



M a r c e l l u s X D e s i g n

The Sullivan County Design Charette

The Pennsylvania State University

Landscape Architecture

2013

Stormwater Mitigation

By: Brandon Graham



“ Once destroyed, nature’s beauty cannot be repurchased at any price ” - Ansel Adams

Problem Statement:

Natural gas pipeline corridors located throughout Sullivan County weave throughout the landscape, leaving Right-of-Way scars and strong visual impacts. What goes unnoticed however is the runoff and other stormwater concerns created from a landscape with vast differences from the largely forested surroundings.

Project Description:

The necessary removal of forest cover to accommodate well-pads, pipelines and access roads results in a change of land cover that usually results in increased intensity and volume of runoff, as well as increased sediment transport to streams. An analysis of stormwater design of pipeline corridors in several slope and adjacent land use conditions will compare current practices with application of best practices approaches to provide design alternatives which better mimic the hydrological performance of prior forest/natural conditions.

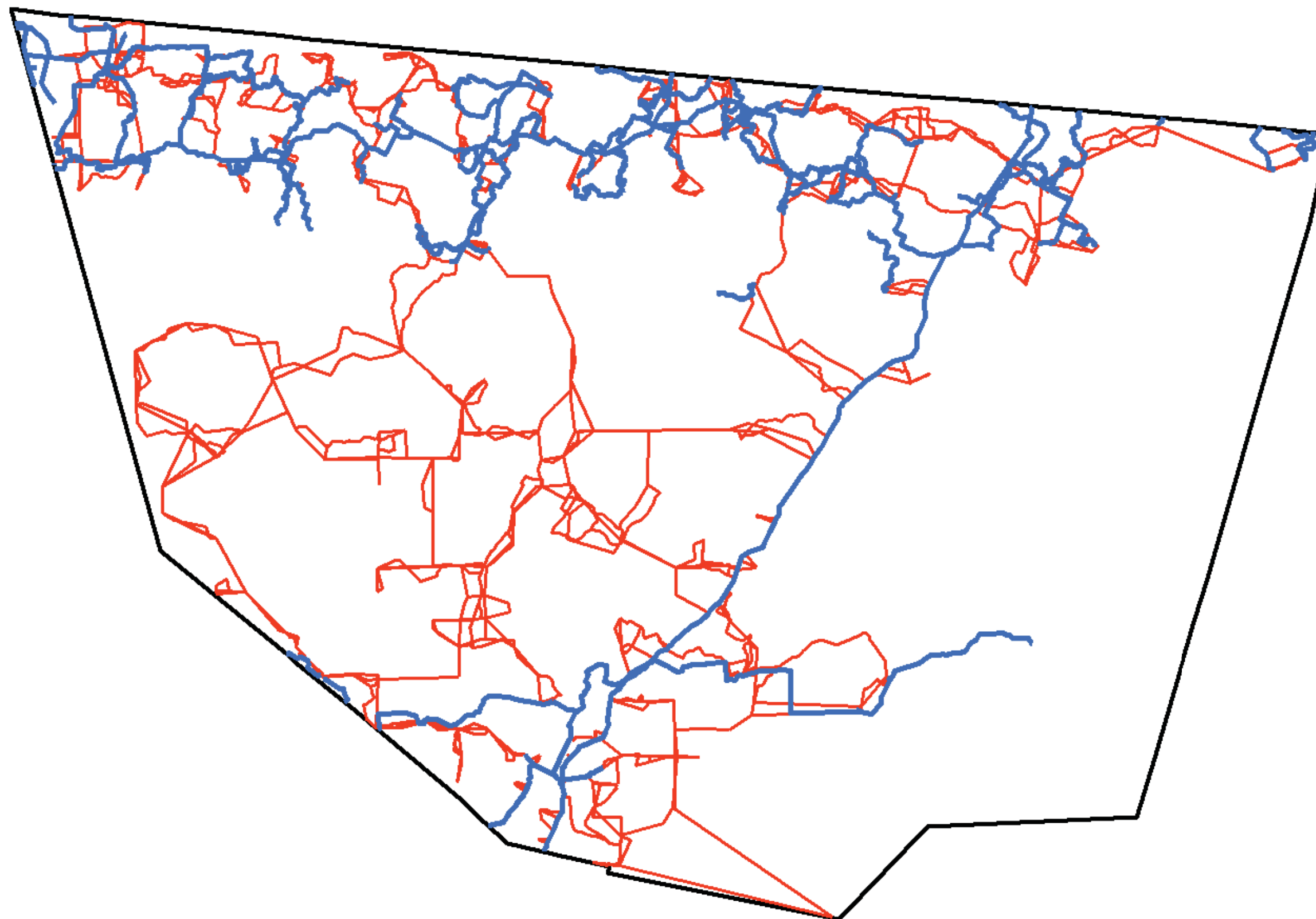
Benefits / Goals of Project:

- Identify the stormwater runoff issues occurring on pipeline corridors
- Provide alternative solutions to mitigate stormwater runoff
- Demonstrate the cost effectiveness of these alternatives





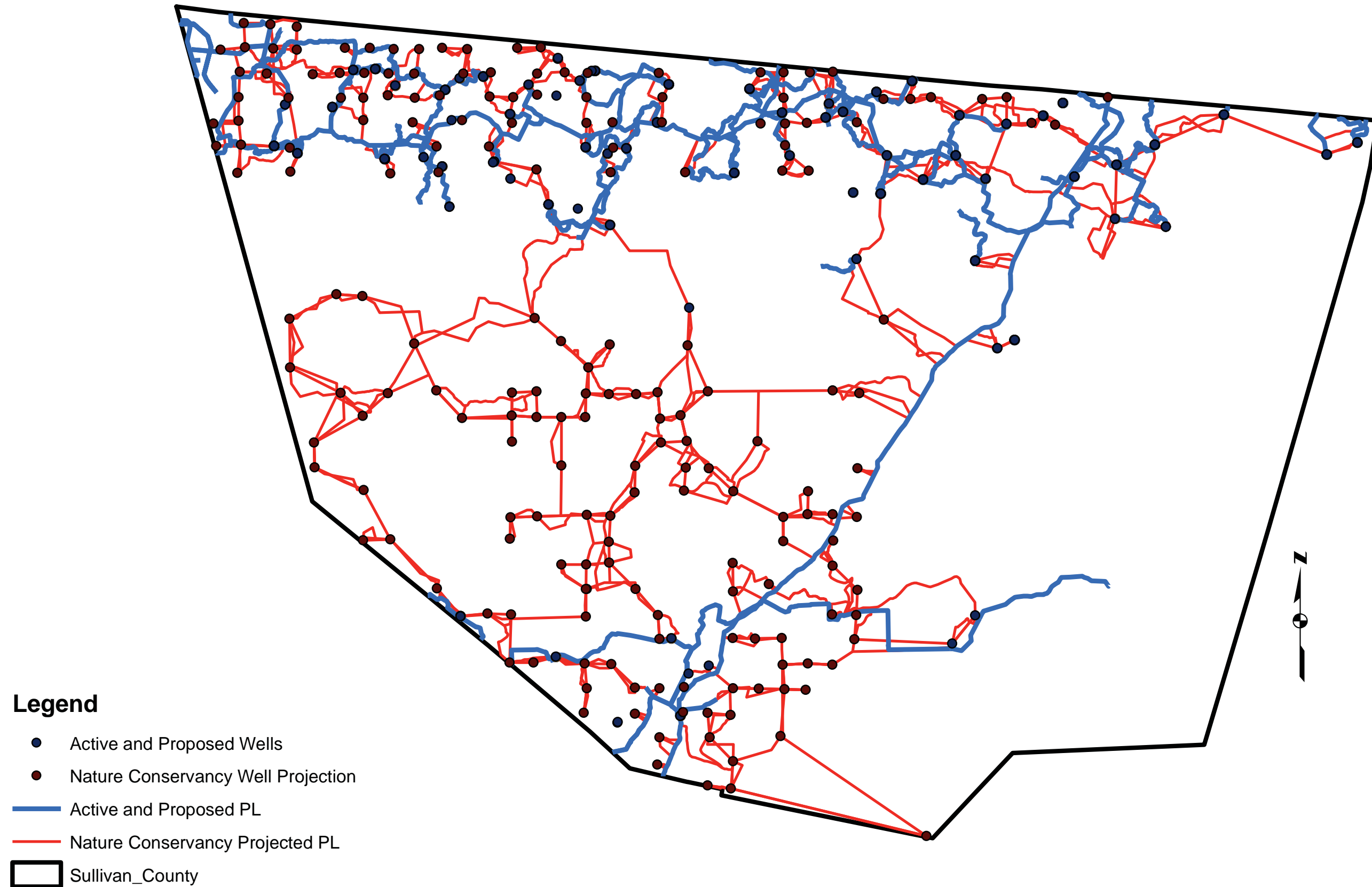
Active, Proposed, and Projected Pipelines in Sullivan County

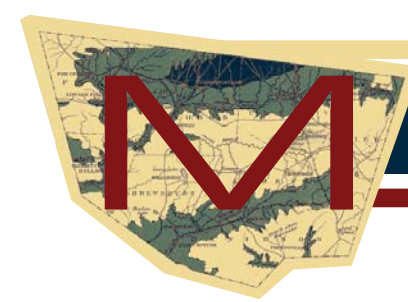


- Active or Proposed
335 Miles
4050 Acres
- NC Projection
(3 Shown)
195 Miles (avg)
2250 Acres

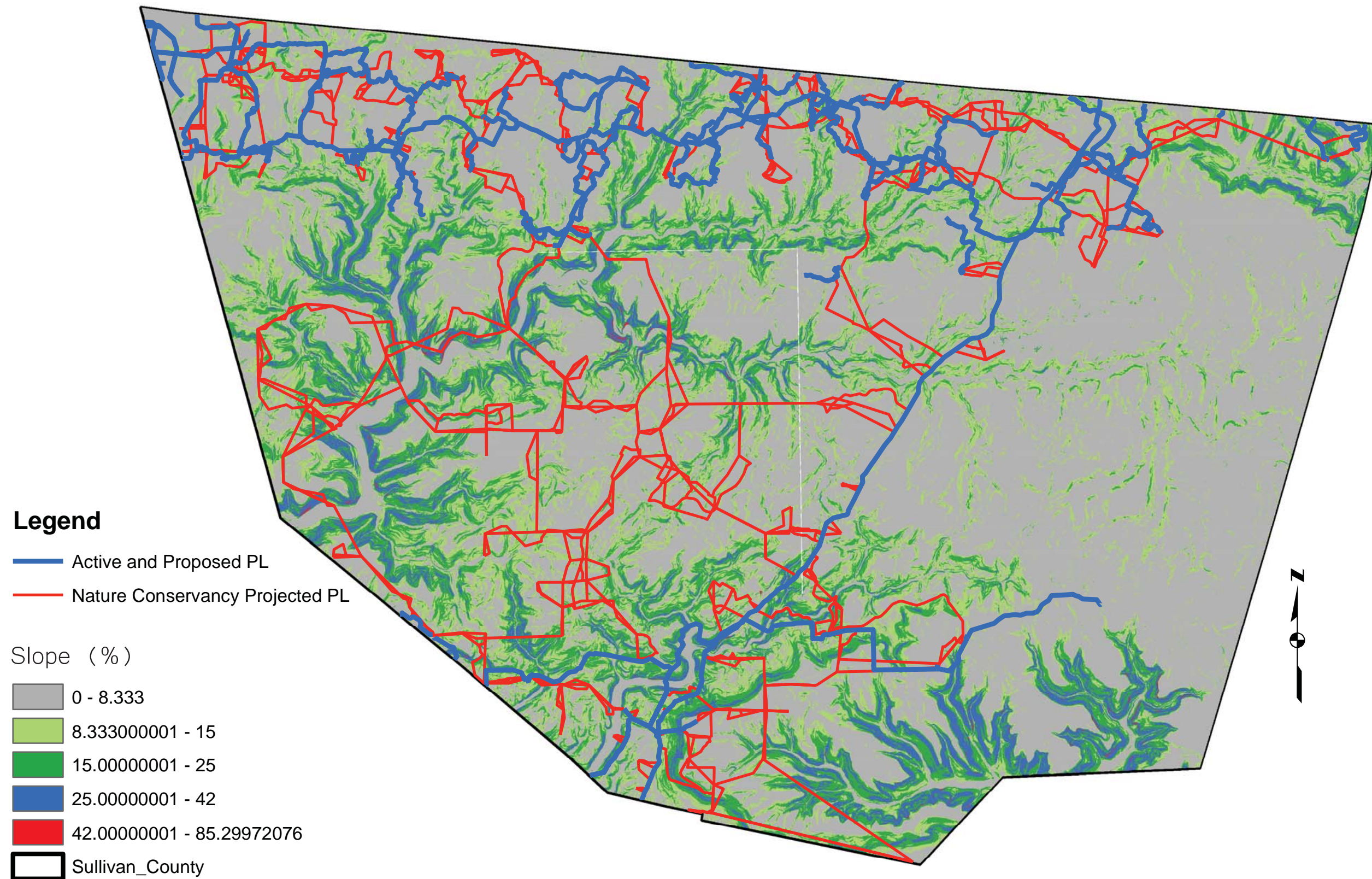


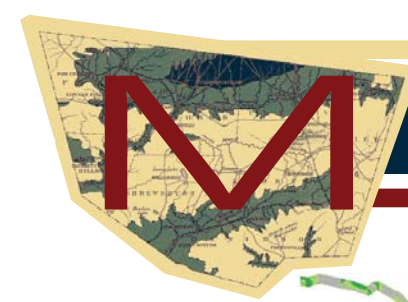
Active, Proposed, and Nature Conservancy Projected Well Locations





County Landform Determined By Slope

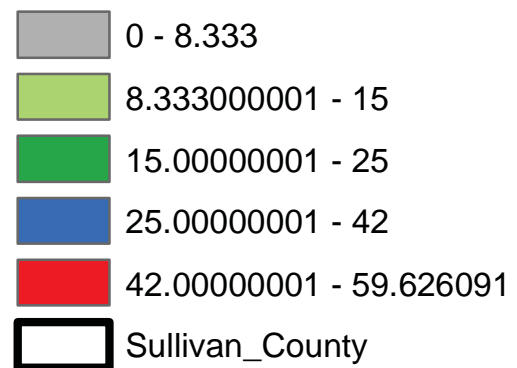




Pipeline Landform Determined By Slope

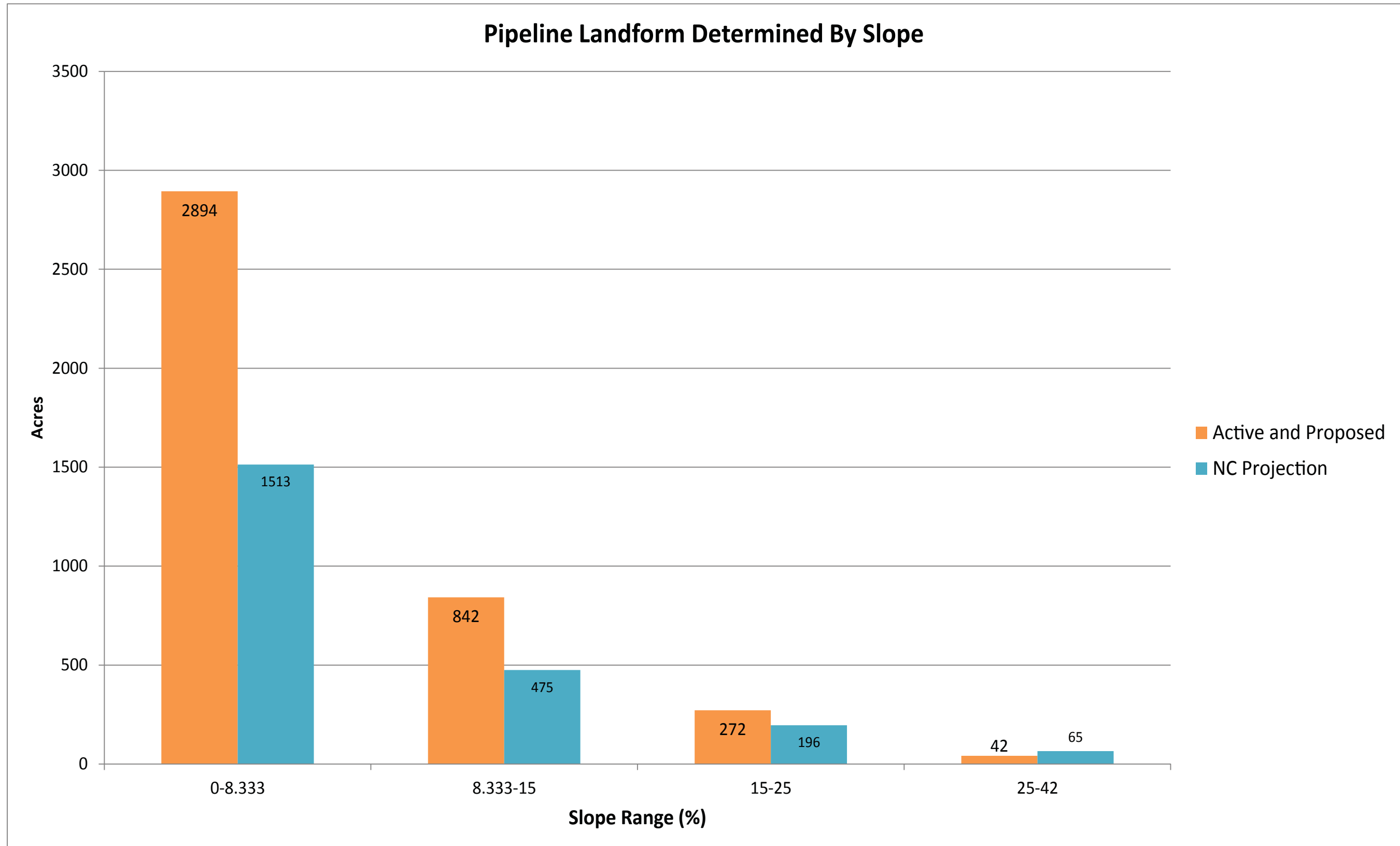
Legend

Slope (%)



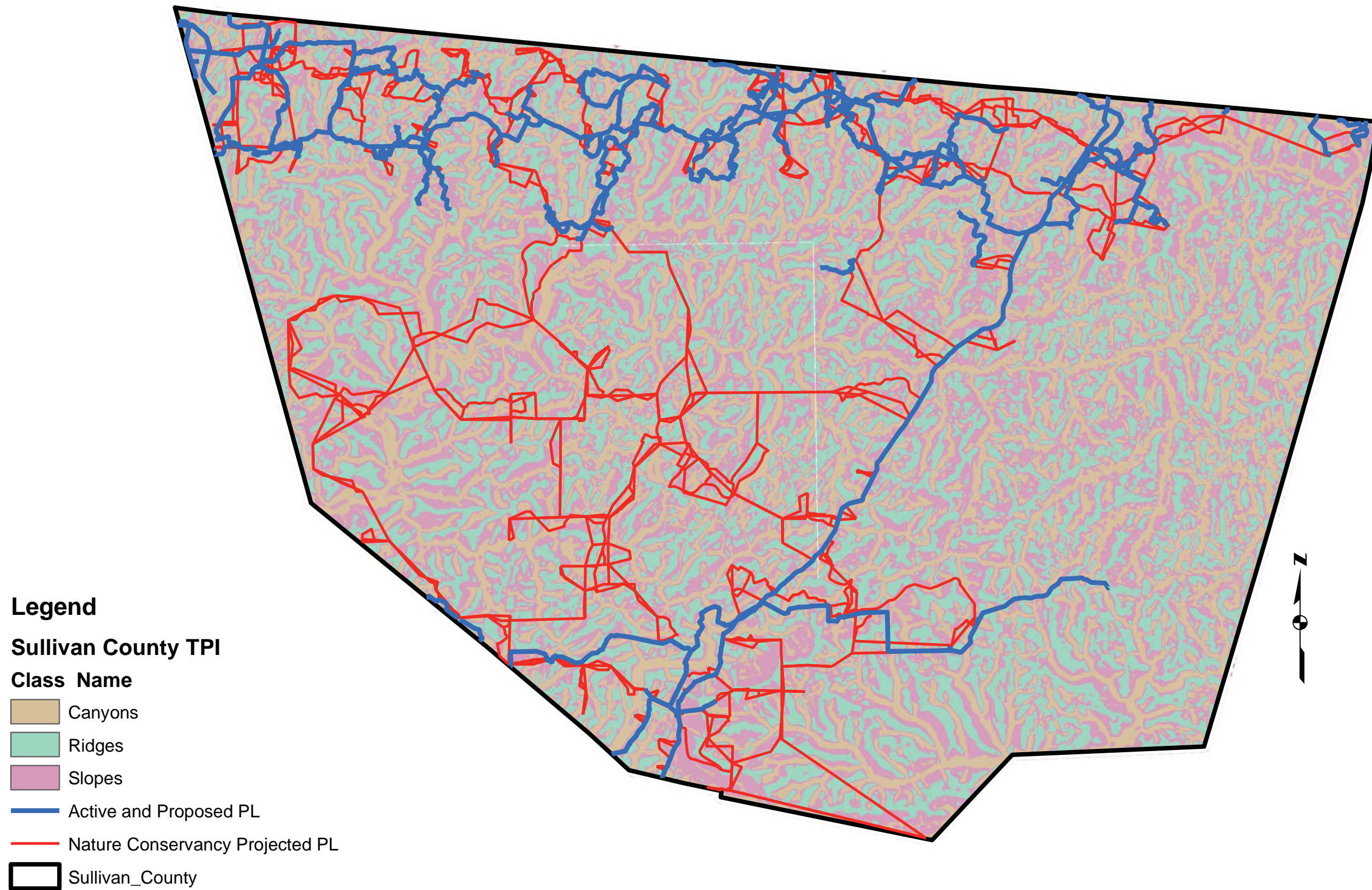


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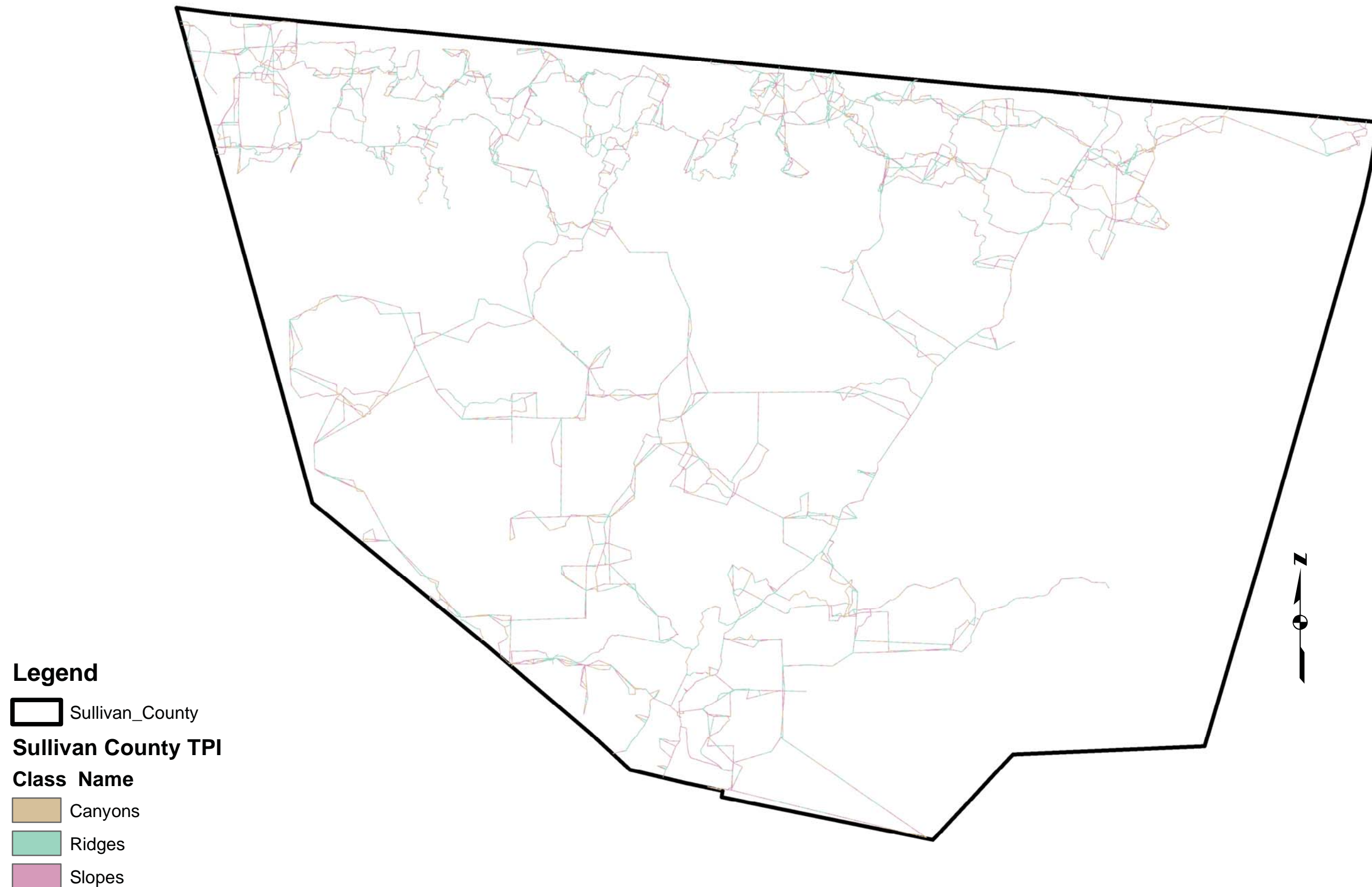


County Determined By Topographic Position Index (TPI)



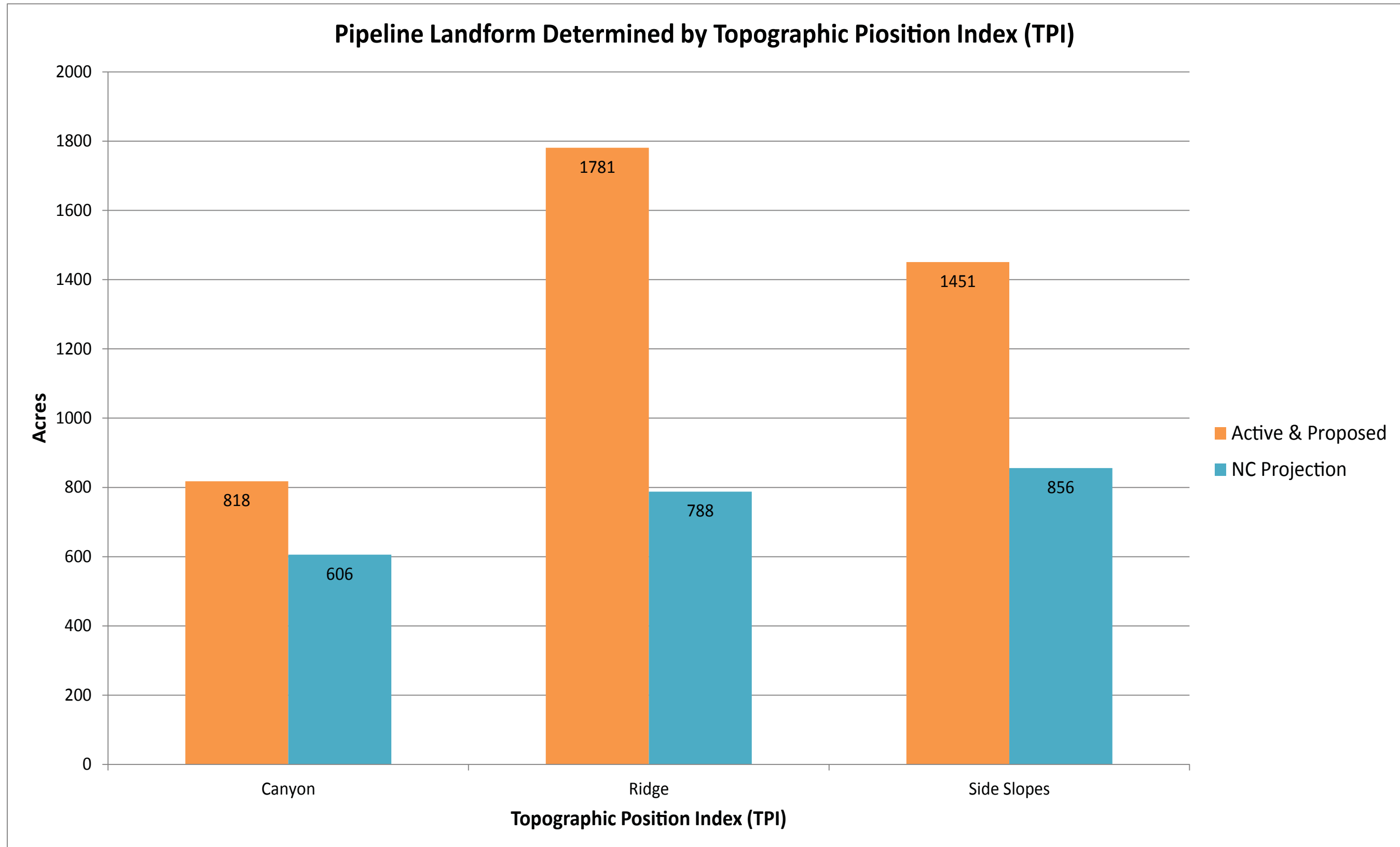


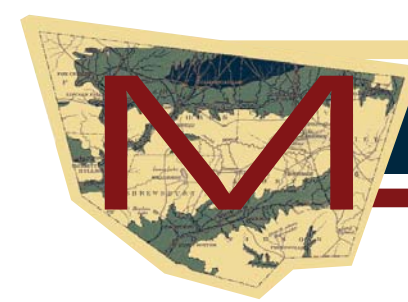
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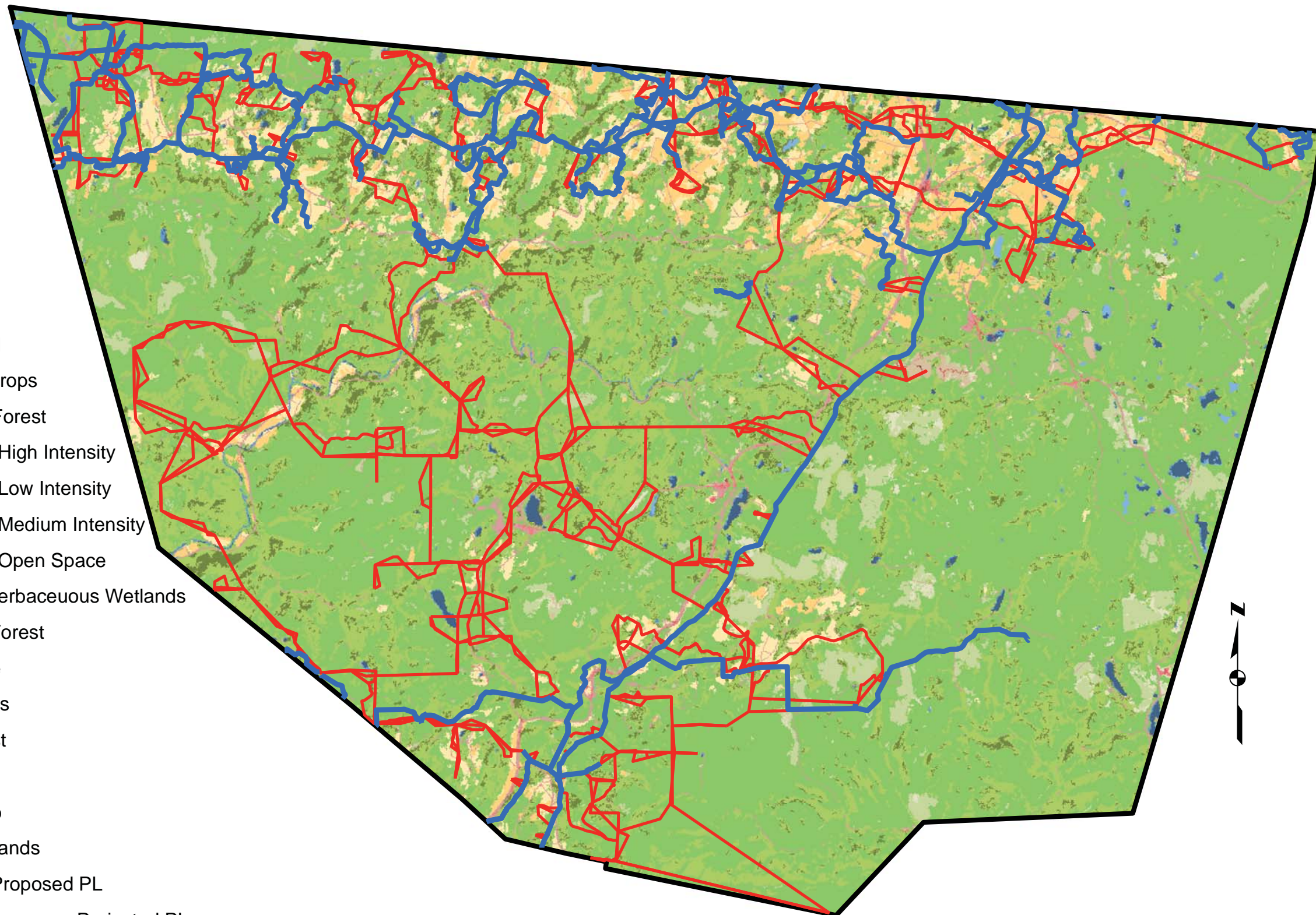


County Landform Determined By Land Use

Legend

Land Use

- Barren Land
- Cultivated Crops
- Deciduous Forest
- Developed, High Intensity
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, Open Space
- Emergent Herbaceous Wetlands
- Evergreen Forest
- Hay/Pasture
- Herbaceous
- Mixed Forest
- Open Water
- Shrub/Scrub
- Woody Wetlands
- Active and Proposed PL
- Nature Conservancy Projected PL
- Sullivan_County


















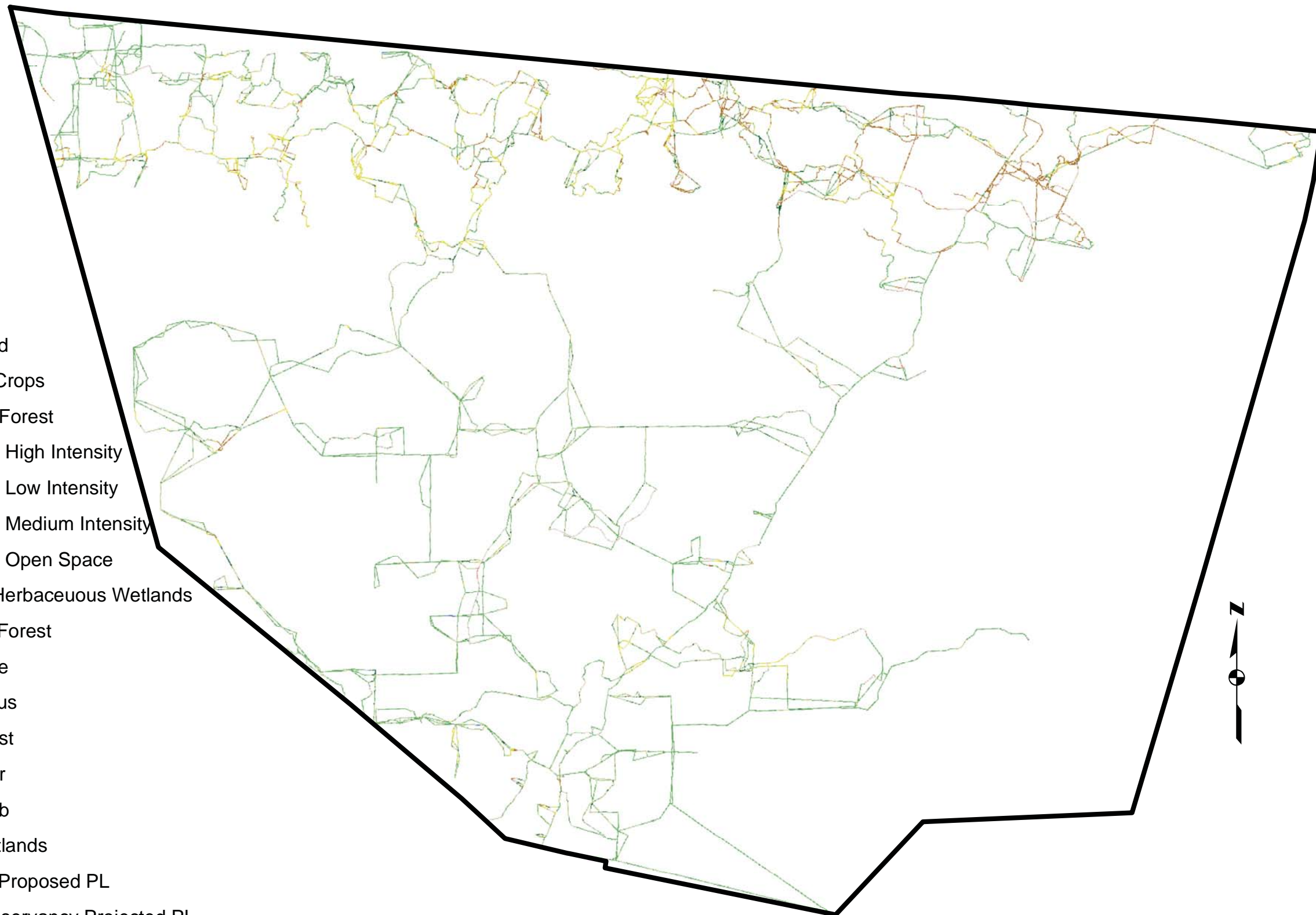


Pipeline Landform Determined By Land Use

Legend

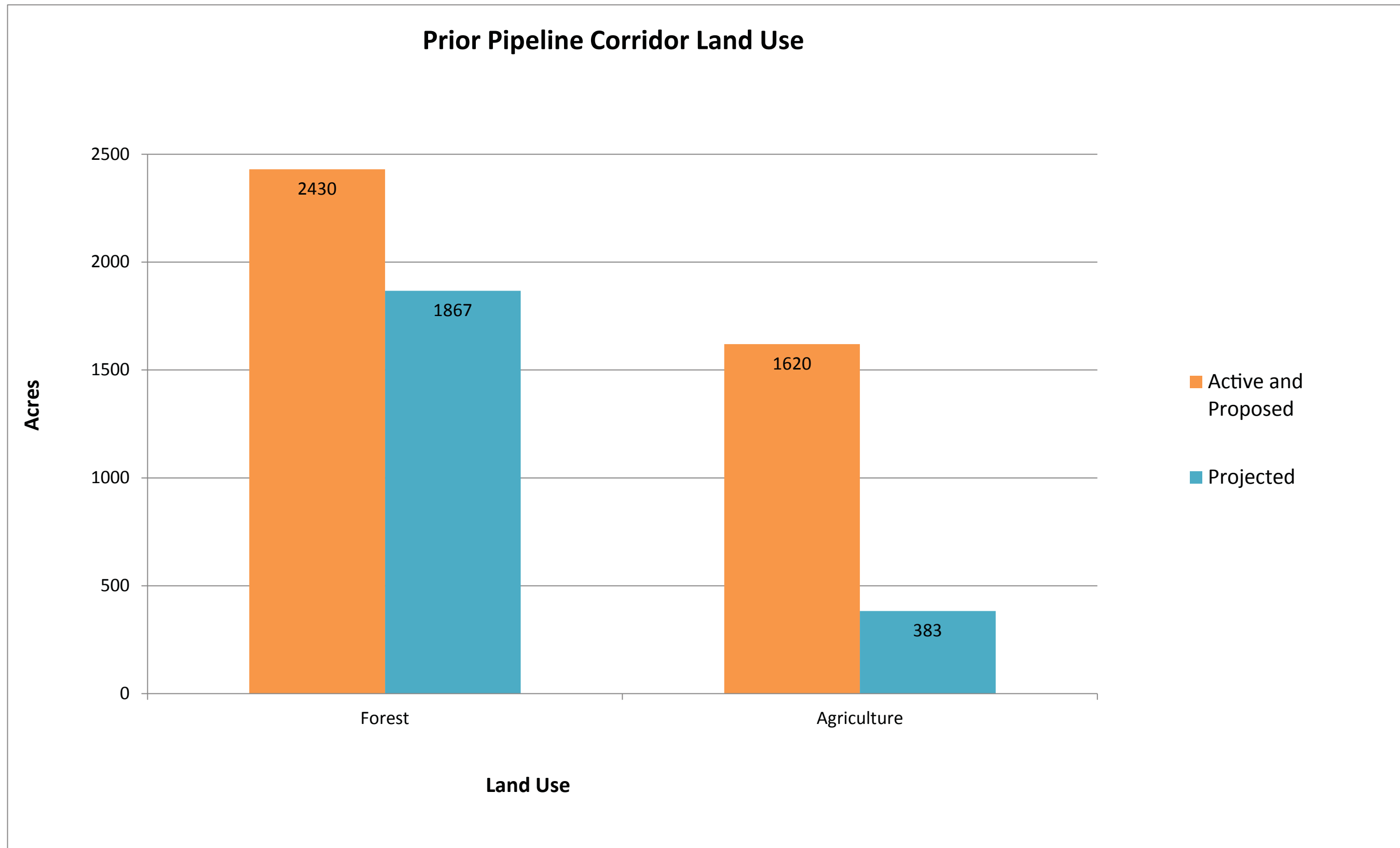
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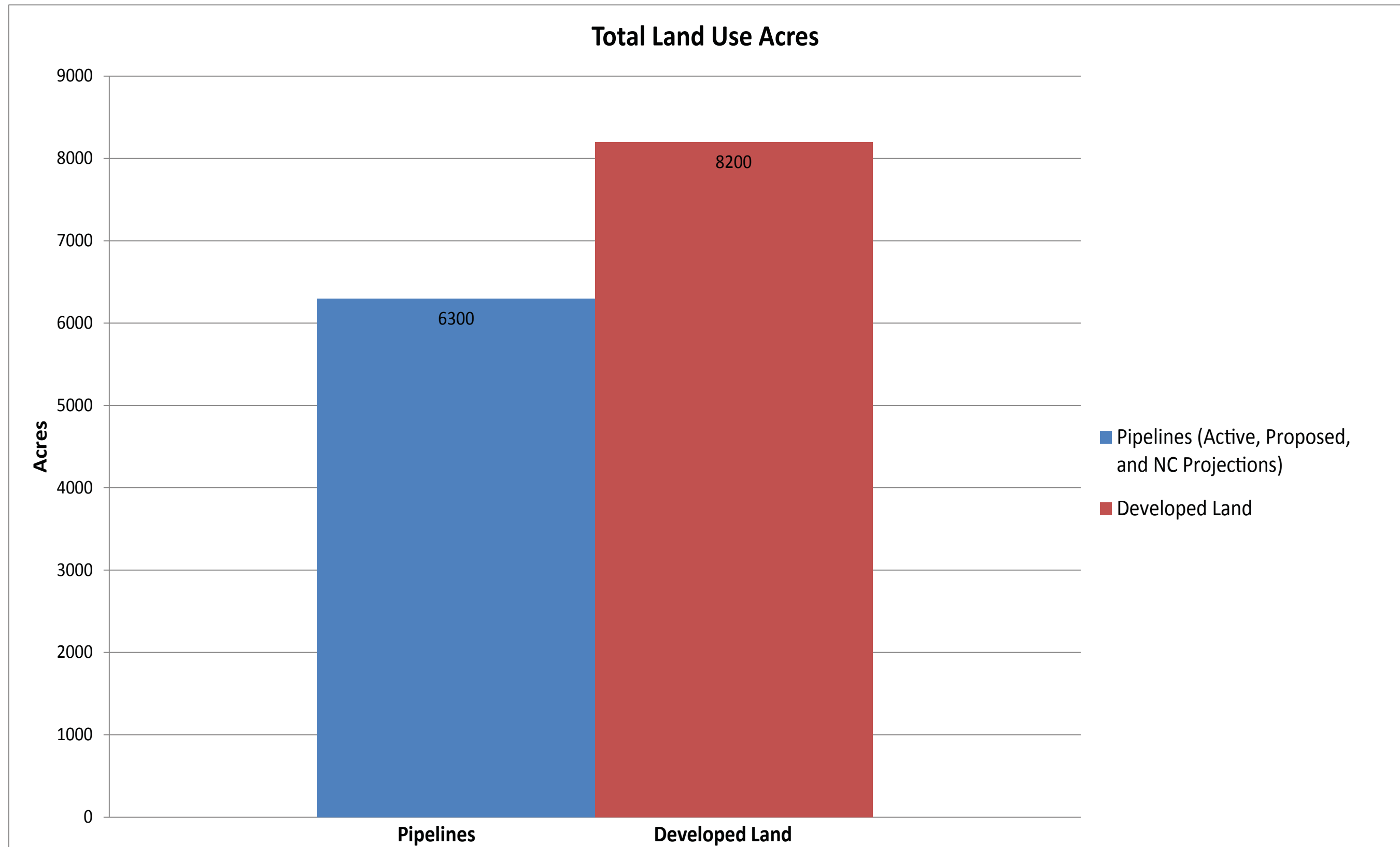


Pipeline Landform Determined By Land Use



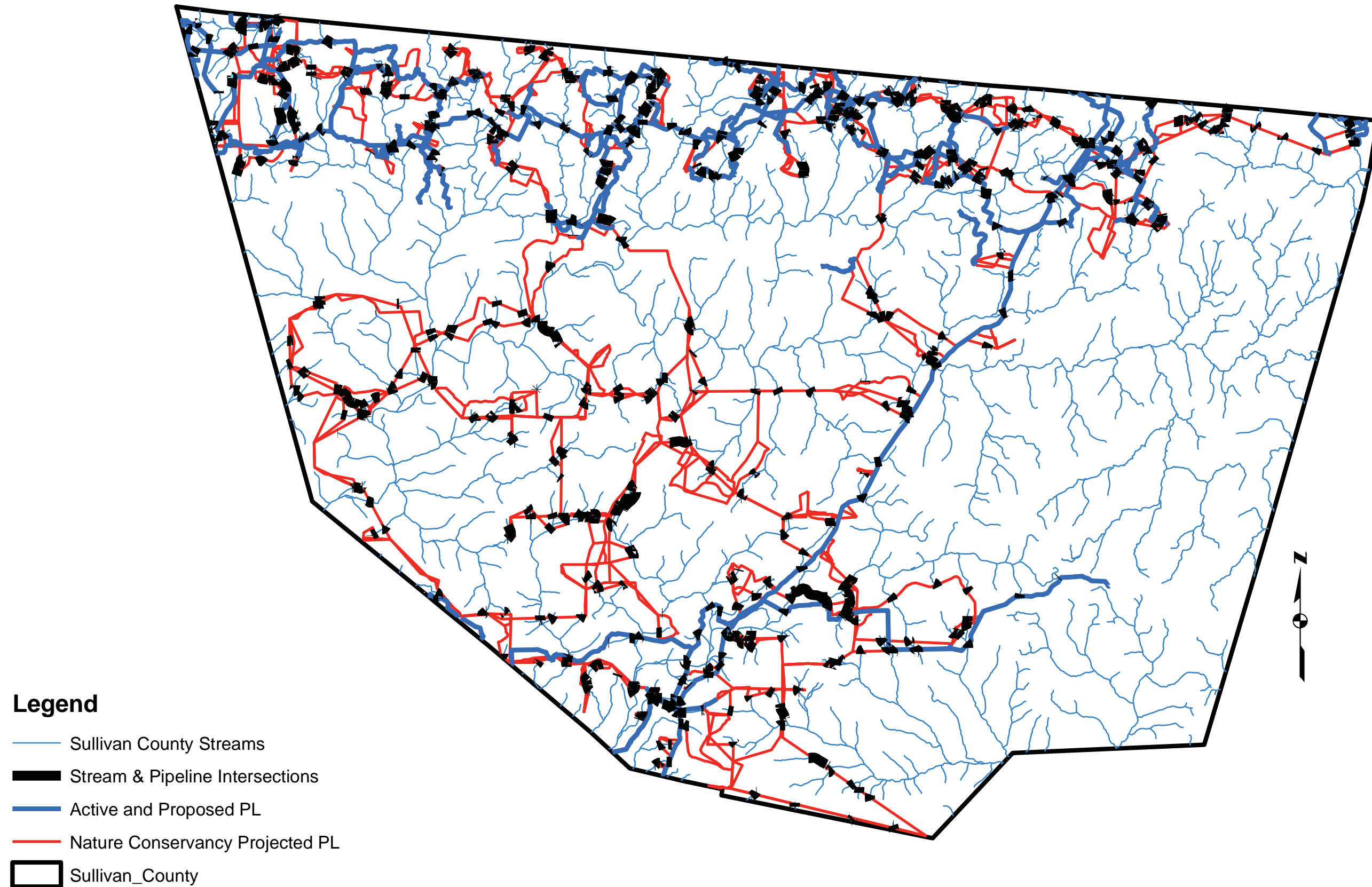


Total Land Use Acres





Active, Proposed, and NC Projected Pipeline Stream Crossings and Adjacencies





Current Pipeline Corridor Conditions

Agriculture



100' Pipeline
Right-Of-Way

Forest



Forest

100' Pipeline
Right-Of-Way

Forest



Alternative Pipeline Corridor Stormwater Solutions



Forest 100' Pipeline Right-Of-Way Forest

Small Trees and Larger Shrubs 5' No Plant Zone Small Trees and Larger Shrubs

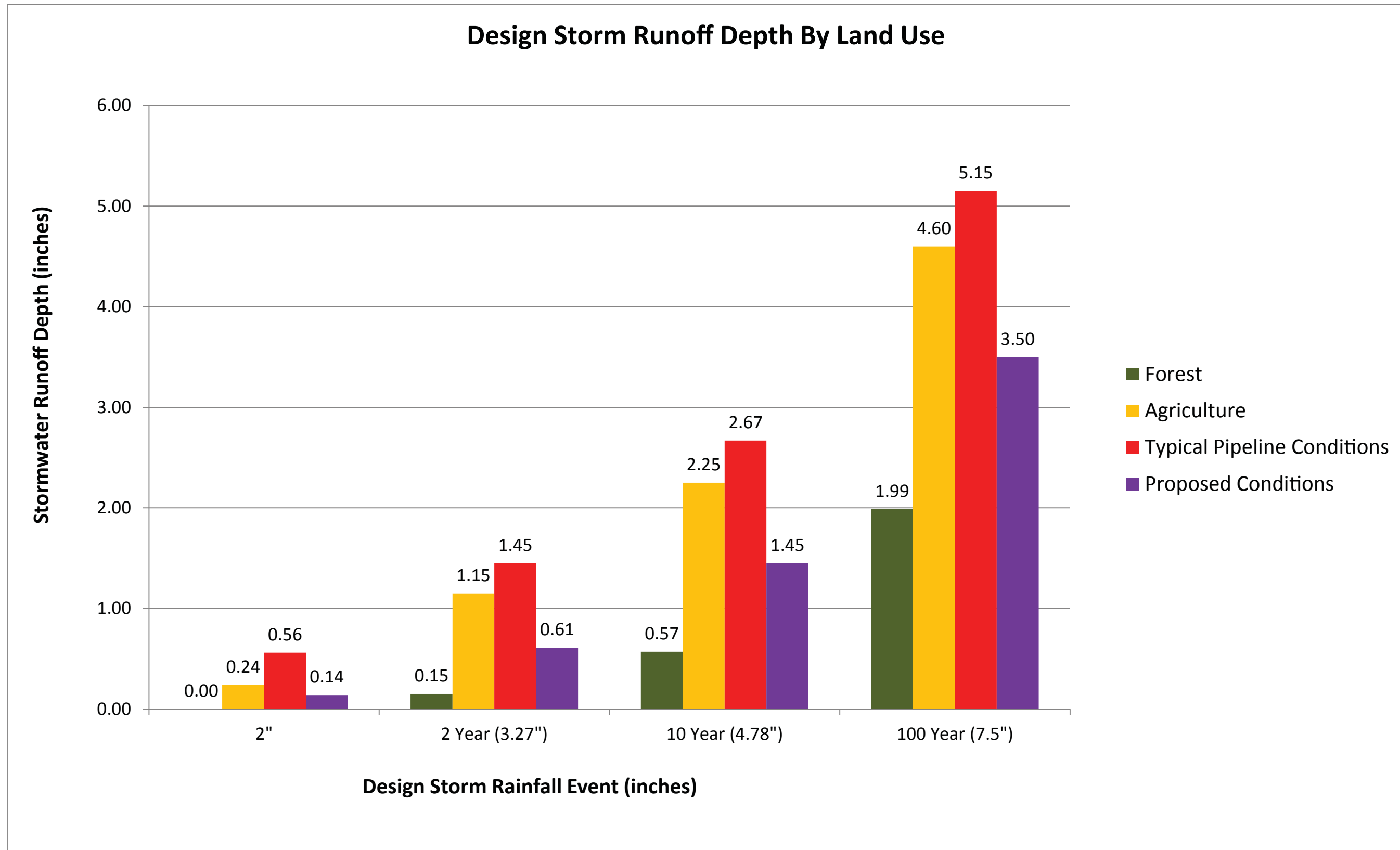
20' Low Shrubs 20' Low Shrubs

Forest 100' Pipeline Right-Of-Way Forest





Stormwater Runoff Depth for Land Uses Adjacent to Pipelines





Summary

Pipeline Landform Determined By Slope: While the majority of the pipelines in the county are located on shallow slopes less than 8.333%, land cover materials still play a crucial part in minimizing stormwater runoff on all slopes.

Pipeline Landform Determined By Topographic Position Index: Ridgelines dominate the landscape of Sullivan County. Coincidentally so do the pipelines that run throughout. Almost one half of the total pipeline area consumes these valuable ridges. The combined area for ridges and side slopes creates a situation in which stormwater management and land cover is crucial for ecosystem protection.

Pipeline Landform Determined By Land Use: The creation of pipelines in Sullivan County has disturbed far less forest land when compared to agriculture when comparing total land use percentages. The projections from the Nature Conservancy, however, almost double the total forest lost, especially in the Southern parts of the county in State Forest and Game Lands.

Pipeline Stream Crossings and Adjacencies: Over 1800 intersections occur between Active, Proposed, and NC Projection pipelines either directly or in adjacencies of 350'. These are areas of extra high risk and present a need for extra sensitivity and attention with land cover on pipeline Right-Of-Ways.

Stormwater Runoff Depth: While typical Right-Of-Way standards for pipelines do not allow for forest like conditions, the alternatives shown allow for a large reduction in stormwater runoff, especially in the largest Design Storm figures. Special considerations need to be taken when replanting agricultural Right-Of-Ways as extra stormwater can be hazardous to the adjacent ecosystems.

Total Land Use: Left unattended, the pipeline corridors of Sullivan County add upwards of a 77% increase in stormwater runoff.