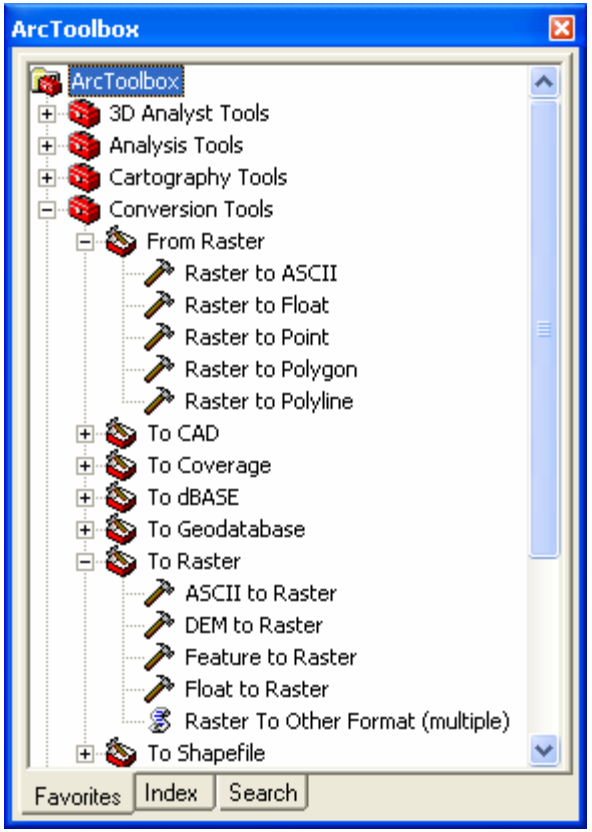
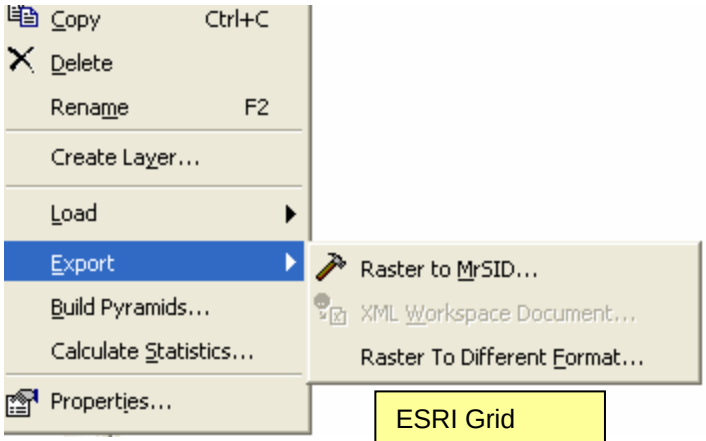
Geoprocessing and georeferencing raster data

Raster conversion tools

Geoprocessing tools



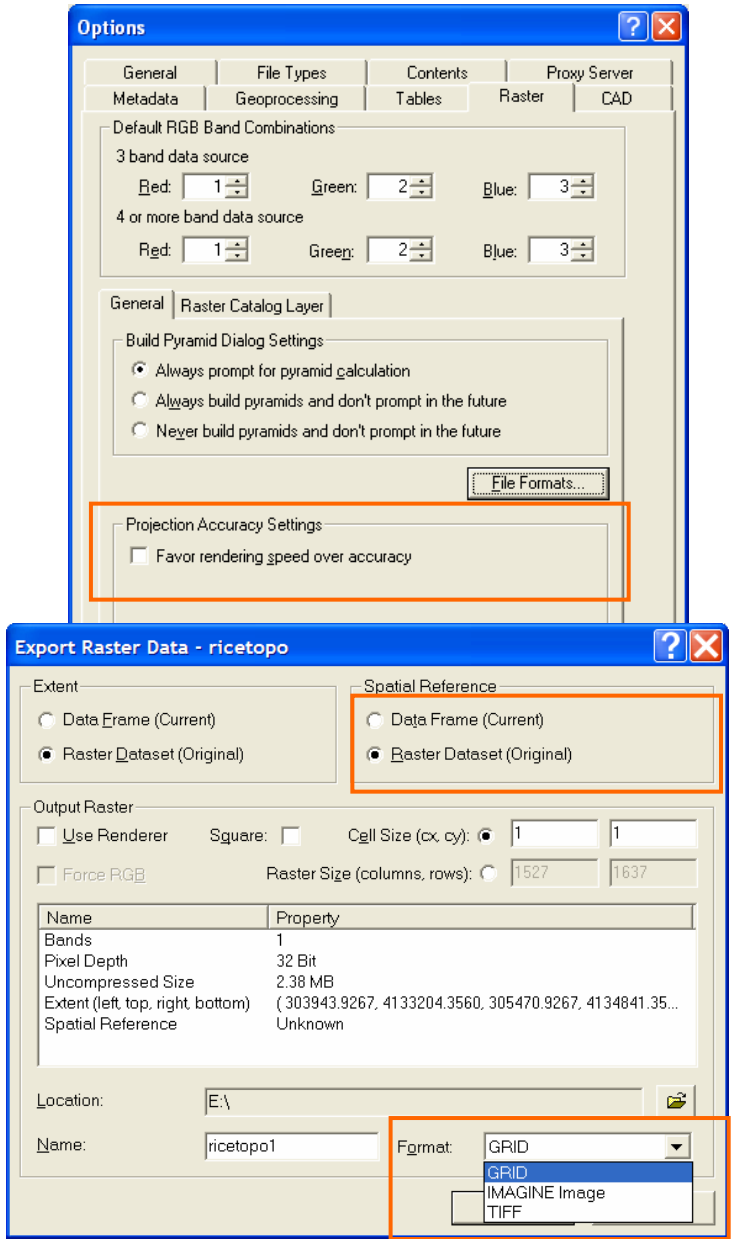
ArcCatalog tools



ESRI Grid
GDB Raster
•Raster Dataset
•Raster Catalog
Erdas IMAGINE
TIFF

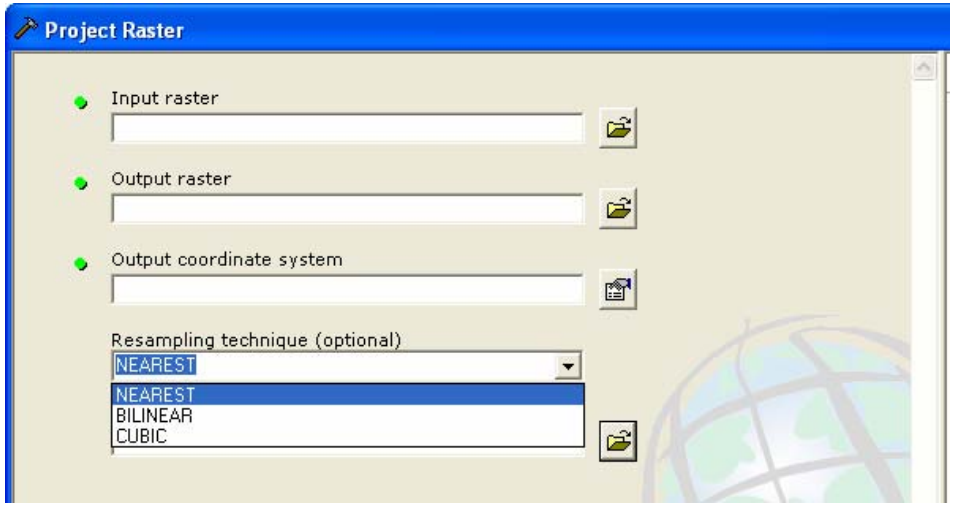
ArcMap - raster projection options

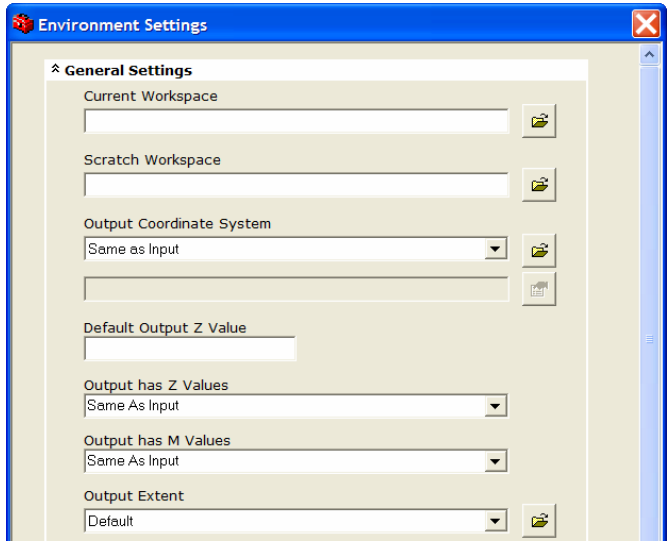
- Best situation - all inputs have same spatial reference
- Simple or robust algorithm choice
- Applies projection on the fly
  - Projection of data frame or first layer
- Export option - data frame or original projection
  - Various export formats



Geoprocessing - raster projection

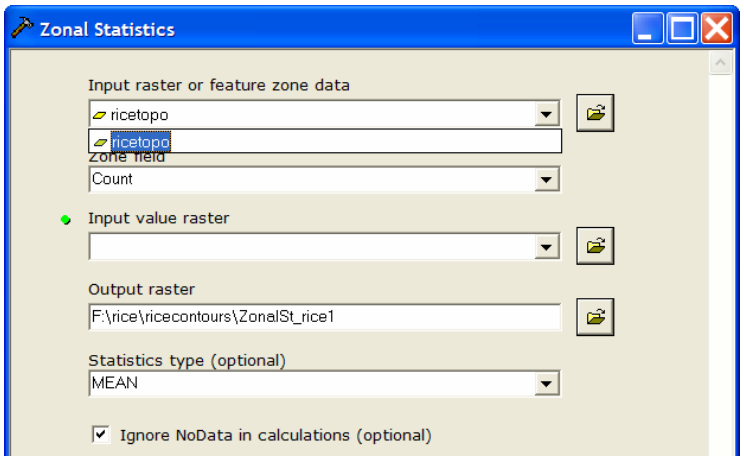
- **Data Management Tools -> Projections**
  - Best raster projection tool
  - Use resample method
    - Nearest neighbor
    - Bilinear interpolation
    - Cubic convolution
  - Option to specify registration points
    - origin point for anchoring output cells
- **Geoprocessing environment**
  - General settings for geoprocessing
  - Applied to all output rasters





Conversion on the fly

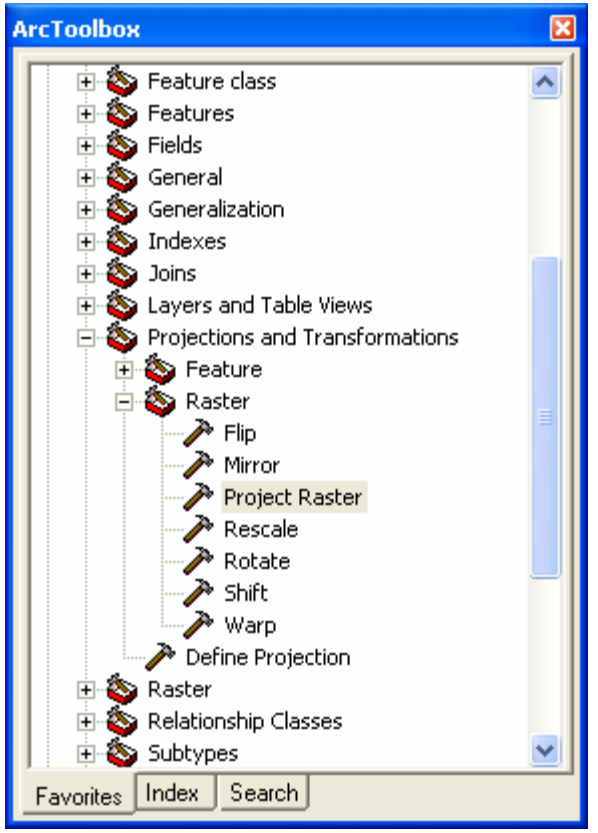
- Many functions accept feature or raster data as input
  - Feature data automatically converted when necessary



- Non-grid rasters converted to grid for analysis
  - Consider converting compressed data before processing

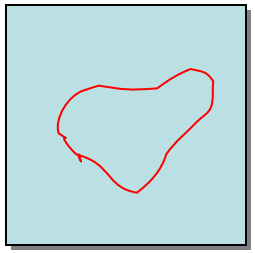
Geoprocessing - raster tools

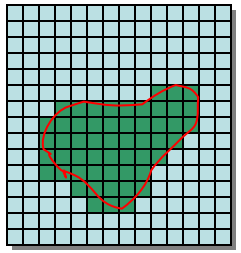
- **Tools to:**
  - Flip raster along horizontal axis.
  - Flip raster along vertical axis.
  - Converts between two coordinate systems.
  - Scale by the specified x and y
  - Rotate around a specified point by a specified angle
  - Shift by specified x and y shift
  - Transform using links



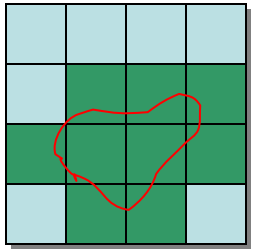
Conversion: polygon to raster

- **Convert using string or numeric field**
  - Unique attributes assigned value in the output raster
  - Conversion field added to VAT
- **May results in:**
  - Loss of detail
    - Smaller cell size — better representation
    - Larger cell size — more generalization
  - Loss of topological relationships





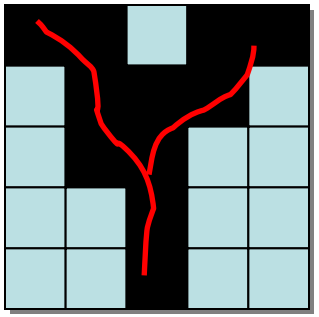
100m



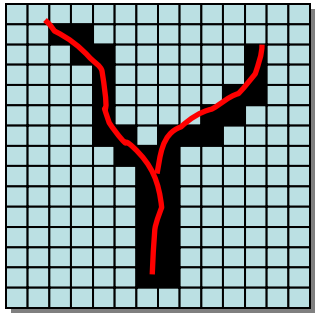
400m

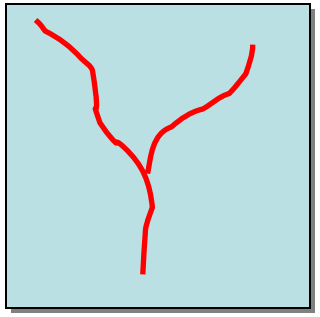
Conversion: line to raster

- Identifies raster cell crossed by the line
  - Codes cells with the attribute value associated with line
  - if more than one value for a cell
    - longest arc used
- Cell size should be
  - Average width of the linear features



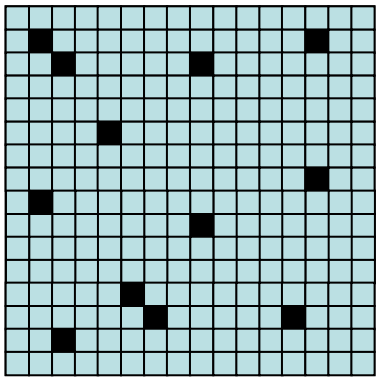
Lines

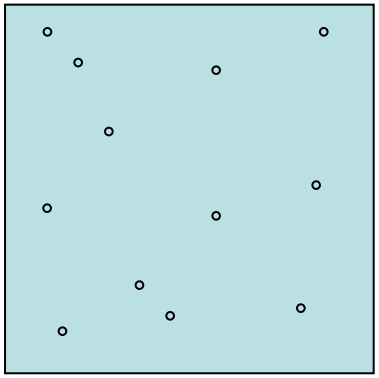


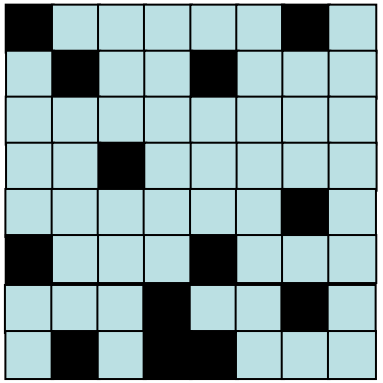


Conversion: Point to raster

- **Method:**
  - Cell with center closest to point xy - coded with attribute of point
- **NoData assigned if no point available.**
- **Cell size — overriding factor**
- **Note:**
  - Most often interpolate z values for points,not convert
  - Seldom can original points be retrieved from converted raster without loss

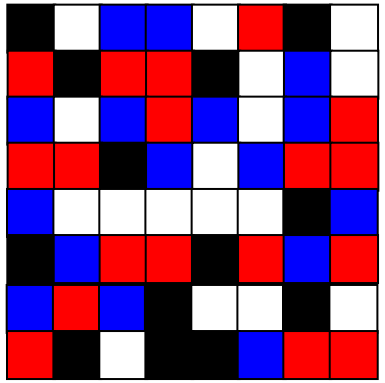


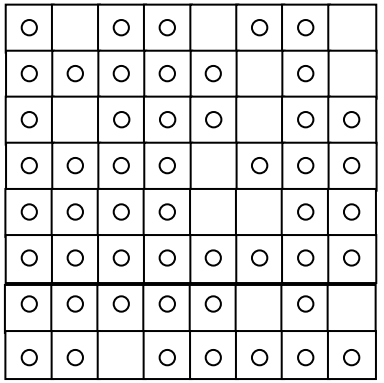




Conversion: Raster to feature

- **Raster to polygon**
  - Regions vector polygons
  - Cell size controls “blockiness”
  - Deploy raster generalization to reduce “stair-step” effect
- **Raster to lines**
  - Stream to feature tool
- **Raster to Point**
  - center of cell
  - defines point feature XV

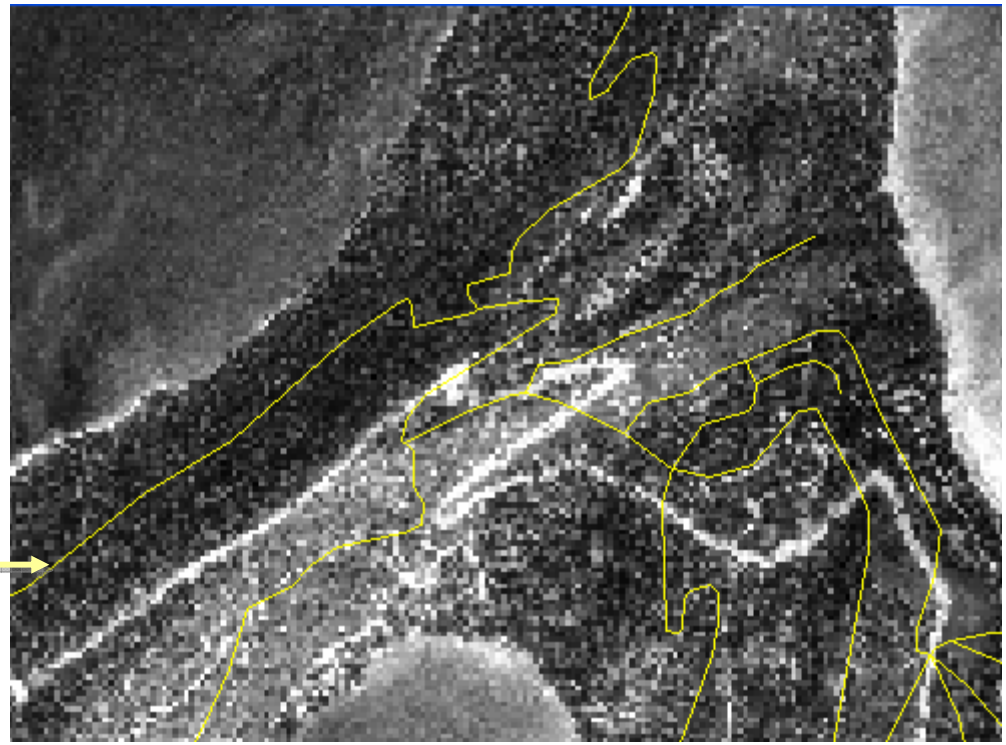




Georeferencing a raster

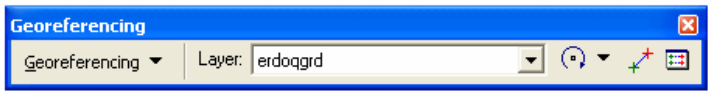
Image: Not georeferenced

Vector Data

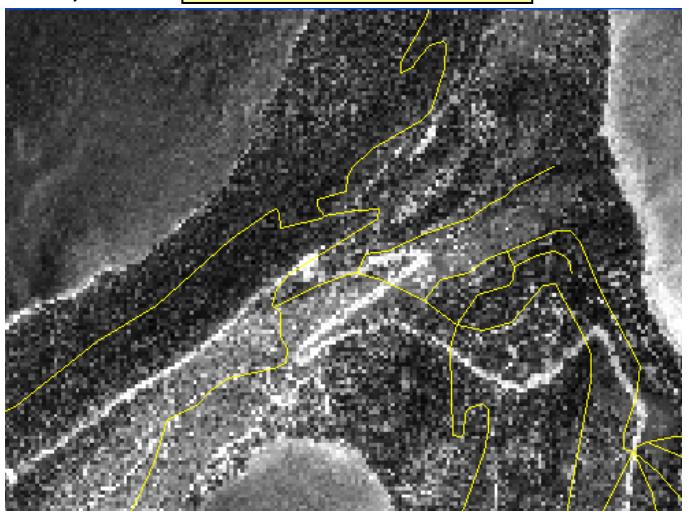


Georeferencing steps

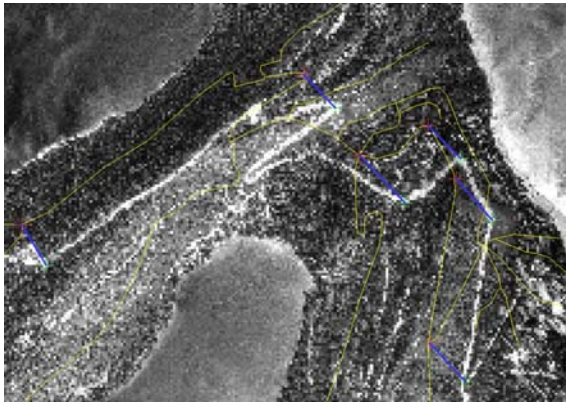
1. Add Georeferencing toolbar



2. Add Layers



3. Establish Links

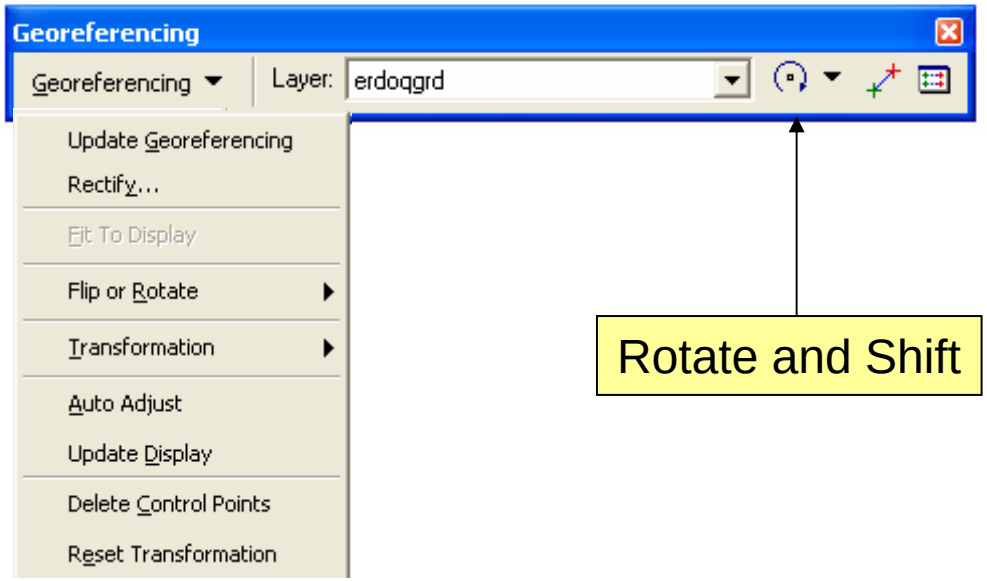


4. Assess Accuracy

5. Save Transformation
   - Update georeferencing
   - Rectify

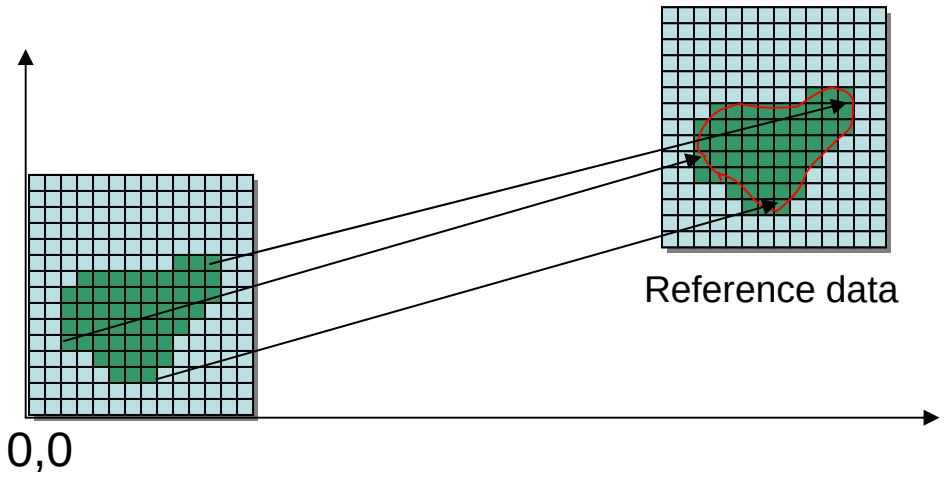
Georeferencing toolbar

- Component of ArcGIS deployed in ArcMap.
- Does not require ArcGIS Spatial Analyst



Establishing links

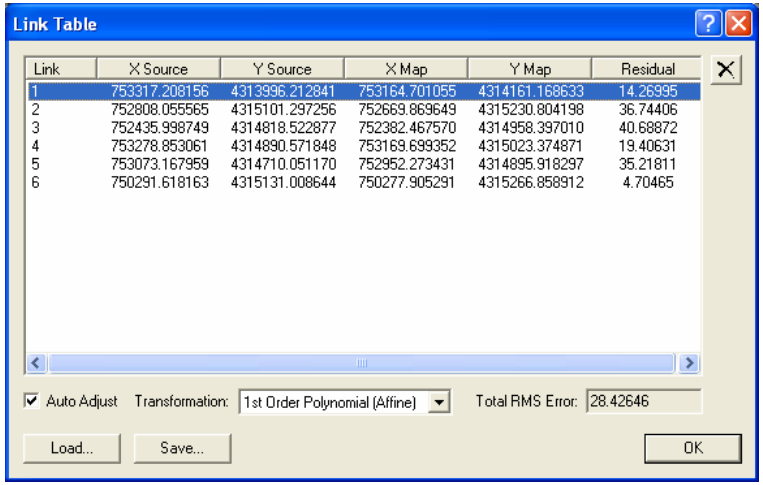
- Links used to tie unreferenced raster to geo-referenced source data
- Requires:
  - At least three links
  - Evenly distributed over the entire raster
- Choose Link features that will not change position with time



Assessing accuracy of links

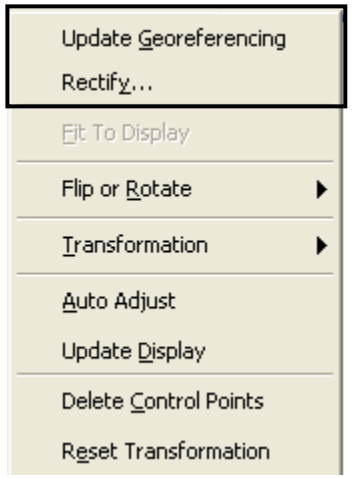
- **The Link Table**
  - Shows accuracy of transformation
  - Reports residual error of each link and RMS error for whole image
- **RMS error depends on**
  - Raster cell size
  - Accuracy in adding links

$$RMS=\sqrt{\frac{E_1^2 + E_2^2 + \ldots e_n^2}{n}}$$



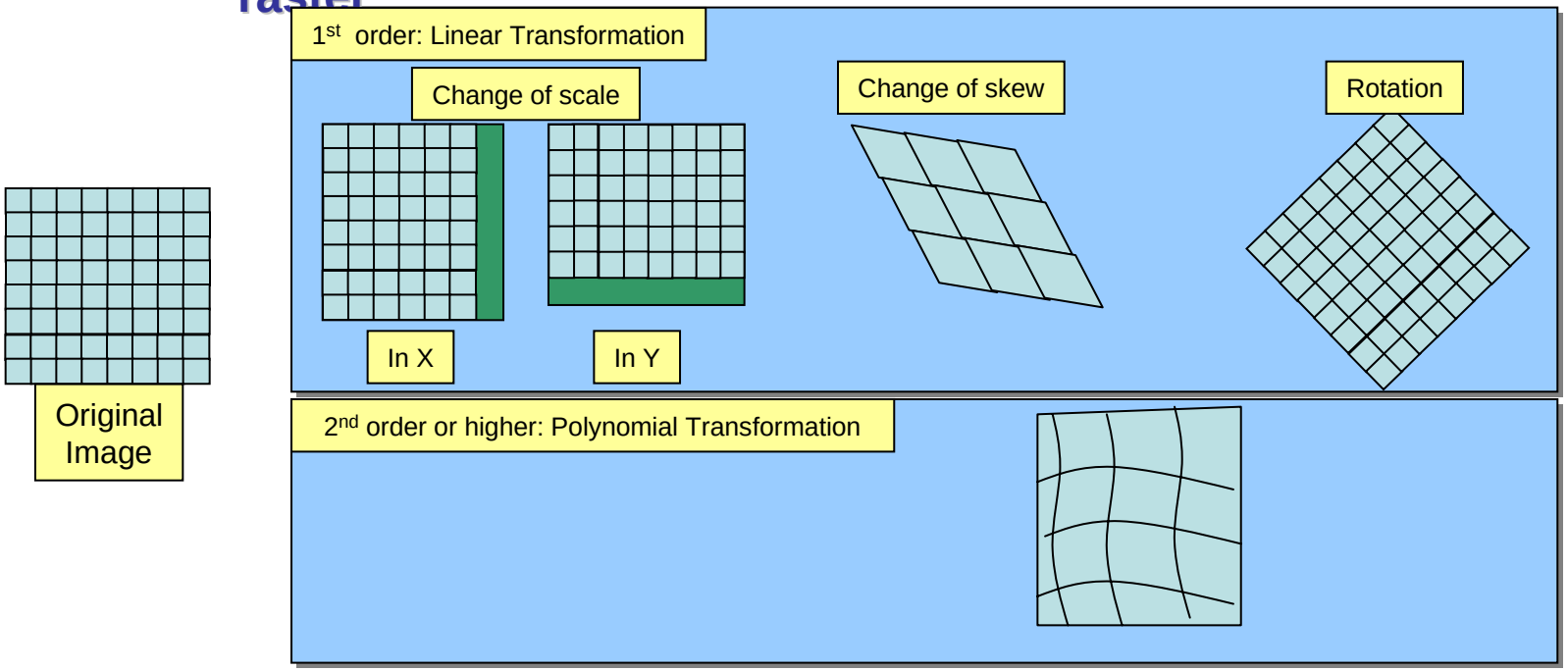
Initiating transformation

- **Final stage of alignment**
  - Two choices
- **Update Georeferencing**
  - Transformation information stored with raster and used when displayed or analyzed
  - No resampling of original data
- **Rectify**
  - Raster is resampled
  - New output created



Transformation process

- **Applies polynomial equation to unreferenced raster**
  - **Source coordinates converted to rectified coordinates**
  - **Transformation complexity determined by:**
    - **polynomial order number of links and distortion of source raster**



The Rectification process

- Creates output raster from link positions
- Resamples source raster
- Fits source raster to output raster