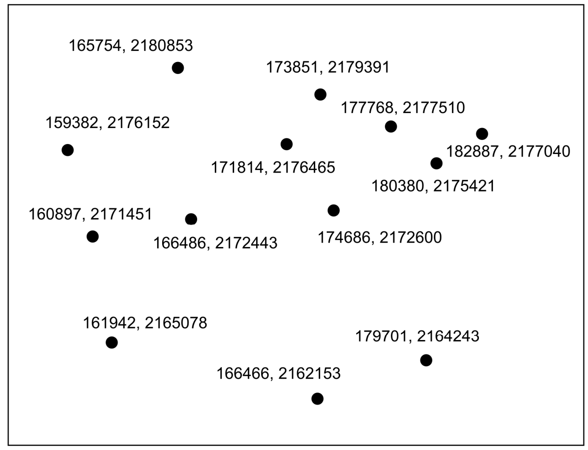
Mean and Weighted Mean Centers

Equations taken from Burt and Barber, 1996

Mean Center

$$\bar{X}_{Coord} = \frac{\sum_{i=1}^{n} X_i}{n} \qquad \bar{Y}_{Coord} = \frac{\sum_{i=1}^{n} Y_i}{n}$$

$$n = 13$$



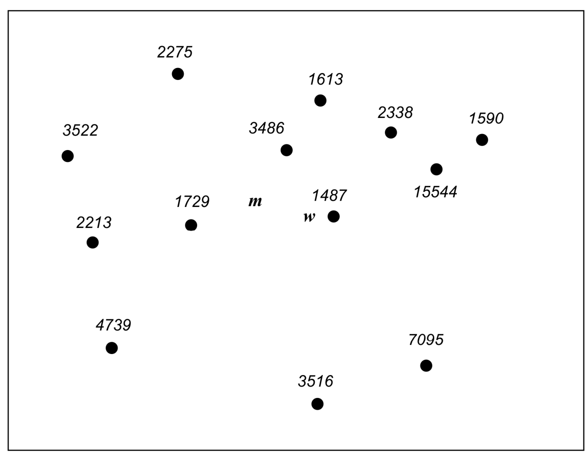
Example: The mean center is the average ***X*** and ***Y*** coordinate for a series of points on a map. The mean center is analogous to the mean of a set of observations. Mean centers can be calculated for any coordinate system, however it is much easier to calculate with projected (rather than geographic) data. The 13 coordinate pairs for the locations on the map at left are in UTM coordinates.

$$\bar{X}_{Coord} = \frac{165754 + 159382 \ldots + 173851}{13} = 170924 \qquad \bar{Y}_{Coord} = \frac{21808553 + 2176152 \ldots + 2179391}{13} = 2173138$$

$$\textit{Mean Center} = 170924,\ 2173138$$

Weighted Mean Center

$$\bar{X}_W = \frac{\sum_{i=1}^{n} w_i X_i}{\sum_{i=1}^{n} w_i} \qquad \bar{Y}_W = \frac{\sum_{i=1}^{n} w_i Y_i}{\sum_{i=1}^{n} w_i}$$



Example: The weighted mean center is the average ***X*** and ***Y*** coordinate for a series of points on a map weighted by some other variable. Using the 13 coordinate pairs for the locations on the first map, the mean center will be calculated by weighting the coordinates based on the population values shown at right.

$$\bar{X}_{Coord} = \frac{(2275)165754 + (3522)159382 \ldots + (1613)173851}{2275 + 3522 \ldots 1613} = \frac{8859431281}{51147} = 173215$$

$$\bar{Y}_{Coord} = \frac{(2275)21808553 + (3522)2176152 \ldots + (1613)2179391}{2275 + 3522 \ldots 1613} = \frac{111105588481}{51147} 2172280$$

$$\textit{Weighted Mean Center} = 173215,\ 2172280$$

Note the difference in the locations of the mean (***m***) and weighted mean (***w***) centers on the second map. The town with the largest population (15,544) pulls the weighted mean center eastward.