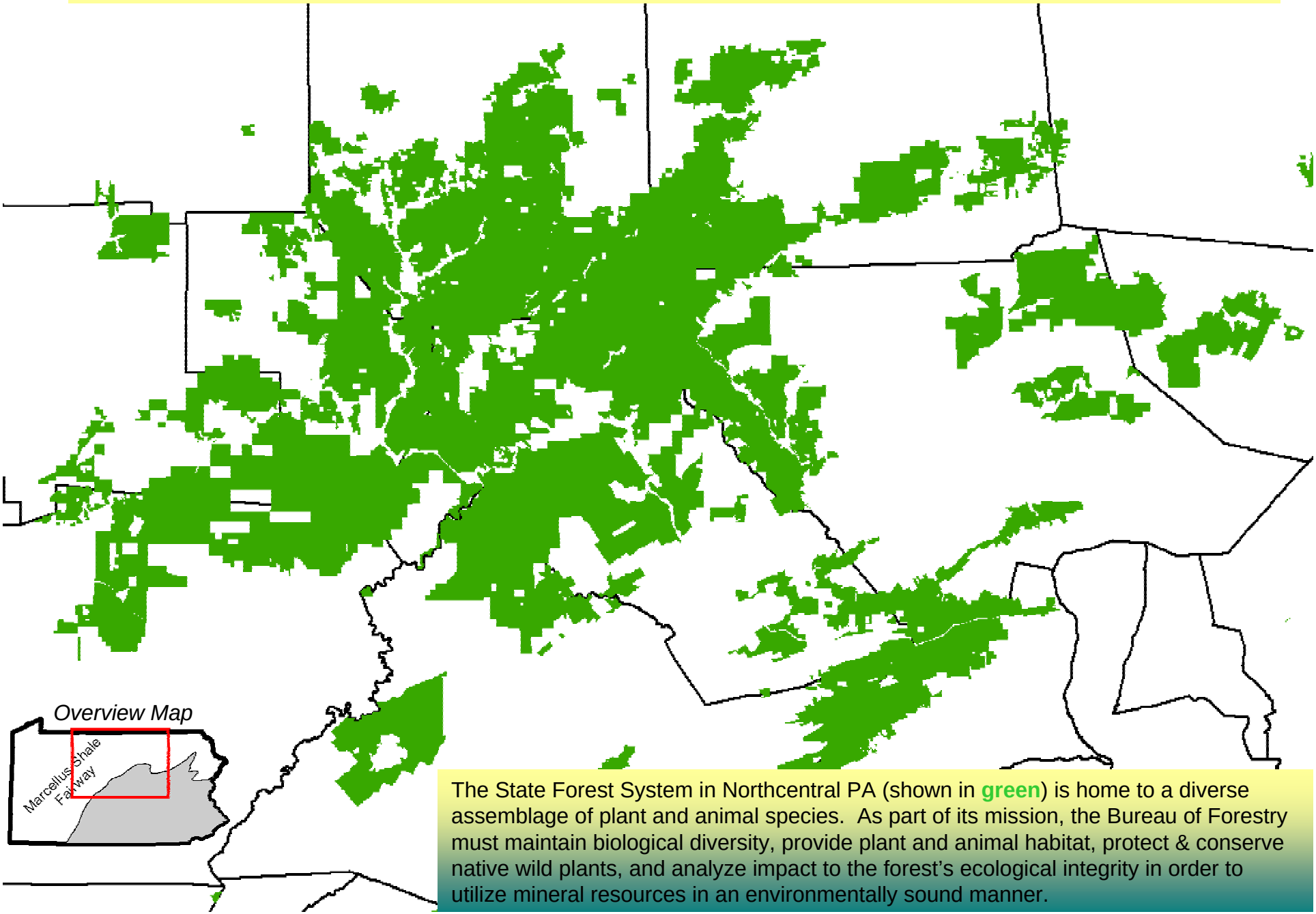
DCNR is entrusted to balance the uses and values of our state forests while protecting the integrity and health of the whole system.

There are proposals and public debate about the merits of a moratorium on natural gas drilling on state forest.

This mapping analysis demonstrates how any additional leasing involving surface disturbance upsets the sustainable balance DCNR is charged to maintain.

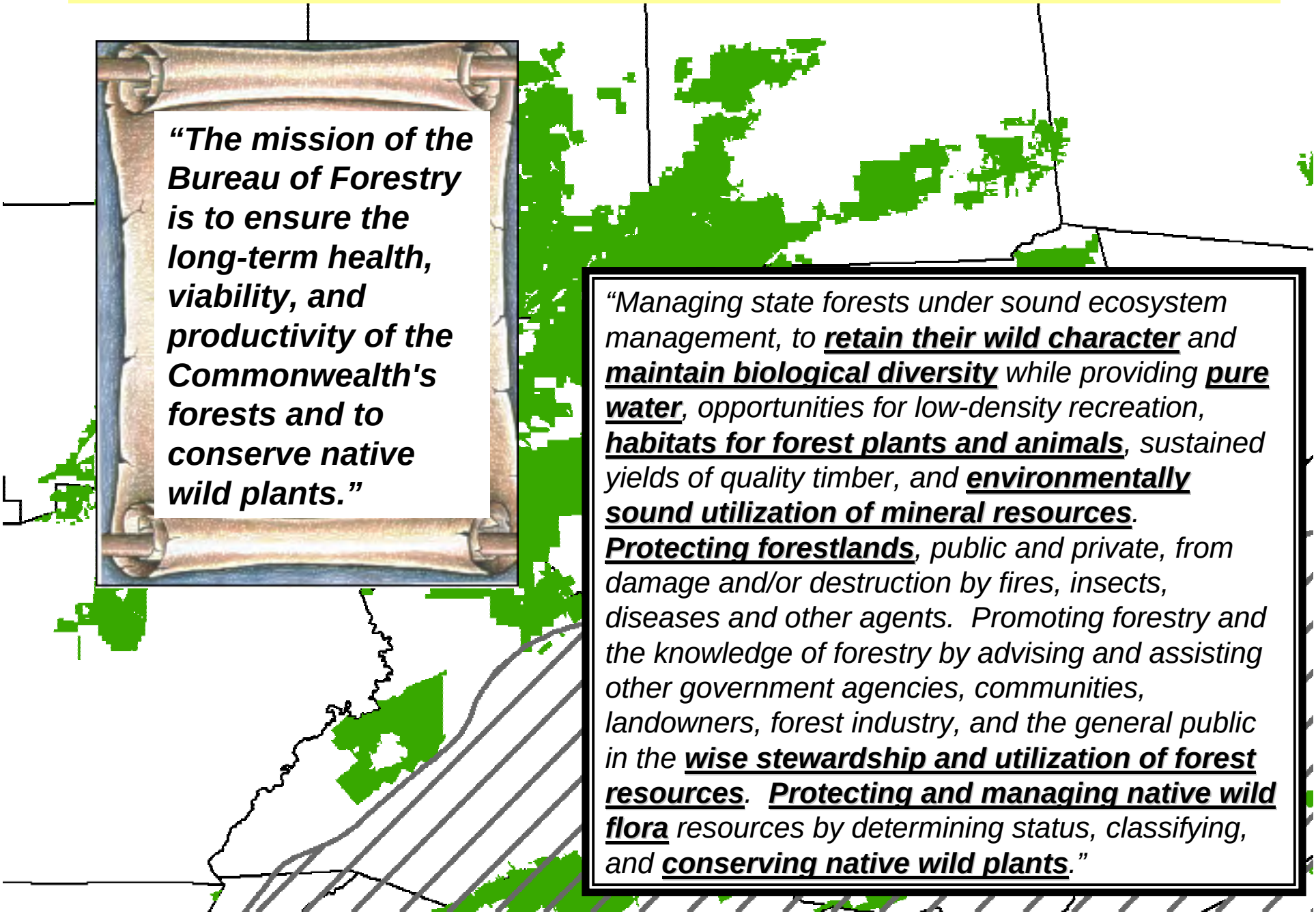


State Forest Land in North-Central Pennsylvania



The State Forest System in Northcentral PA (shown in **green**) is home to a diverse assemblage of plant and animal species. As part of its mission, the Bureau of Forestry must maintain biological diversity, provide plant and animal habitat, protect & conserve native wild plants, and analyze impact to the forest's ecological integrity in order to utilize mineral resources in an environmentally sound manner.

State Forest Land in Northcentral Pennsylvania



"The mission of the Bureau of Forestry is to ensure the long-term health, viability, and productivity of the Commonwealth's forests and to conserve native wild plants."

"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****.* ***Protecting forestlands****, public and private, from damage and/or destruction by fires, insects, diseases and other agents. Promoting forestry and the knowledge of forestry by advising and assisting other government agencies, communities, landowners, forest industry, and the general public in the* ***wise stewardship and utilization of forest resources****.* ***Protecting and managing native wild flora*** *resources by determining status, classifying, and* ***conserving native wild plants****."*

Maintaining the Forest's Ecological Integrity

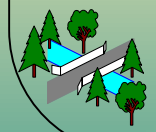
Species of Concern

Native Biological Diversity
Threatened / Endangered Spp.
Rare / Declining Spp.

Unique Areas

Wild & Natural Areas
Steep, Wet, & Rocky Areas
Old Growth
Wild Plant Sanctuaries

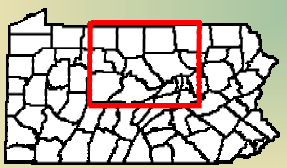
Road, Trail, & Stream Buffers

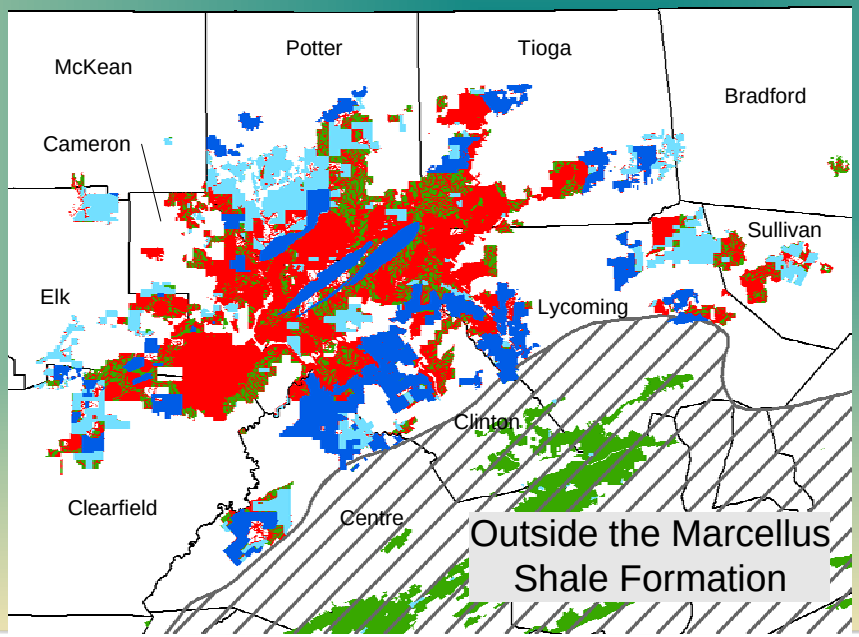


Aesthetics / Scenery
Corridors
Connectivity
Water Quality

Legend

- DCNR Gas Lease
- Severed Rights
- Ecologically Sensitive
- Other State Forest





State Forest Land in the Marcellus Shale Region

State Forest Land Currently Leased or Severed

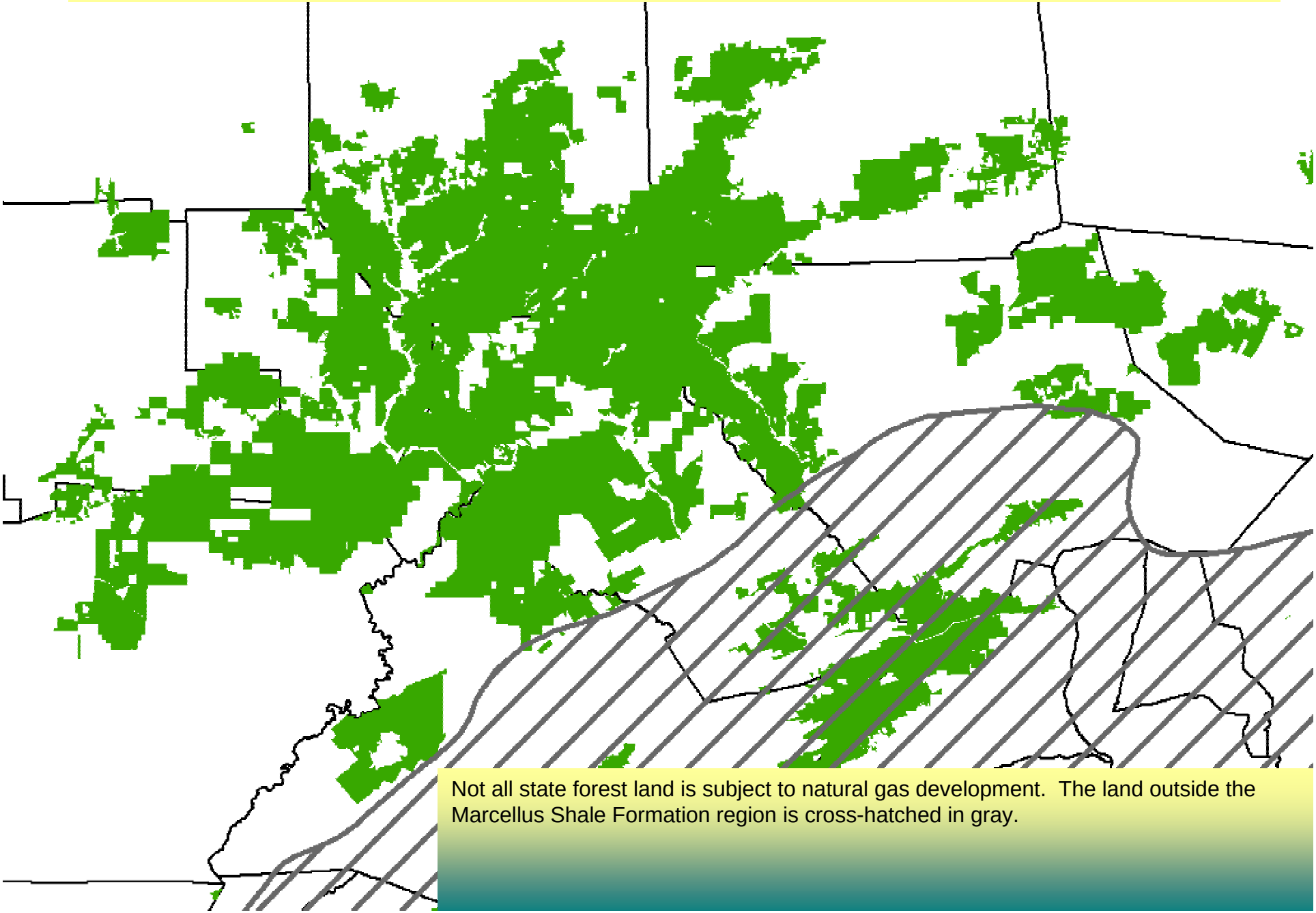
Unleased Land in Ecologically Sensitive Areas

Inaccessible w/o Damaging Ecologically Sensitive Areas

1,500,000 acres
- 700,000 acres
- 702,500 acres

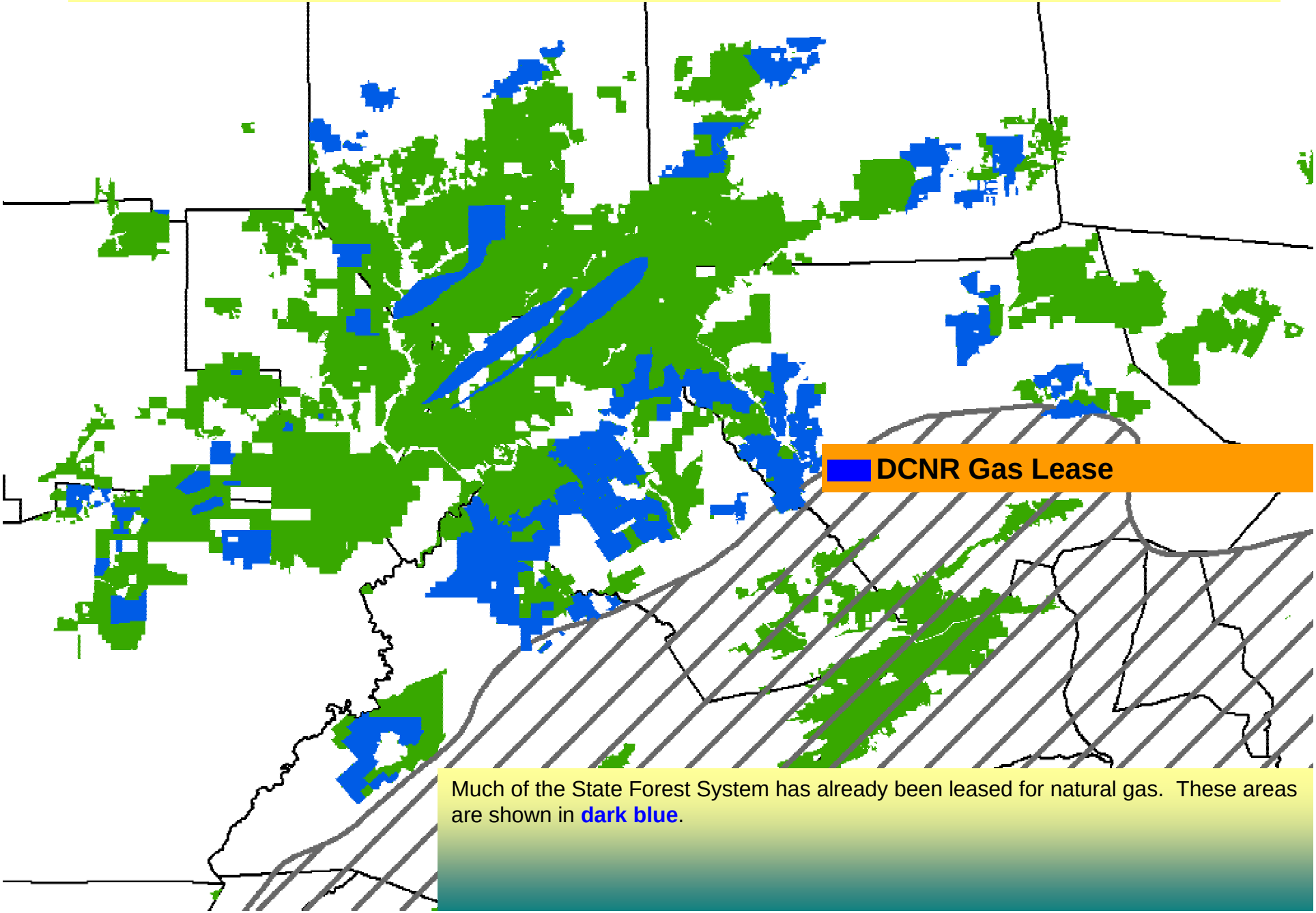
97,500 acres

Maintaining the Forest's Ecological Integrity



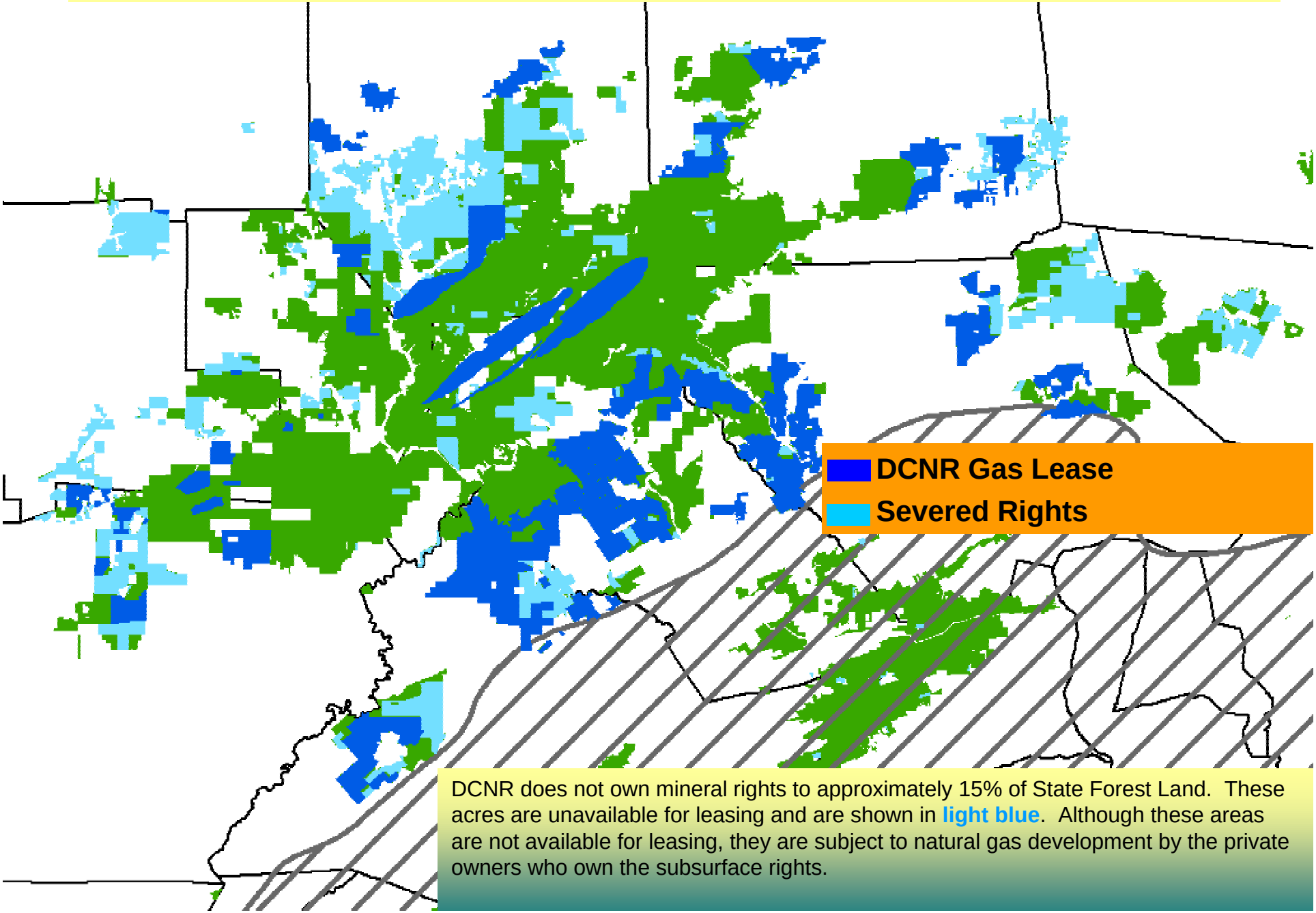
Not all state forest land is subject to natural gas development. The land outside the Marcellus Shale Formation region is cross-hatched in gray.

Maintaining the Forest's Ecological Integrity



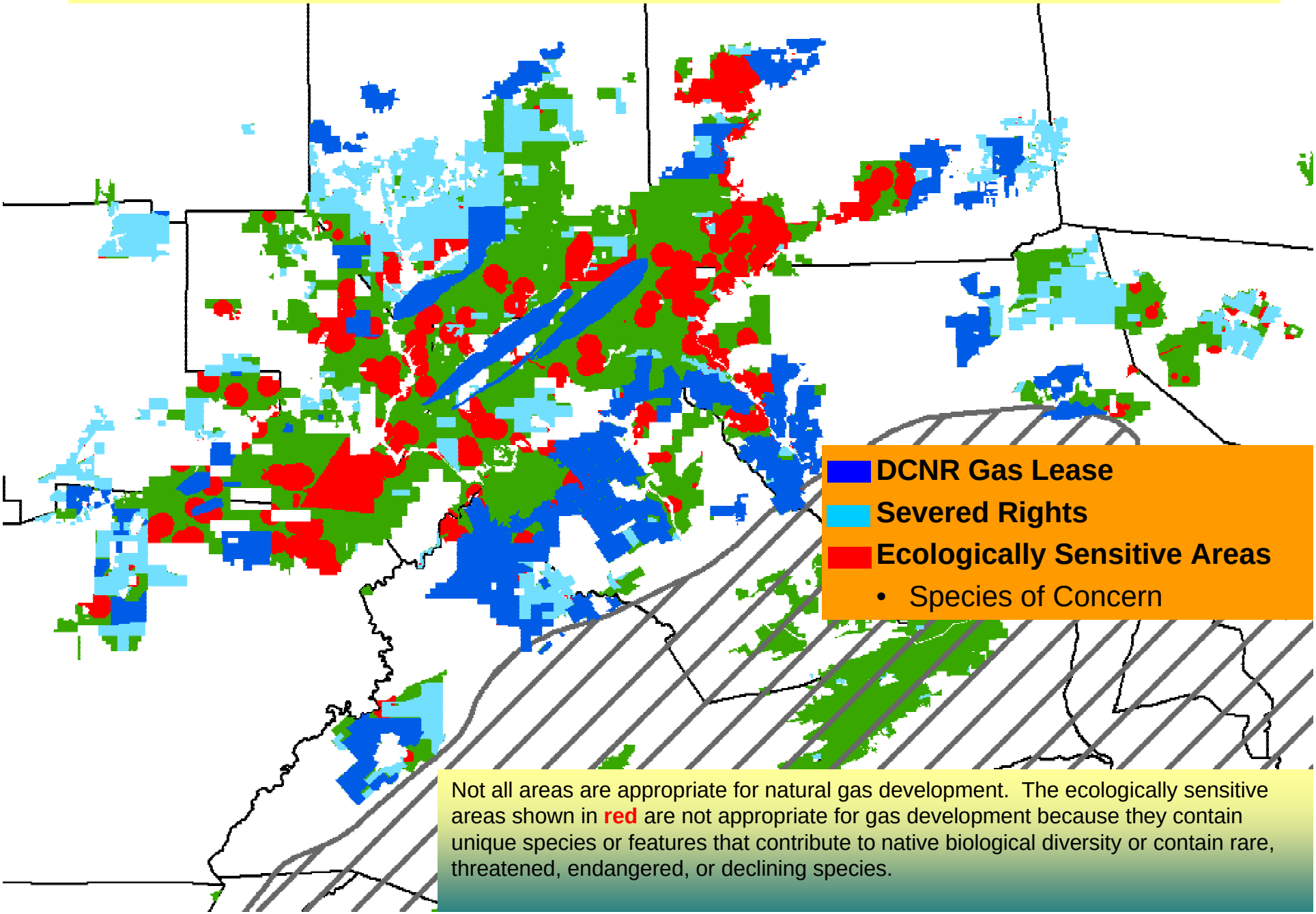
Much of the State Forest System has already been leased for natural gas. These areas are shown in **dark blue**.

Maintaining the Forest's Ecological Integrity



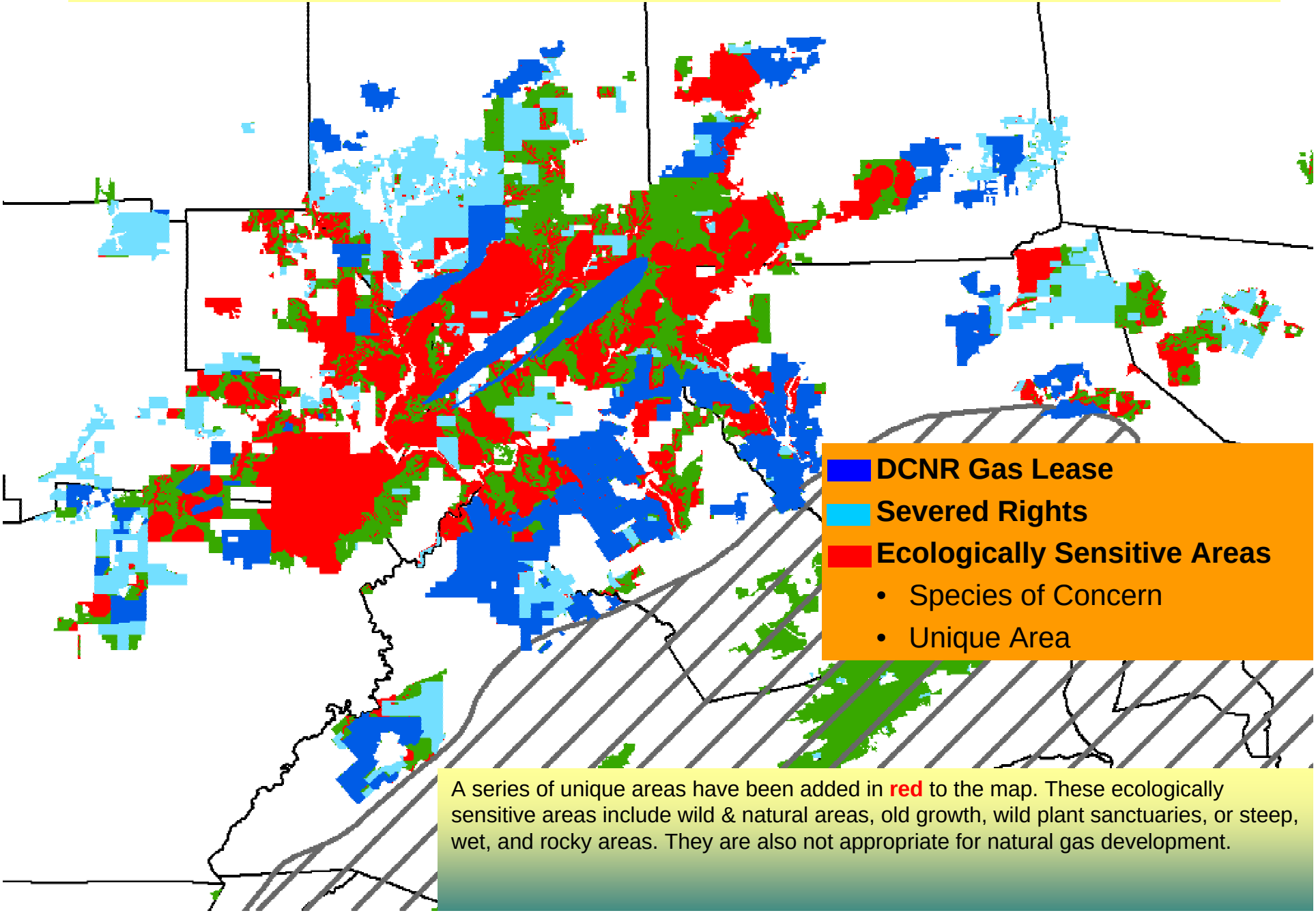
DCNR does not own mineral rights to approximately 15% of State Forest Land. These acres are unavailable for leasing and are shown in **light blue**. Although these areas are not available for leasing, they are subject to natural gas development by the private owners who own the subsurface rights.

Maintaining the Forest's Ecological Integrity



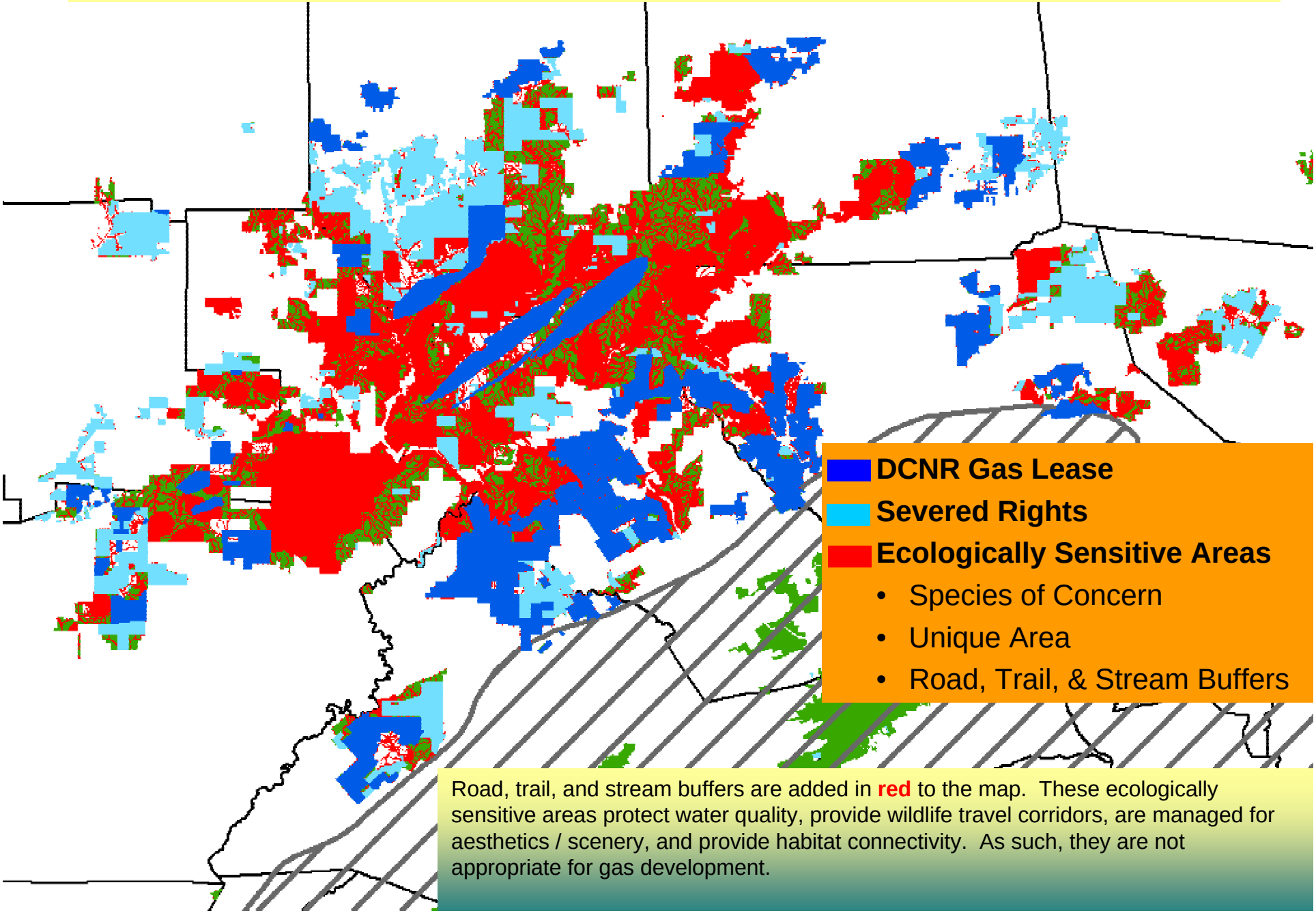
Not all areas are appropriate for natural gas development. The ecologically sensitive areas shown in **red** are not appropriate for gas development because they contain unique species or features that contribute to native biological diversity or contain rare, threatened, endangered, or declining species.

Maintaining the Forest's Ecological Integrity



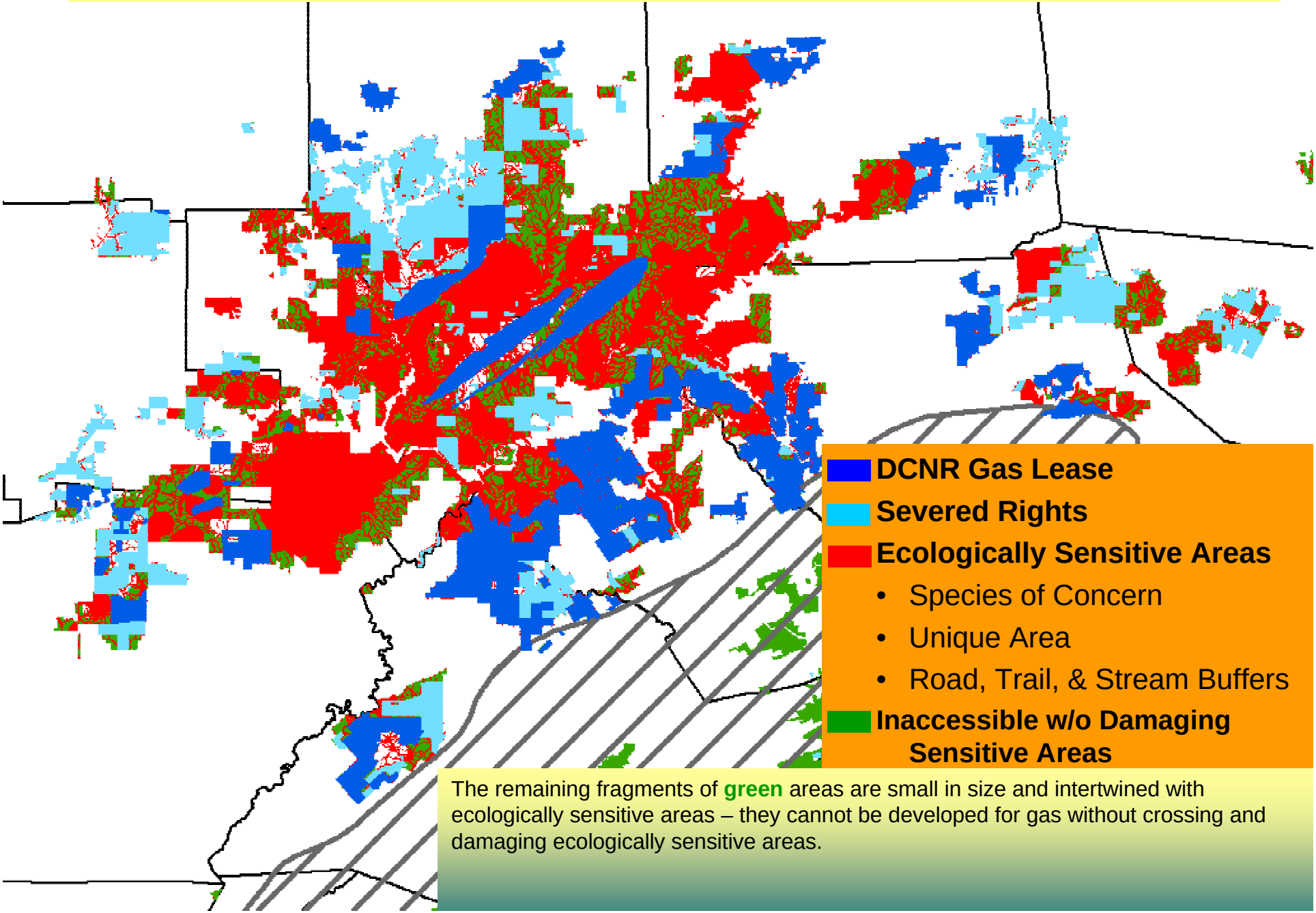
A series of unique areas have been added in **red** to the map. These ecologically sensitive areas include wild & natural areas, old growth, wild plant sanctuaries, or steep, wet, and rocky areas. They are also not appropriate for natural gas development.

Maintaining the Forest's Ecological Integrity



Road, trail, and stream buffers are added in **red** to the map. These ecologically sensitive areas protect water quality, provide wildlife travel corridors, are managed for aesthetics / scenery, and provide habitat connectivity. As such, they are not appropriate for gas development.

Maintaining the Forest's Ecological Integrity



The remaining fragments of **green** areas are small in size and intertwined with ecologically sensitive areas – they cannot be developed for gas without crossing and damaging ecologically sensitive areas.

Maintaining the Forest's Wild Character

No Management

Primitive

- Peace, Solitude, Remoteness, Backland Experience
- Non-Motorized Recreation

298,093 acres

Semi-Primitive

- Moderate Probability of Experiencing Solitude
- Limited Timber & Gas Activities

412,806 acres

Semi-Developed

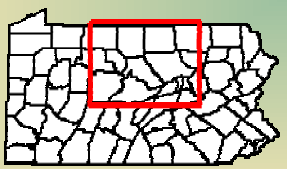
- Commonly Encounter Other Recreationists
- Motorized Recreation
- Timber & Gas Activities

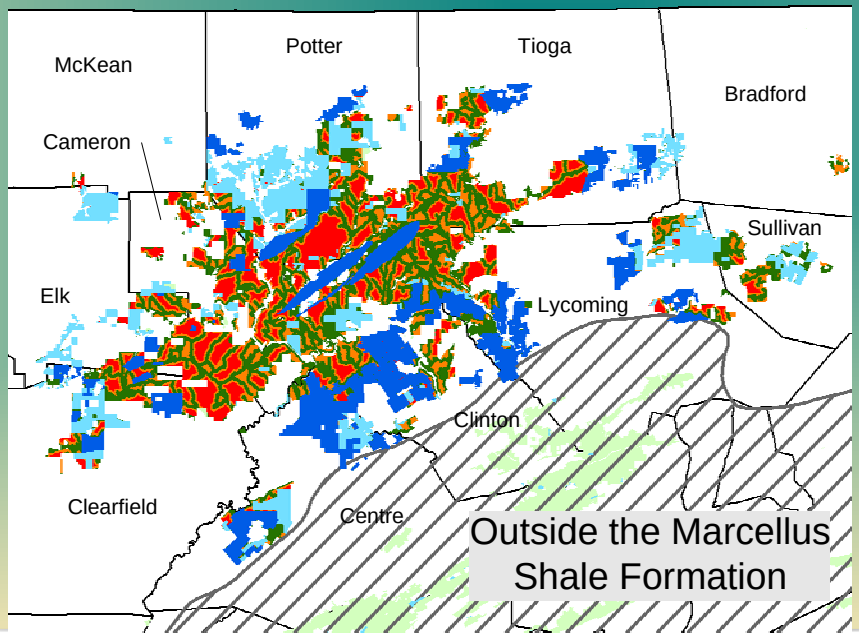
706,412 acres

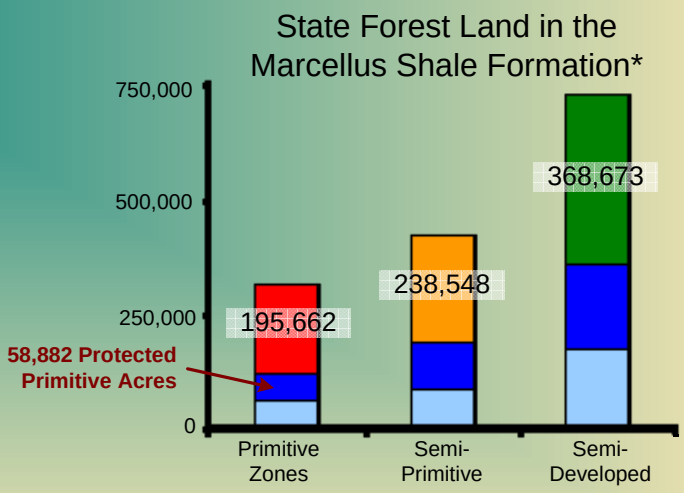
Intense Management

Legend

- DCNR Gas Lease
- Severed Rights
- Semi-Developed
- Semi-Primitive
- Off Limits (Primitive)

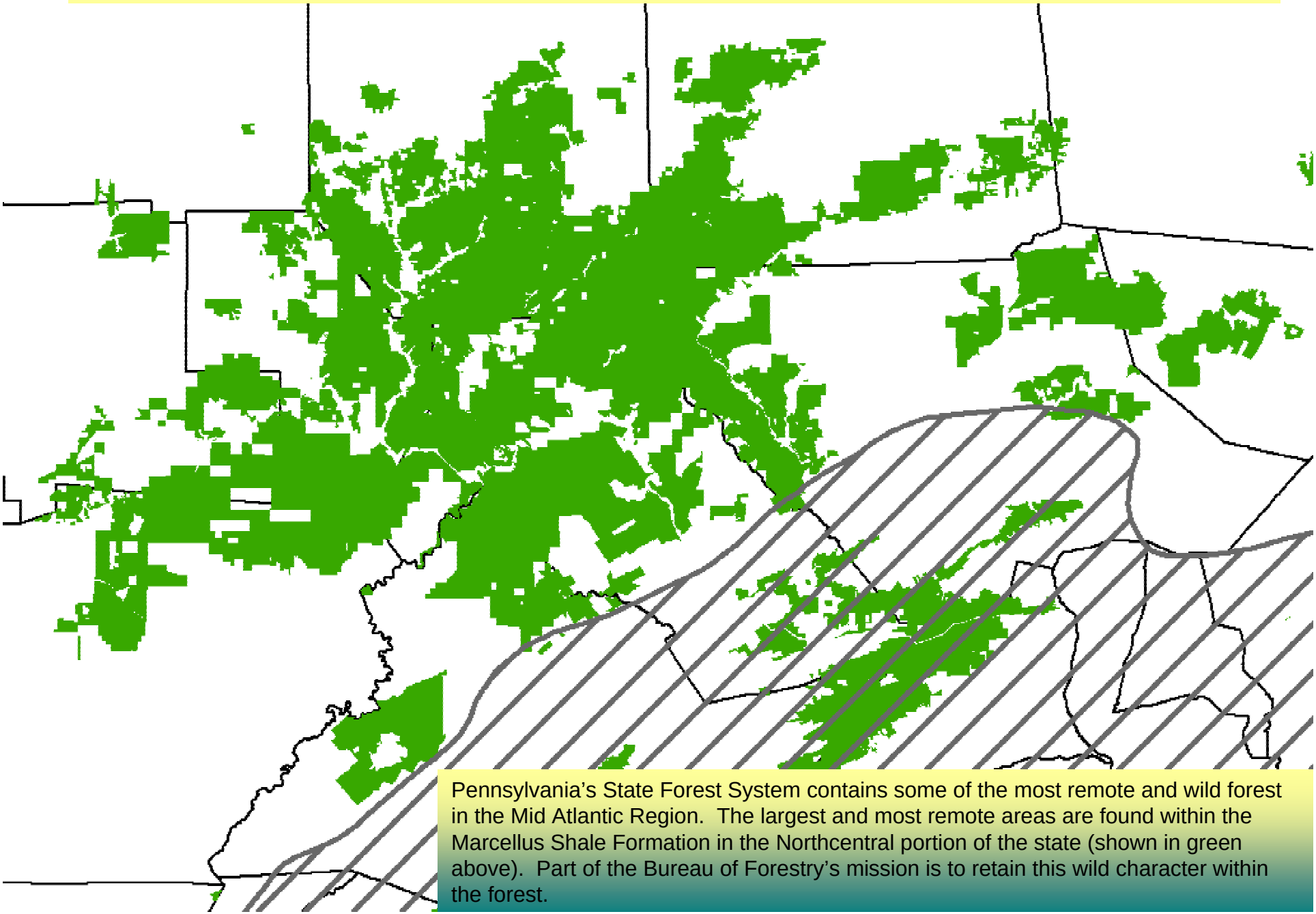






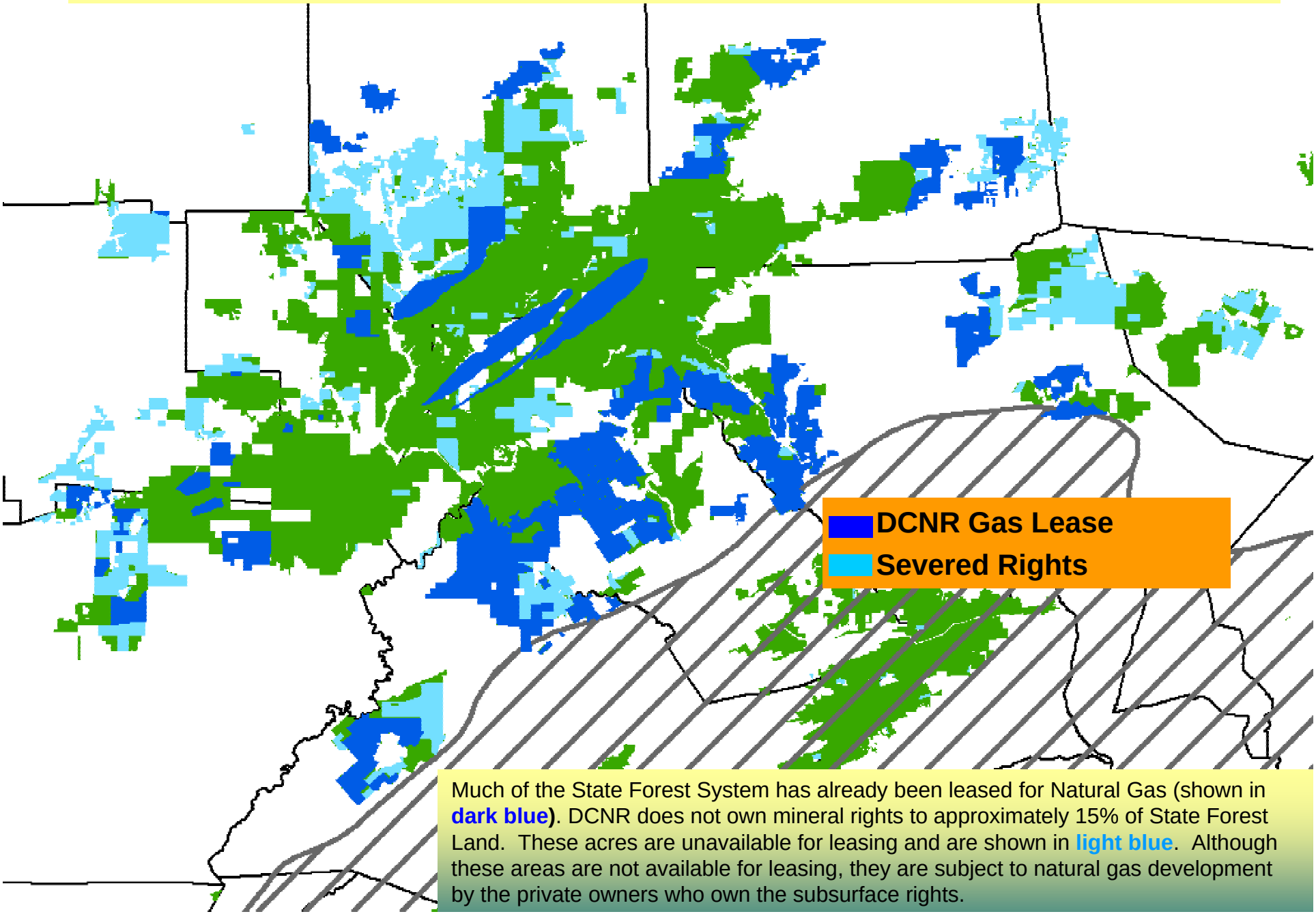
*Delaware State Forest not included.

Maintaining the Forest's Wild Character



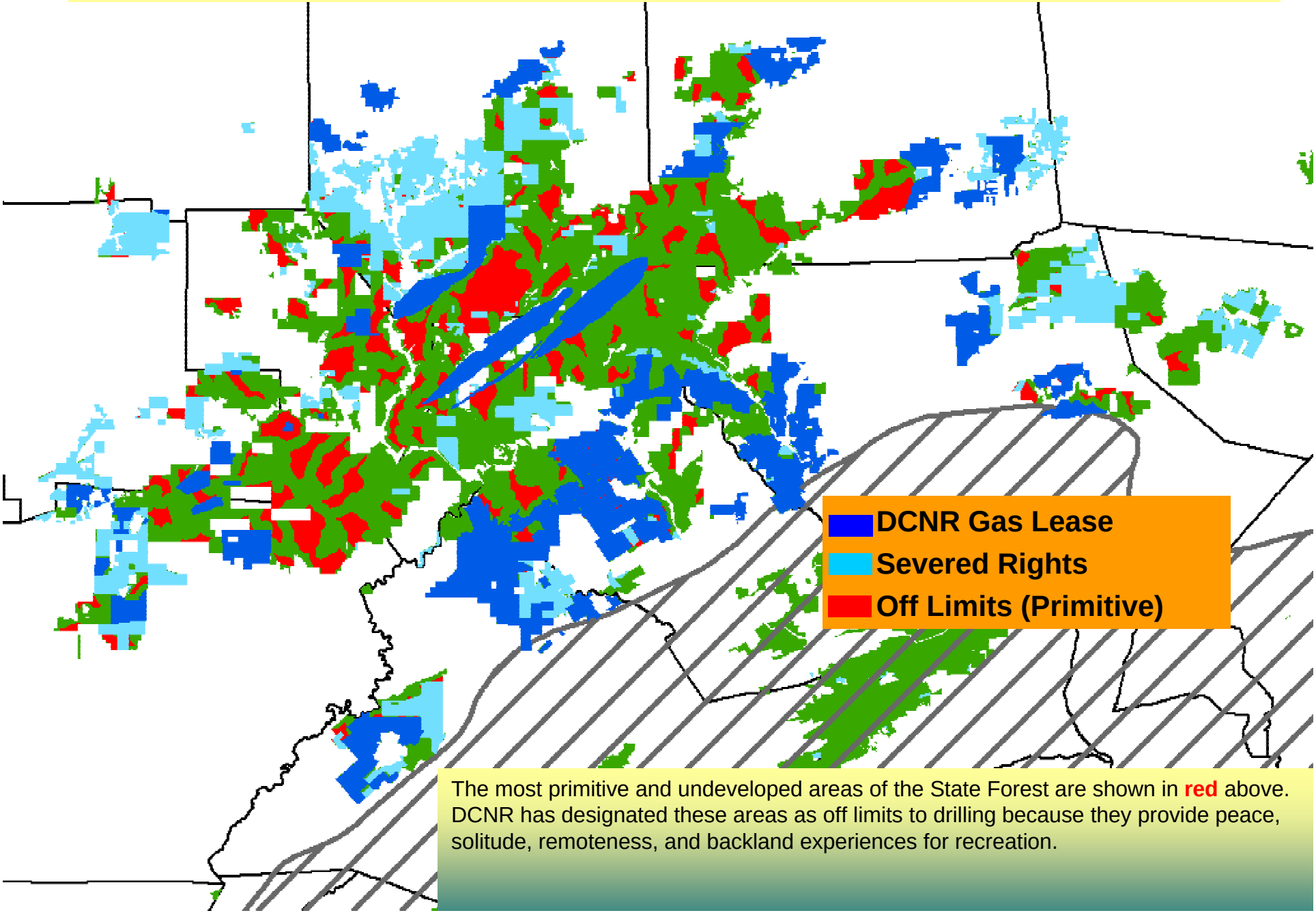
Pennsylvania's State Forest System contains some of the most remote and wild forest in the Mid Atlantic Region. The largest and most remote areas are found within the Marcellus Shale Formation in the Northcentral portion of the state (shown in green above). Part of the Bureau of Forestry's mission is to retain this wild character within the forest.

Maintaining the Forest's Wild Character



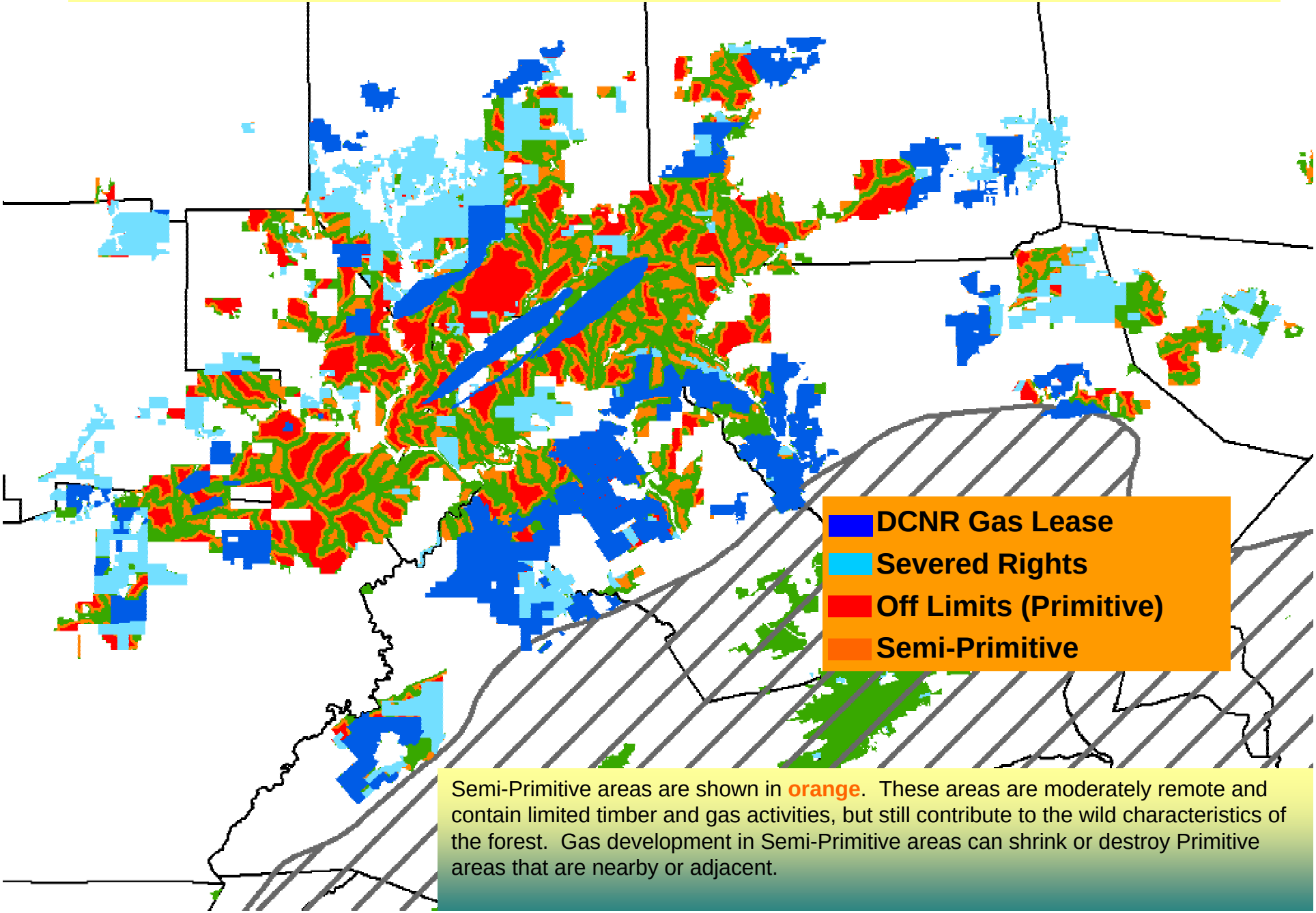
Much of the State Forest System has already been leased for Natural Gas (shown in **dark blue**). DCNR does not own mineral rights to approximately 15% of State Forest Land. These acres are unavailable for leasing and are shown in **light blue**. Although these areas are not available for leasing, they are subject to natural gas development by the private owners who own the subsurface rights.

Maintaining the Forest's Wild Character



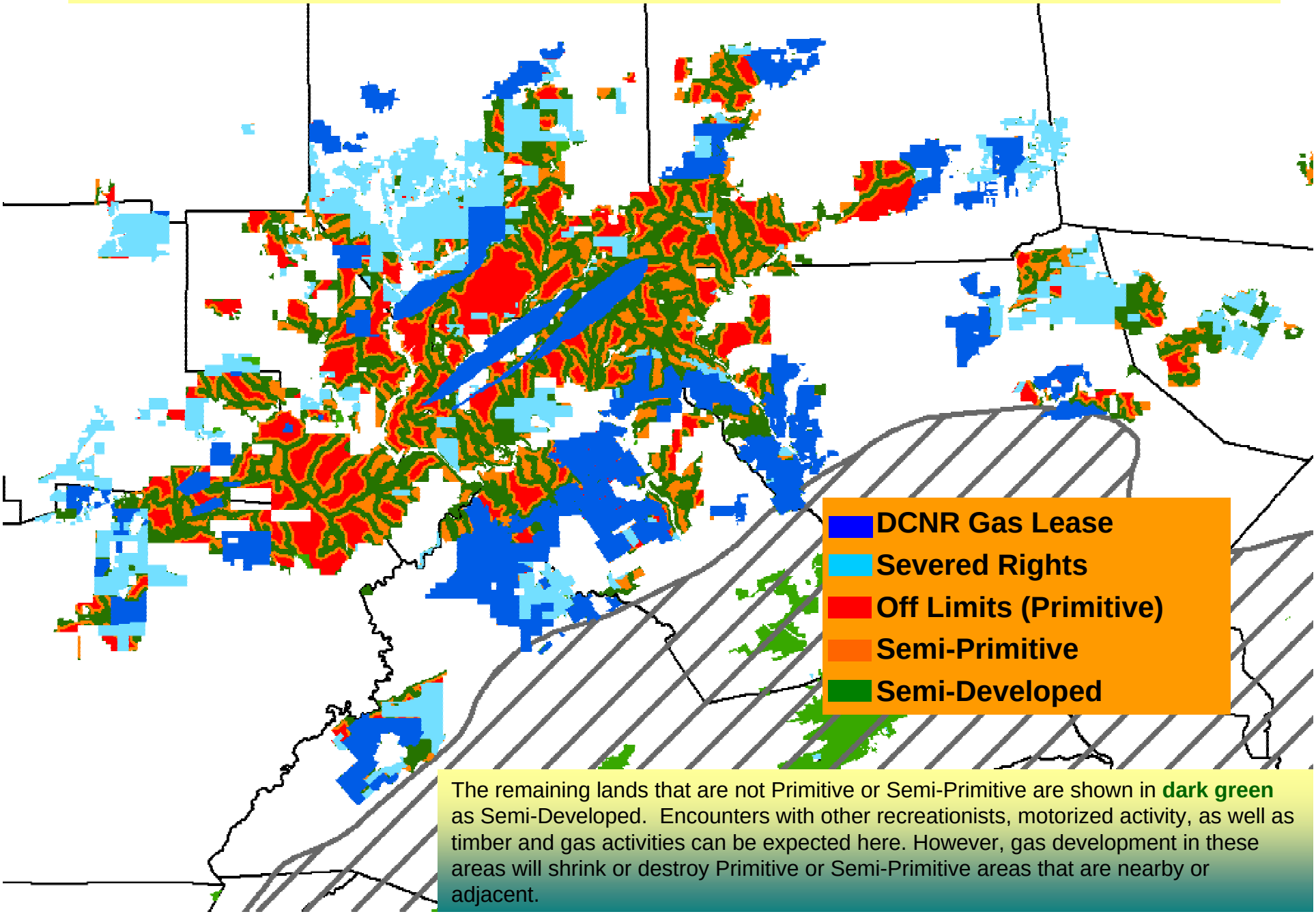
The most primitive and undeveloped areas of the State Forest are shown in **red** above. DCNR has designated these areas as off limits to drilling because they provide peace, solitude, remoteness, and backland experiences for recreation.

Maintaining the Forest's Wild Character



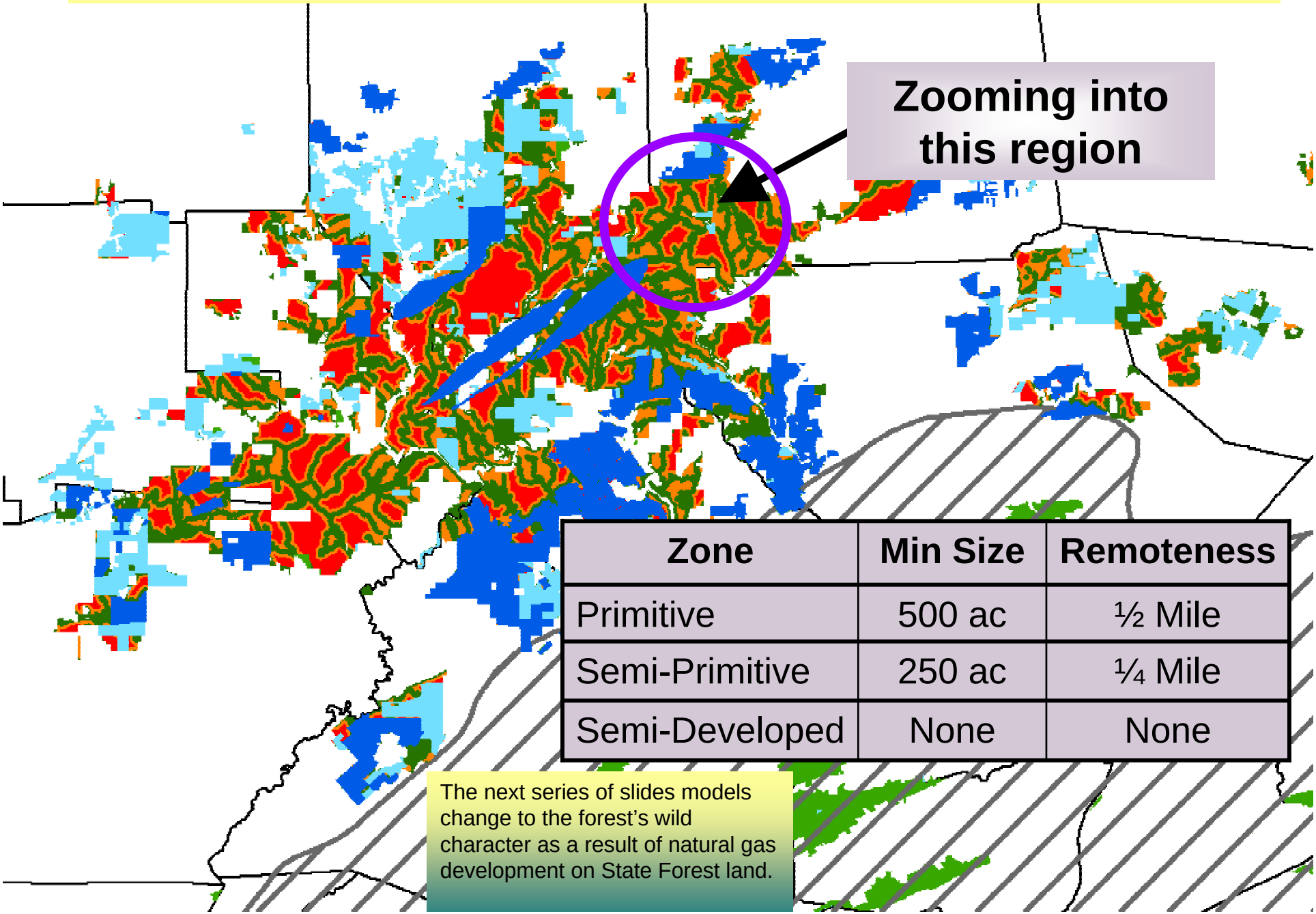
Semi-Primitive areas are shown in **orange**. These areas are moderately remote and contain limited timber and gas activities, but still contribute to the wild characteristics of the forest. Gas development in Semi-Primitive areas can shrink or destroy Primitive areas that are nearby or adjacent.

Maintaining the Forest's Wild Character



The remaining lands that are not Primitive or Semi-Primitive are shown in **dark green** as Semi-Developed. Encounters with other recreationists, motorized activity, as well as timber and gas activities can be expected here. However, gas development in these areas will shrink or destroy Primitive or Semi-Primitive areas that are nearby or adjacent.

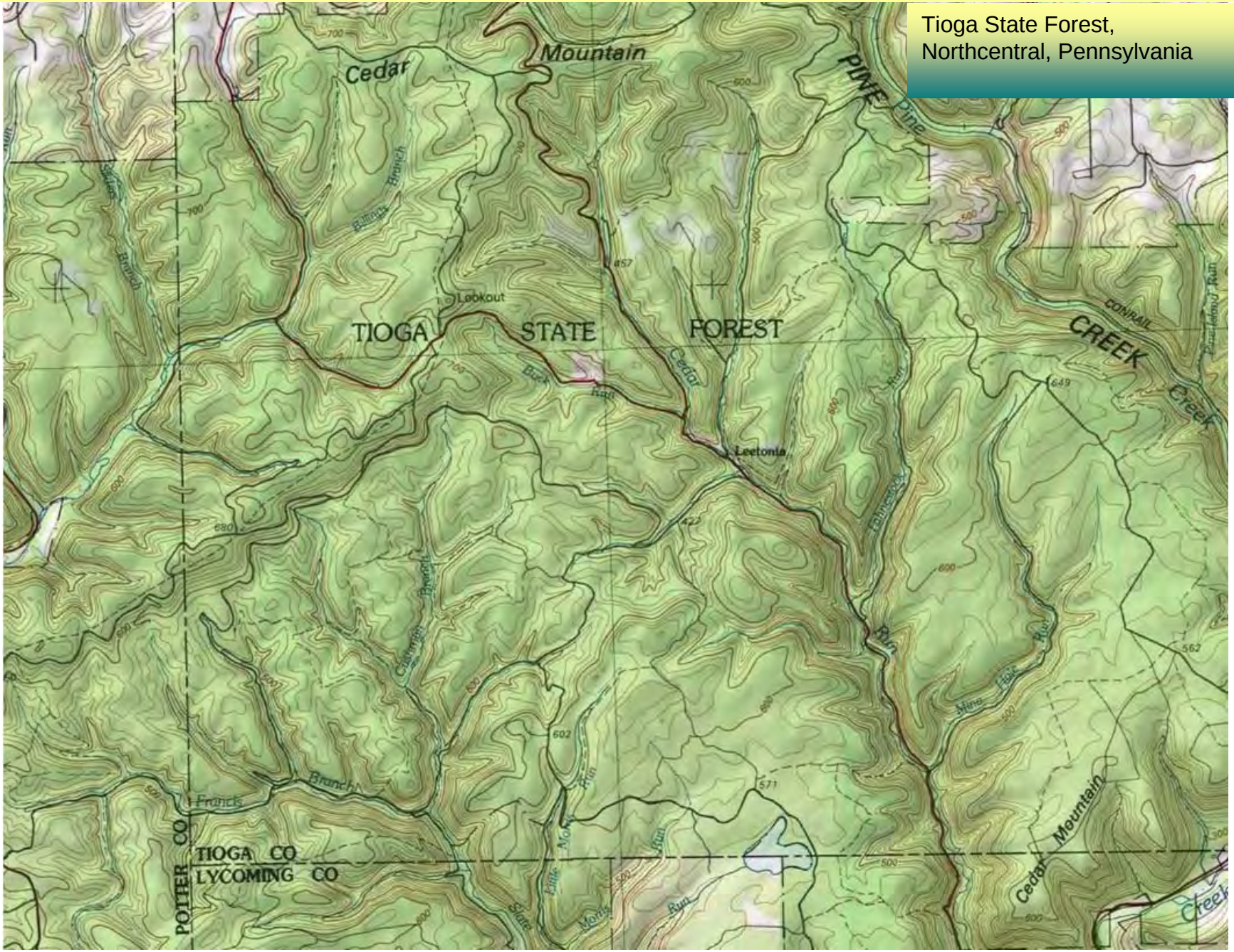
Impacts on the Wild Character



Zone	Min Size	Remoteness
Primitive	500 ac	½ Mile
Semi-Primitive	250 ac	¼ Mile
Semi-Developed	None	None

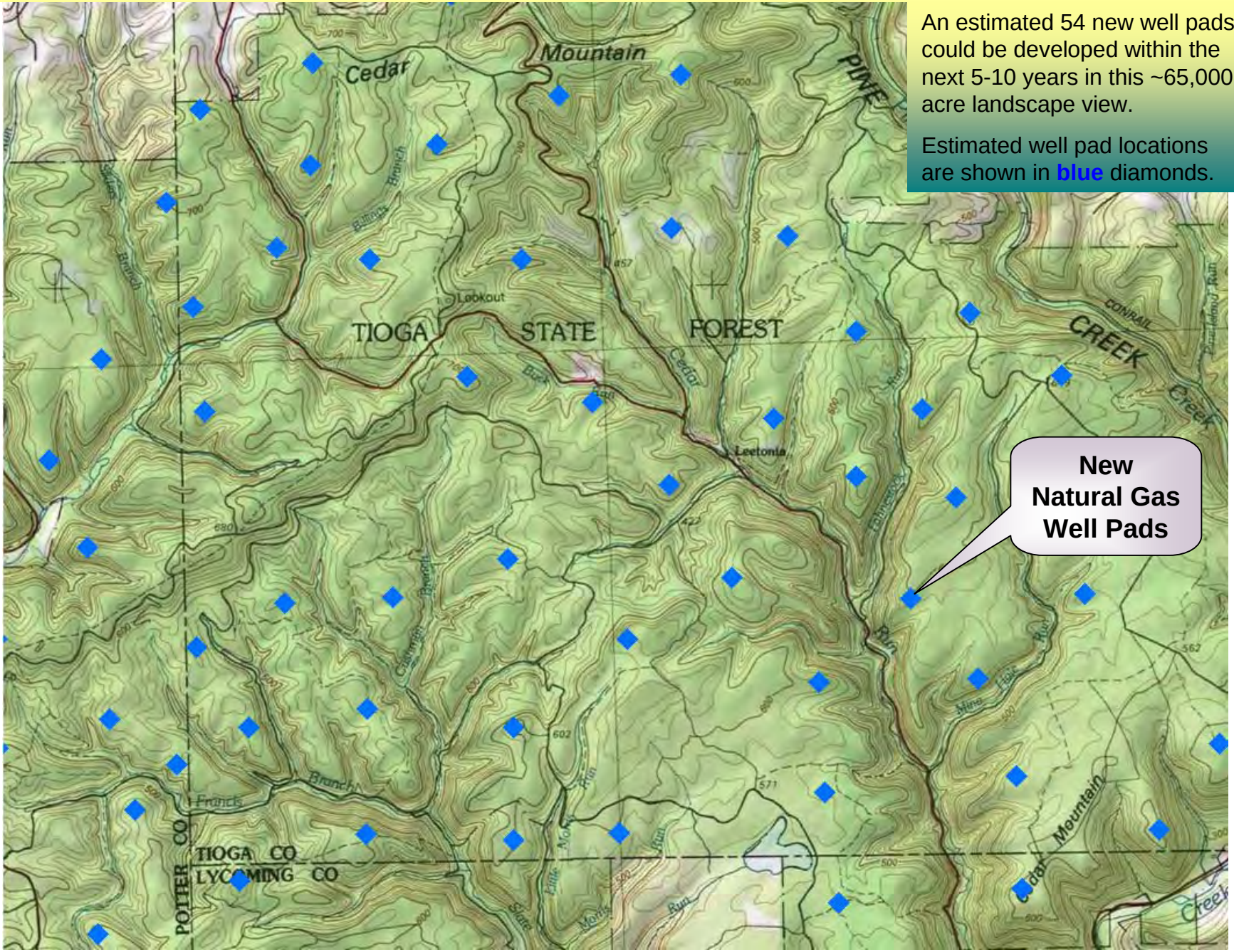
The next series of slides models change to the forest's wild character as a result of natural gas development on State Forest land.

Topography



Tioga State Forest,
Northcentral, Pennsylvania

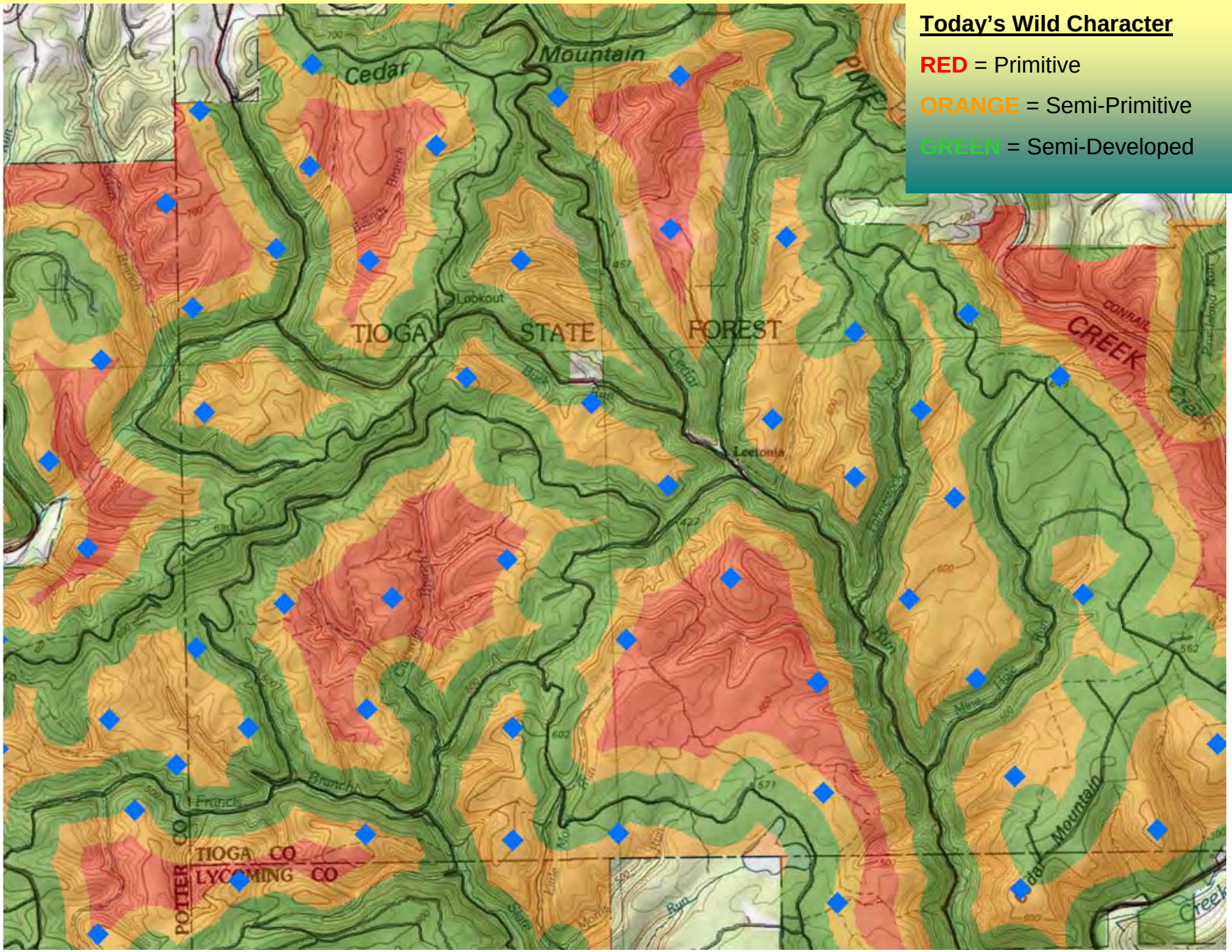
New Well Pad Locations



An estimated 54 new well pads could be developed within the next 5-10 years in this ~65,000 acre landscape view.

Estimated well pad locations are shown in **blue** diamonds.

Wild Character before Well Pads



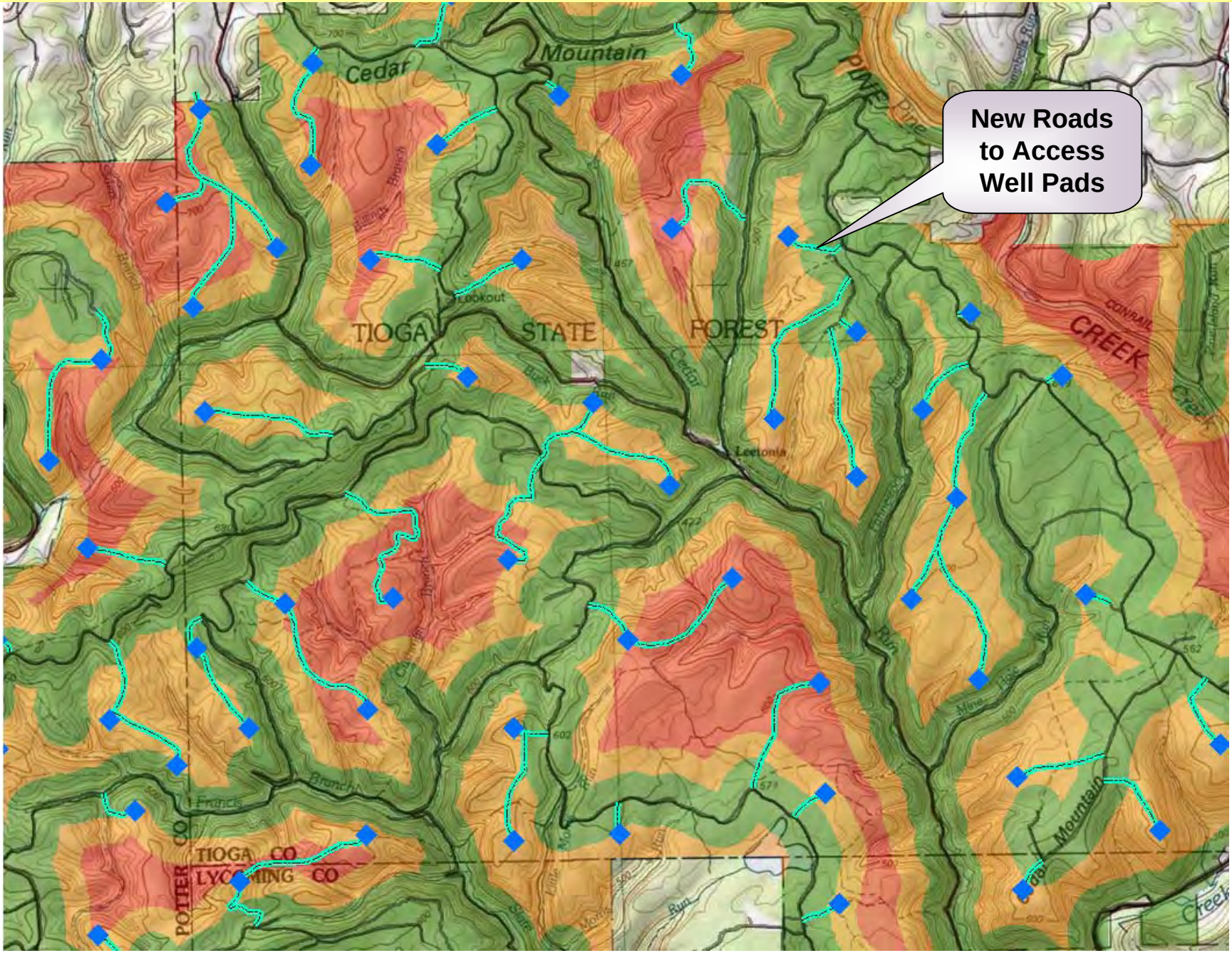
Today's Wild Character

RED = Primitive

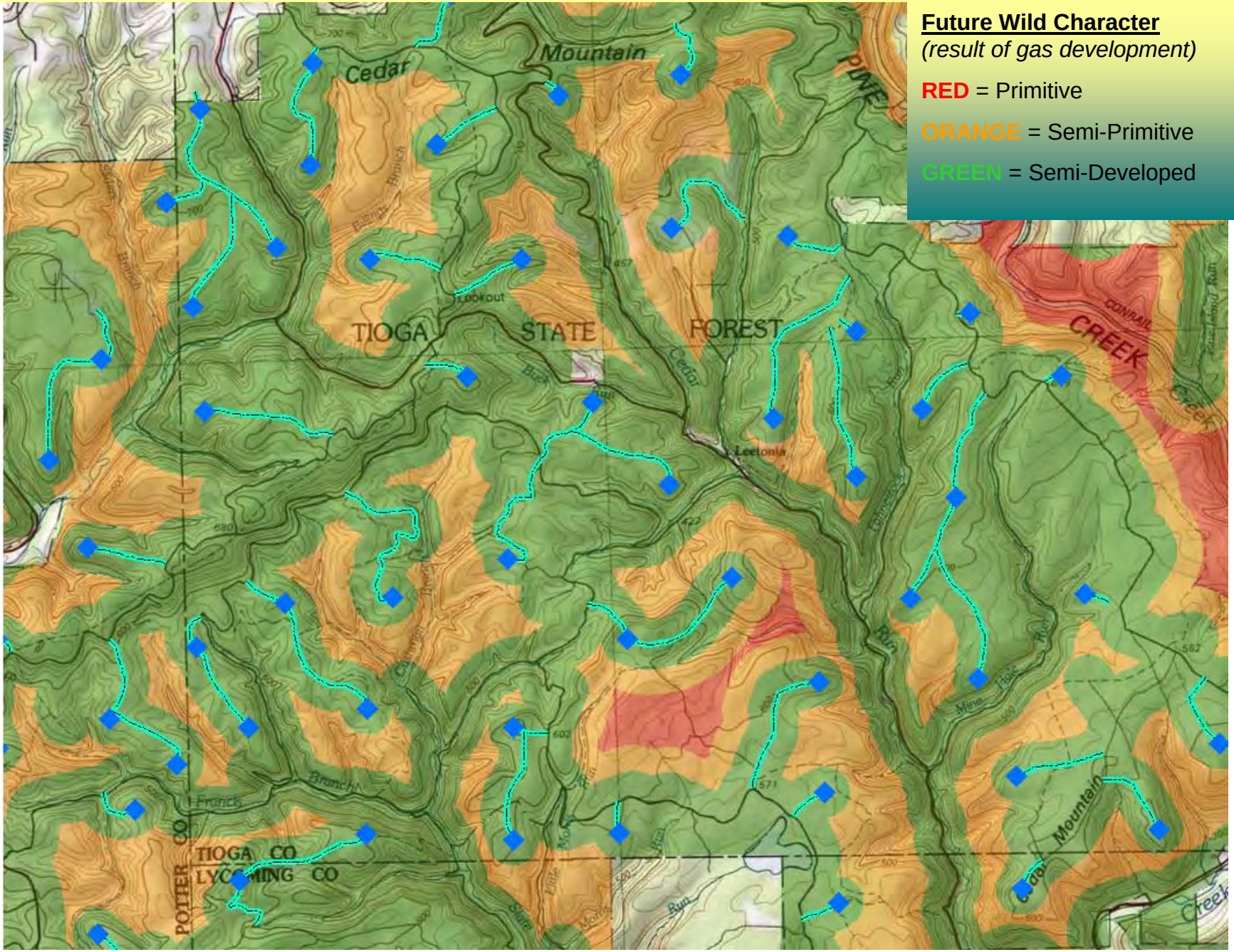
ORANGE = Semi-Primitive

GREEN = Semi-Developed

New Access Roads Required



Forest's Wild Character with New Well Pads



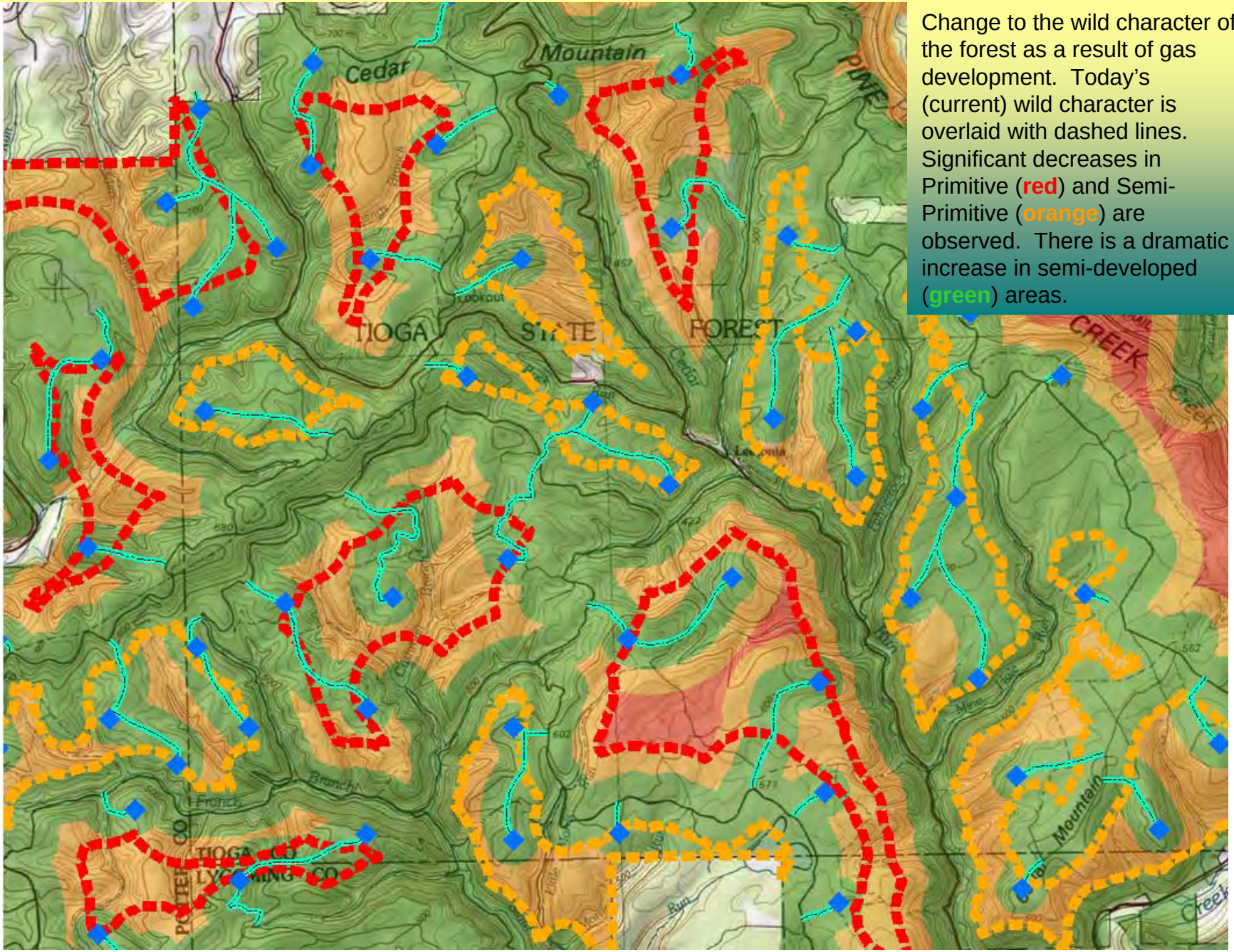
Future Wild Character
(result of gas development)

RED = Primitive

ORANGE = Semi-Primitive

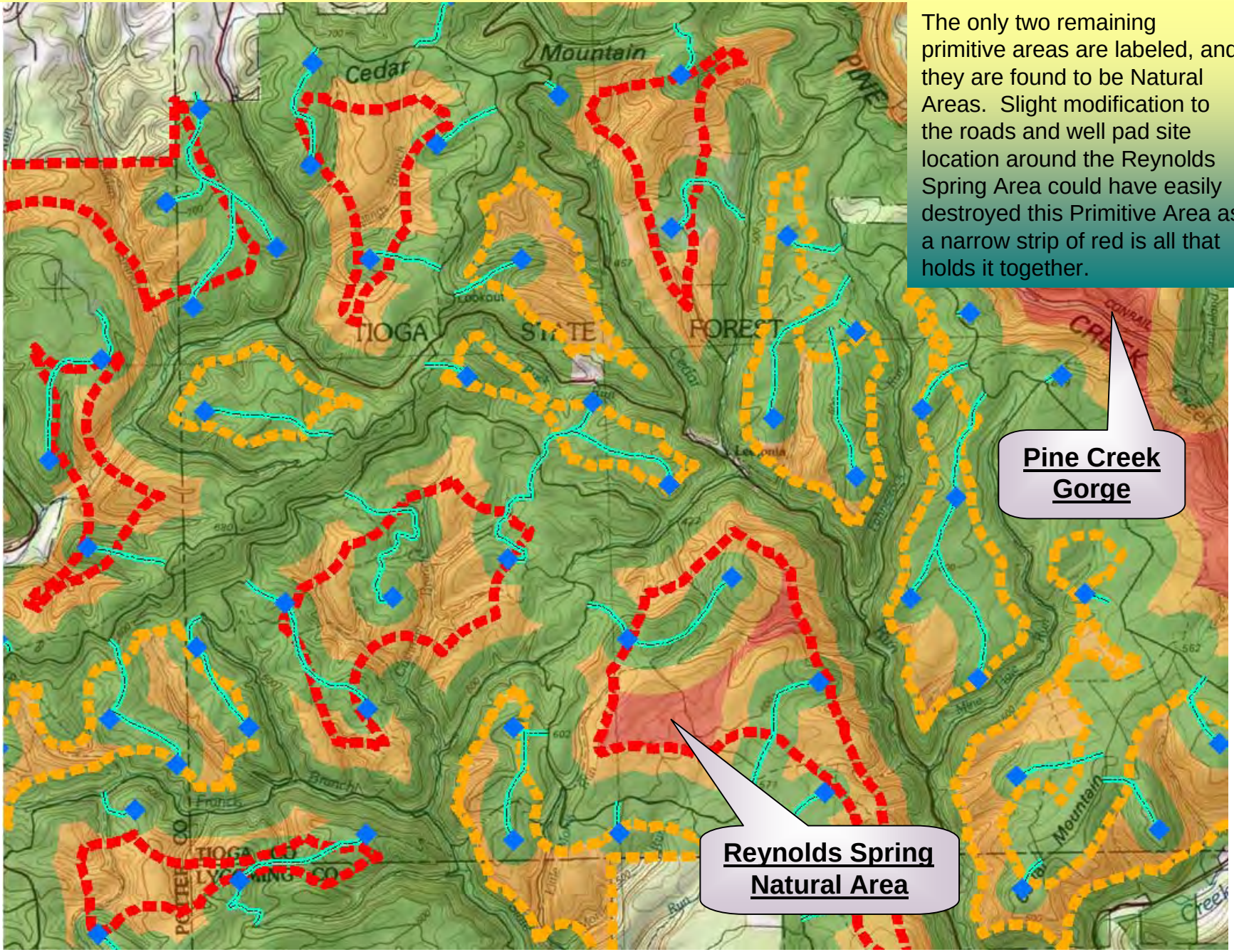
GREEN = Semi-Developed

Impact on the Forest's Wild Character



Change to the wild character of the forest as a result of gas development. Today's (current) wild character is overlaid with dashed lines. Significant decreases in Primitive (**red**) and Semi-Primitive (**orange**) are observed. There is a dramatic increase in semi-developed (**green**) areas.

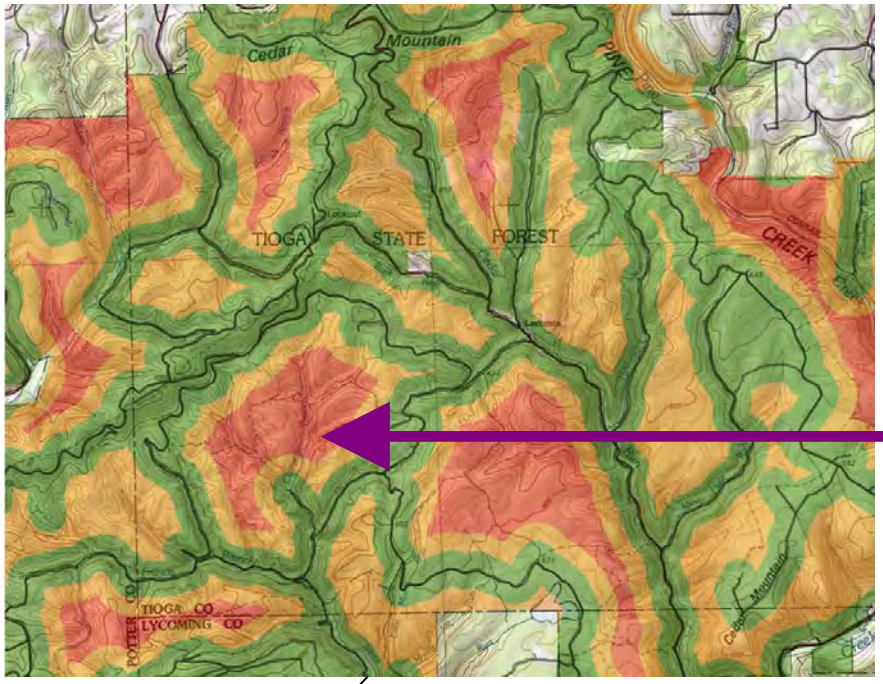
Impact on the Forest's Wild Character



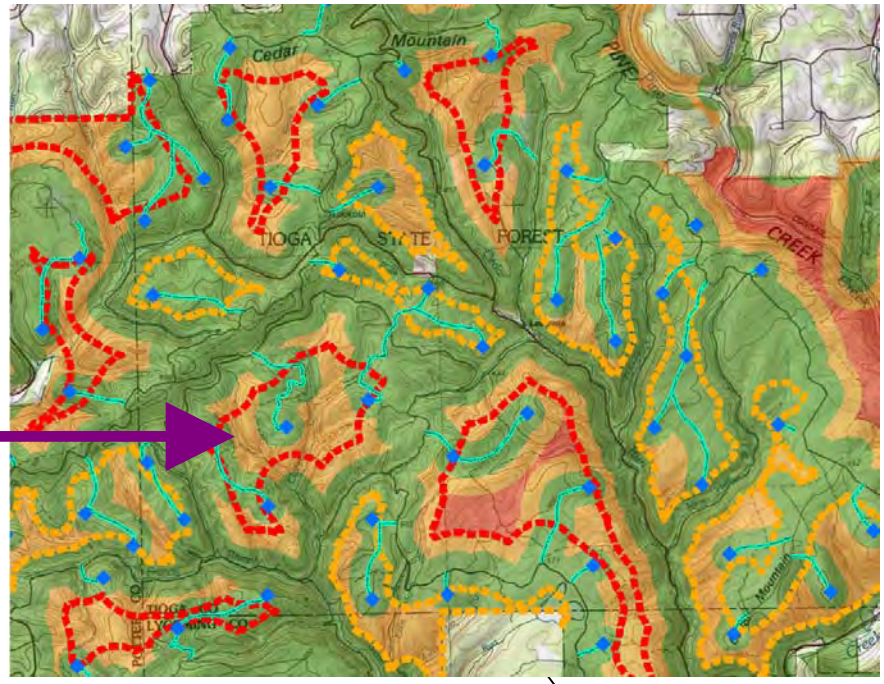
The only two remaining primitive areas are labeled, and they are found to be Natural Areas. Slight modification to the roads and well pad site location around the Reynolds Spring Area could have easily destroyed this Primitive Area as a narrow strip of red is all that holds it together.

Change in the Forest's Wild Character

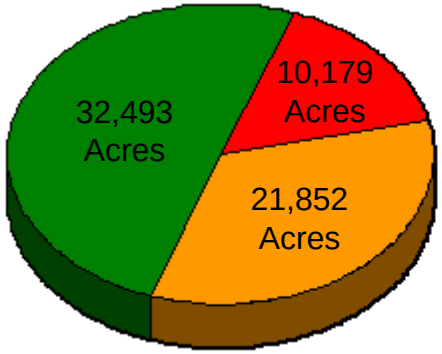
Before



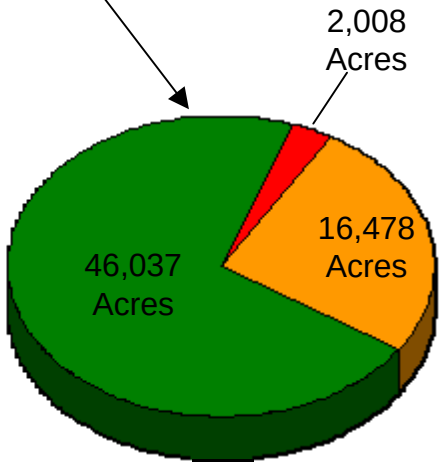
After



In this ~65,000 acre landscape view, with 54 new well pads…



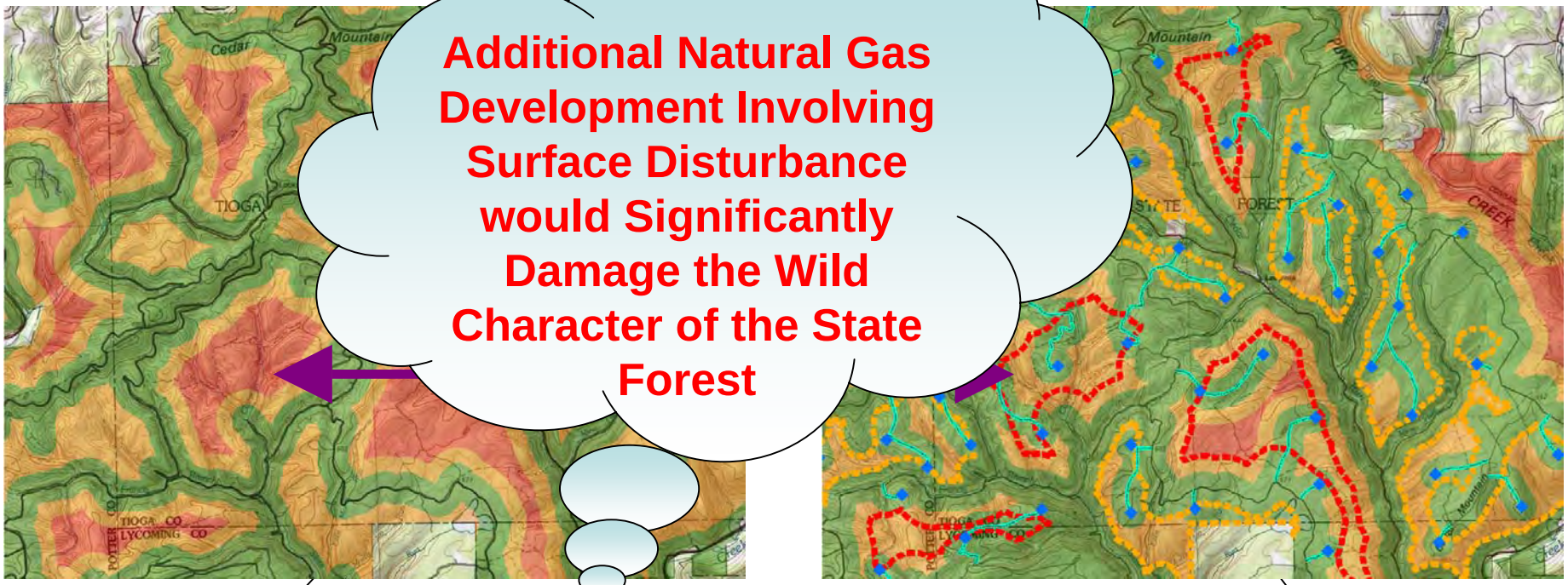
Zone	Net Gain/Loss
Primitive	-8,171
Semi-Primitive	-5,374
Semi-Developed	13,545



Modeling Change in the Forest's Wild Character

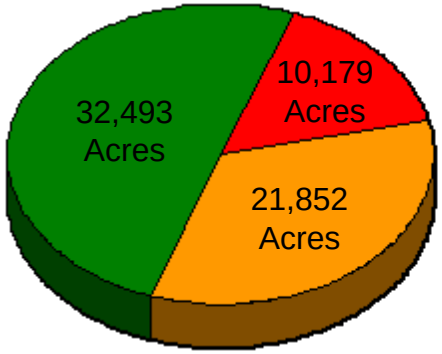
Before

After



Additional Natural Gas Development Involving Surface Disturbance would Significantly Damage the Wild Character of the State Forest

In this ~65,000 acre landscape view, with 54 new well pads…



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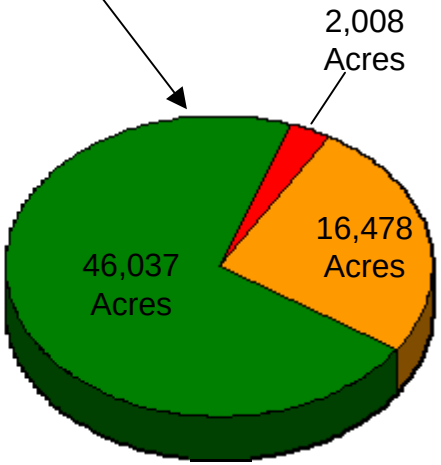
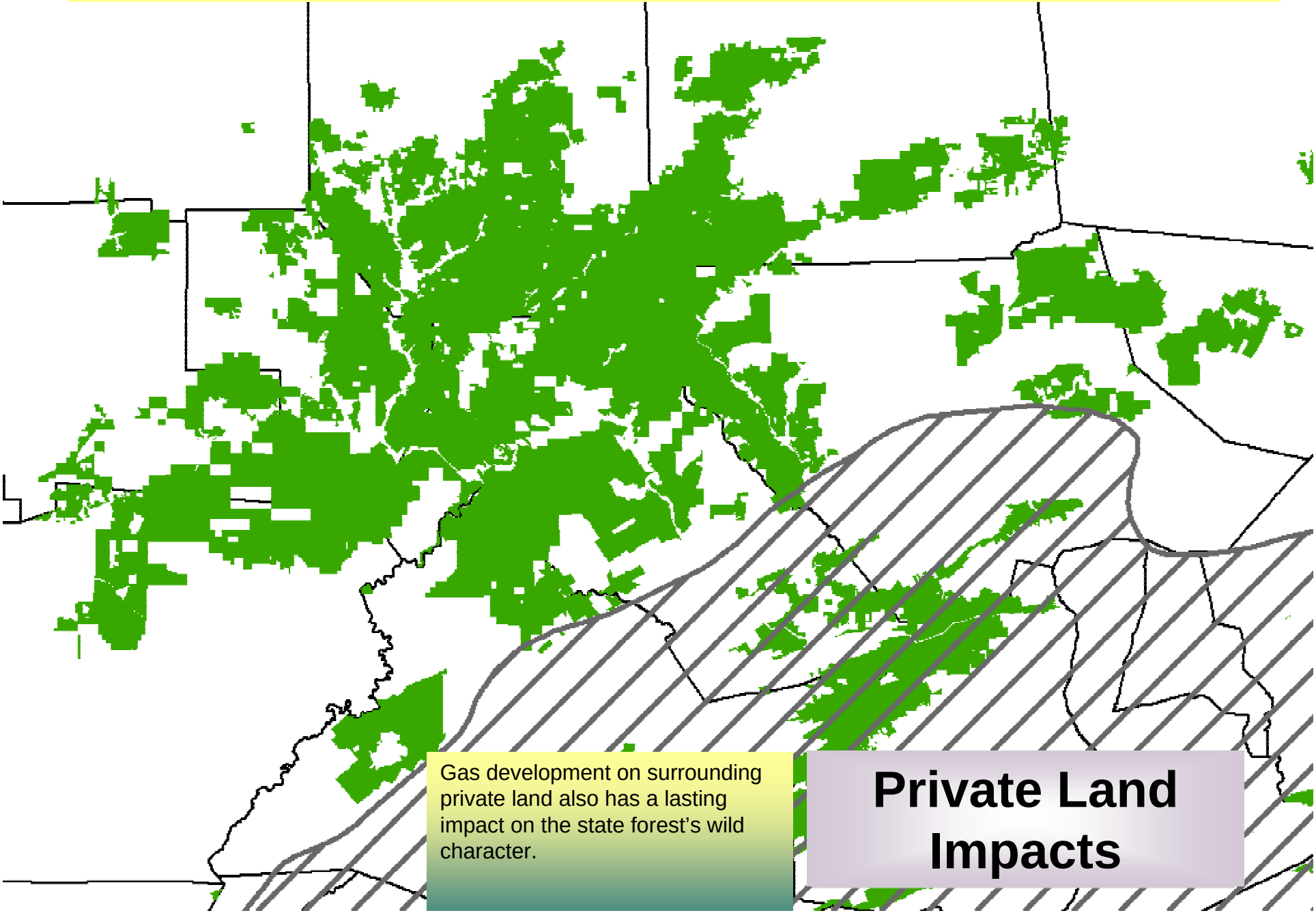
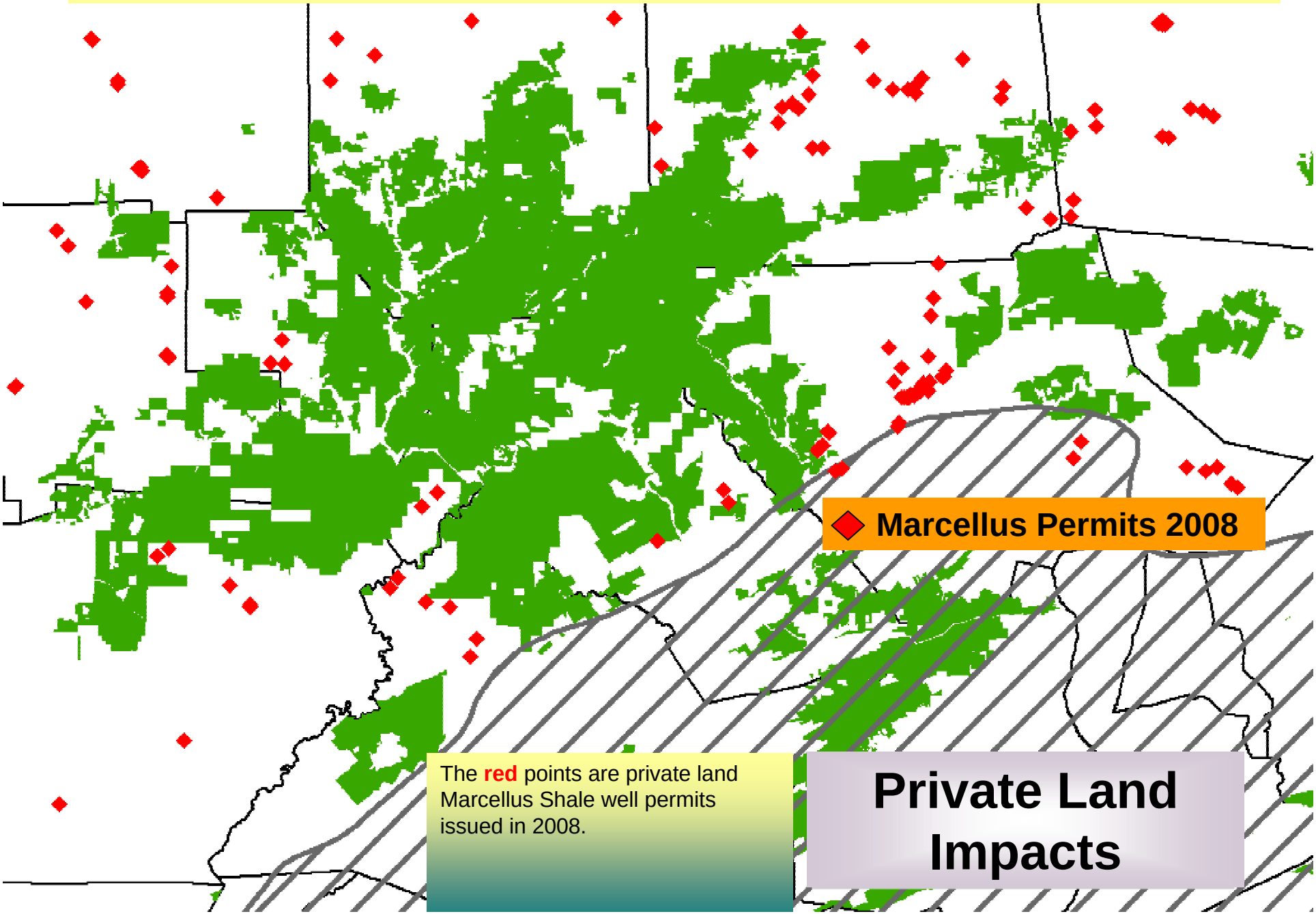


Maintaining the Forest's Wild Character



Gas development on surrounding private land also has a lasting impact on the state forest's wild character.

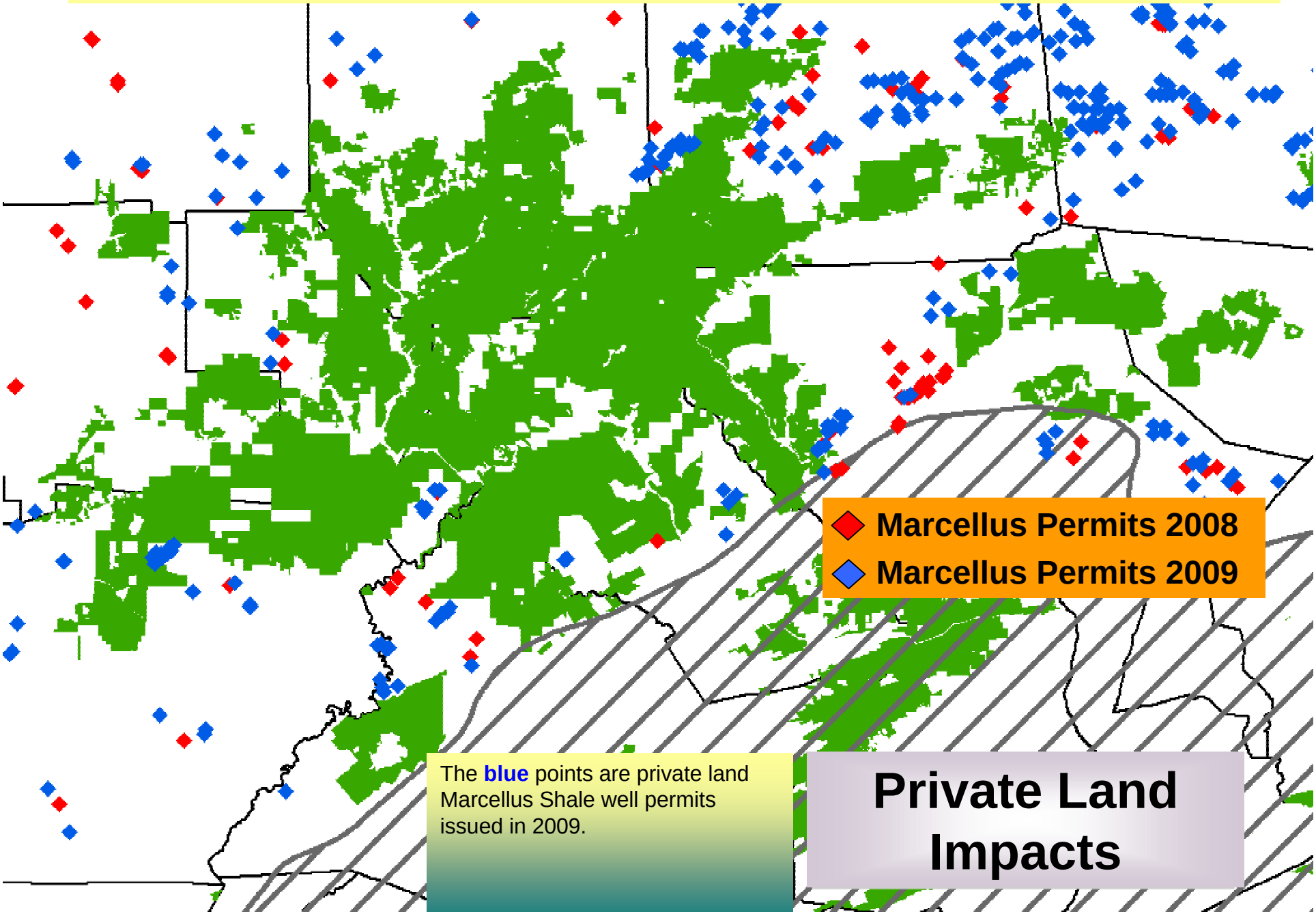
Maintaining the Forest's Wild Character



The **red** points are private land Marcellus Shale well permits issued in 2008.

Private Land Impacts

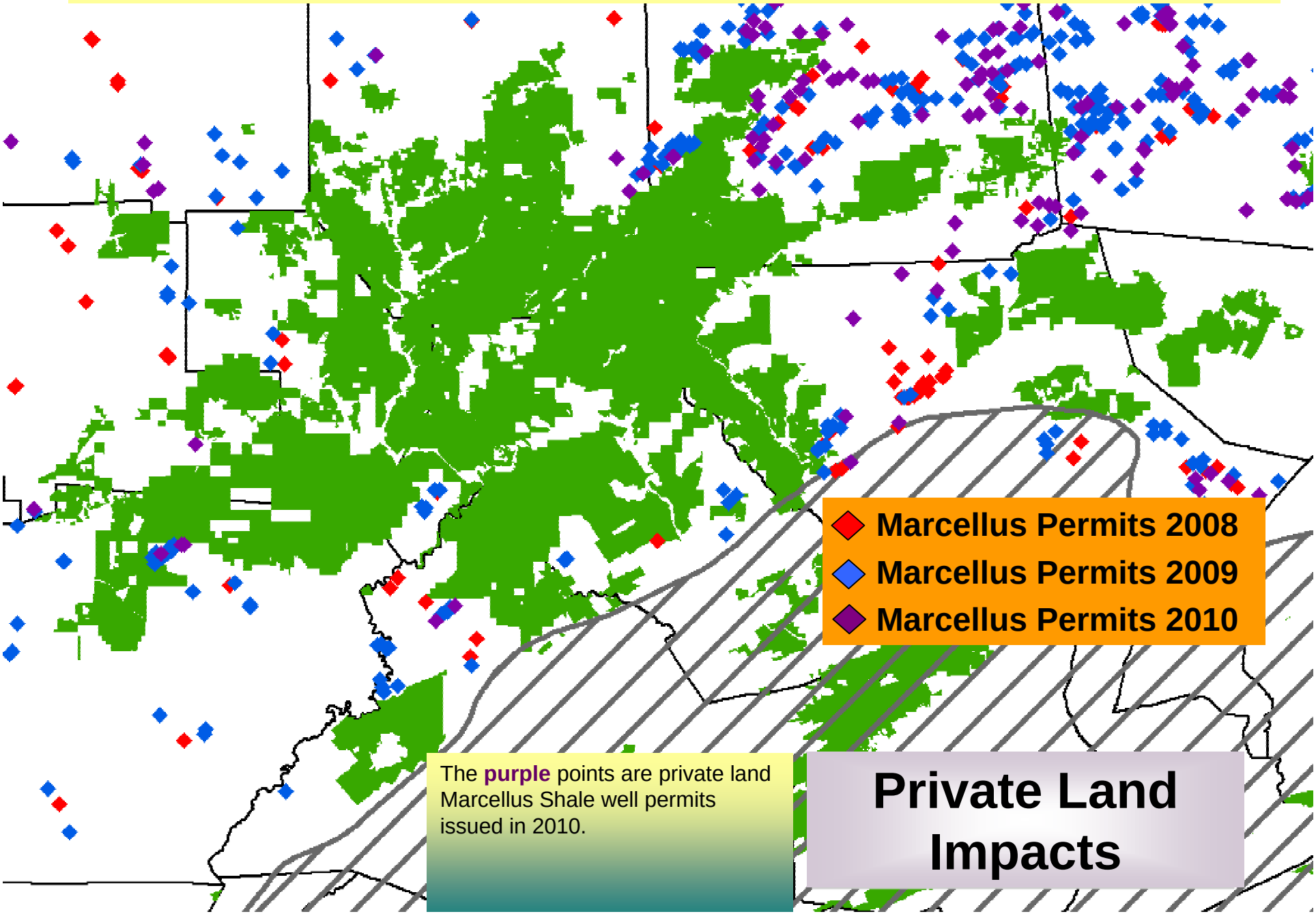
Maintaining the Forest's Wild Character



The **blue** points are private land Marcellus Shale well permits issued in 2009.

Private Land Impacts

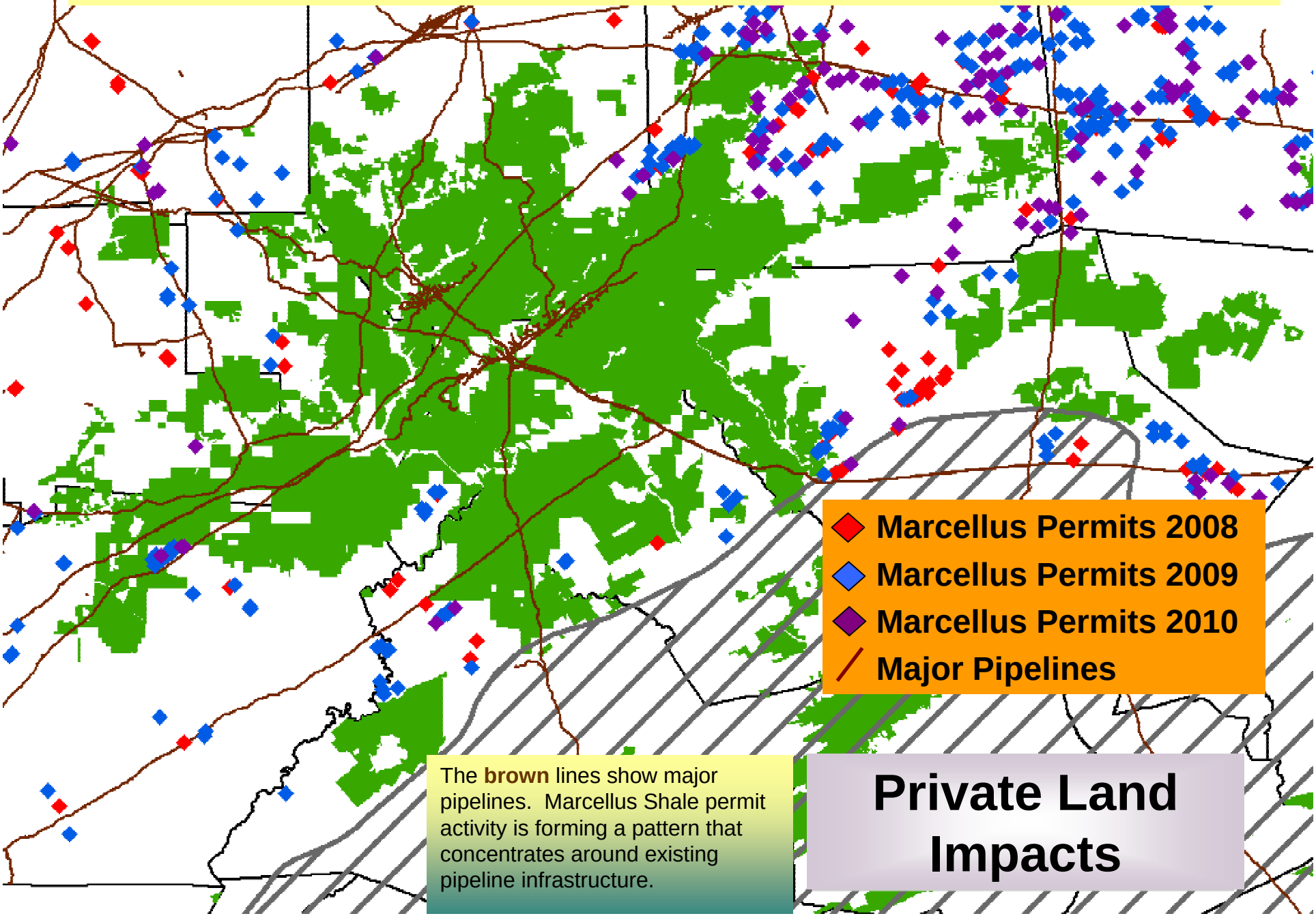
Maintaining the Forest's Wild Character



The **purple** points are private land Marcellus Shale well permits issued in 2010.

Private Land Impacts

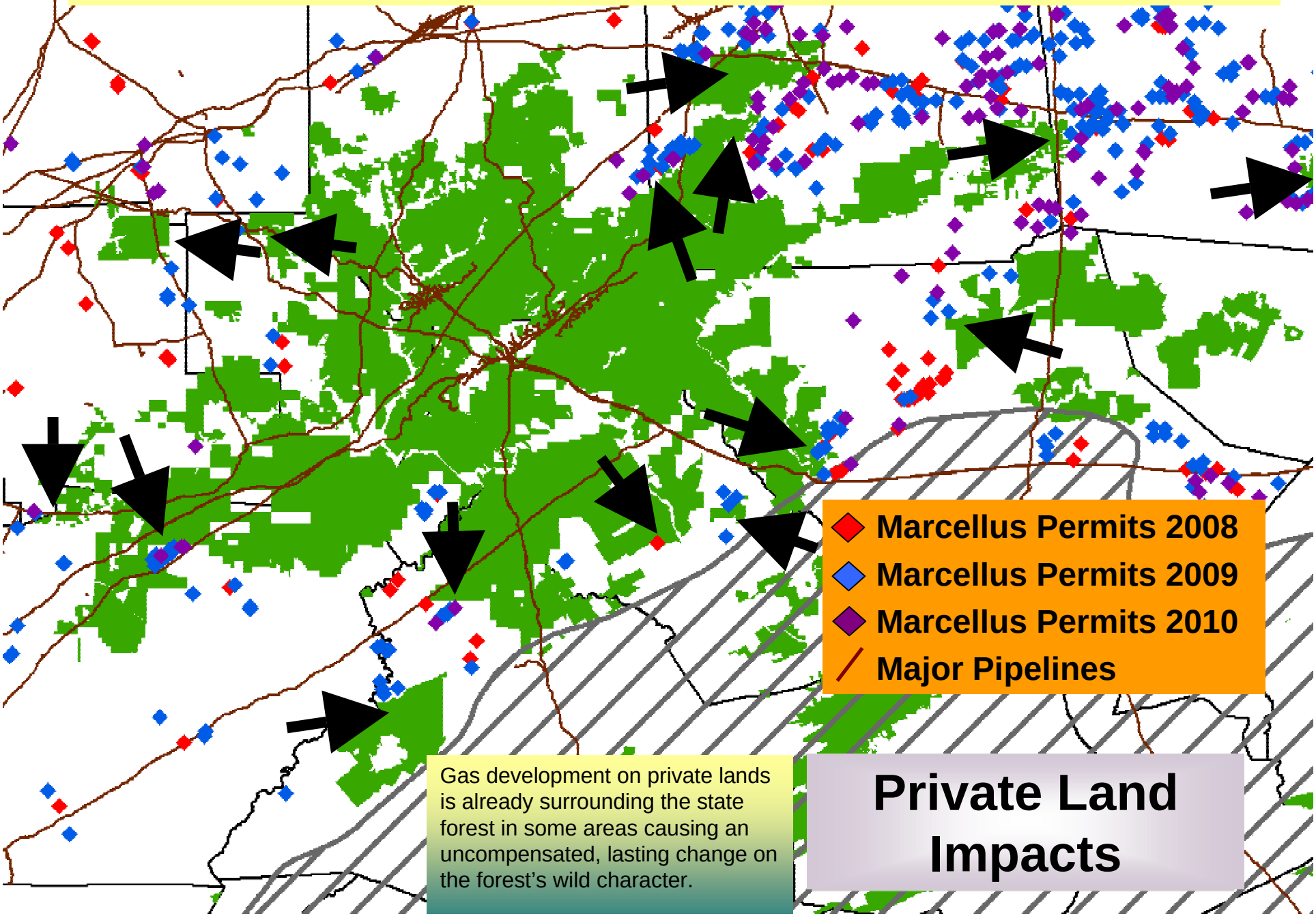
Maintaining the Forest's Wild Character



The **brown** lines show major pipelines. Marcellus Shale permit activity is forming a pattern that concentrates around existing pipeline infrastructure.

Private Land Impacts

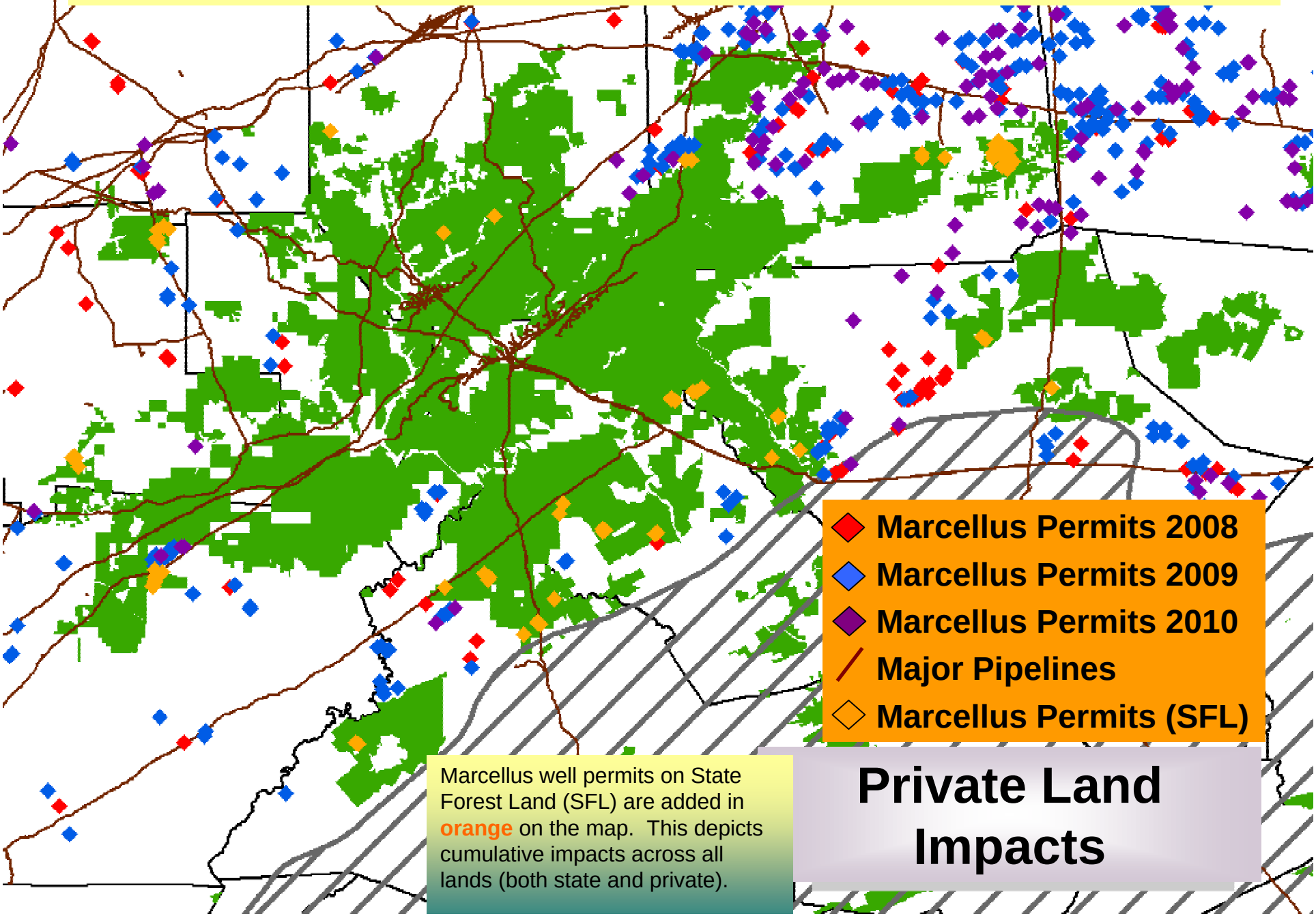
Maintaining the Forest's Wild Character



Gas development on private lands is already surrounding the state forest in some areas causing an uncompensated, lasting change on the forest's wild character.

Private Land Impacts

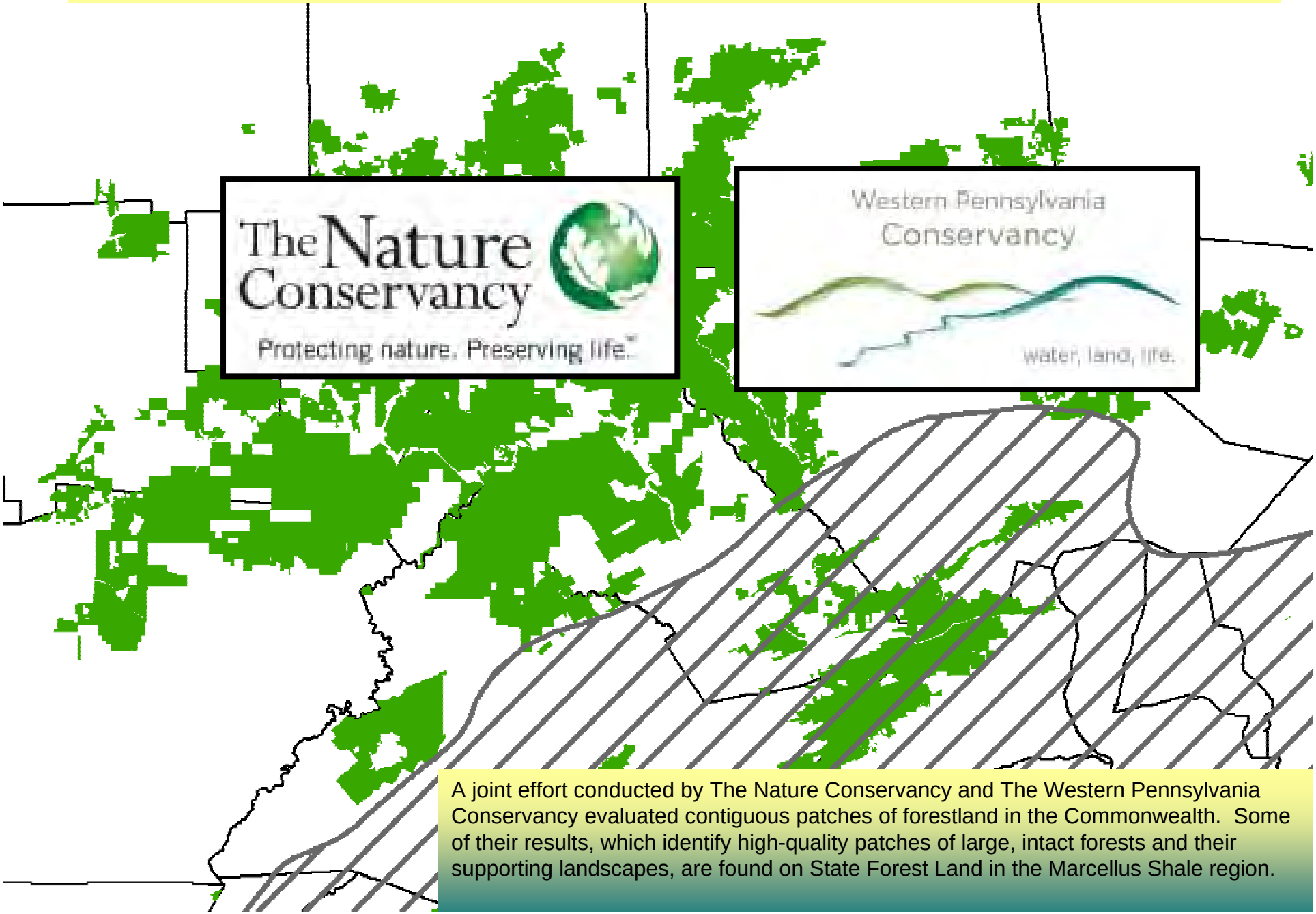
Maintaining the Forest's Wild Character



Marcellus well permits on State Forest Land (SFL) are added in **orange** on the map. This depicts cumulative impacts across all lands (both state and private).

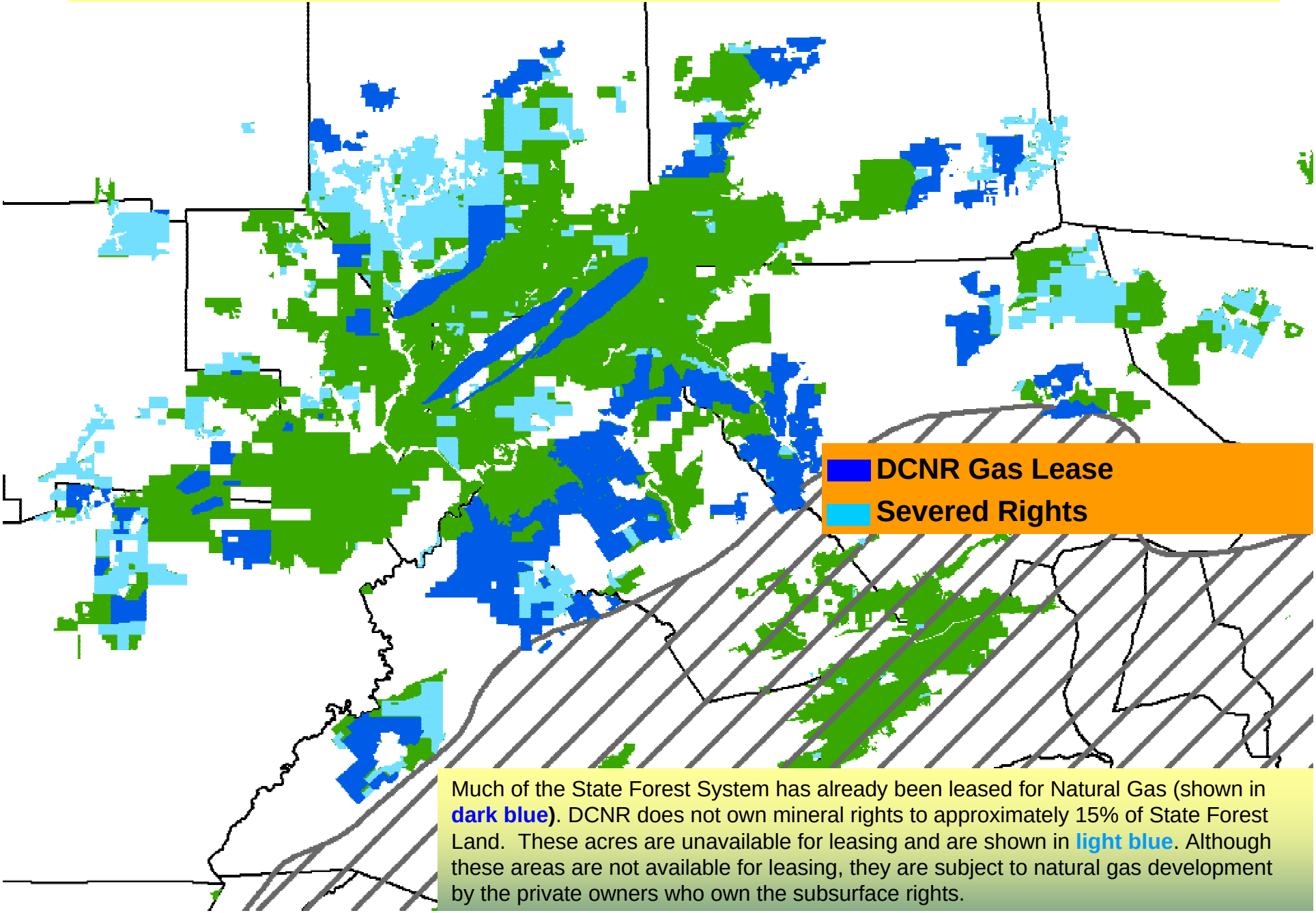
Private Land Impacts

TNC-WPC Priority Forest Patches



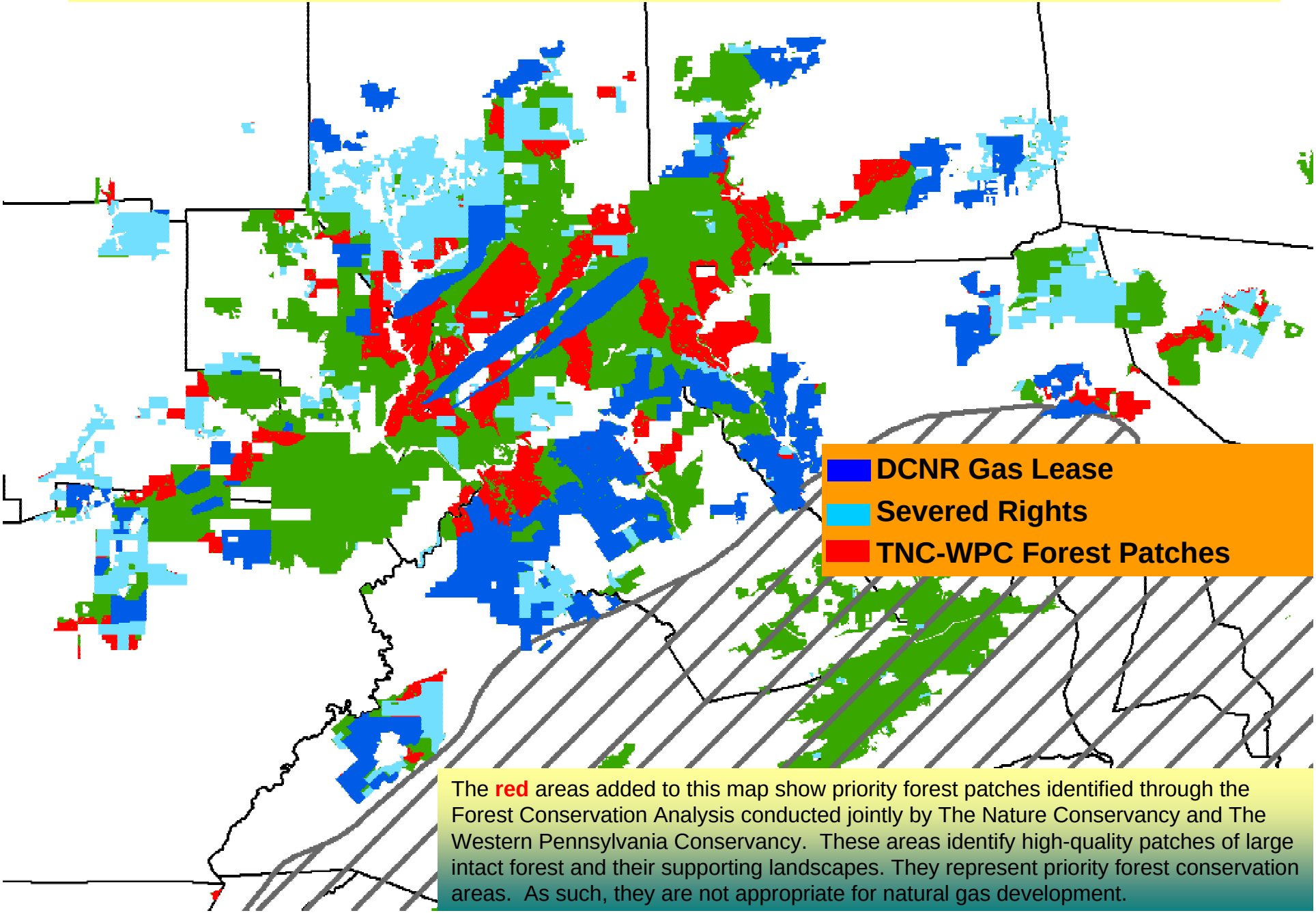
A joint effort conducted by The Nature Conservancy and The Western Pennsylvania Conservancy evaluated contiguous patches of forestland in the Commonwealth. Some of their results, which identify high-quality patches of large, intact forests and their supporting landscapes, are found on State Forest Land in the Marcellus Shale region.

TNC-WPC Priority Forest Patches



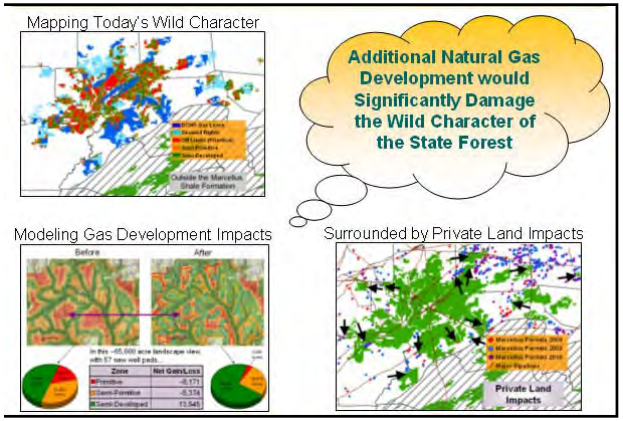
Much of the State Forest System has already been leased for Natural Gas (shown in **dark blue**). DCNR does not own mineral rights to approximately 15% of State Forest Land. These acres are unavailable for leasing and are shown in **light blue**. Although these areas are not available for leasing, they are subject to natural gas development by the private owners who own the subsurface rights.

TNC-WPC Priority Forest Patches



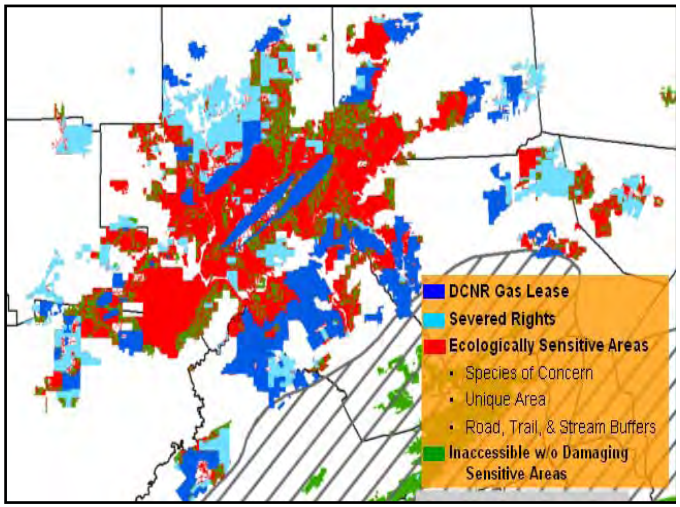
The **red** areas added to this map show priority forest patches identified through the Forest Conservation Analysis conducted jointly by The Nature Conservancy and The Western Pennsylvania Conservancy. These areas identify high-quality patches of large intact forest and their supporting landscapes. They represent priority forest conservation areas. As such, they are not appropriate for natural gas development.

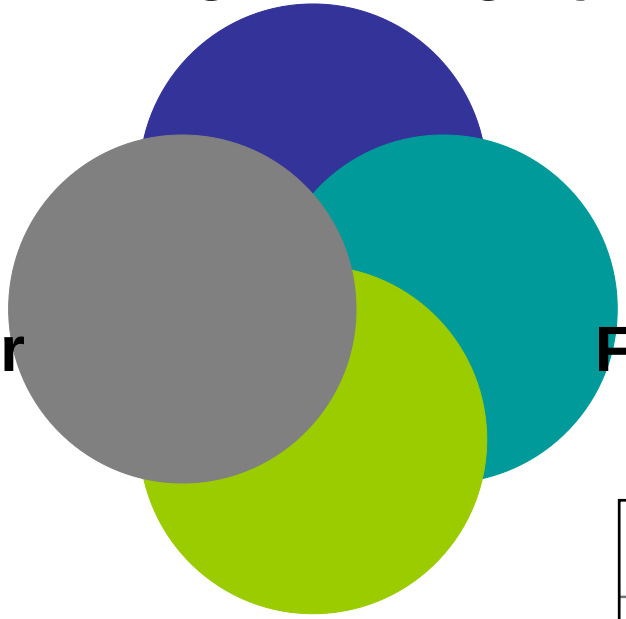
Cumulative Assessment & Impacts



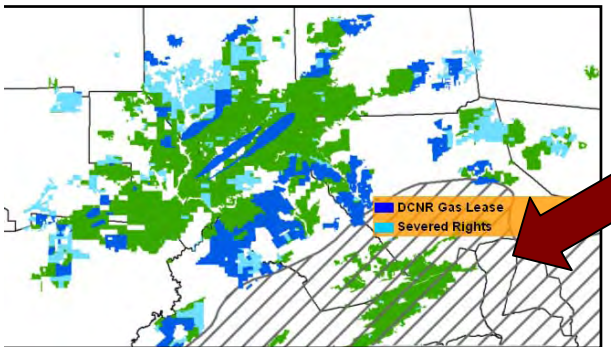
The Forest's Wild Character

The Forest's Ecological Integrity

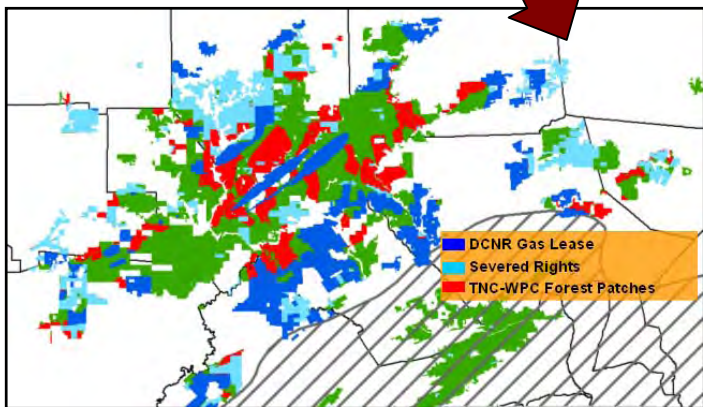




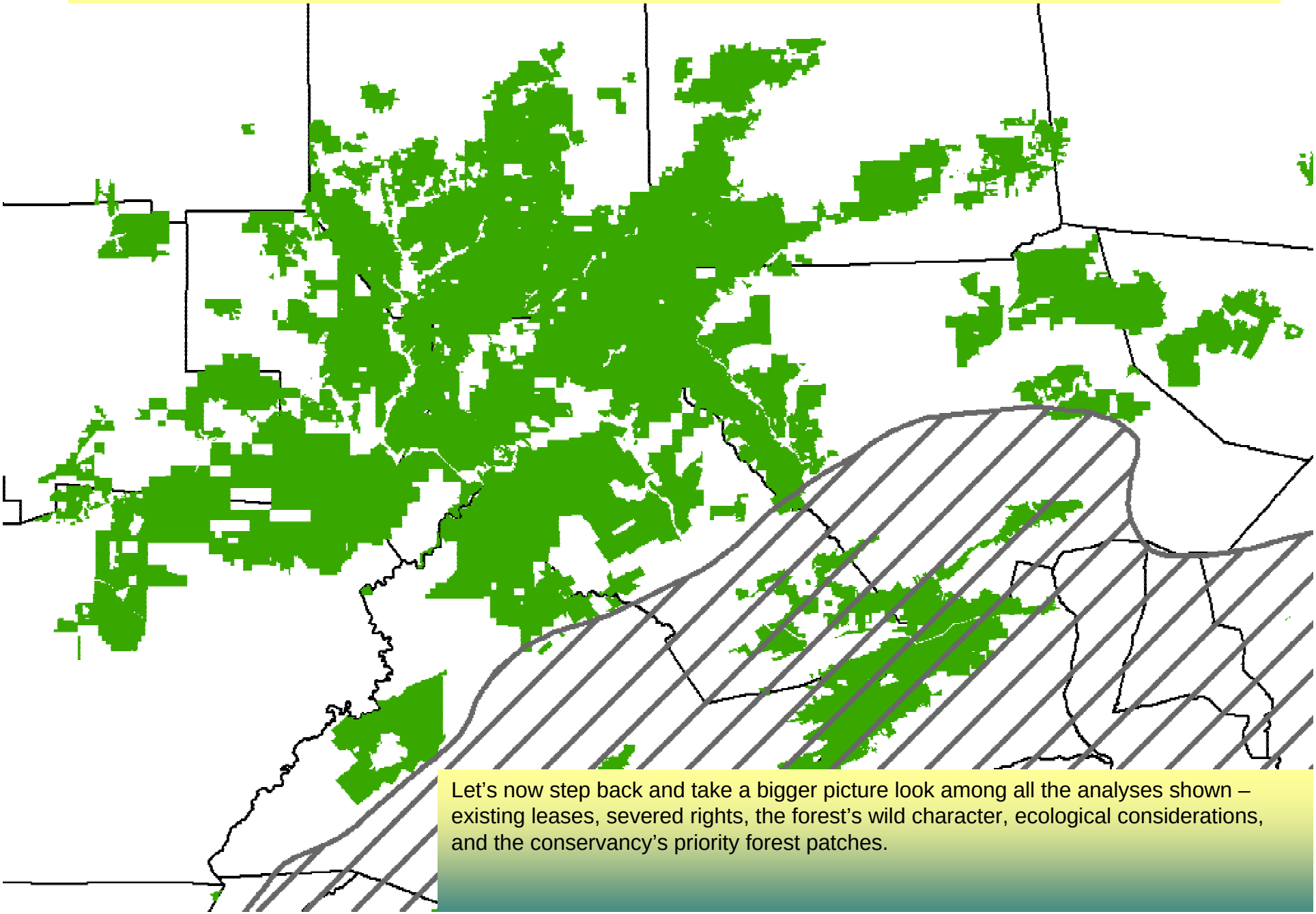
TNC-WPC Forest Patches



Existing Leases & Severed Rights

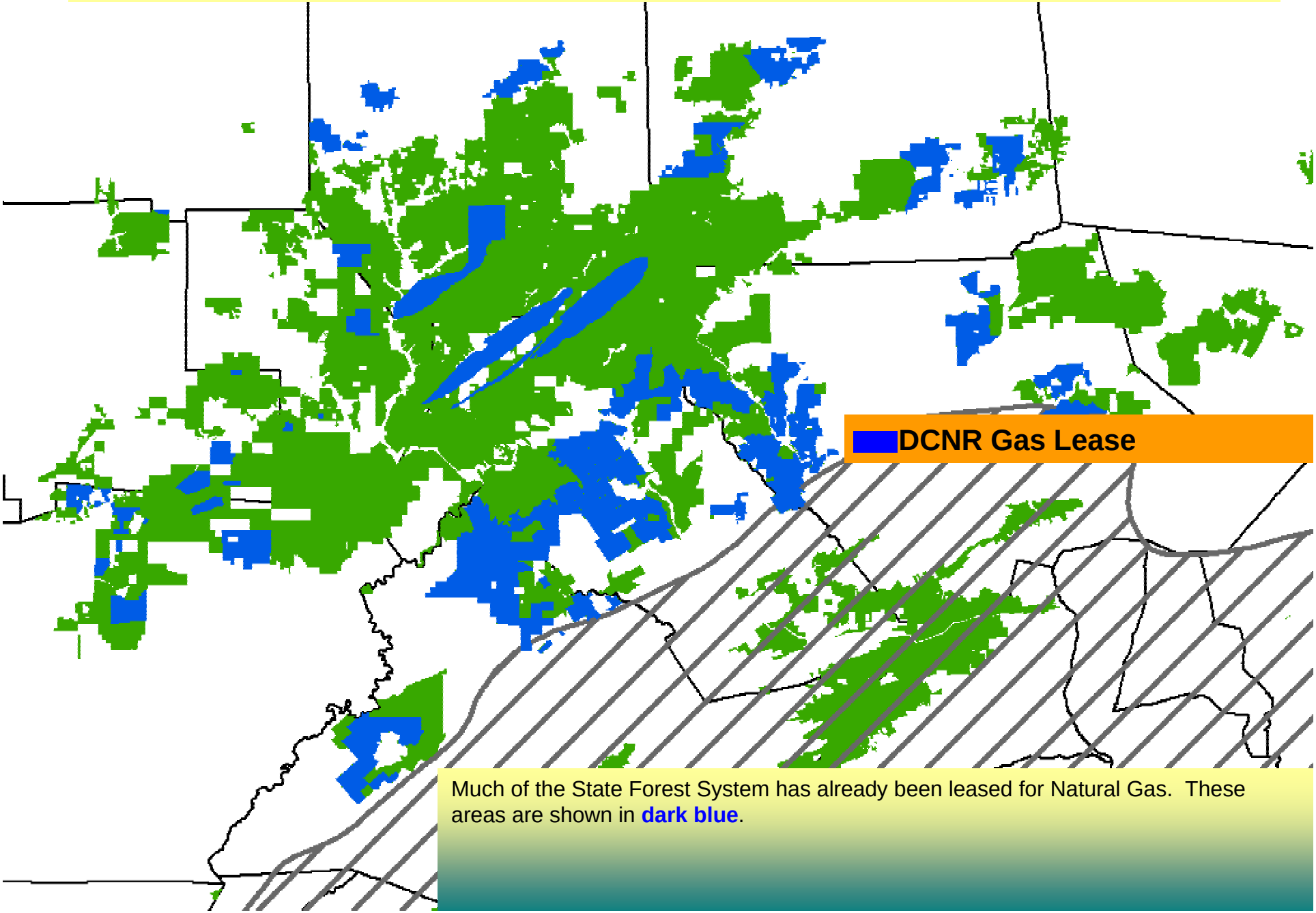


Cumulative Assessment & Impacts



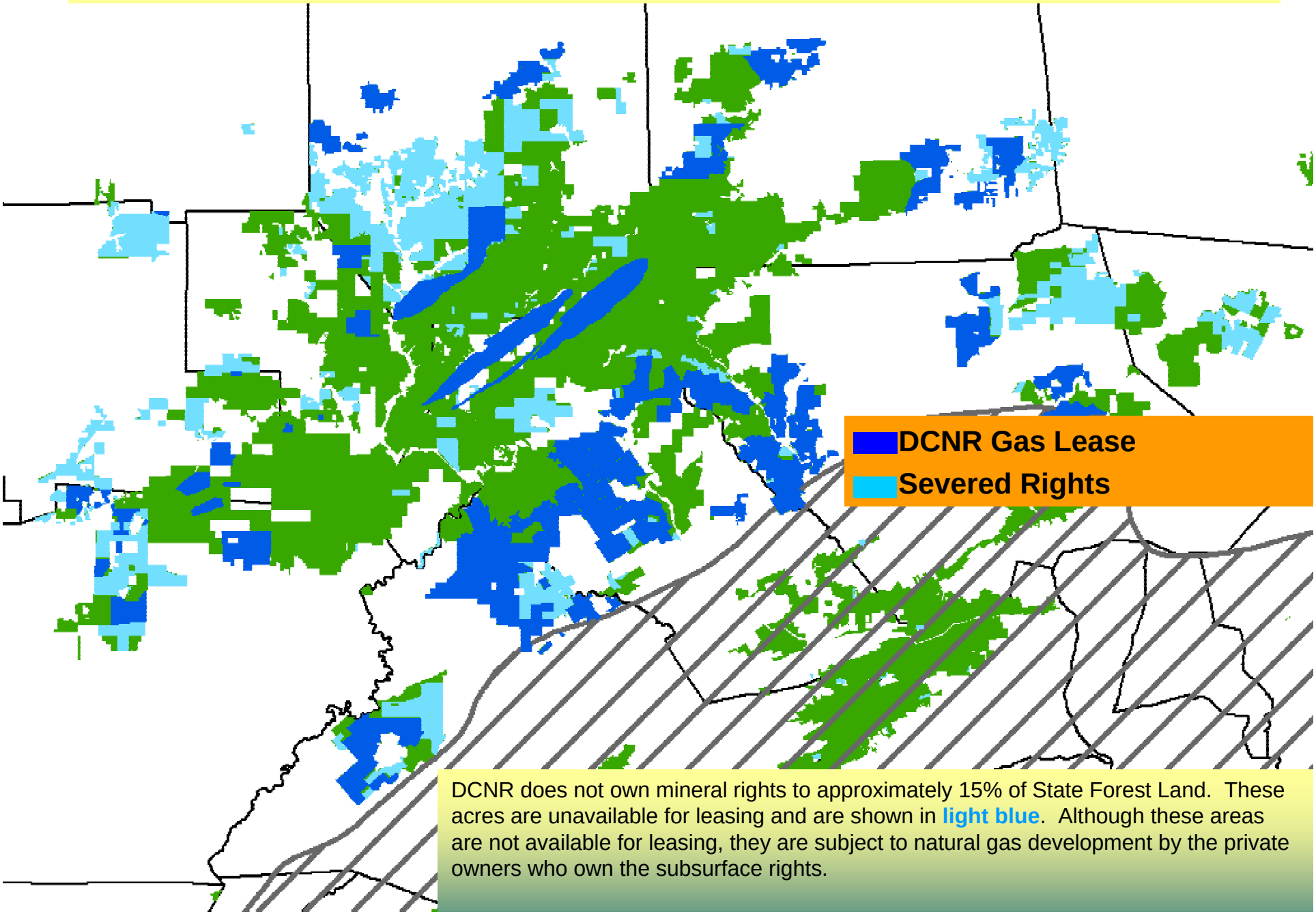
Let's now step back and take a bigger picture look among all the analyses shown – existing leases, severed rights, the forest's wild character, ecological considerations, and the conservancy's priority forest patches.

Cumulative Assessment & Impacts



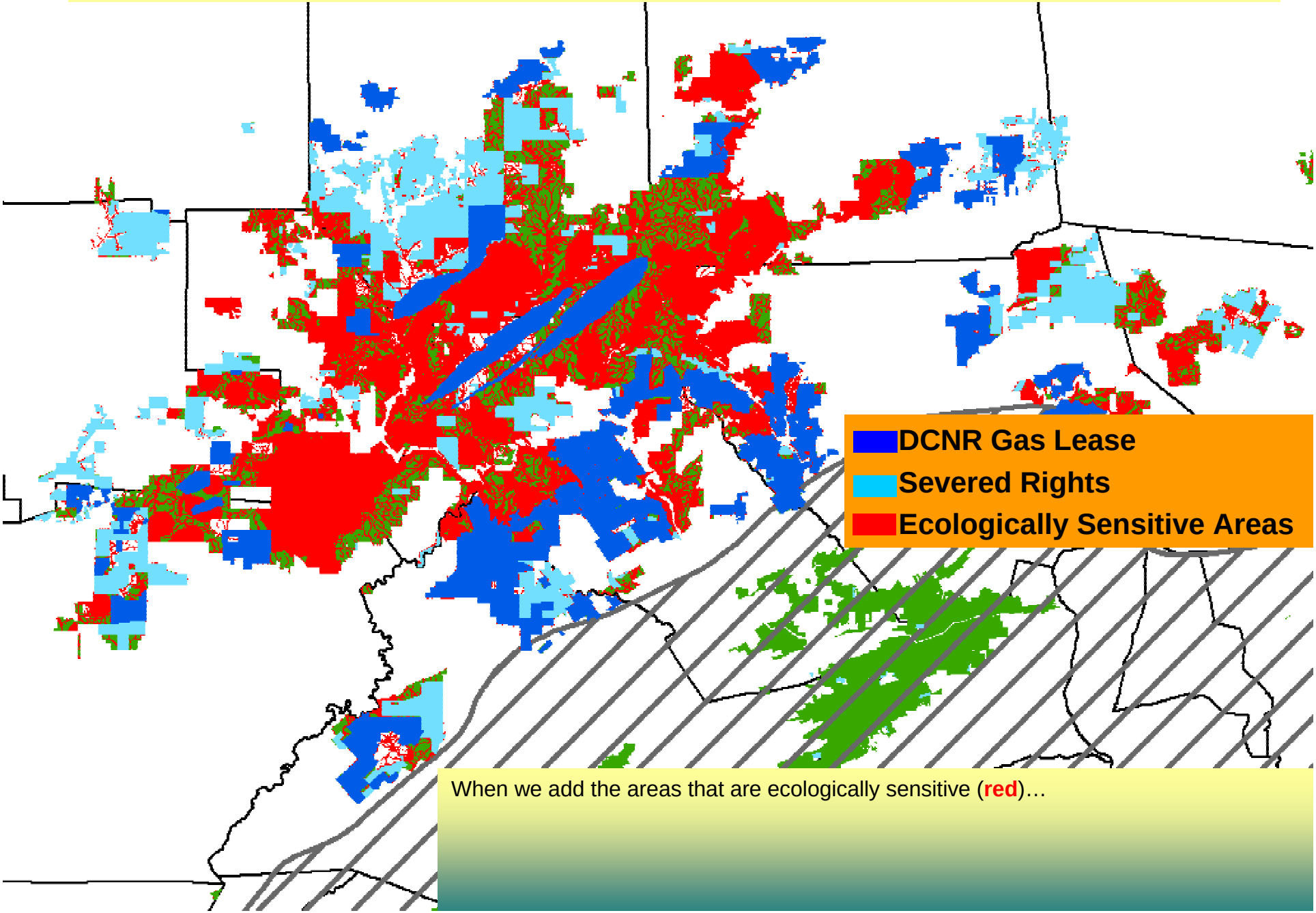
Much of the State Forest System has already been leased for Natural Gas. These areas are shown in **dark blue**.

Cumulative Assessment & Impacts



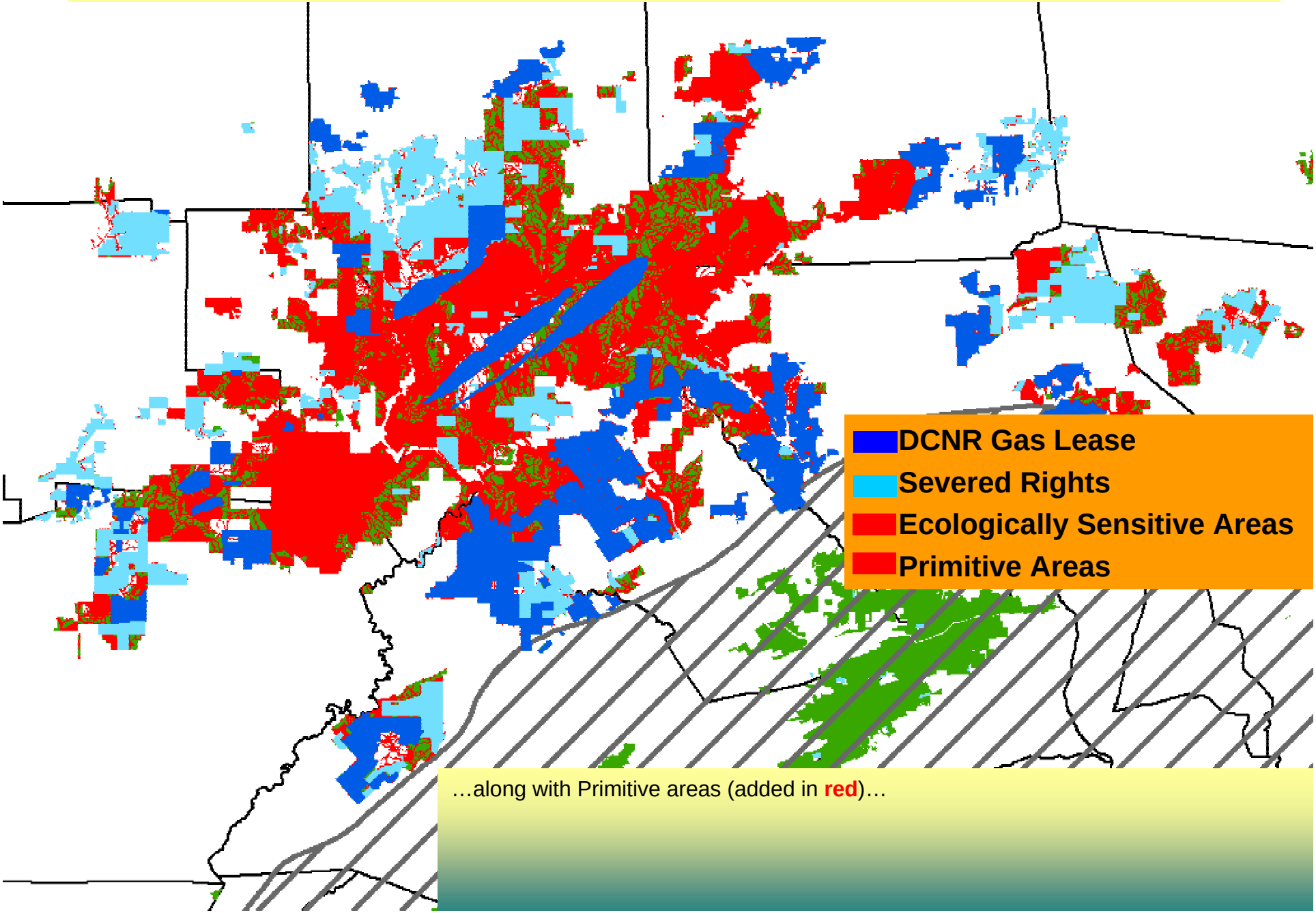
DCNR does not own mineral rights to approximately 15% of State Forest Land. These acres are unavailable for leasing and are shown in **light blue**. Although these areas are not available for leasing, they are subject to natural gas development by the private owners who own the subsurface rights.

Cumulative Assessment & Impacts



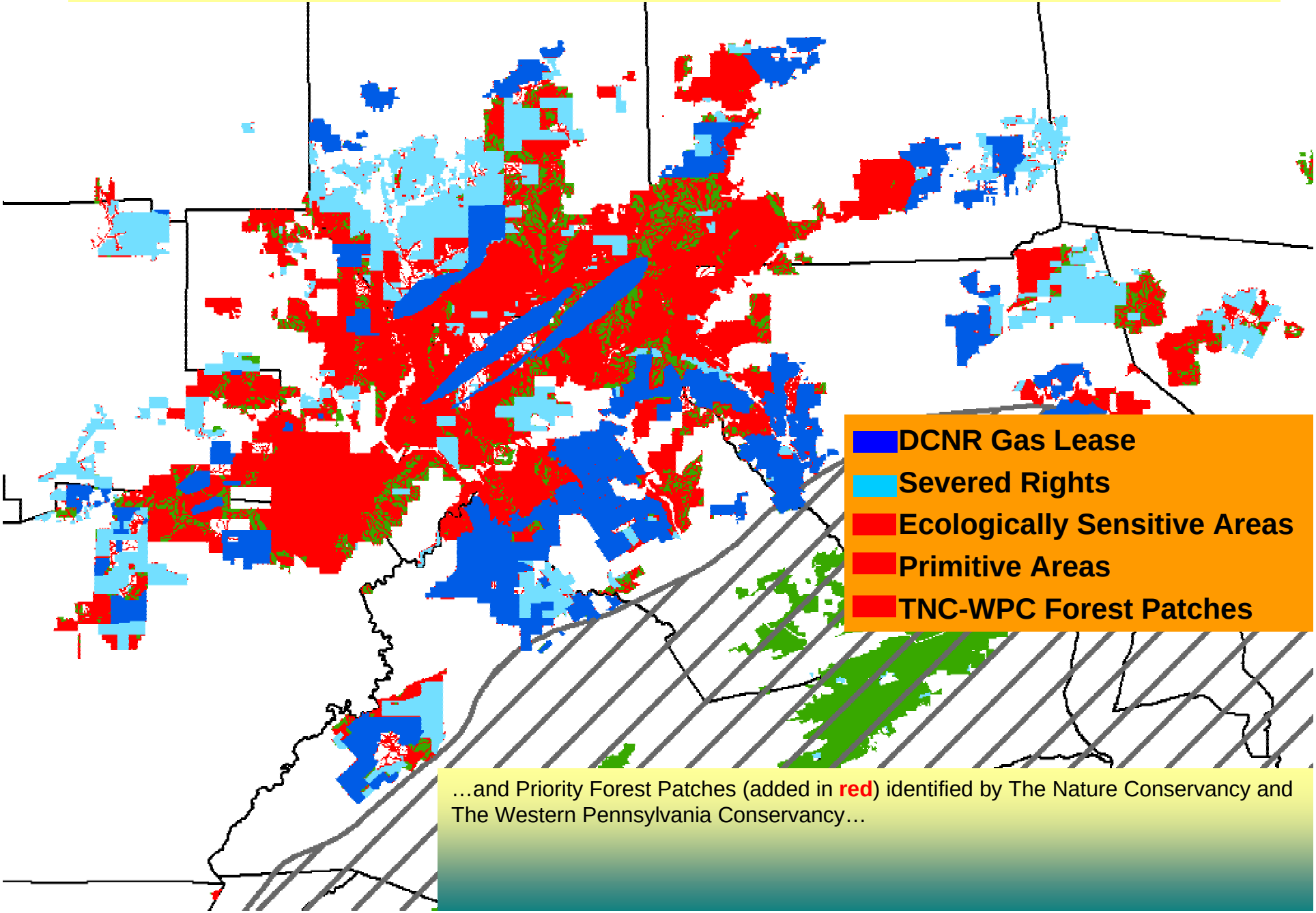
When we add the areas that are ecologically sensitive (**red**)…

Cumulative Assessment & Impacts



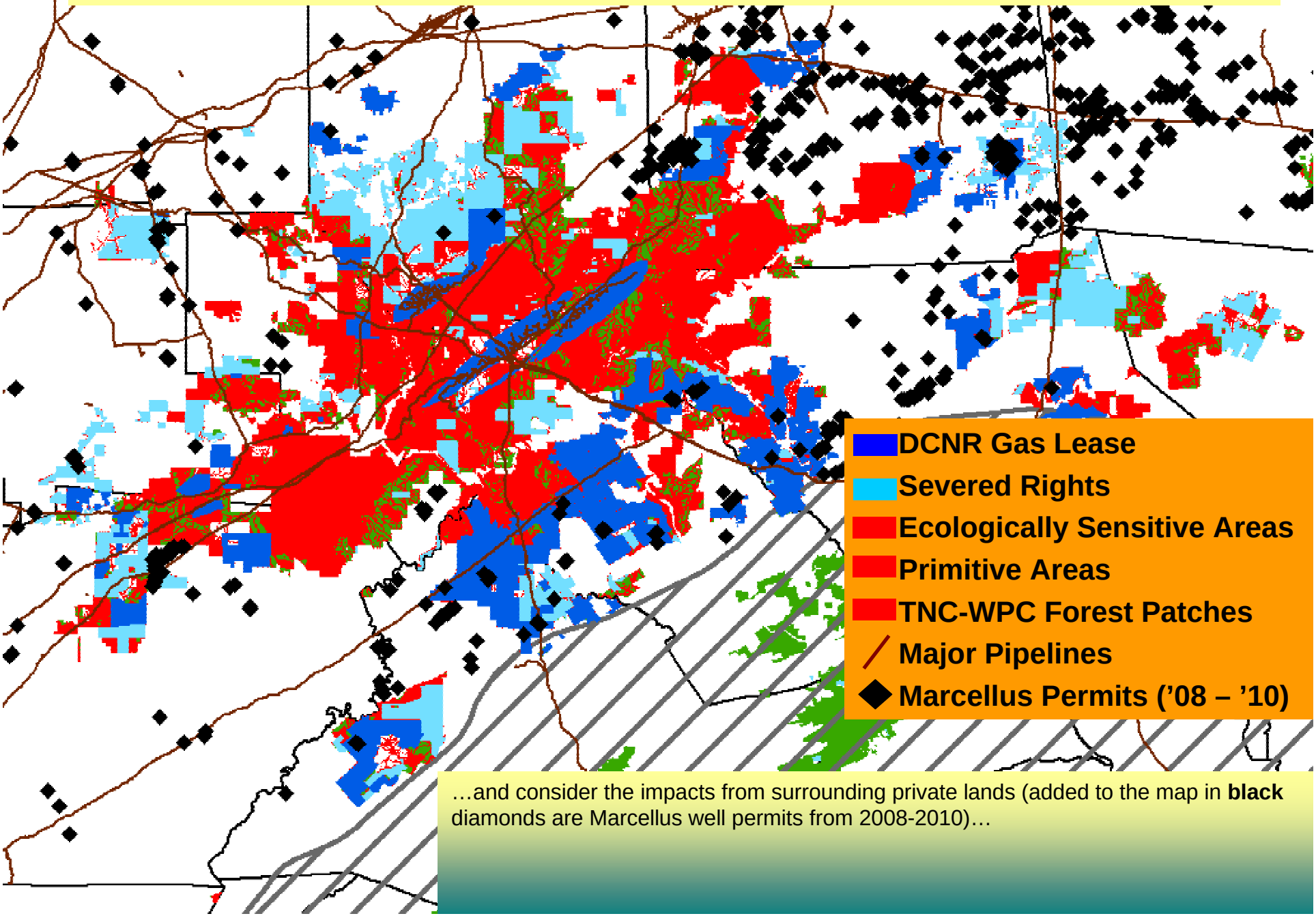
…along with Primitive areas (added in **red**)…

Cumulative Assessment & Impacts



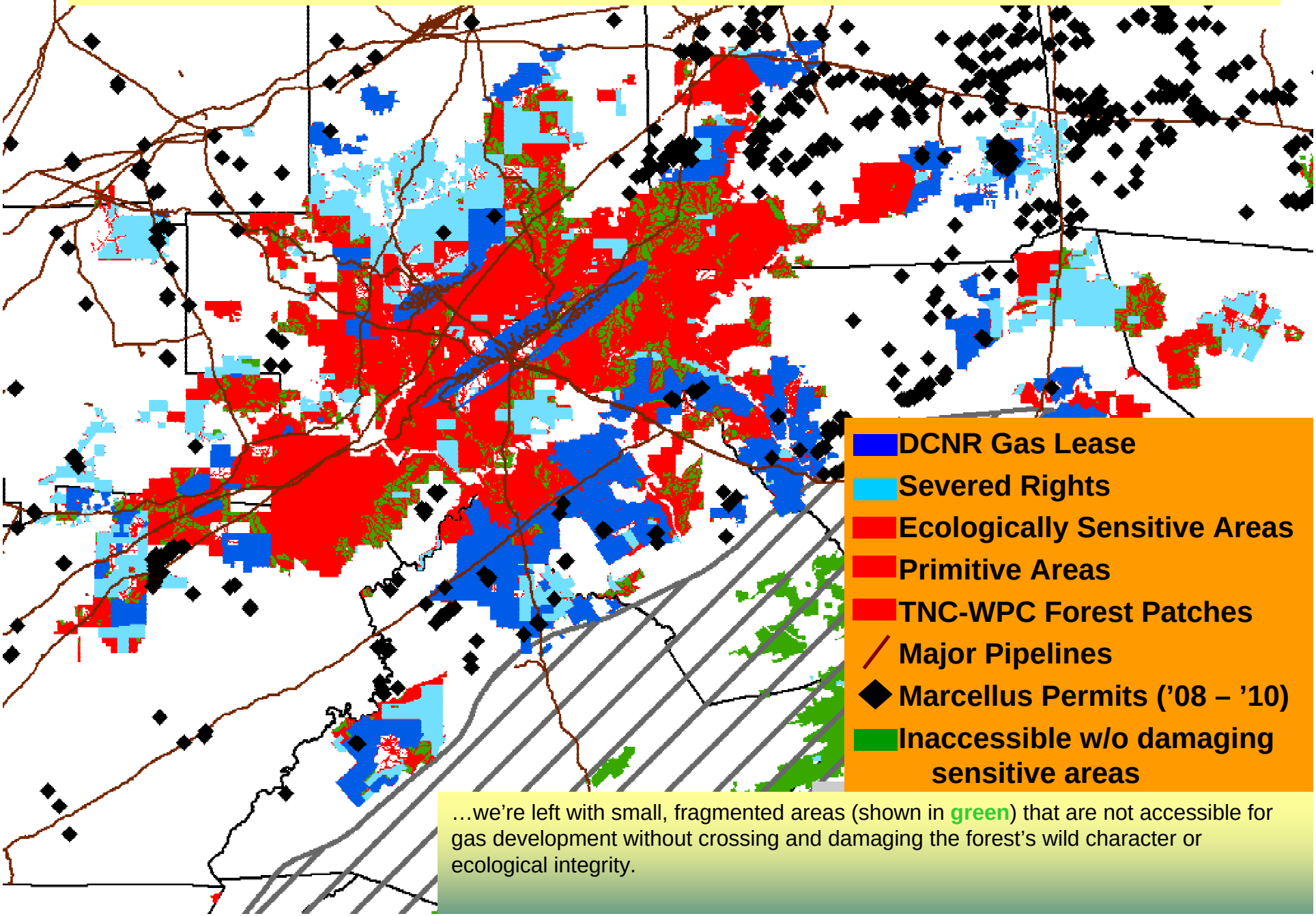
…and Priority Forest Patches (added in **red**) identified by The Nature Conservancy and The Western Pennsylvania Conservancy…

Cumulative Assessment & Impacts



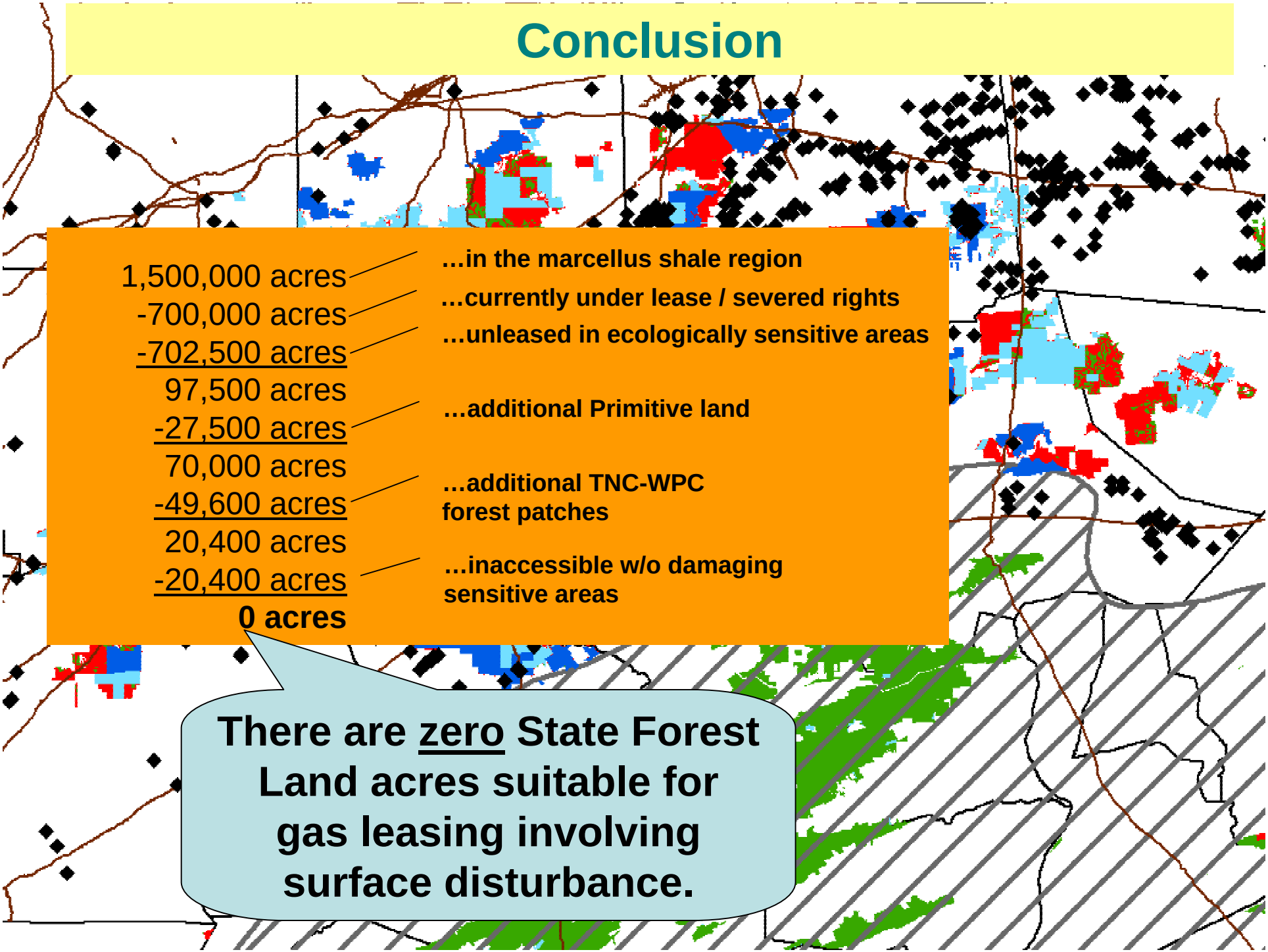
…and consider the impacts from surrounding private lands (added to the map in **black** diamonds are Marcellus well permits from 2008-2010)…

Cumulative Assessment & Impacts



…we're left with small, fragmented areas (shown in **green**) that are not accessible for gas development without crossing and damaging the forest's wild character or ecological integrity.

Conclusion



1,500,000 acres	…in the marcellus shale region
-700,000 acres	…currently under lease / severed rights
-702,500 acres	…unleased in ecologically sensitive areas
97,500 acres	
-27,500 acres	…additional Primitive land
70,000 acres	
-49,600 acres	…additional TNC-WPC forest patches
20,400 acres	
-20,400 acres	…inaccessible w/o damaging sensitive areas
0 acres	

There are zero State Forest Land acres suitable for gas leasing involving surface disturbance.