
Photo: Tamara Gagnolet


Photo: Nels Johnson

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Marcellus Gas Development and Habitat Impacts

Nels Johnson

Pinchot Institute Marcellus Science Workshop
Academy of Natural Sciences , Philadelphia
April 1, 2011

Pennsylvania Energy Impacts Assessment

- **Project Goal**: Develop projections of how new energy development could impact forest, freshwater, and rare habitats to shape strategies that avoid or minimize impacts

- **Energy Types:** Energy types with most potential for land use change during the next twenty years in Pennsylvania:
  - ***Marcellus natural gas***
  - ***Woody biomass***
  - ***Wind***
  - ***Transmission lines (electric and gas)***

- **Analytical Team:** Twelve staff from The Nature Conservancy, Western Pennsylvania Conservancy, Audubon Pennsylvania

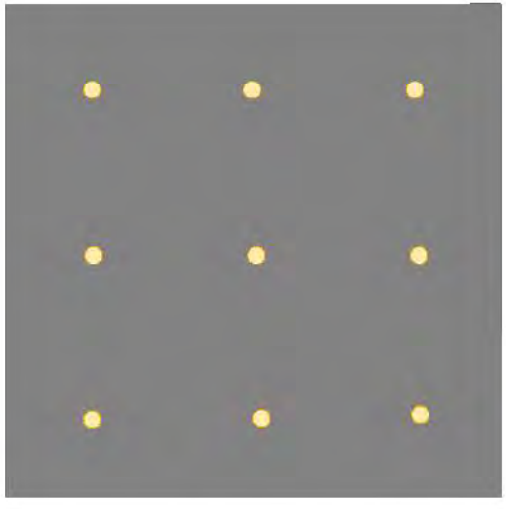
Pennsylvania Energy Impacts Assessment

- **Assumptions**:
  - 20-year time period
  - Stable and sufficient prices and capital investment for steady development growth
  - Continued recent trends and patterns of energy development
- **Keep in mind** that:
  - Energy projections are informed scenarios – *not predictions*
  - The assessment focuses on habitat impacts and *does not* address other potential environmental impacts (water withdrawal, water quality, air quality, and migratory pathways)

Marcellus Shale Natural Gas

Photo: Tamara Gagnolet

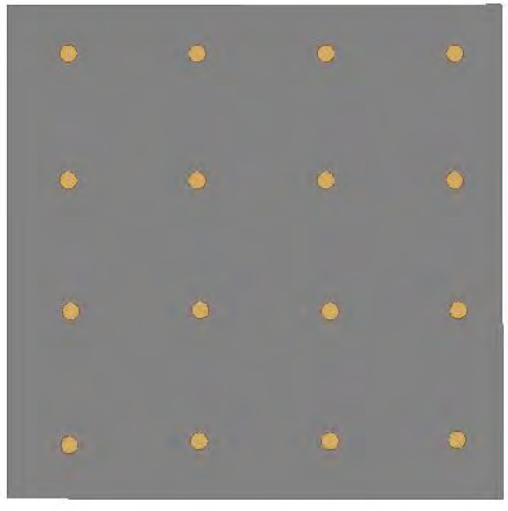
How Many Marcellus Well Pads?



Low Scenario

10 wells per pad

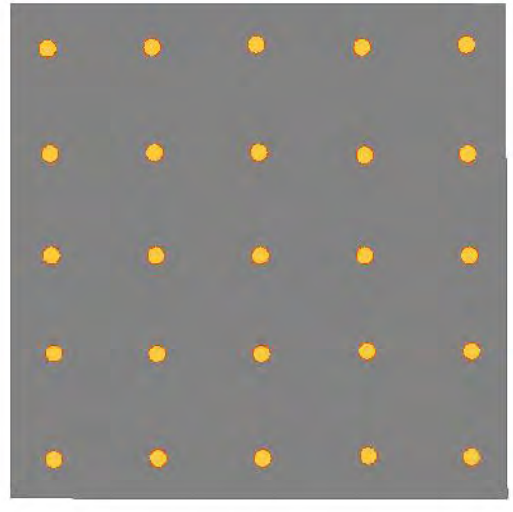
Pads spaced ~5,200 ft apart



Medium Scenario

6 wells per pad

Pads spaced ~4,100 ft apart



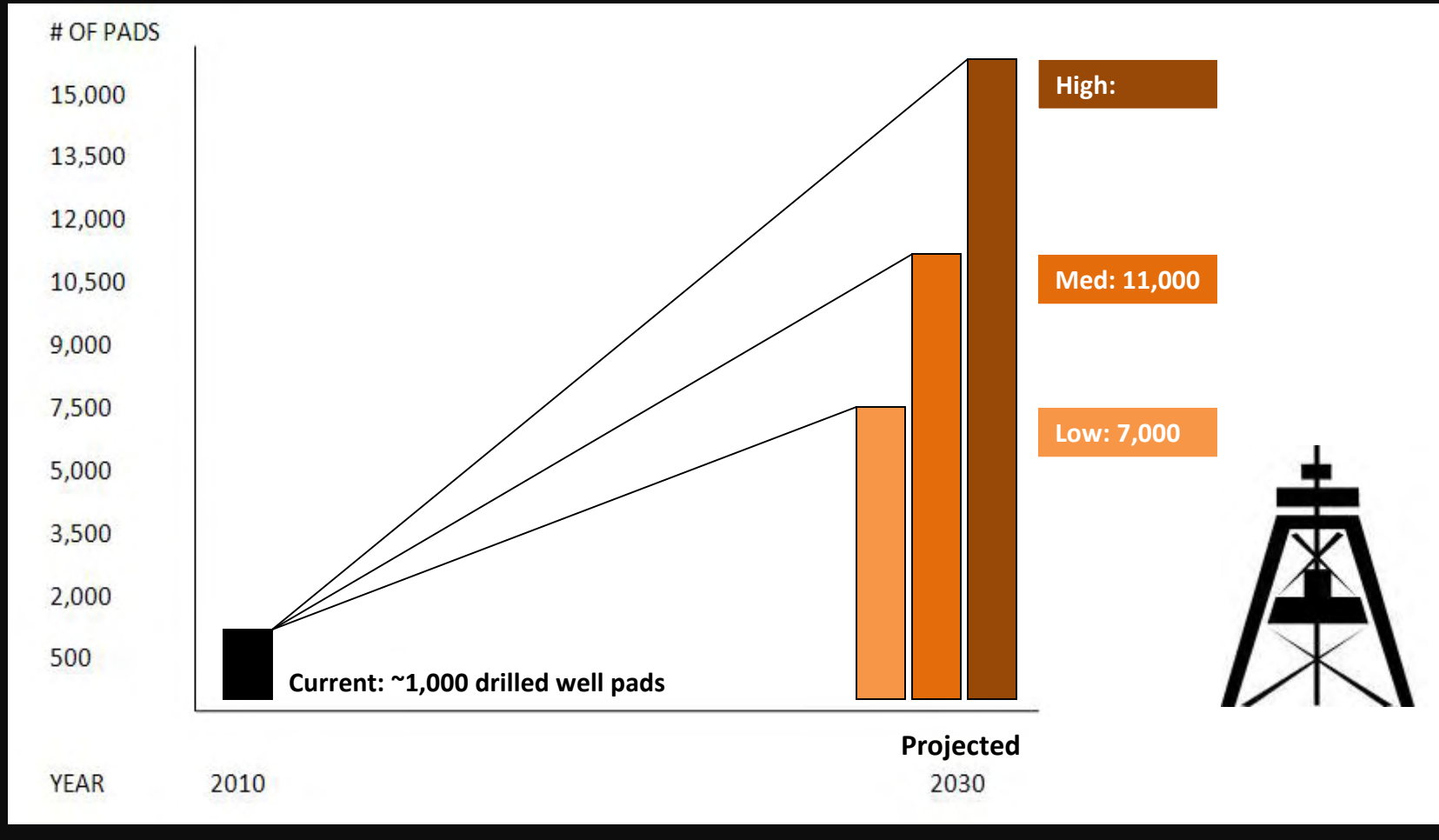
High Scenario

4 wells per pad

Pads spaced ~3,350 ft apart

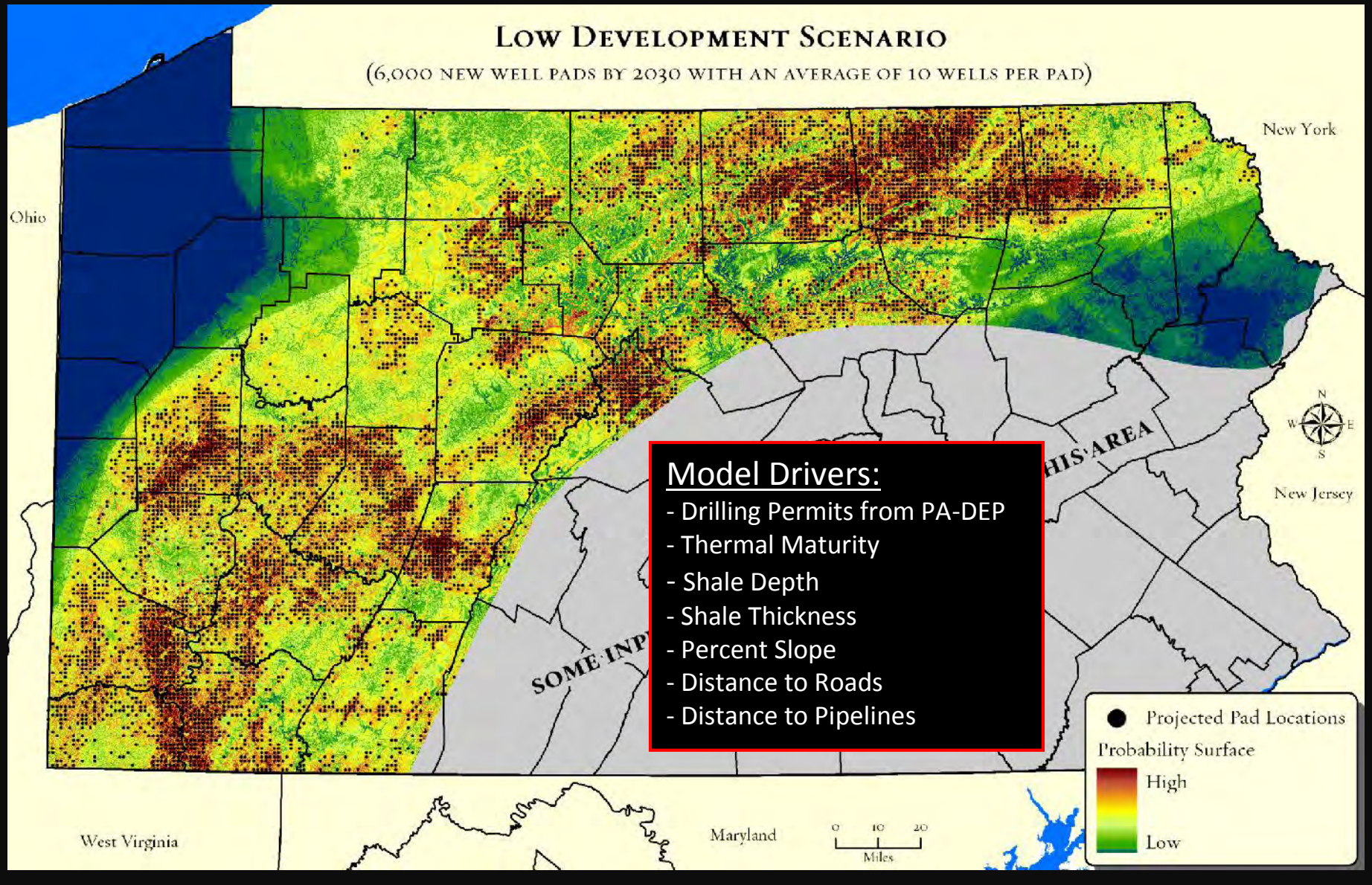
Key drivers: number of rigs, number of wells per pad.

How Many Marcellus Well Pads?



Key drivers: number of rigs, number of wells per pad.

Where Is Marcellus Development Most Likely?



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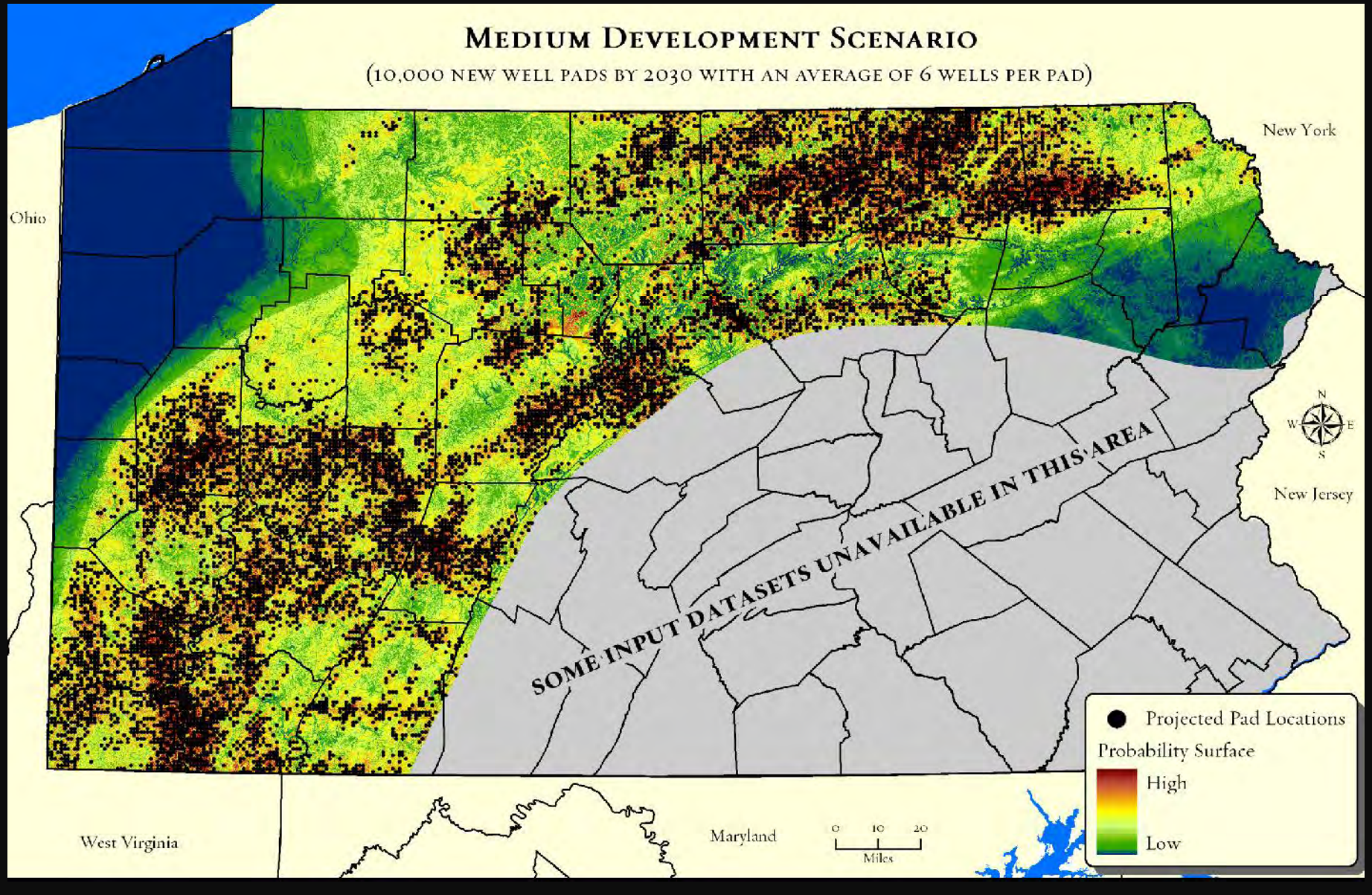

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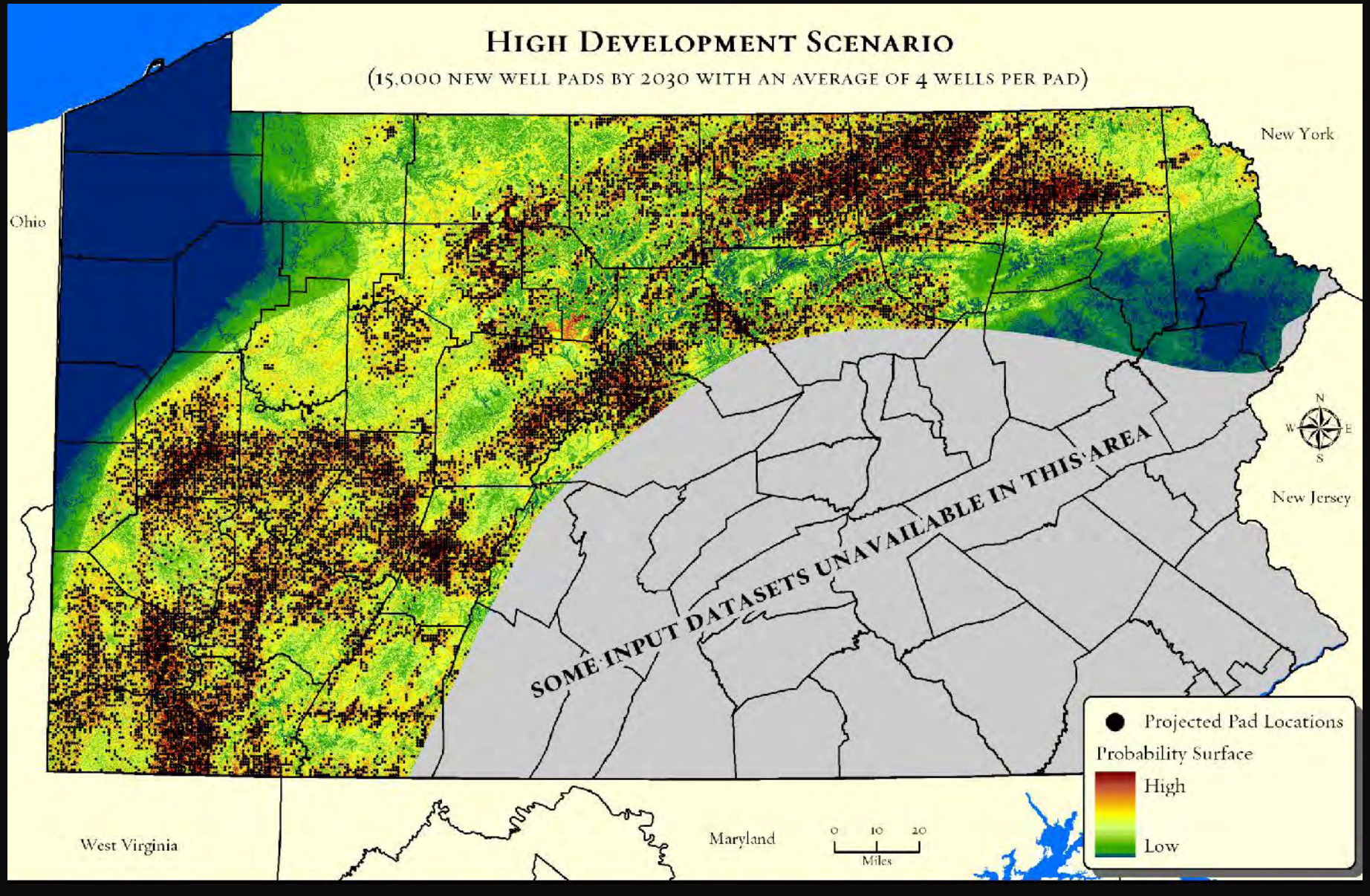

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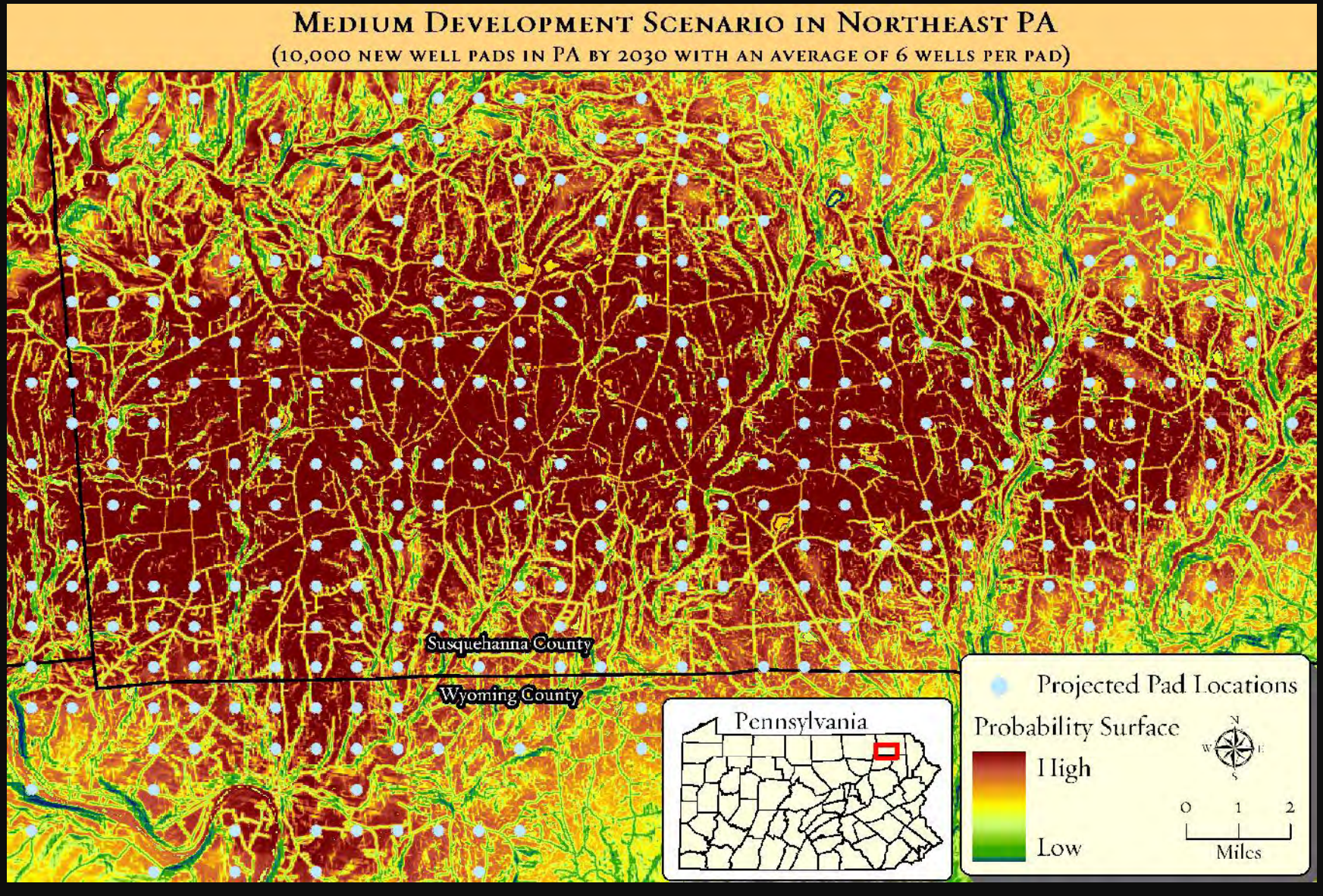

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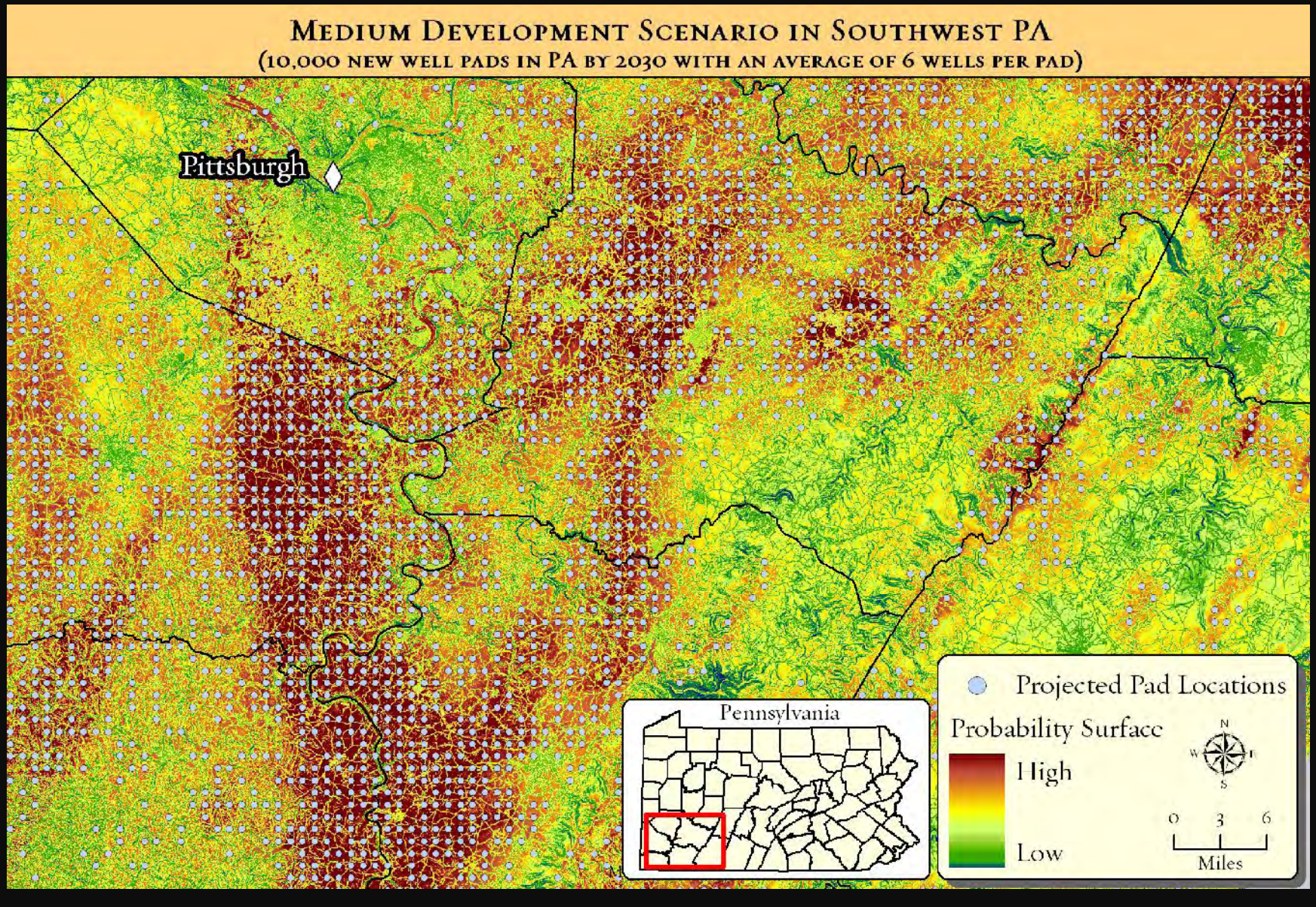
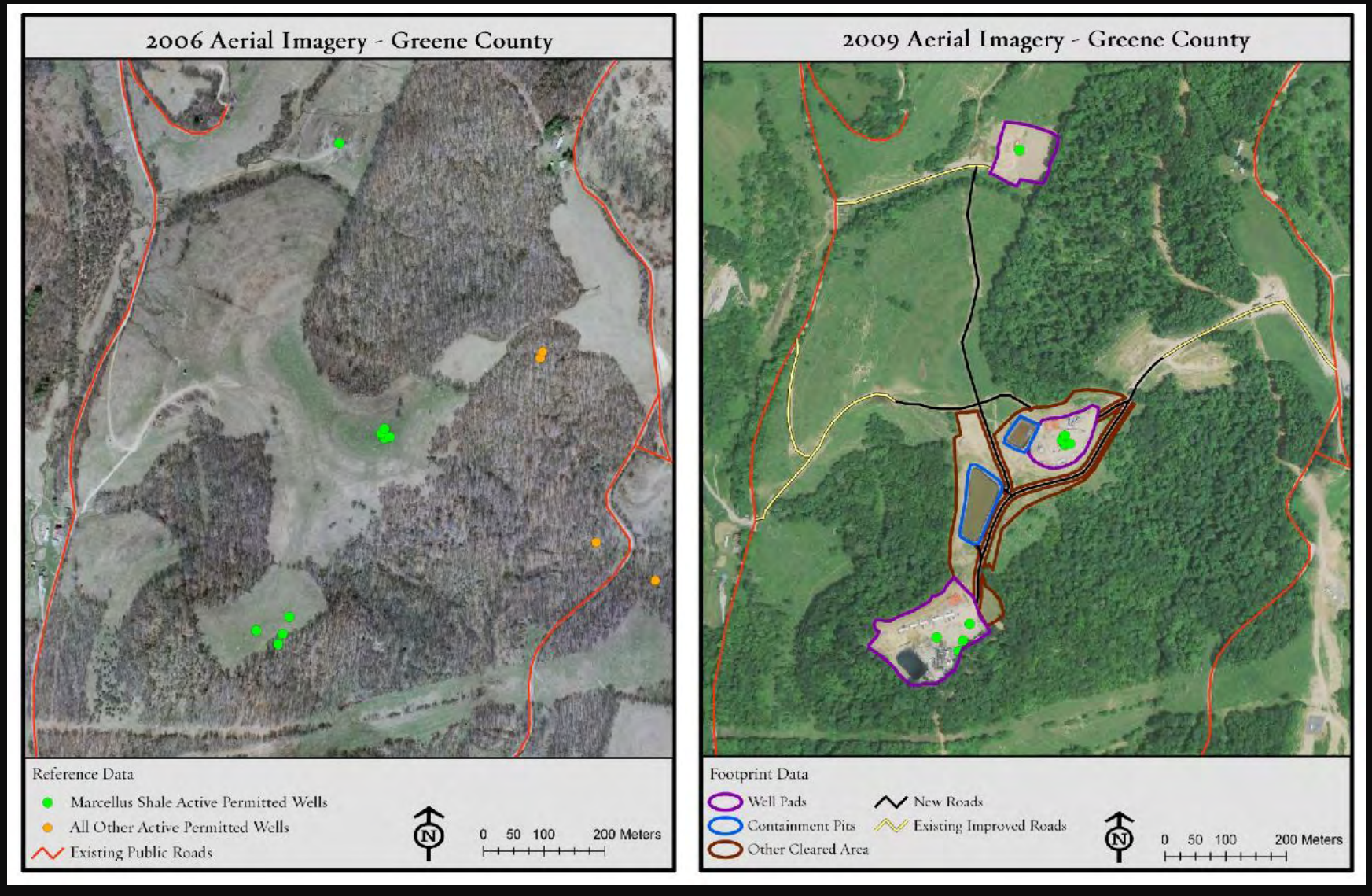
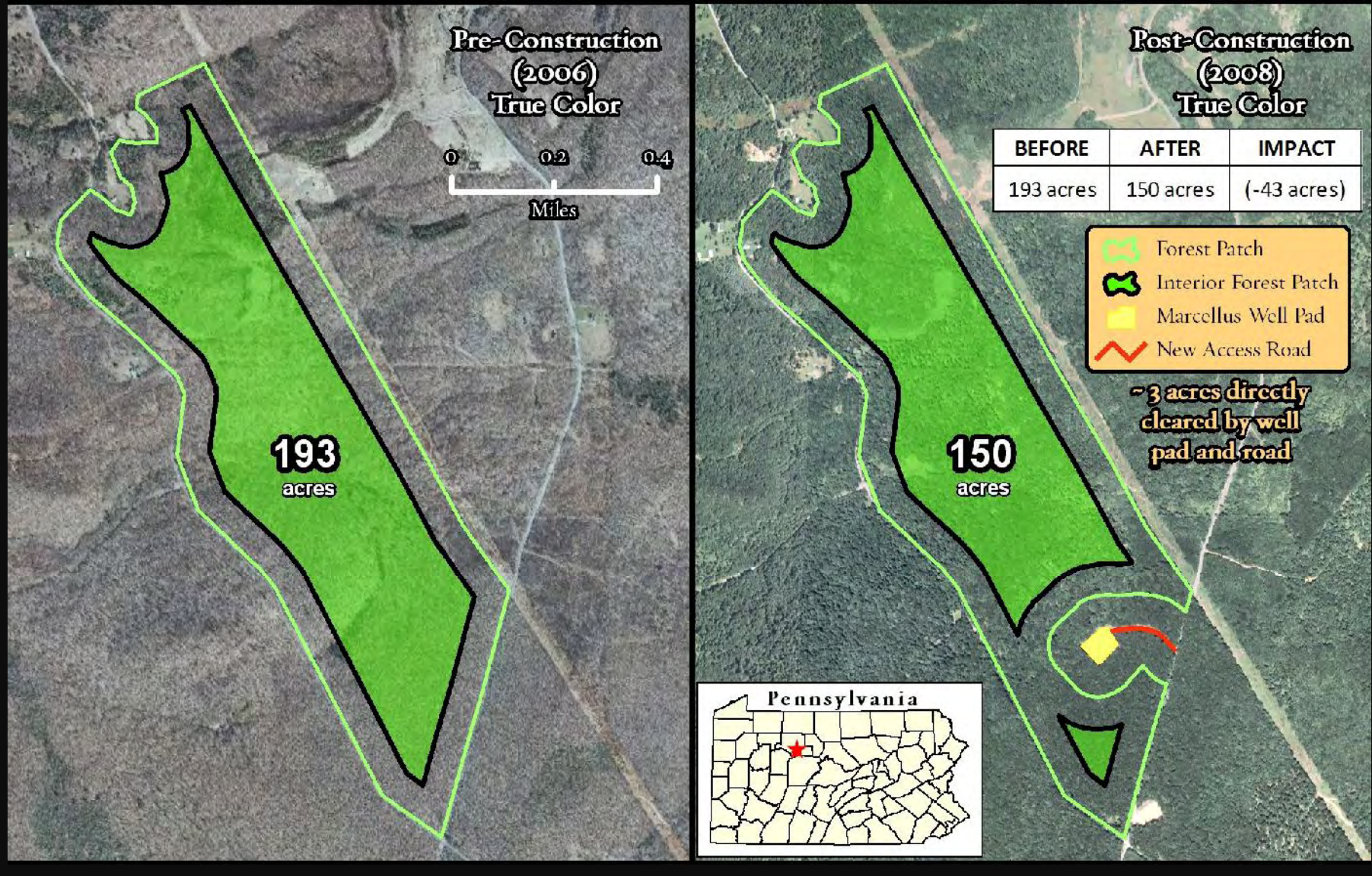


Spatial Footprint – Marcellus Gas



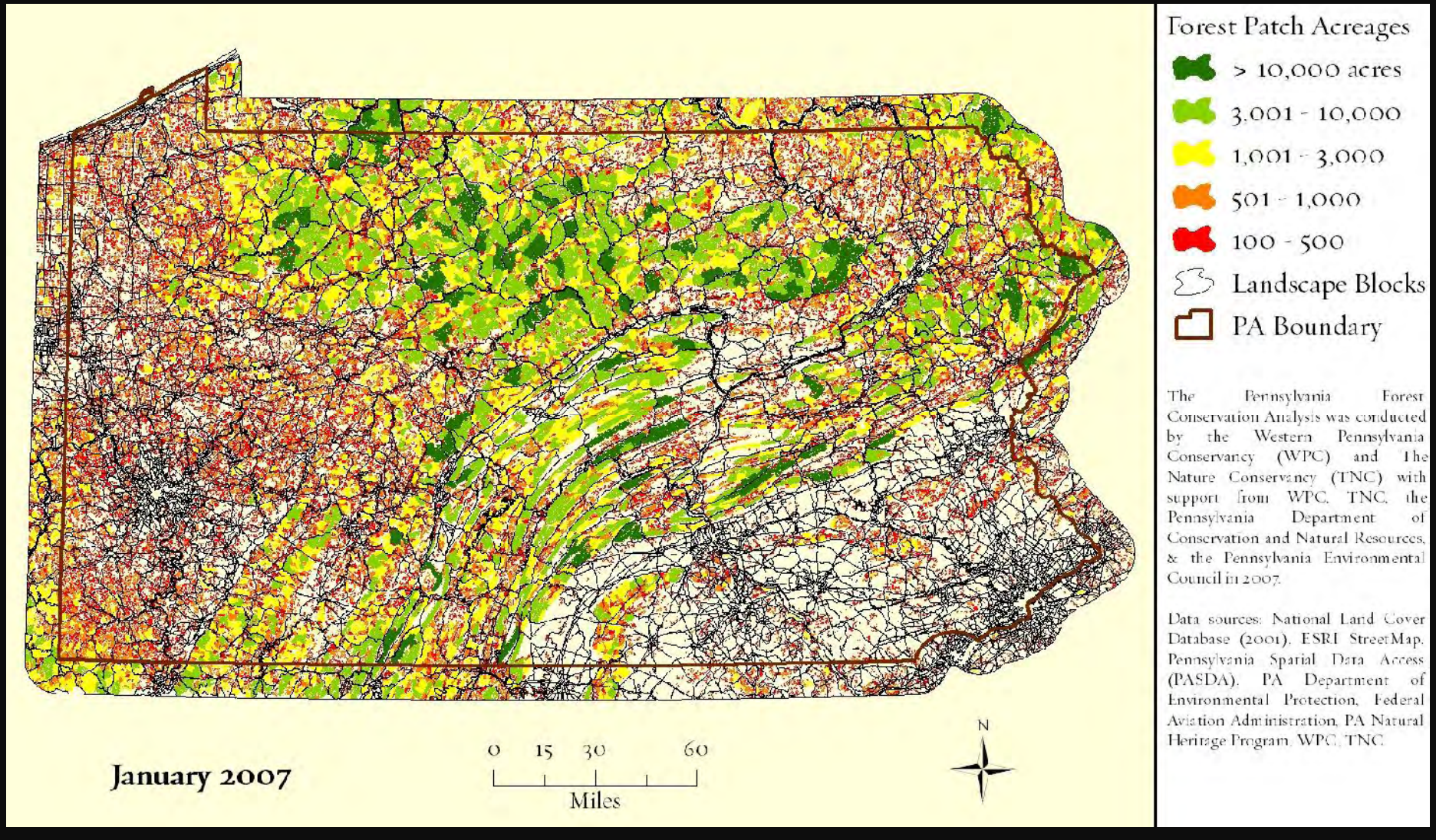
Forest Habitat Impacts – Marcellus Gas



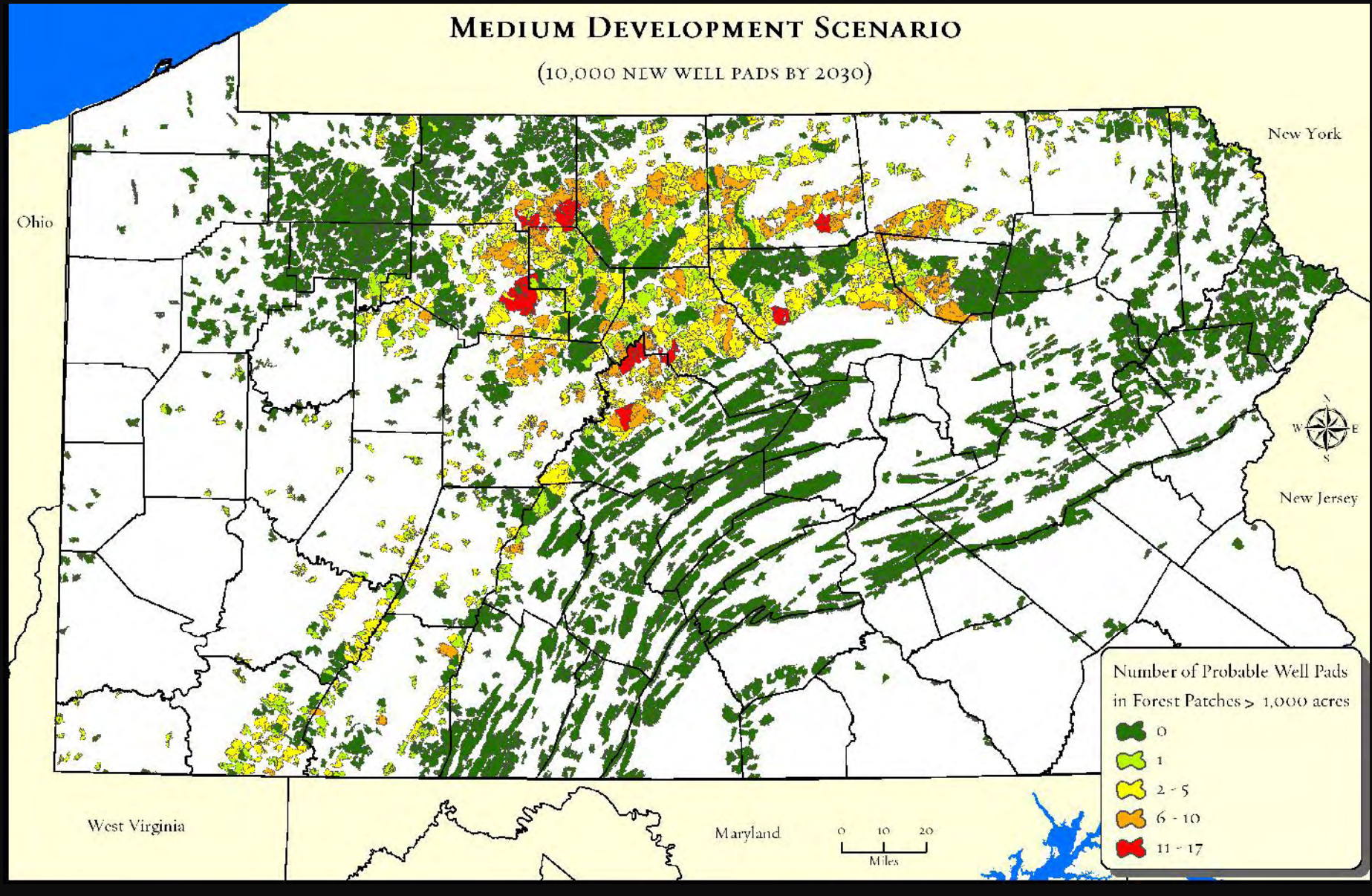
Forest Habitat Impacts – Marcellus Gas

Average Spatial Disturbance for Marcellus Shale Well Pads in Forested Context (acres)		
Forest cleared for Marcellus Shale well pad	3.1	8.8
Forest cleared for associated infrastructure (roads, pipelines, containment pits, etc.)	5.7	
Indirect forest impact from new edges	21.2	
TOTAL DIRECT AND INDIRECT IMPACTS	30	

Pennsylvania Forest Conservation Analysis



How Could Forests Be Affected?



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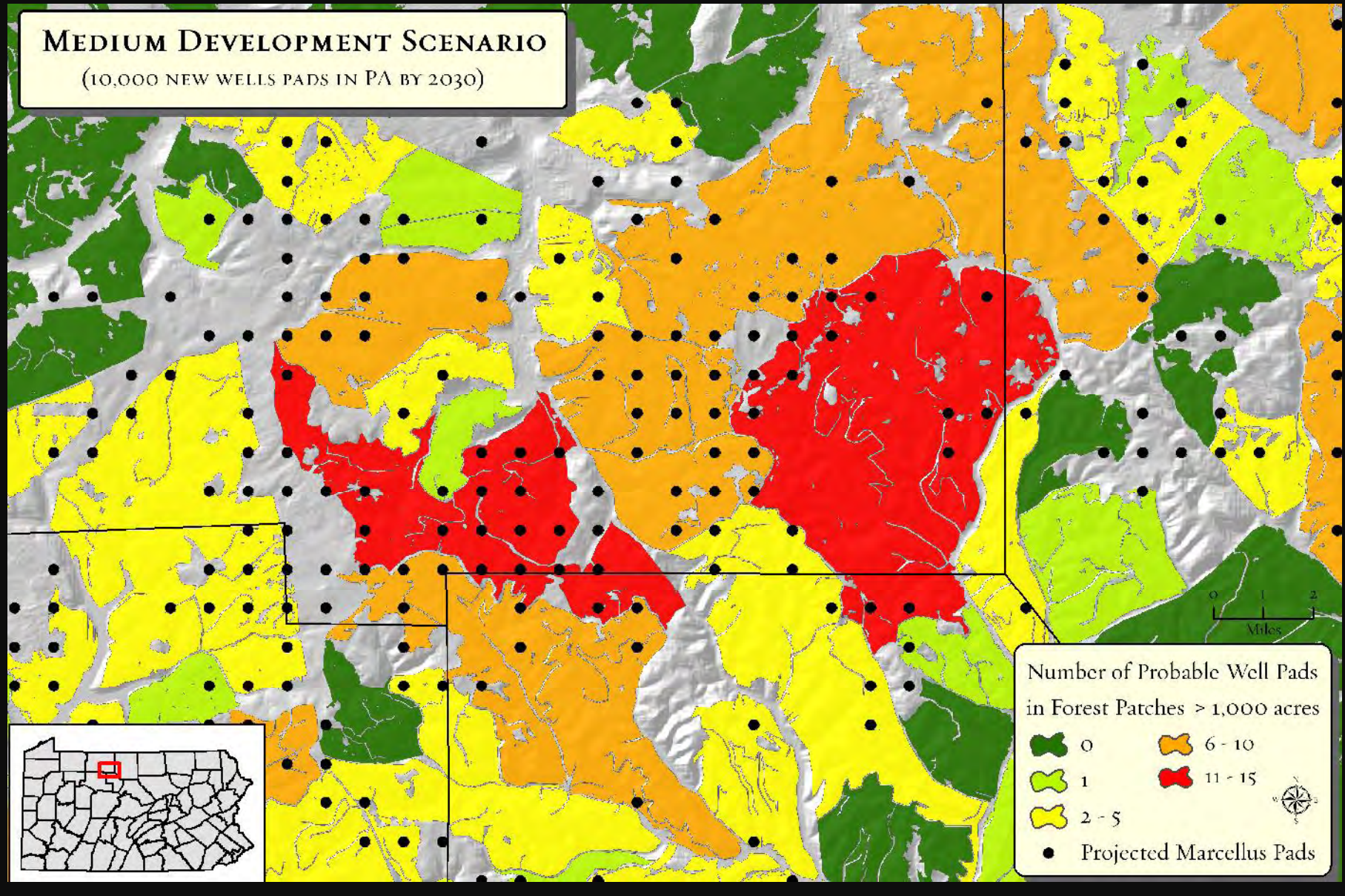
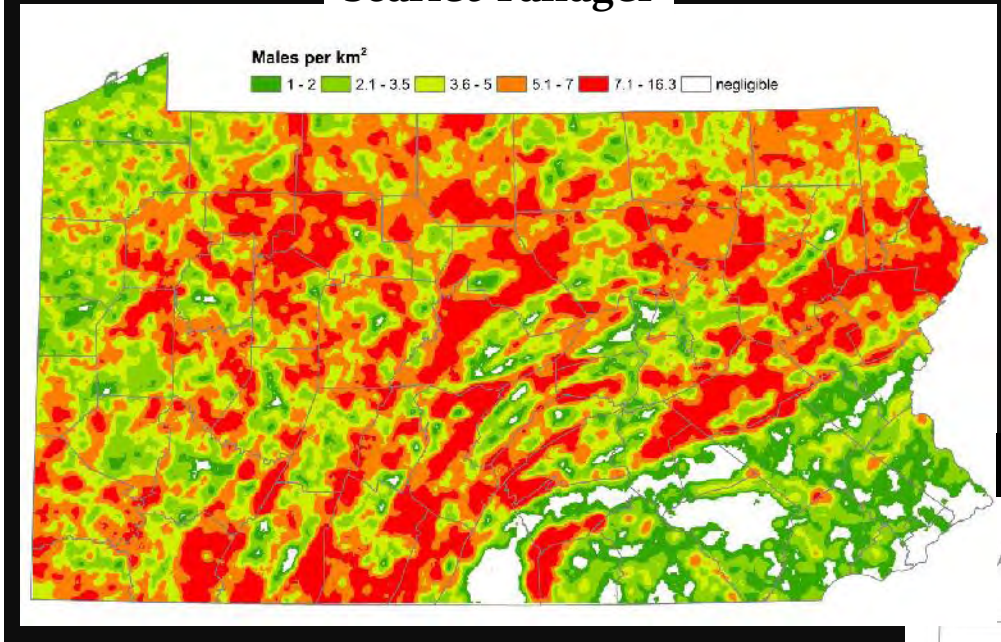
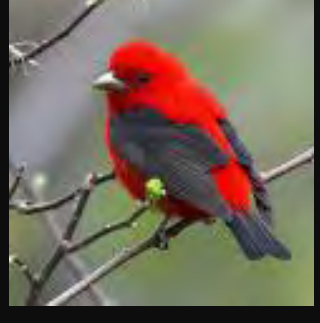


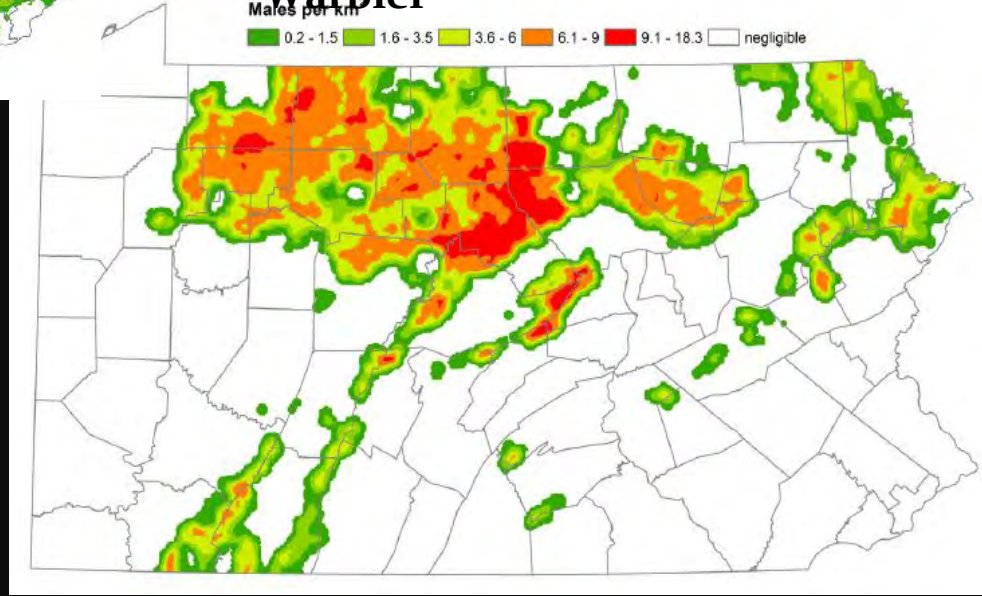
How Could Bird Species Be Affected?

Scarlet Tanager

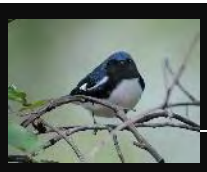




Black-throated Blue Warbler

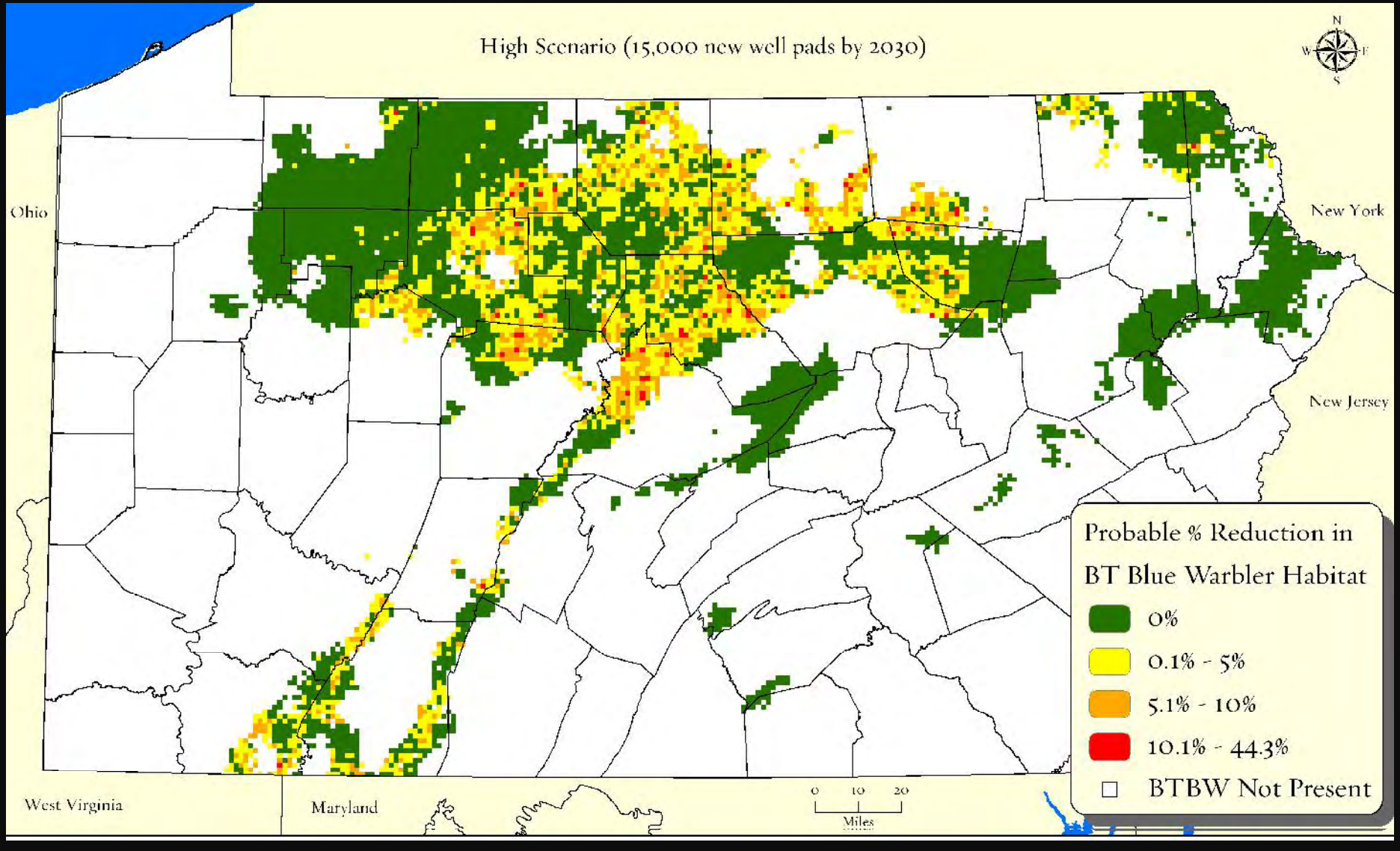


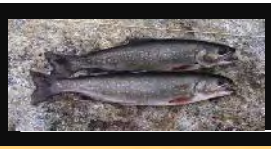
Source: Draft maps from 2nd Pennsylvania Breeding Bird Atlas (2010)



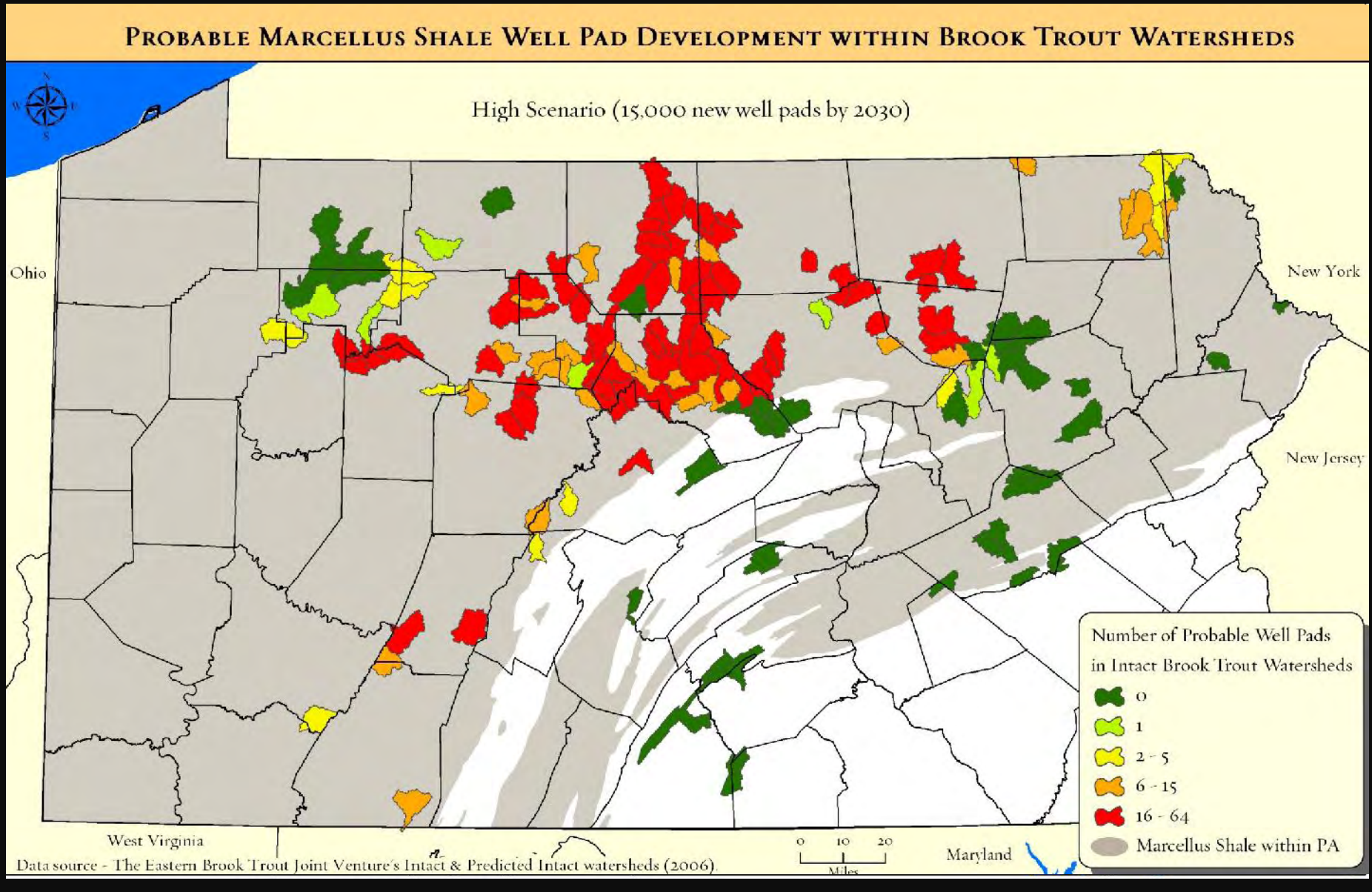
How Could Bird Species Be Affected?

Black-Throated Blue Warbler





How Could Brook Trout Be Affected?

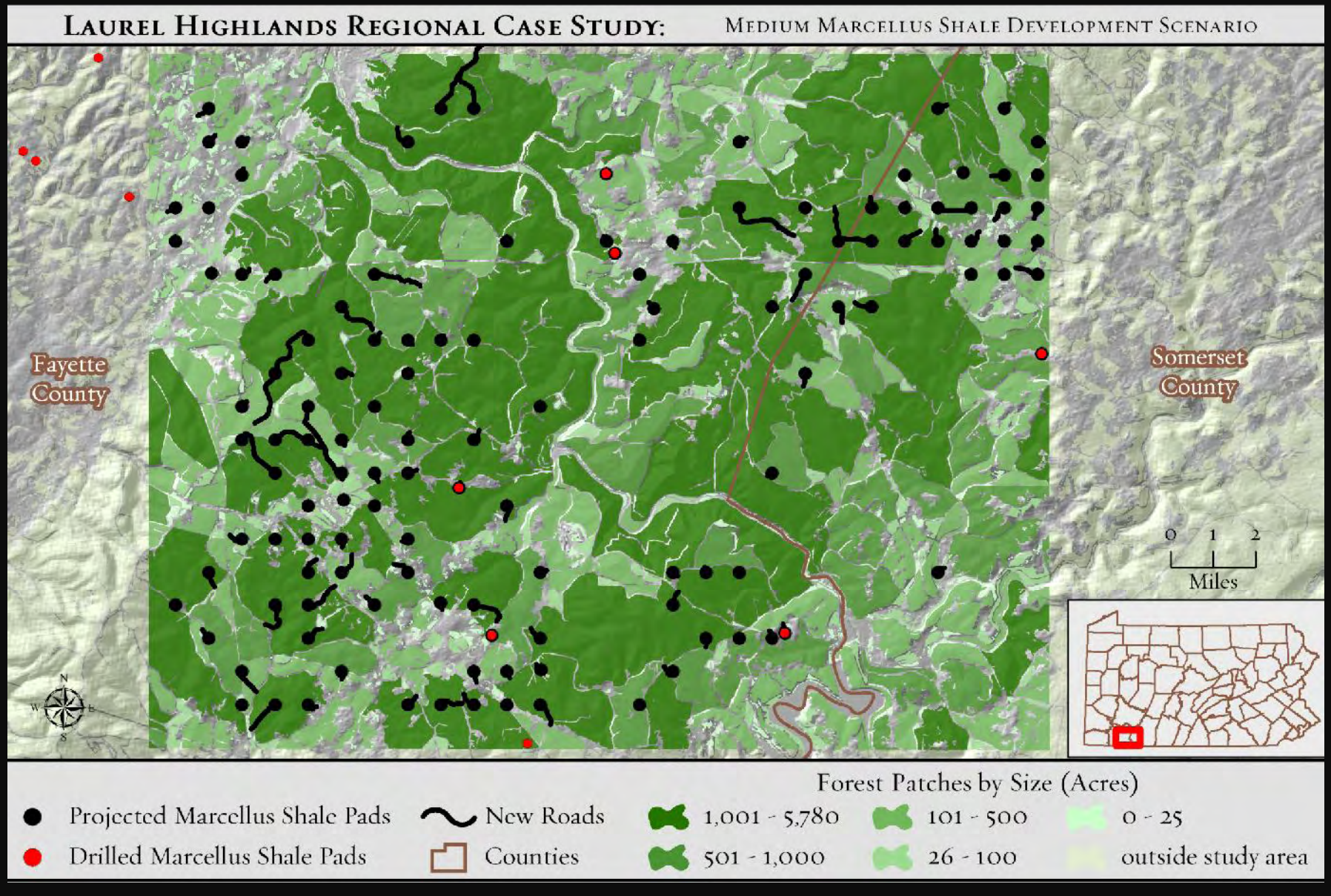


How Could Rare Species Be Affected?

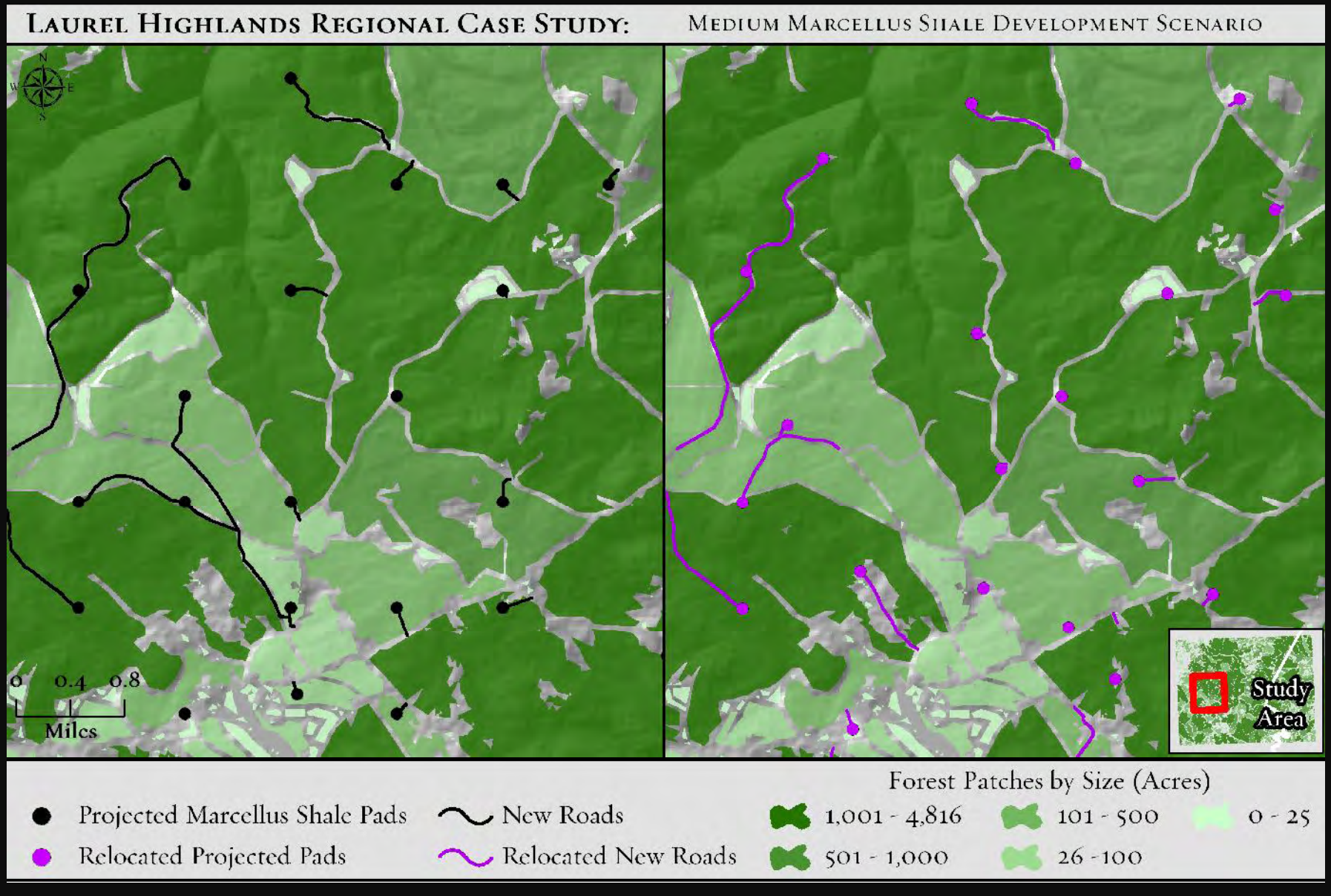
Pennsylvania Natural Heritage Program (PNHP) records indicate that 329 tracked species (~31% of extant taxa in the state) have populations within pixels that have a relatively high modeled probability for Marcellus development. Nearly 40 percent (132) are considered to be globally rare, and most are critically endangered or imperiled in Pennsylvania.

Two examples of species at risk are the green salamander (*Aniedes aeneus)* with all known populations in relatively high probability Marcellus development pixels and snow trillium (*Trillium nivale*) with 73 percent of known populations in relatively high probability pixels.

How Could Forests Be Affected?



How Does Pad Placement Pattern Impact Forest Habitat?



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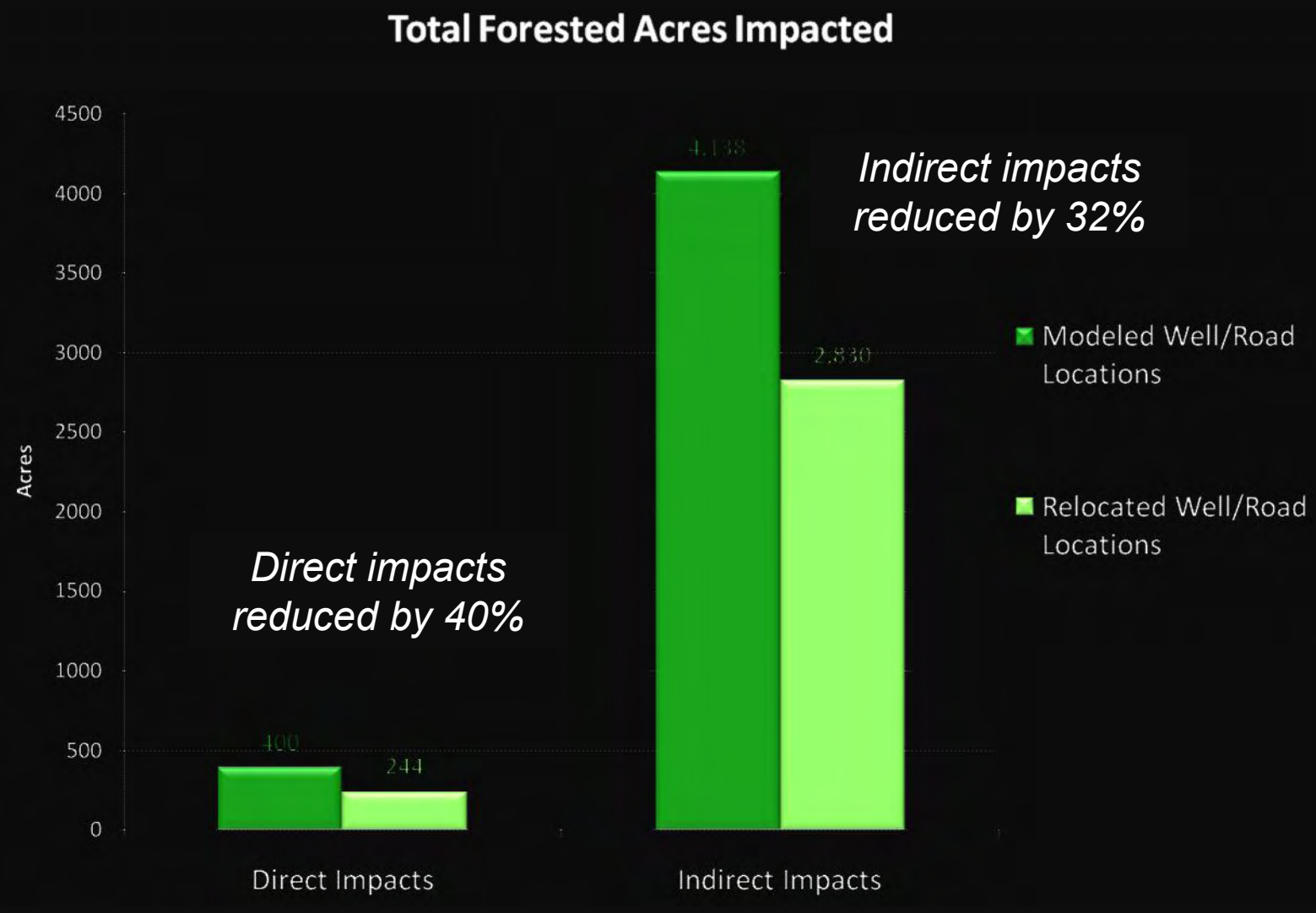

Questions / Comments

***Pennsylvania Energy Impacts Assessment* can be found at:**

www.nature.org/paenergy

Interactive web map at: maps.tnc.org/paenergy

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