3D Analyst – Surface Analysis
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Surface Analysis

• Derivatives
  - Slope
  - Aspect
  - Hillshade

• Feature Interpolation
  - Interpolate Shape
  - Interpolate Poly To Patch
  - Surface Length
  - Surface Spot
  - Contour

• Visibility
  - Viewshed
  - Line of Sight

• Volume
  - Surface Volume
  - Cut Fill
  - Surface Difference
  - Polygon Volume
  - Extrude Between
Slope: steepness

Aspect: direction of steepest slope

Hillshade: steepness and direction relative to light source
Derivative Calculation

• Raster based
  - Local functions, 3x3 roving windows
  - Plane fitted to this ‘neighborhood’

• TIN based
  - Each triangle defines a plane unambiguously
3x3 Roving Windows

Note: Hillshade will not estimate values for boundary cells
Interpolation

• Feature interpolation
  - Raster
    - Bilinear
    - Sample distance
  - TIN
    - Linear
    - Natural Neighbors
    - ‘Natural’ densification

• Contouring
  - Similar for both raster and TIN
    - Linear threading through triangles
Cell vs. Surface Data Area

Raster image boundary

Surface domain

Interpolation zone is ½ cell in from image boundary
Raster Profile Sampling
TIN Profile Sampling
Visibility

- **Line Of Sight (LOS)**
  - Inputs are 2D or 3D lines
  - Only 1st and last vertices used as observer and target points
  - Raster and TIN implementations

- **Viewshed**
  - Frequency and Observers options
  - Raster algorithm
Line of Sight

- **Observer**
- **Target**

![Graph showing line of sight](image)
Line of Sight

When offset, the target can be visible even though the profile on the surface at that position is not.
When a target isn’t visible, its obstruction point always occurs along a visible portion of the profile.
Volumetrics

- **CutFill**
  - Raster/cell based

- **SurfaceVolume**
  - Raster and TIN/Terrain

- **TIN/Terrain specific**
  - Polygon Volume
  - Surface Difference
  - Extrude Between