

## ADDITIONAL RESEARCH ON METHODS TO DETERMINE COMPACTNESS, CONTIGUITY AND CONGRUENCE WITH POLITICAL SUBDIVISIONS

### COMPACTNESS

There are at least four approaches that can be used to achieve compactness. The two most widely used, both of which can be turned into mathematical scores for the commission, the public and the courts to use in comparisons, are "total perimeter" and radius or length-width (two different ways to measure basically the same thing). The two other criteria are grid tiling and intuitive oddness vs. normality. All criteria that encourage formal compactness can also make it harder to achieve other goals, such as community of interest, when a relevant community is spread out.

**Total perimeter**, employed in various states: calculate the length of the boundary line that surrounds each district, and minimize the sum you get by adding up that number for all districts.

The **Colorado** constitution's language on this is some of the strongest: "Each district shall be as compact in area as possible and the aggregate linear distance of all district boundaries shall be as short as possible."

Advantage: This method strongly discourages both wide-area gerrymandering and tactical zigzagging of local lines to punish or reward candidates. Disadvantage: It discourages zigzagging of local lines that may make sense to respect municipal boundaries or unite coherent communities.

**Length-width or radius approaches**, also used in many states: minimize the aggregate size of the rectangles or circles you would need to draw around each district to enclose them individually. **Iowa**: "In general, reasonably compact districts are those which are square, rectangular, or hexagonal in shape...[length + width sums] may be cumulated for all districts in a plan in order to compare the overall compactness of two or more alternative districting plans". **Michigan** uses circles rather than rectangles: "Compactness shall be determined by circumscribing each district within a circle of minimum radius and measuring the area, not part of the Great Lakes and not part of another state, inside the circle but not inside the district."

Advantage: This method discourages wide-area gerrymandering that uses long or serpentine districts. Disadvantage: It does little to discourage tactical local zigzagging.

**Grid tiling:** **Arizona** seems to be unique in prescribing that mappers begin with "districts of equal population in a grid-like pattern across the state" then adjust it to account for a list of factors.

**Oddness:** **Idaho** says "To the maximum extent possible, the plan should avoid drawing districts that are oddly shaped."

Some states use **more than one formula**. **Iowa**, widely admired for its fair results, prescribes (by law, not in its constitution) detailed versions of both the total-perimeter and length-width

tests "if it is necessary to compare the relative compactness of two or more districts, or of two or more alternative districting plans."

## **CONTIGUITY**

Many states prohibit corner-to-corner connection between parts of a district from being deemed contiguous.

Several others cite road connections as relevant in deciding whether a district is contiguous.

In **Oregon**, each district must be "connected by transportation links." **Maine** has a similar idea defining: "functionally contiguous and compact territory" as "one that facilitates representation by minimizing impediments to travel within the district. Impediments to travel include, but are not limited to, physical features such as mountains, rivers, oceans" etc. **South Carolina** cites "a representative's reasonable access to constituents via roads and highways."

On water connections, relevant to Maryland's issues with the Chesapeake Bay, **Minnesota** uses "Contiguity by water is sufficient if the water is not a serious obstacle to travel within the district."

## **COUNTY SPLITS AND POLITICAL SUBDIVISIONS**

Because of equal-population and Voting Rights Act considerations, there will always need to be a certain number of county splits, but many states give a high priority to minimizing the number of splits given these constraints.

**Iowa** uses, "To the extent consistent with [provisions on population variance], district boundaries shall coincide with the boundaries of political subdivisions of the state. The number of counties and cities divided among more than one district shall be as small as possible. When there is a choice between dividing local political subdivisions, the more populous subdivisions shall be divided before the less populous," with an exception for cities that are in more than one county.

**Colorado** has some of the strongest language: "Except when necessary to meet the equal population requirements of section 46, no part of one county shall be added to all or part of another county in forming districts. Within counties whose territory is contained in more than one district of the same house, the number of cities and towns whose territory is contained in more than one district of the same house shall be as small as possible. When county, city, or town boundaries are changed, adjustments, if any, in legislative districts shall be as prescribed by law."

**Idaho** is also very strong. Its constitution: "a county may be divided in creating districts only to the extent it is reasonably determined by statute that counties must be divided to create senatorial and representative districts which comply with the constitution of the United States." Statute: "Counties should be divided into districts not wholly contained within that county only to the extent reasonably necessary to meet the requirements of the equal population principle."

In the event that a county must be divided, the number of such divisions, per county, should be kept to a minimum."

**Kansas** guidelines add some philosophy that may be relevant for us too. "Whole counties should be in the same congressional district to the extent possible while achieving population equality among districts. County lines are meaningful in Kansas and Kansas counties have historically been significant political units. Many officials are elected on a countywide basis, and political parties have been organized in county units. Election of the Kansas members of Congress is a political process requiring political organizations which in Kansas are developed in county units. To a considerable degree most counties in Kansas are economic, social, and cultural units, or parts of a larger socioeconomic unit."

**Alabama, Kansas, Kentucky, and Wyoming** are among states that specify that census blocks, voting precinct boundaries, or both must be respected where feasible.

**Minnesota** discourages multi-splits of a single jurisdiction: "When any county, city, or township must be divided into one or more districts, it will be divided into as few districts as possible."

**Massachusetts**, where the town rather than the county is the basic political unit, protects its smaller towns from splits: "no town containing less than twenty-five hundred inhabitants according to said census shall be divided." "such districts shall be formed, as nearly as may be, without uniting two [political subdivisions] into one district."