



# marcellus X Design

The Sullivan County Design Charette  
The Pennsylvania State University  
Landscape Architecture  
2013

## THE ENDLESS MOUNTAINS

Colin Nahill

image by Colin Nahill



" We abuse land because we regard it as a commodity  
belonging to us. When we see land as a community to which we  
belong, we may begin to use it with love and respect. "  
- Aldo Leopold

## Project Statement

The focus of this project is ridgeline protection within Sullivan County. In order to protect the aesthetic and function of the ridgelines a visual impact assessment must be conducted where key ridgeline characteristics are evaluated for their regional importance to the county communities. There will be an emphasis on view protection as this is an aspect admired by both county residents and tourists alike. From the establishment of ridgeline character and quality a model for a new zoning ordinance will be created. The research, analysis, and model ordinance will be compiled into one presentation for use throughout the county in an effort to preserve the ridgelines from development not only from the natural gas industry but also from all future development.





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## A Developmental Past

- + With an industrial past in regards to timber harvesting and shallow drilling, Sullivan County is no stranger to development and will most certainly be targeted in the future for development whether energy related or residential.
- + A rural, blue collar area is targeted by the natural gas industry to drill and extract gas from the Marcellus shale.
- + The gas companies flash some coin and quickly gain the support of many community members to drill and lease the land owners' mineral rights
- + Not everyone is benefiting from the influx of money which creates a subtle tension within the county's towns
- + Currently the biggest threat to the ridgelines is the creation of gathering pipelines which take the shortest route to compressor stations, refineries, and the Marc 1.
- + Gas companies are resistant to running the pipeline around the ridges as it is exponentially more costly than running directly over the ridge.



## Stakeholders

- + **The Landscape** is the most important character in this story as it is the focus of the developers and the pride of the residents. The landscape attracts visitors. The Landscape improves the aesthetic quality of the county. Above all else the landscape preserves the county's history for much of the forested land has been untouched and deemed a county treasure.
- + **The Gas Companies** are currently reshaping the face of the rural landscape in particular the hillsides and ridgelines. These companies are pining over precious land in order to create new pipeline corridors connecting to the Marc 1 pipeline. The gas companies often build their pipelines directly over ridges as that is the cheapest and quickest method for reaching other pipelines. This activity is scarring the face of the wooded areas and reducing the visual quality of the landscape.
- + **The Residents** and surrounding residents of Sullivan County are observing the effects of natural gas development directly and wish for some way to protect themselves from being overdriven by development and its lasting effects on the area.
- + **Transients** such as summer residents, campers, sightseers, and other tourists alike invest time and money into the county for its pristine beauty. These transients come to Sullivan County to escape their ordinary routine and immerse themselves in a setting of wild contentment.
- + **Home Builders** and prospective residents that plan to retire or change location may wish to build a place of residence upon hilltops and ridges in order to gain a desired view of the county. Protection of the ridgelines through zoning should prohibit such development.



## Current Level of Protection

Currently the Ridgelines Are unprotected from development.

Without any existing laws or ordinances regulating development on or along the ridgeline, gas companies go unchecked with the creation of well pads and pipeline corridors.

An emphasis must be placed upon public ridgelines as these are shared by both residents and non-residents.





## Solution

### Objective

Provide a countywide ordinance that protects the ridgelines from destructive development.

- + Map out existing ridgelines within the county through the use of GIS
- + Provide suggestions for alternative routes of development
- + Minimize the visual impacts of hillside development and preserve the scenic ridgelines
- + Provide data and proposals for more valued / aesthetically sensitive ridgelines (Some ridgelines may be more suitable for development than others)





## Ridgeline Protection

### Problem Statement:

The creation of gathering lines jeopardizes the aesthetic and ecological quality of the ridgelines.

### Project Description:

Ridgeline protection through visual impact assessment and new countywide zoning

### Benefits/Goals of Project:

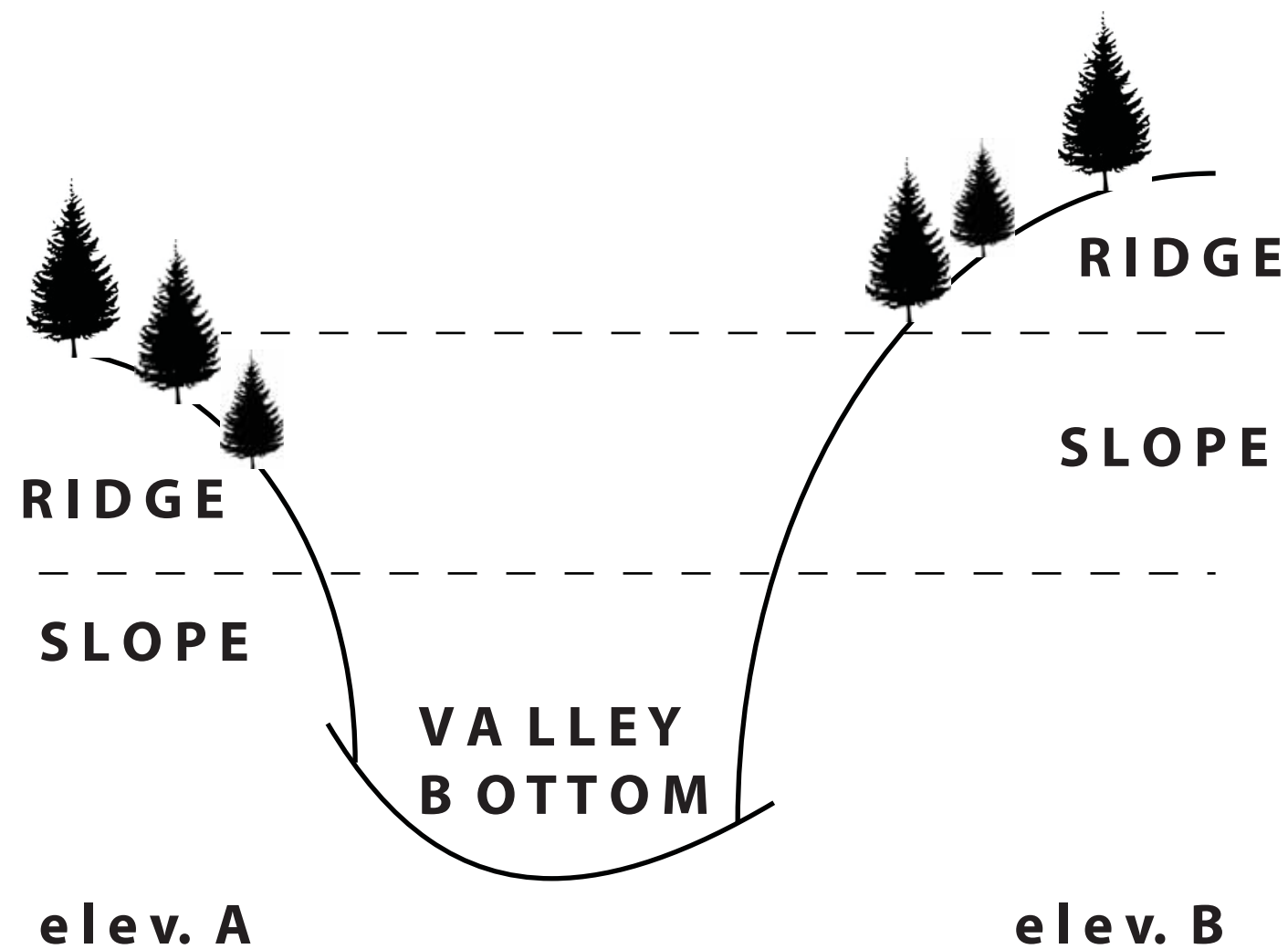
- + Map all Ridges in Sullivan County
- + Identify Stakeholders
- + Prioritize Ridgelines
- + Establish Guidelines for Protection





## Defining a Ridgeline

- Ridgeline :**
1. a line formed along the highest points of a mountain ridge.
  2. an area of higher ground separating two adjacent streams or watersheds.



In dealing with the topography of Sullivan County traditional methods of identifying ridgelines was not suitable. From sample ordinances regarding ridgeline protection the ordinances were able to set a standard elevation and prohibit any development above that set elevation. This is not the case for this project as defined ridgelines within Sullivan County are located at a wide range of elevations. Therefore in order to accurately map out the ridgelines a top-down approach was employed using a method called **Topographic Position Index (TPI)**. This method utilizes an algorithm that classifies landforms into either ridge, slope, or canyon in its most basic sense. TPI can be further worked to find more precise landforms such as steep slopes and gentle slopes.

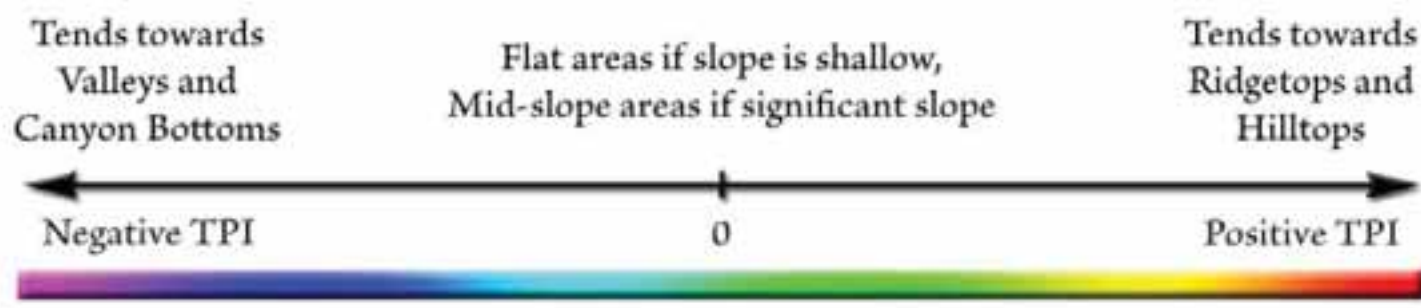


# Topographic Position Index

Using the Land Facet Analysis extension in ArcMap from Jenness Enterprises and the TPI tool within the extension ridgelines were able to be found using the parameters below. These parameters are not ultimate but relatively experimental as there was no precedent to base the values from; however, these parameter values gave the best results.

"The algorithms are clever and fairly simple. The TPI is the basis of the classification system and is simply the difference between a cell elevation value and the average elevation of the neighborhood around that cell. Positive values mean the cell is higher than its surroundings while negative values mean it is lower.

The degree to which it is higher or lower, plus the slope of the cell, can be used to classify the cell into slope position. If it is significantly higher than the surrounding neighborhood, then it is likely to be at or near the top of a hill or ridge. Significantly low values suggest the cell is at or near the bottom of a valley. TPI values near zero could mean either a flat area or a mid-slope area, so the cell slope can be used to distinguish the two. "



3-Category Slope Position Parameters:

This tool will create a 3-category Slope Classification raster based solely on the Topographic Position Index of each cell. Depending on your threshold values, low TPI values will be classified as "Canyons", TPI values around 0 will be classified as "Slopes", and high TPI values will be classified as "Ridges". You may change the

Class 1: Canyons

TPI <= [-1] units

Class 2: Slopes

[-1] units < TPI <= [1] units

Class 3: Ridges

TPI > [1] units

Canyons:  $TPI \leq [A]$

Slopes:  $[A] < TPI \leq [B]$

Ridges:  $TPI > [B]$

[A] = -0.25

[B] = 0.25

Reset Class Names

☐ Set to NoData if any NoData cells in neighborhood

Output Raster Format:

ESRI GRID

Output Raster Dataset Name:

D:\arcGIS\_stuff\consultation\brost\_climate\_change\TPI\_out\Slope\_3\_4

Cancel

Manual

OK

-- Select DEM Raster Layer --

Slope\_4\_3

-- Select TPI Type to create --

Standardized Elevation

Neighborhood Options

Neighborhood Shape

Circle

Neighborhood Size Units

Cells

Radius =

20





## Ridgelines Within Sullivan County

Total Area of Sul. Co. =

**452 sq. mi.**

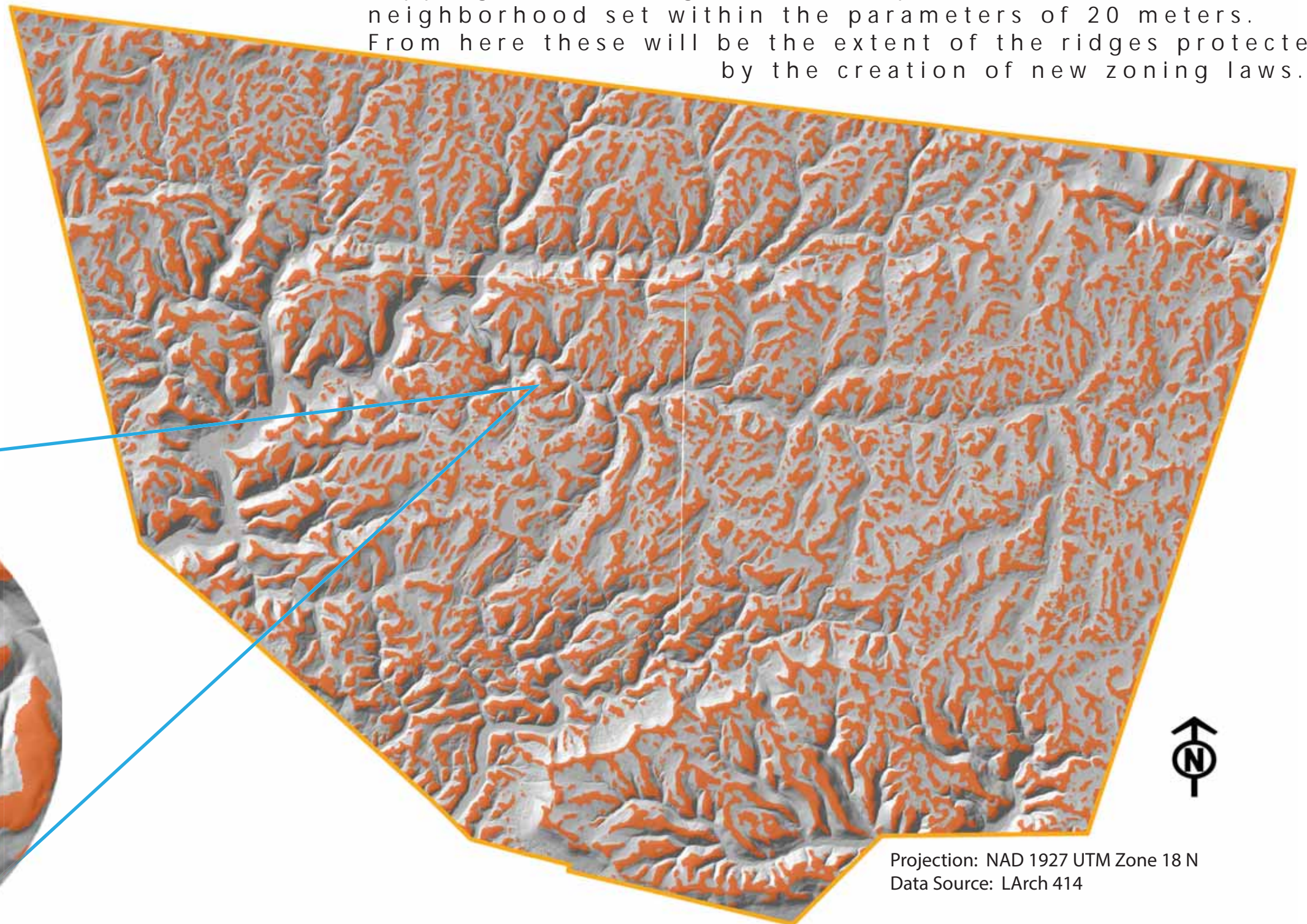
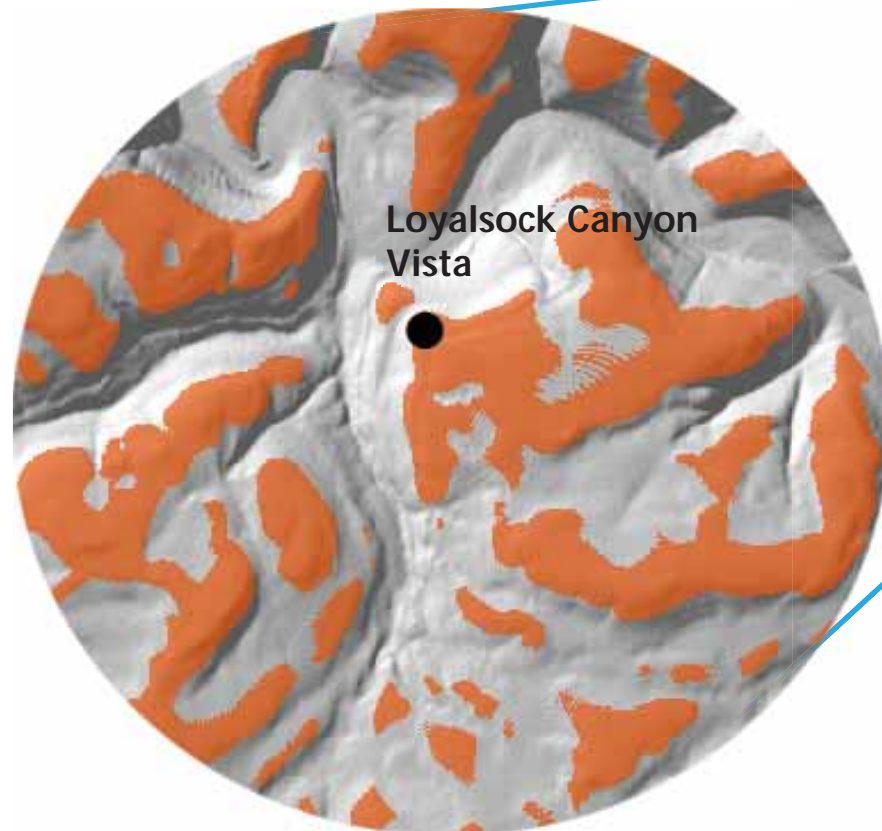
Total Area of Ridgelines in Sul. Co. =

**150 sq. mi.**

Total Percentage of Ridgeline =

**33%**

From the TPI analysis these ridgelines were produced capping off the ridges with the prescribed radius or neighborhood set within the parameters of 20 meters. From here these will be the extent of the ridges protected by the creation of new zoning laws.



Projection: NAD 1927 UTM Zone 18 N  
Data Source: LArch 414





## Ridgeline Protection

The next two pages look at how most people residents and tourists alike see the ridgelines.

First is the view of the ridges from the road and where the most traffic is along these major roads.

Next is the ridges visible from three highly popular viewpoints within the county.

These two sets of ridges should be given top priority under the ordinance as they are the most visible within the county and most valued from an aesthetic point of view.

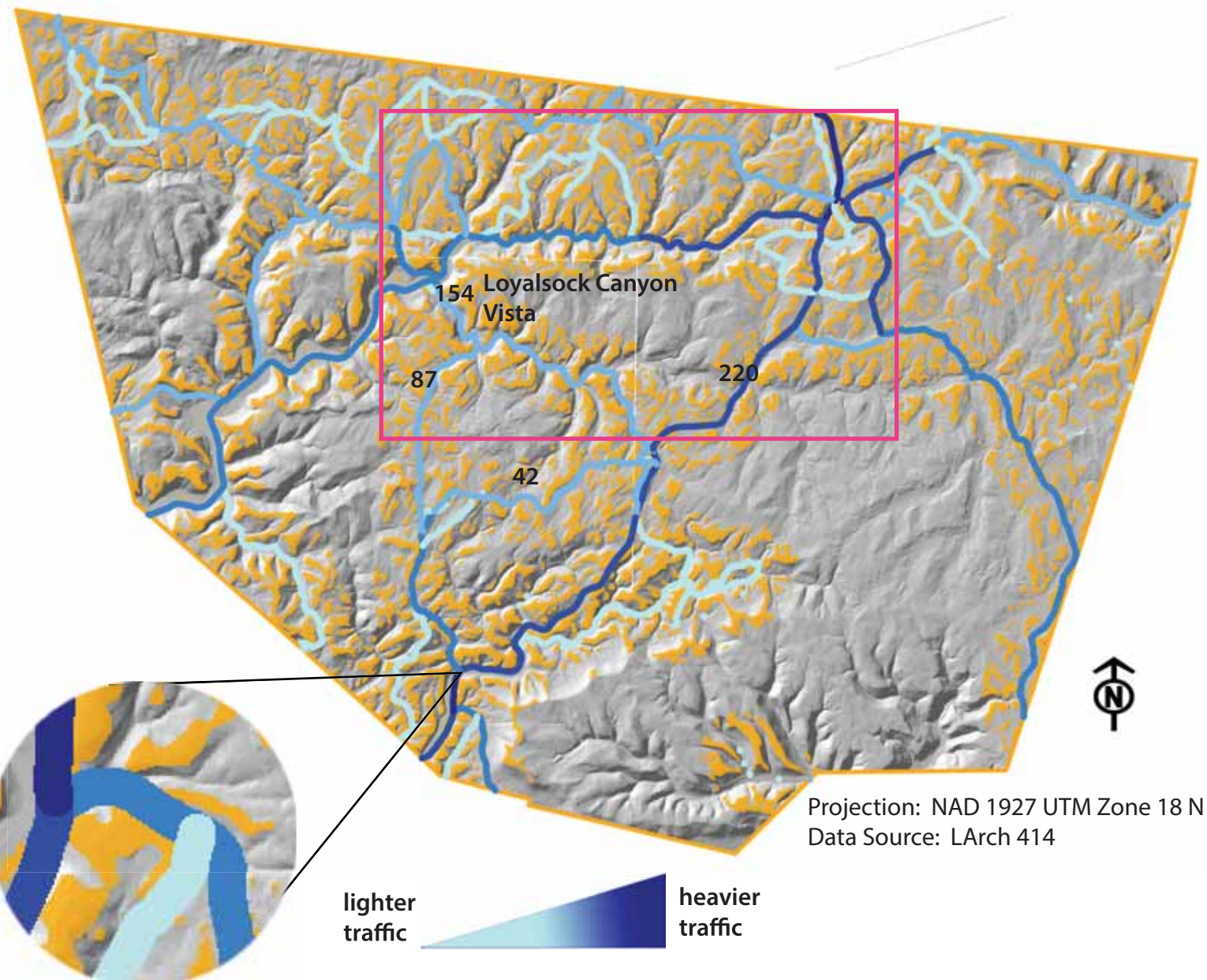


## Ridgelines from the road

- + One mile radius of major highways
- + Denote as primary importance
- + Range of users of the highways
- + Scenic corridors within the county

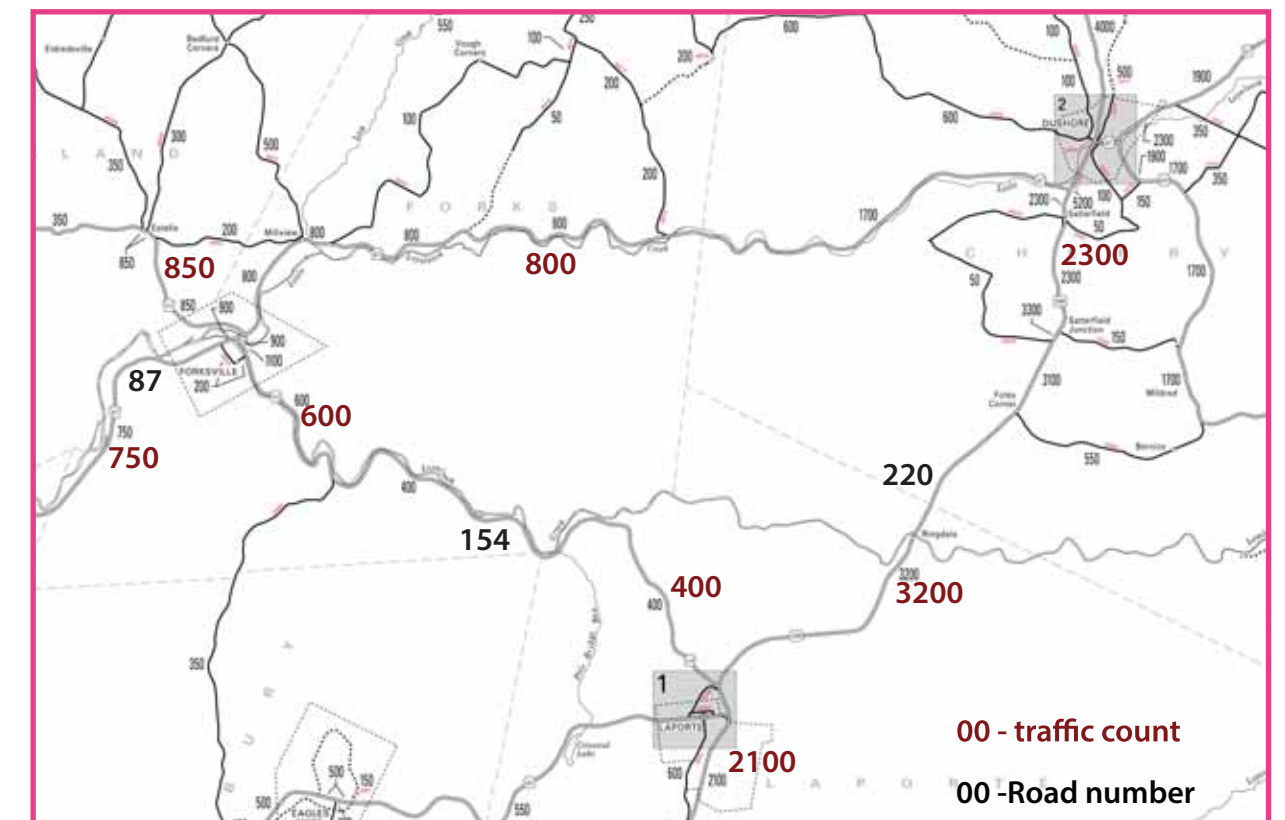
Percentage of Ridgeline Visible from Major Highways =

82%



## Traffic Data

From the map one can see where the heavier traffic flow is located and what ridgelines are visible from there. Numerically this heavier traffic is represented from a PENNDOT traffic survey where the numbers represent typical daily traffic on a road segment for all the days in a week over a period of a year.



AADT (Annual Average Daily Traffic) - typical daily traffic on a road segment for all the days in week over a year period





## Ridgelines as seen from viewpoints

- + Viewshed should be given top priority
- + Maintain aesthetic value for both residents and tourists
- + Historic significance within the county

**9% of the state's** visible ridgelines



**Loyalsock Vista**

**1.9 sq mi** visible



Loyalsock Canyon Vista



**High Knob**

**9.3 sq mi** visible



High Knob Overlook

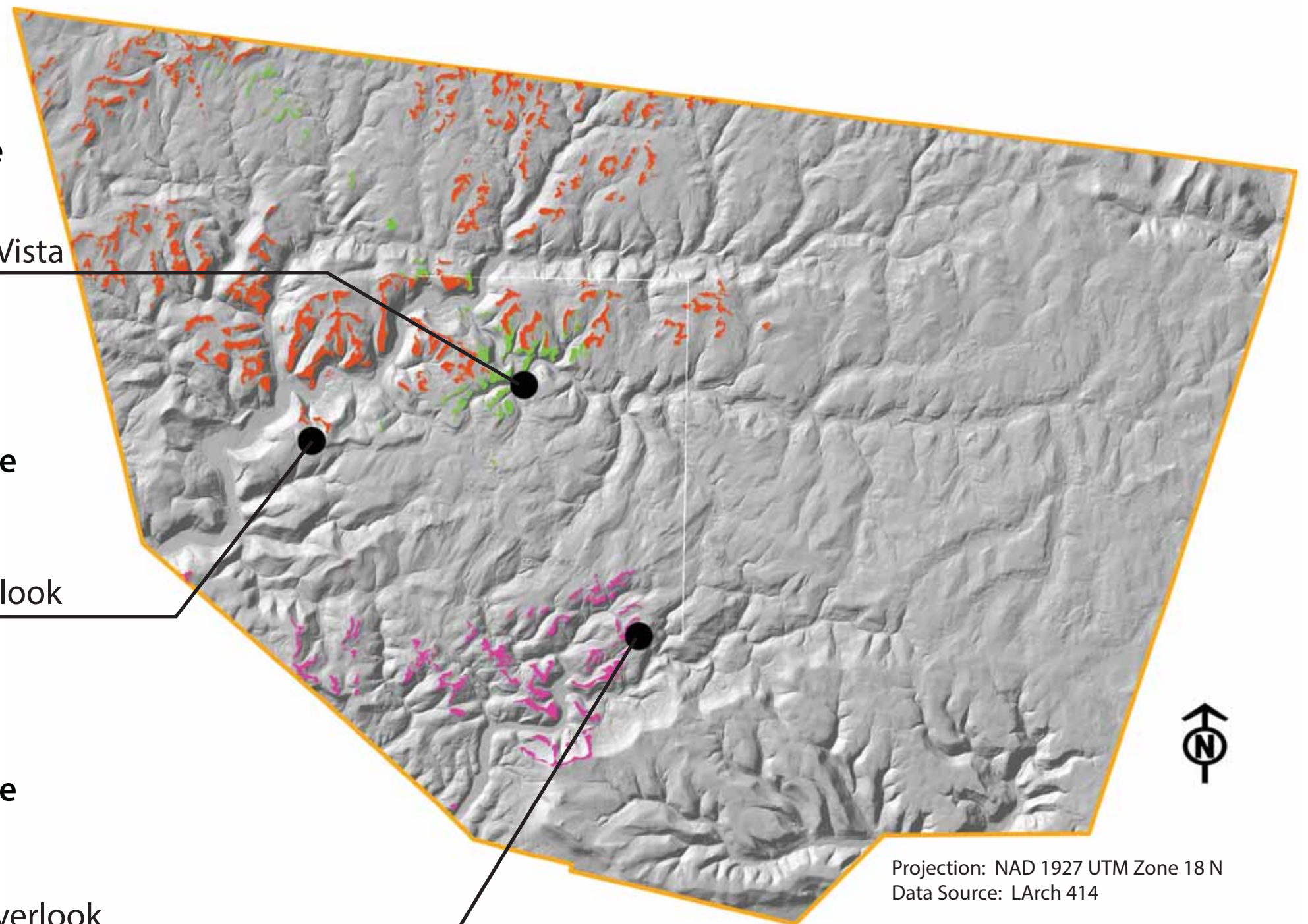


**Wright's View**

**2.3 sq mi** visible



Wright's View Overlook



Projection: NAD 1927 UTM Zone 18 N  
Data Source: LArch 414



## Ridgeline Protection

The next two pages look at where these ridgelines lie in the aspect regarding public vs. private land and forested vs. unforested land.

First the ridges are segregated into public land and private land. This information is helpful in deciding the extent an ordinance will have on private land owners.

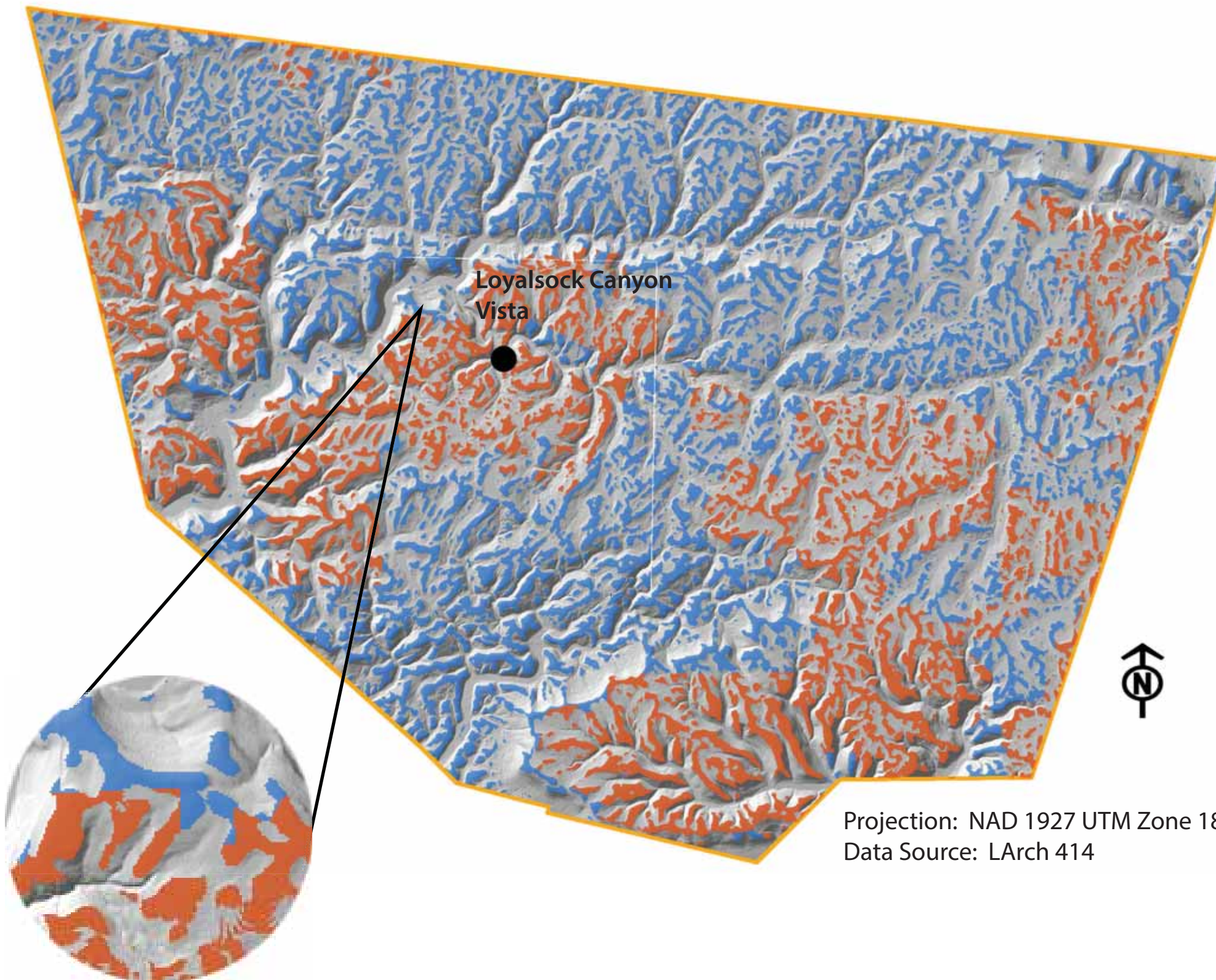
Next is a map illustrating ridge type whether or not a ridge is forested or unforested may determine the path of a proposed pipeline.





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## Public vs. Private Ridgelines



Public Ridgelines =

38%

 public

Private Ridgelines =

62%

 private

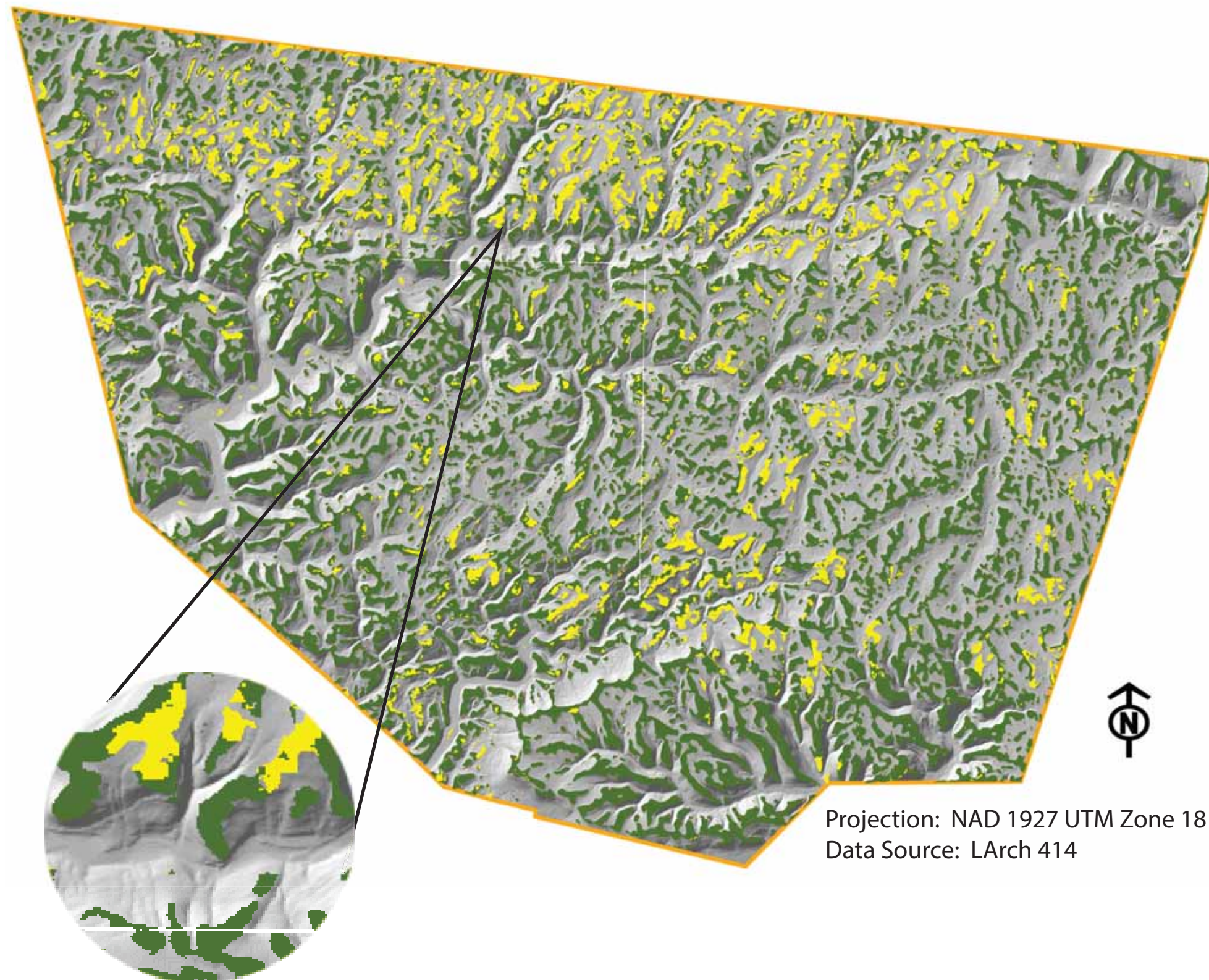
- + Identify public domain ridgelines (gameland, state forest, state parks)
- + Biggest benefits of protection may benefit the public
- + A zoning ordinance on private land owners may inhibit their ability for economic gain
- + May be more feasible to gain support for protection of public lands

Projection: NAD 1927 UTM Zone 18 N  
Data Source: LArch 414





## Ridge Type



Open Ridge =

**18%**

 **open**

Wooded Ridge =

**79%**

 **wooded**

Developed Ridge =

**3%**

 **not depicted**

- + Identify variable land uses within the county
- + Locate in particular forests, pasture, and edge environments
- + Advocate development in private, low lying, pasture-type setting
- + Reduce destruction of forest communities along the ridgelines

Projection: NAD 1927 UTM Zone 18 N  
Data Source: LArch 414





## Zoning

### **Objective**

Incorporation of new zoning ordinances or overlays may be included into the county's comprehensive plan

- + Enhance existing regulations regarding natural resource protection
- + Promote growth (development) management
- + Enhance local (county level) planning strategies
- + Create ridgeline standards for preservation and development

The creation of these ordinances is to represent the silent majority who are ill-equipped to confront major developers of the land such as the gas companies that are currently reshaping the face of the county through well pad and pipeline creation.





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

## Zoning Ordinance Considerations

### Steep Slope and Ridgeline Protection

Ridgeline : 1. a line formed along the highest points of a mountain ridge.  
2. an area of higher ground separating two adjacent streams or watersheds.

Aesthetic quality of hillsides and ridgelines can be lost when they are developed.

First the planning commission must determine what the definition of a ridgeline is based upon the TPI values given. Setting a predetermined elevation and prohibiting any development beyond that number will result in a botched plan as ridgelines are found at varying elevations in Sullivan County.

Typically in an area where the views are as well known by tourists statewide as they are by locals establishing some type of ordinance protecting these views is top priority. These new ordinances can be implemented through overlay zoning and the creation of overlay districts.

To determine which ridges hold primary status for protection refer to viewpoint and roadside visibility analyses. In addition it may be more feasible to implement these overlay districts within the publicly owned ridgeline areas of the county. Attempting to force a overlay upon private citizens owning land with ridgelines could slow down the process of ordinance creation.

Efficient protection will require adequate identification of the resources to be protected in this case the ridgelines. Take into consideration local and tourist favorites, particularly sensitive areas, and heavily trafficked areas. Comprehensive plans are a strong tool when conceiving new management strategies. Incorporating ridgeline protection into the County's comprehensive plan can create compatible uses of ridgelines, establish development standards, and develop "policies for current inappropriate land uses.



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## Napa County Ordinance

## Sample

### VIEWSHED PROTECTION PROGRAM

#### APPLICATION COMPLETENESS REQUIREMENTS AND CHECKLIST

1. ☐ Completed and Signed Application and Indemnification Form.
2. ☐ Vicinity Map.
  - A. A 7" by 5 1/2" portion of a 7.5-minute (1"=2000') United States Geological Survey (USGS) topography map.
  - B. Map shall show improvements in their relationship to abutting properties/structures and major and minor ridgelines.
3. ☐ Proposed Site Plan. A proposed site plan shall be prepared to locate only the proposed site improvements and areas to be disturbed (i.e. building site, graded area). Scale of the plan shall be appropriate to the area disturbed either through grading, construction or clearing of vegetation. The area surrounding the building pad/site shall be scaled at 1" = 20' or finer and roads or driveways at 1"=100' or finer. A scaled Site Plan shall include:
  - A. Location of all existing structure(s) to be removed or remain on site; note on plan whether to remain or to be removed.
  - B. Location of all existing vegetation six inches in diameter or greater, measured in diameter at breast height (DBH), including variety, height and canopy width.
  - C. Location of all proposed impervious surfaces (i.e. driveways, motor courts, patios).
  - D. Location of all wastewater disposal systems on site.
  - E. Proposed setbacks from property lines(s) and other structures.
  - F. Location of all spoils/stock pile area for all excavated and/or imported soils.
  - G. Total floor area shown, including all floors, of all structures, regardless of use.
4. ☐ Topographic Map/Preliminary Grading Plan. Map shall note the following:
  - A. Existing and proposed contours of the building site before and after all construction is completed, drawn at 2' or 5' intervals at a scale of 1"=20' or better; driveways or access roads must show 5' intervals at a scale of 1"=100' or better.
  - B. Map shall include the following section(s) at minimum:
    - i. Disturbed areas, including proposed/existing roads;
    - ii. Building(s) height(s), measured according to the most recently County adopted California Building Code;
    - iii. Roadways/Driveways, shown at intervals as required in County Slope Determination Methodology, Conservation Regulations Exhibit A (Resolution 91-61), shorter intervals may be required in areas of changing topography;
    - iv. Retaining walls or man-made embankments and berms, illustrating location and height (scale of 1/4" = 1').
  - C. Preliminary drainage plans for the site, showing the pattern and direction of flow, as well as any on site natural or man-made drainage/waterways.
  - D. Highest point of the proposed structure(s) measured vertically to top of nearest ridgeline.
5. ☐ Building/Structure Elevations.
  - A. Elevations shall scaled and include type of building material, color treatment and sample color-chip, roofing material and color.
  - B. Include information on window reflectivity and extent of window coverage.
  - C. "Building Height(s)," as defined in the most recent County adopted edition of the California Building Code, must also be shown on the elevations (See item #3 C. Determining Building Height in the Viewshed Protection Manual for measurement details).
6. ☐ Landscaping and/or Vegetation Retention Plan. Newly planted vegetation for the purpose of visual screening, must be of sufficient size to adequately screen the proposed structure(s) in two (2) to five (5) years. A complete plan shall include the following:
  - A. Identify and locate all the existing vegetation to remain as visual screening for the proposed structure(s), indicate variety, height and canopy width.
  - B. Identify initial planting sizes and varieties of all materials to be installed.
  - C. Illustrate the size and canopy width of planted materials, as they would appear 10 years after installation.
  - D. Distinguish the natural and/or installed landscaping to be included in the visual impact analysis.
  - E. Installed landscaping must be compatible with existing vegetation and landscape.
  - F. Establish a comprehensive landscape maintenance program, including a protection and pruning program for existing and planted trees.
7. ☐ Exterior Lighting Plan. Identifying the location, type of fixture, focus/purpose, as well as the use of any timers or motion sensor devices
8. ☐ Visual Impact Analysis. One or more of the following may be required to determine the visual impact of the structure(s) and its associated improvements and their conformance with the Viewshed Protection Program.
  - A. Story poles (the temporary placement of a mock wooden skeleton in the general shape of the building, then draping plastic orange snow fencing around the roofline to portray the visual prominence and bulk of the proposed structure).
  - B. Computer simulation.
  - C. Photomontage.
  - D. Picture or visual as viewed from designated public road at point(s) where the structure(s) is/are visible.
  - E. Appropriately scaled model.
  - F. Additional views or materials as required by staff from other vantage points.
9. ☐ Title Insurance Company Certified List of Adjoining Property Owners within 300 feet. Identifying all property owners within 300' of the subject parcel, specifying name, address and parcel number; included on two sets of mailing labels with accompanying Assessor's Pages used to compile the above property owner list. Please see " ADJOINING PROPERTY OWNER LIST REQUIREMENTS" for details on preparing the requested list.
10. ☐ Application Fee of \$\_\_\_\_\_ (to be determined at Pre-App meeting) plus an Initial Environmental Review Fee (if applicable) of \$\_\_\_\_\_ (to be determined at Pre-App meeting) (Napa County Policy Manual, Part 3 § 80.050). Checks made payable to the County of Napa.



## References

The Landscape Institute with the Institute of Environmental Management and Assessment. Guidelines for Landscape and Visual Impact Assessment. second ed. London: Spoon Press, 2002. N. pag. Print.

[http://en.wikipedia.org/wiki/Sullivan\\_County,\\_Pennsylvania](http://en.wikipedia.org/wiki/Sullivan_County,_Pennsylvania)

- information regarding Sullivan County's population

[http://en.wikipedia.org/wiki/IUCN\\_protected\\_area\\_categories#Category\\_V\\_.E2.80.94\\_Protected\\_Landscape.2FSeascape](http://en.wikipedia.org/wiki/IUCN_protected_area_categories#Category_V_.E2.80.94_Protected_Landscape.2FSeascape)

- IUCN category definitions

[http://www.anyplaceamerica.com/topographic\\_maps/search/pennsylvania/sullivan\\_county/-/5/orderby=5/](http://www.anyplaceamerica.com/topographic_maps/search/pennsylvania/sullivan_county/-/5/orderby=5/)

- Topography data within Sullivan County

[https://cms.psu.edu/Fall2/201314FA/201314FAUP\\_\\_\\_R-](https://cms.psu.edu/Fall2/201314FA/201314FAUP___R-LARCH414_002/_assoc/61C9EC8478DA4E76A76CB82E28CA6558/RidgelineProtOrd-TCClinton-edited.pdf)

[LARCH414\\_002/\\_assoc/61C9EC8478DA4E76A76CB82E28CA6558/RidgelineProtOrd-TCClinton-edited.pdf](https://cms.psu.edu/Fall2/201314FA/201314FAUP___R-LARCH414_002/_assoc/61C9EC8478DA4E76A76CB82E28CA6558/RidgelineProtOrd-TCClinton-edited.pdf)

- Ordinance sample

[http://old.nwm.org/downloads/scenicviewshedprotection\\_with\\_sample\\_language.pdf](http://old.nwm.org/downloads/scenicviewshedprotection_with_sample_language.pdf)

- Scenic viewshed protection strategies

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[http://www.jennessent.com/downloads/Land\\_Facet\\_Tools.pdf](http://www.jennessent.com/downloads/Land_Facet_Tools.pdf)

- Information regarding TPI