



# Marcellus Design

## Pipeline Corridor Ecology

WARNING  
WATERS  
TUNNEL  
RURAL

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LArch 414





## Pipeline Corridor Ecology

By: Andrew Polonus

### Problem Statement:

Pipeline corridors present a unique design challenge. While economics dictates that these pipelines be as direct as possible, this often causes the corridors to intersect valuable forest habitats. The resulting condition is often a fragmented, disturbed landscapes that become avenues for invasive species and offer little opportunity for habitats or biodiversity.

### Project Description:

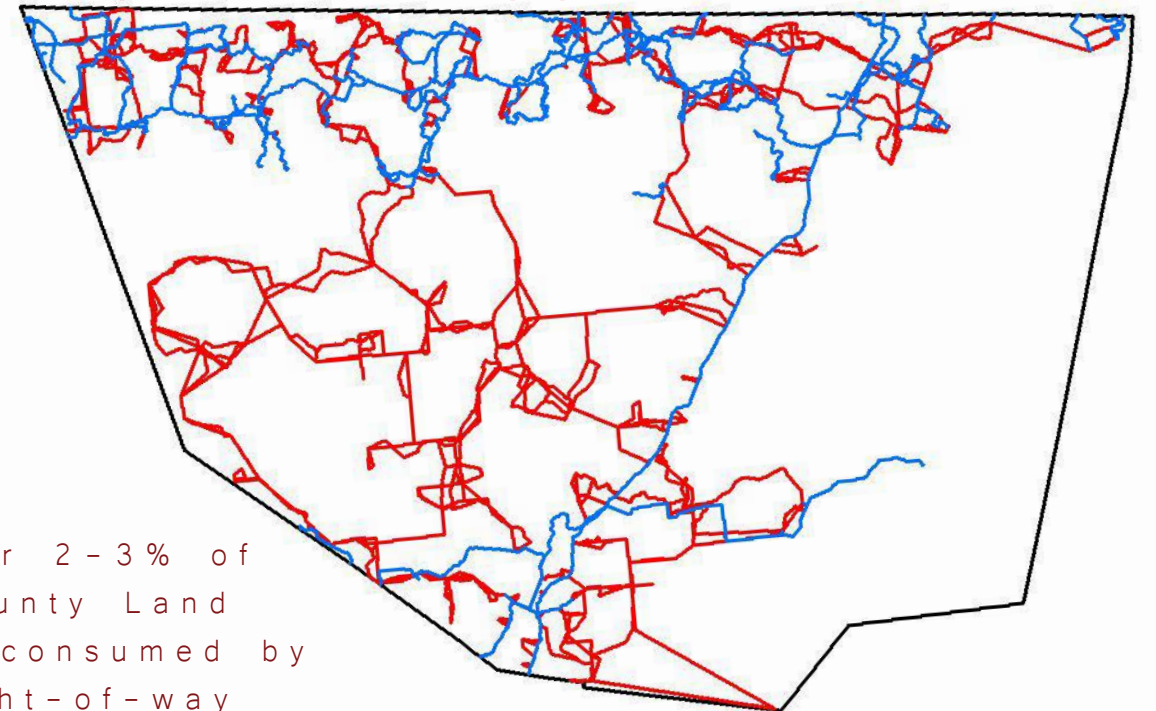
The intent of my project is to identify innovative ecosystem solutions that minimize the impacts of forest fragmentation and habitat degradation while working within the guidelines of pipeline right-of-way construction. The goal is to use these currently underutilized landscapes to enhance the biodiversity and habitat opportunity in Sullivan County.

### Benefits/Goals of Project:

- Implement plant species that provide food and habitat for native wildlife species
- Reduce the harsh edge transition
- Decrease opportunity for invasive species to establish
- Provide solutions for both new corridor construction and existing corridor retrofit
- Increase aesthetic appeal of corridors to reduce visual impact on the landscape



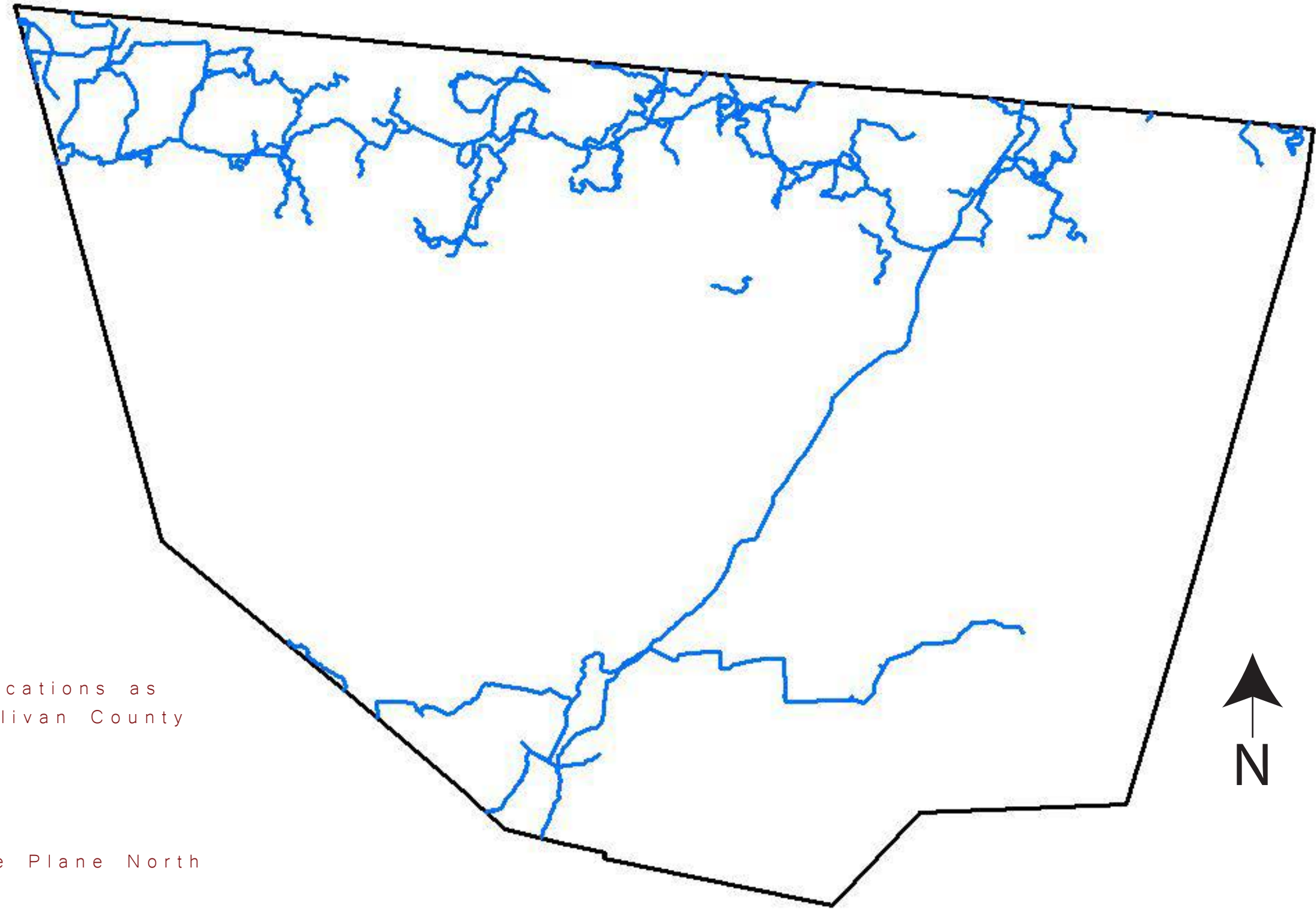
330+ miles of corridor built or in development  
185+ miles of potential new pipeline



Potential for 2-3% of  
Sullivan County Land  
area to be consumed by  
pipeline right-of-way



# Existing Corridor Location



Existing Pipeline Locations as  
provided by the Sullivan County  
Planning Office.

Distance: 330 Miles

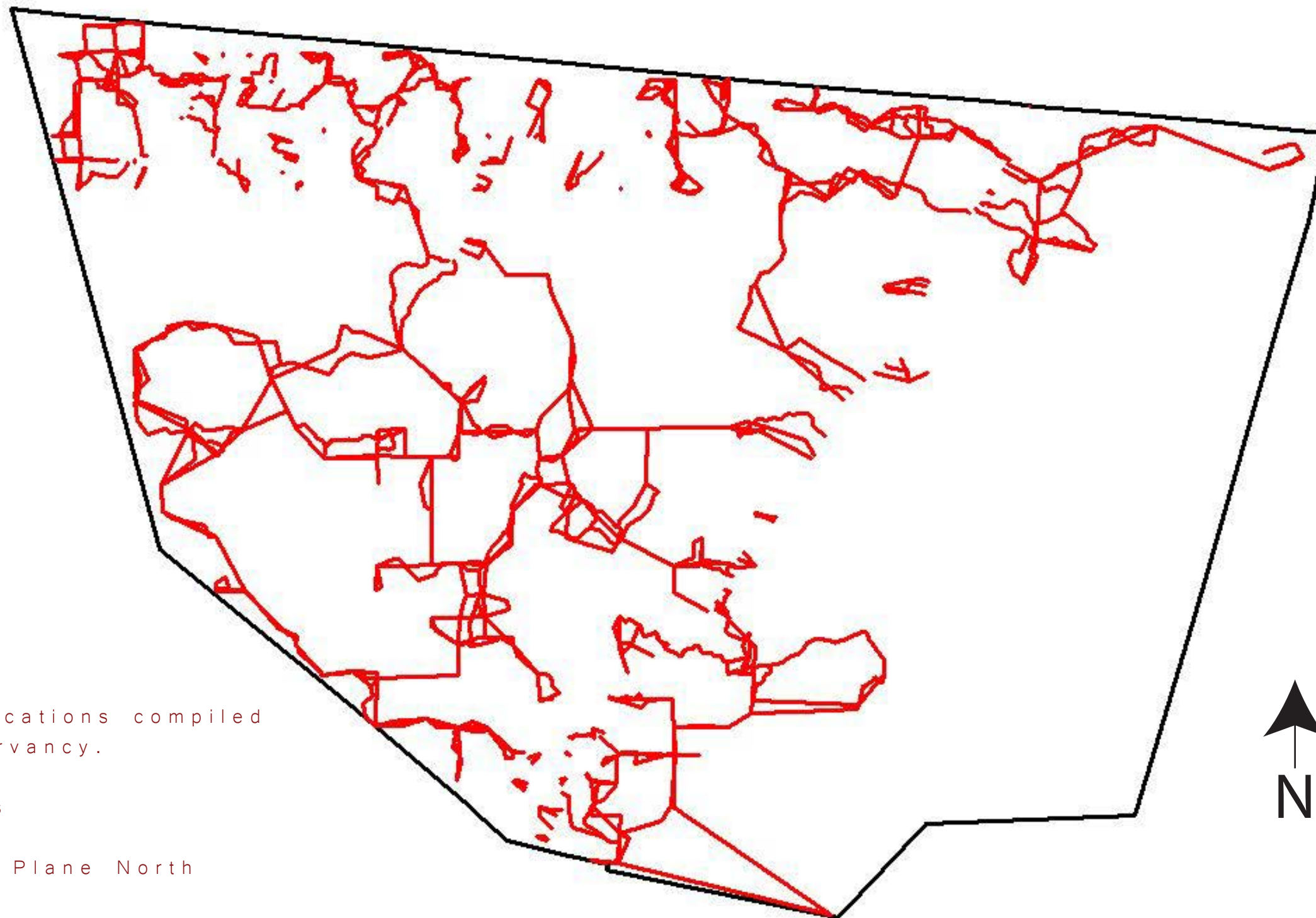
Projection: PA State Plane North





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## Proposed Corridor Locations



Potential Pipeline Locations compiled  
by the Nature Conservancy.

Distance: 185+ Miles

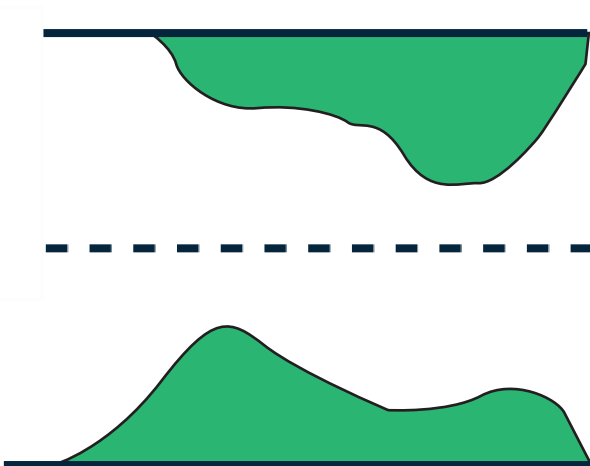
Projection: PA State Plane North





# Varying the Edge Condition

Variation 1: Curvilinear Edges



By creating curvilinear variation in the process of clear cutting, we see an decrease in the overall distance from one side to the other, encouraging inhabitation. Based on the study of landscape ecology by Wenche Dramstad in Landscape Ecology Principals in Landscape Architecture, it is evident that this promotes habitat usage and substantially increases cross traffic as opposed to a stark edge transition.





# Varying the Edge Condition

Variation 2: Curvilinear Edges & Habitat Islands



By creating curvilinear variation in addition to preserving pockets or “islands” of habitat within the corridor, we can strongly encourage wildlife to inhabit the zone. Islands provide pockets of protection, habitat, and food sources for a variety of wildlife types including small game animals, songbirds, and other core habitat species. This theory is derived from the Landscape Ecology Principals in Landscape Architecture by Dramstad as well.





## Proposed Corridor Locations

Allowable Landscaping Diagram



- Grasses / Groundcover
- Low-lying Shrubs (<5')
- Trees & Large Shrubs Permissible

Sample Landscape Guidelines

### 13. LANDSCAPING

- A. Trees are not permitted on DTI's right-of-way.
- B. No large, deep-rooted shrubs are permitted on DTI's right-of-way.
- C. On properties subject to easement agreements with undefined right of way widths, trees must be kept a minimum of twenty-five (25) feet from the edge of the outermost pipelines.
- D. With prior approval from DTI, the planting of lawn and shallow-rooted, low growing shrubs (less than five (5) feet in height at maturity) will be permitted provided that the shrubs are located at least five (5) feet from the edge of each pipeline, thus allowing clearance over each pipeline for periodic inspections of DTI's facilities.

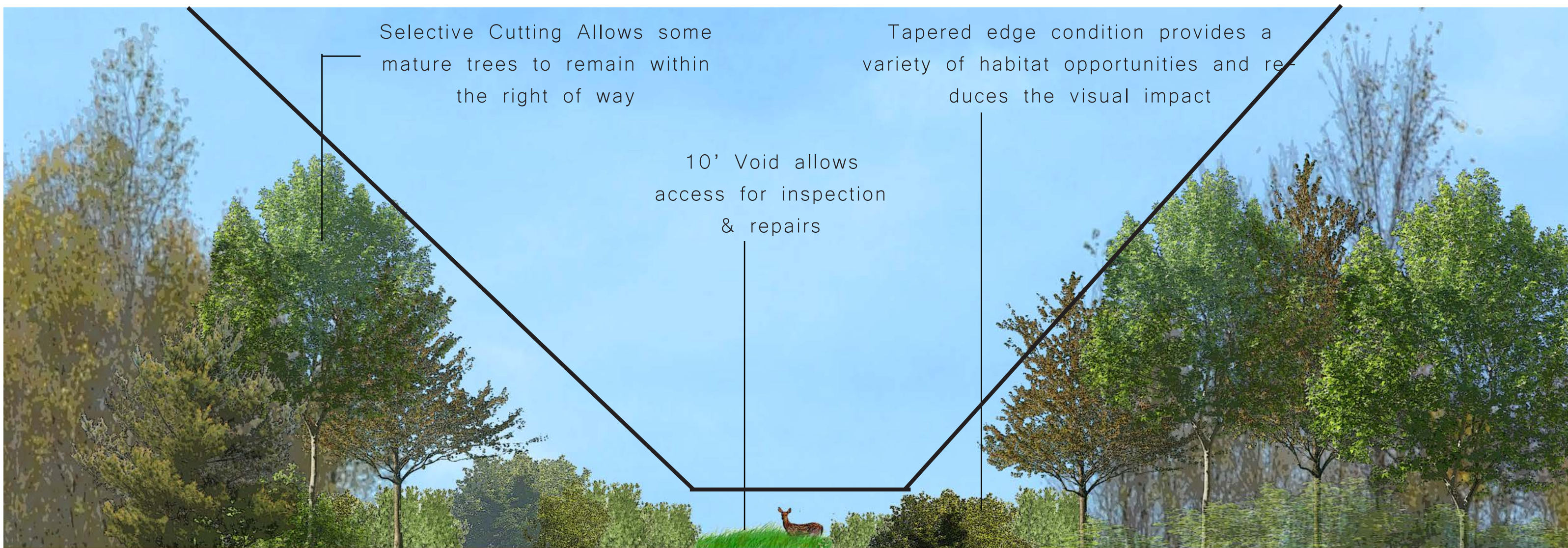
Although it is largely discouraged by the pipeline companies, this sample documentation available from Dominion Transmission makes it clear that planting is in fact allowable on the pipeline corridors. While they initially state no trees and shrubs they quickly go on to state how planting can be accomplished within their guidelines which gives plenty of opportunity within the right-of-way.





## Edge Condition Variation

While working within the guidelines of pipeline corridor construction, we are able to create tapered edge landscapes such as the one shown below. When mature, this habitat represents a well rounded sample of biodiversity while allowing access to the pipeline with grass cover only in order to accommodate repairs, inspection, and maintenance. The tapered edge promotes cross traffic and habitation by a wide variety of native wildlife species.





# Recommended Species

Grass & Groundcover:



Rye Grass  
(Lolium Multiflorum)



Creeping Red Fescue  
(Festuca rubra)



Alsike Clover  
(Trifolium hybridum)

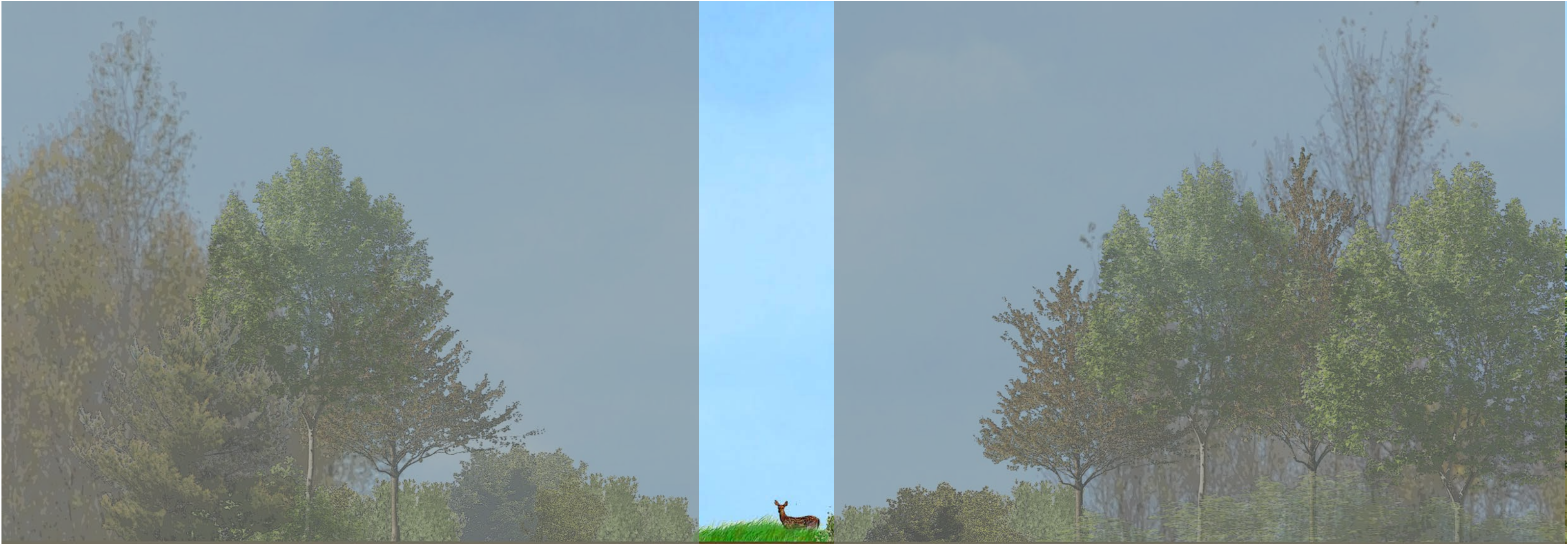


Purpletop  
(Tridens Flavus)



Switchgrass  
(Panicum virgatum)

Working with Penn State Extension research focusing on PA Native plants and cross referencing with many data sources focusing on disturbed sites remediation, I was able to compile a recommended species list for each zone, promoting biodiversity, seasonal interest for wildlife, and food and habitat sources. The grass and groundcover would likely be applied as a seed mix or plug application overtop of the pipeline and out to 5’ beyond the outer boundary of the pipeline.





# Recommended Species

Low-lying Shrubs & Vegetation:



Lowbush  
Blueberry



American  
Elderberry



Common  
Spicebush



Staghorn  
Sumac



Winterberry


Working with Penn State Extension research focusing on PA Native plants and cross referencing with many data sources focusing on disturbed sites remediation, I was able to compile a recommended species list for each zone, promoting biodiversity, seasonal interest for wildlife, and food and habitat sources. The shrubs and low lying vegetation would be best served to be planted as plugs or small nursery grown plants to enhance biodiversity more quickly.








# Recommended Species


Large Shrubs & Small Trees


- 


American Crabapple
- 

Mountain Ash
- 

Chokeberry
- 

Flowering Dogwood
- 

Quaking Aspen
- 

Serviceberry
- 

Hawthorn

Working with Penn State Extension research focusing on PA Native plants and cross referencing with many data sources focusing on disturbed sites remediation, I was able to compile a recommended species list for each zone, promoting biodiversity, seasonal interest for wildlife, and food and habitat sources. Trees and large shrubs should be planted on the boundary of the pipeline in a form that most realistically replicates the local core habitat.







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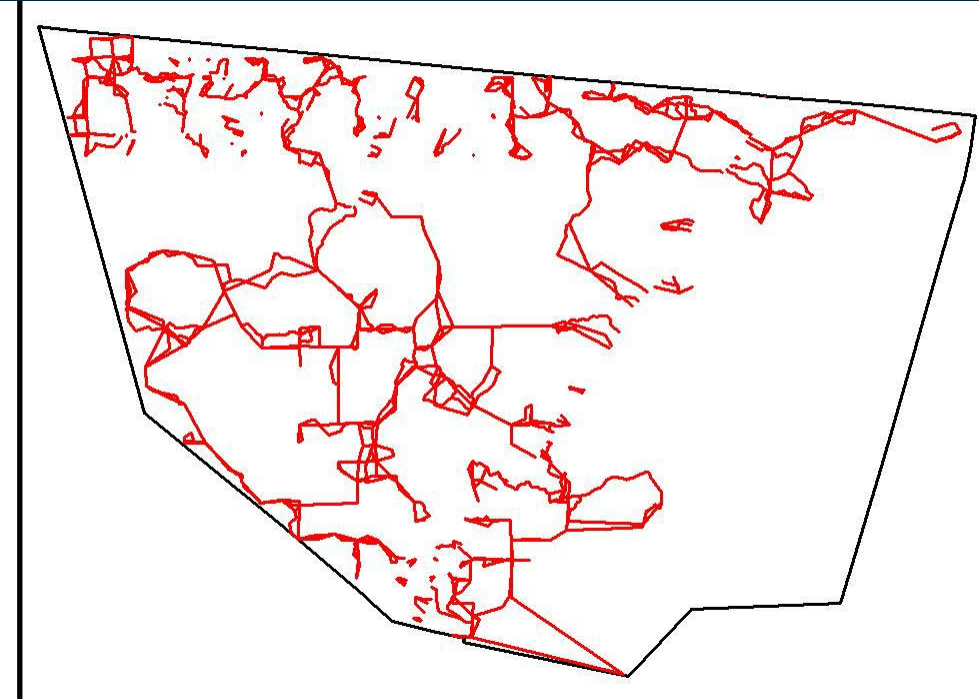


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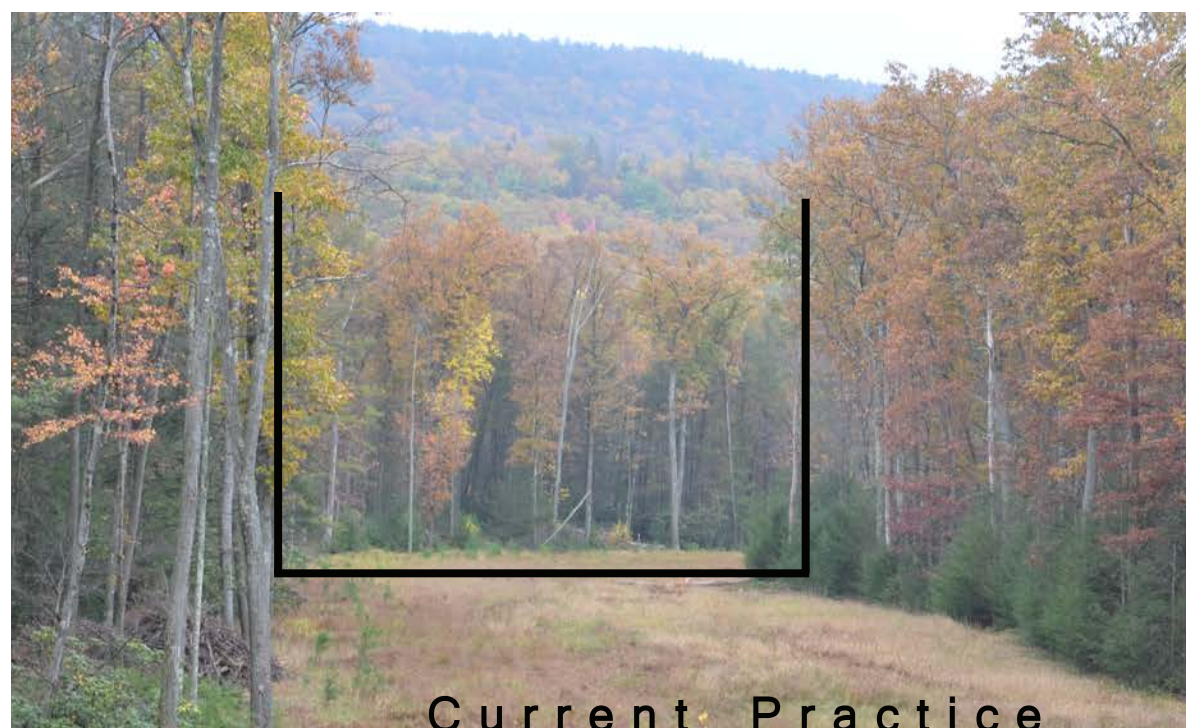
## New Corridor Construction

### Selective Cutting & Recommended Species Infill

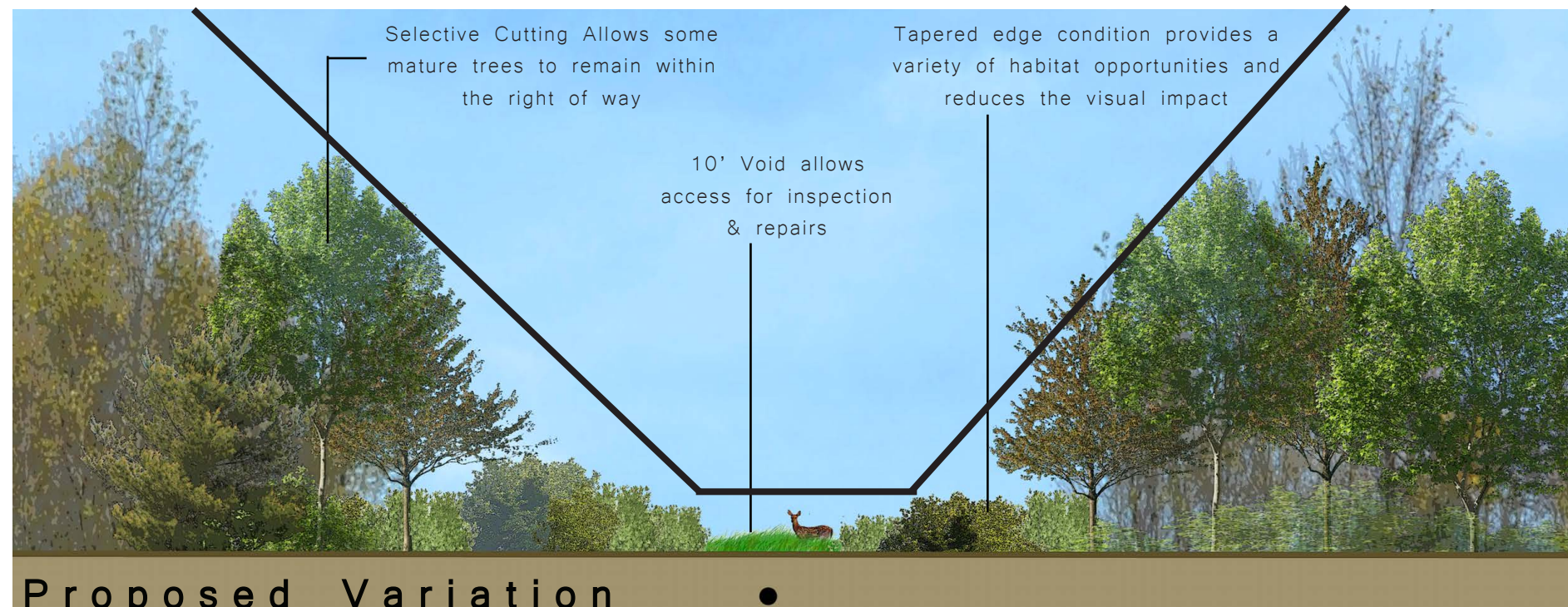
- Survey & tag important specimen for protection during clear cutting process
- Consider curvilinear edge variation that reduces the distance between opposite edges
- After construction & meadow seeding use preserved species as a starting point for woody plant restoration by incorporating into new islands or curvilinear edges
- Filling in the voids with recommended species in addition to the remaining existing species will increase biodiversity and build habitat opportunity for native wildlife



185 miles of proposed corridor



Current Practice



Proposed Variation





Marcellus

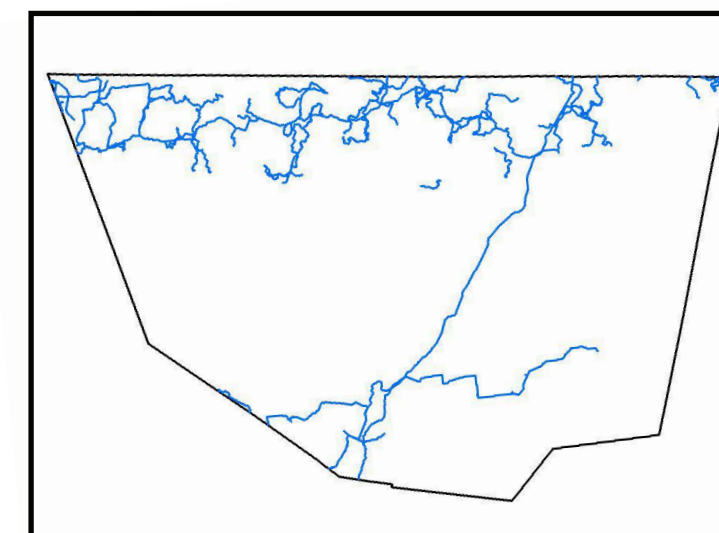


Design

## Existing Corridor Retrofit

Identifying “high priority” corridors for restoration efforts

- Corridors with high visability from roadways and vistas
- Corridors crossing through state forest, gameland, or other ecologically sensitive areas
- Corridors <1 year old as unwanted vegetation has likely not taken a strong foothold



185 miles of existing corridor

- Planning is site specific; Islands can be used to block a view or minimize visual impact
- Plan with the wildlife in mind: work toward the center from the edges insuring minimal allowable gap distance reducing the habitat void
- Diverse plant selection with varied seasonal food and habitat interest will result in the quickest return of wildlife biodiversity in a disturbed site





Marcellus X Design

## Pipeline Corridor Ecology

Pipeline Corridors unfortunately have become barren, disturbed sites that offer little opportunity for habitat or biodiversity. However, This doesn't have to be the case. With careful planning, a focus on preservation, and adapted clear cutting and replanting processes we can change the landscape of existing corridors as well as newly constructed corridors to reduce the fragmentation and habitat degradation they typically cause.

WARNING  
WATERS  
TURNS  
RIGHT