Polygon Analysis

This method is GIS dependent. Polygon-based analysis has the advantage of capturing the full extent of channel changes and utilizing the automated functions available in GIS.

Step 1: Scan and register remote sensing data (aerial photographs, maps) into GIS and rectify

Define a working scale then register the photos and maps using coordinates from pre-existing photos and maps such as orthophotos and digital elevation models or other previously rectified common base map or photo. Aerial photographs are orthorectified and maps are georeferenced so that all the data are in a common spatial projection. Data can then be brought into a GIS and channel features (e.g., gravel bar, islands) and channel locations can be digitized from the aerial photographs and maps. The changes in features and channel locations can then be analyzed with the GIS environment.

LIDAR can also be used for elevation model however DEM's and LIDAR should not be mixed to obtain one elevation model. Use the elevation data that covers the entire analysis area.

Step2: Digitize channel and floodplain features as polygons for each data set

Step 3: Calculate area changes between sets to determine erosion rates and estimate floodplain turnover rates for each channel reach. The floodplain turnover rate—also used for estimating the EHA, defines the amount of time it takes for a channel to occupy its entire valley bottom. In some systems, the river may occupy its entire valley bottom within a period of decades. Other systems may have floodplain turnover rates that extend over centuries. For each record of channel position, calculate:

- The total area of the active channel
- The area of the channel outside the area of previous record
- The area of channel outside all past channel locations.
- The area of floodplain that includes high flow and relic channels

Additional calculations may include but are not limited to:

- Area of deposition features (bars)
- Number of LWD structures

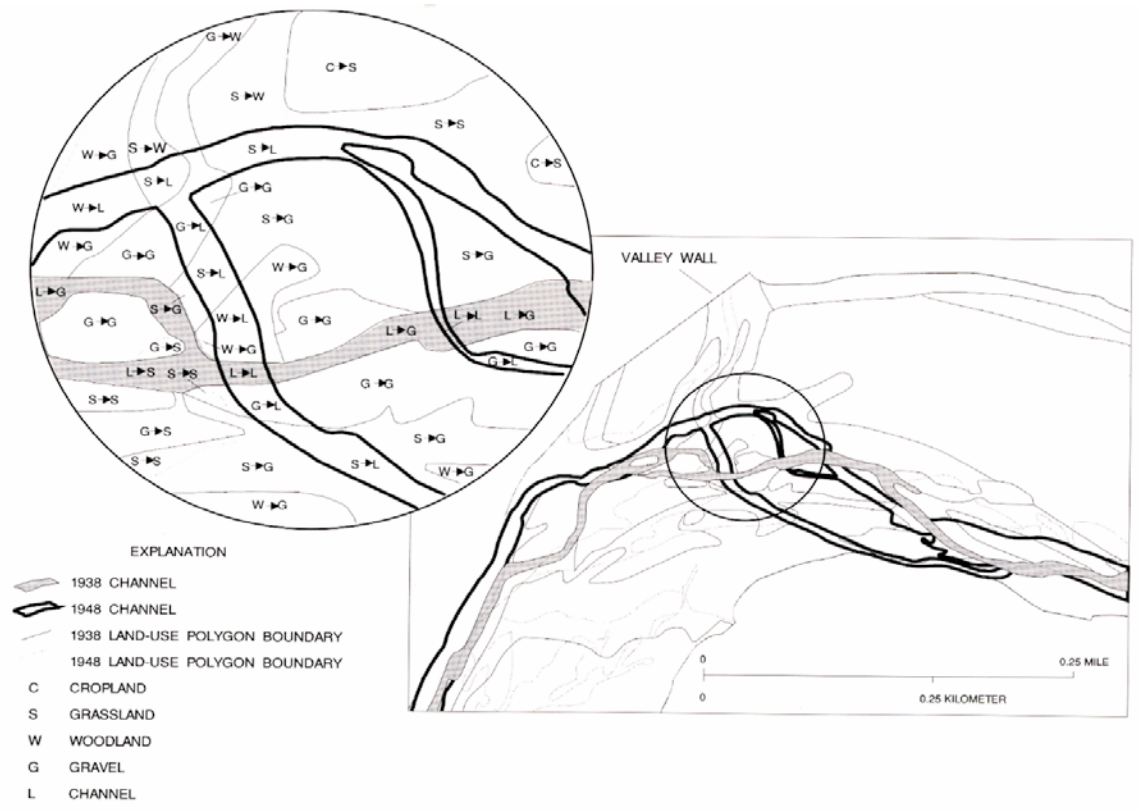

Figure: Example of using polygons in GIS to identify changes in attributes between two data sets (Jacobson and Pugh 1997 cited in Rapp and Abbe 2003).

EXAMPLE—Gray's River