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# **Creating Surfaces with 3D Analyst**

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## **Overview of Surface Data Types in ArcGIS**

#### Raster

Single-band Raster

- File or geodatabase
- Multi-resolution



#### TIN

**Triangulated Surface** 

- File based
- Single Resolution



#### Terrain

**Triangulated Surface** 

- Geodatabase
- Multi-resolution



#### **Raster Dataset**

- Square cells of equal size arranged in rows and columns
- Created through interpolation
- Data precision is defined by cell size



**Fine Resolution** 



**Coarse Resolution** 

## **Triangulated Surfaces Concepts**

- Irregularly spaced data points
- Constructed using Delaunay triangulation
- Support surface feature types:
  - Mass points
  - Break lines
  - Clip polygon
  - Erase polygon
  - Replace polygon
  - Fill polygon



# **Triangulated Surface Type: Mass Points**



# Triangulated Surface Type: Replace Polygon



# Triangulated Surface Type: Erase Polygon



# Triangulated Surface Type: Replace Polygon



### **TIN Dataset**

- Suited for smaller study areas
- Node limit of around 15 20 million
- Can be edited in ArcMap
- Supported in ArcScene



#### **Terrain Dataset**

- Stored in a geodatabase feature dataset
- Suited for larger data collections (e.g. lidar, sonar)
- Supports lidar attributes
- Supports anchor points
- Does not support GCS



ulton County Dept. of Health and Wellness/District 3, Unit 2,

# **Triangulated Surface Demo**



- Creating & Editing TIN Datasets
- Creating & Updating Terrain Datasets

### **IDW (Inverse Distance Weighted)**

- Applies distance based weights to measurements surrounding query point
- Resulting values are within range of input points
- Supports barrier features
- Ideal for dense point measurements



**IDW Neighborhood for Selected Point** 

### **Natural Neighbor**

- Weighted average method
- Uses Voronoi polygons to assign values
- Resulting values are within range of input points
- Does not infer trends



# Kriging

- Geostatistical interpolation method
- Most suited for data with spatially correlated distance or directional bias
- CPU intensive operation
- Has diverse applications



# Spline

- Creates smooth surface that passes through input points
- Infers trends
- Supports barriers
- Suited for smoothly varying phenomenon (e.g. temperature)

### **Topo To Raster**

- Ensures hydrologically correct surface
- Supports the following feature types:
  - Point elevation
  - Contour lines
  - Stream networks (line features)
  - Sinks (point features)
  - Boundary (polygon features)
  - Lake (polygon features)



### Trend

- Creates gradually varying surface using low-order polynomials
- Fits a smooth surface to the input points
- Supports up to 12<sup>th</sup> order polynomial
- Suited for modeling gradually changing physical processes - wind direction, pollution concentration



1<sup>st</sup> Order Polynomial



2<sup>nd</sup> Order Polynomial

#### **ArcGIS Help Resources**

- <u>Understanding interpolation analysis</u>
- Comparing interpolation methods
- Triangulated surface concepts
- Fundamentals of TIN triangulation
- Fundamentals of creating TIN surfaces
- <u>Terrain dataset overview</u>
- Benefits of using terrain
- Using the terrain wizard
- Updating and editing terrain

# **Questions?**

#### Please fill out the survey at www.esri.com/sessionevals

