Night Skies Visibility Modeling
Grand Canyon National Park

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Grand Canyon National Park
July 23, 2015

Photo: Wally Pacholka/Astropics.com
Night Sky Protection Goals

• Refine and Finalize Lighting Guidelines

• Prioritize Lighting Retrofits (~3000)
  – Bulb Replacement
  – Light Fixture Shielding
  – Light Fixture Replacement

• International Dark-Sky Association (IDA) Certification for GRCA
Wide Field CCD Camera Mosaic
GRCA Sky Brightness, September 2007
Phantom Ranch (13 km), Las Vegas (290 km) and North Rim Lodge (12 km) from Walhalla Plateau
A single Line of Sight (LOS) in a particular direction, with examples of viewer and target offsets. Collectively, all of the LOS from a given location make up its viewshed.
Grand Canyon: South Rim as viewed from North Rim Lodge September 2013
Visibility

Determines the raster surface locations visible to a set of observer features, or identifies which observer points are visible from each raster surface location.
Visibility of Village Lights Set Back 100m from Rim
Visibility of Village Lights Set Back 300m from Rim
North Rim Lodge at Night
Visibility of North Rim Lodge Lights
Vegetation Considerations

- Vegetation Data Source and Type
- Vegetation Height Classification
- Vegetation Density
- Canopy Density
Vegetation Data

• LANDFIRE
  • Existing Vegetation Height (EVH)
  • Nationwide coverage
  • 30 meter resolution (raster)

❖ GRCA Vegetation Map
  ❖ Grand Canyon Nat’l Park only
  ❖ 0.5 hectare minimum mapping unit (polygon)
GRCA Vegetation Map (Lifeform)
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<th>Average Height Meters</th>
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Modify the Elevation Raster with Vegetation and Buildings Data
S Rim Village Visibility from Phantom Ranch, Ground Level
S Rim Village Visibility from Phantom Ranch, 6m Height
Visibility of Museum & Visitor Center Lights from Phantom Ranch
South Rim Lodges Visibility from Indian Garden
South Rim Observation Points
Visibility from North Rim Observation Points
Grand Canyon South Rim
Power Outage

During power outage
8:15pm

After power outage
8:30pm

All images exposed at ISO3200, f/3.5 for 8 seconds with a 24mm lens.
No post-processing except for minimal noise reduction and sharpening.
Camera location: Trailview Overlook on Hermit Road, February 27, 2014
Other Considerations

- Validation
- Resolution
- Vegetation (Density, Canopy, Height Classification…)
- Buildings
- Observation Point Heights
- Glare Distance
- Ground Reflectance (Albedo)