A Formal Model of Apportionment and District Plans

For any redistricting process, is it feasible to maintain county boundaries intact to eliminate manipulation for political and partisan purposes? From 1990 through 2010, recent district planning purportedly de-emphasizes splitting, dividing, otherwise crossing local jurisdictional boundaries of major and minor civil districts. This study analyzes a linear programming model with existence of integer coefficients and integer solutions. This model also provides for determining the number of apportionment and district plan solutions. The data for this analysis involves the transition in district plans from bills of adjustment to what were considered permanent district plans, to comprehensive decennial redistricting. The evidence for seven states provisions, in California, Nevada, New Mexico, Oregon, Colorado, Washington and Alaska, demonstrates the critical point of transition during the apportionment decisions. These results describe the effort and potential to change redistricting by minimizing the division of local jurisdiction for electoral purposes.

This study presents an analysis of legislative apportionment and division in seven states, during two periods of critical transition: 1950-1965 and 1972-2012. The analysis tests a model of apportionment and division to explain variation in county division for selected redistricting plans.

Keywords apportionment (elections) law, legislative redistricting, local jurisdiction

The choice of a legislative district plan has become a decennial political process to implement a method of proportionality and district planning. The evolution of apportionment (elections) law is such that the methods have changed from (state) constitutional apportionment, to methods of apportionment and division, and then methods of apportionment and district planning. Because demographic changes from 1910 to 1990 resulted in differential county population growth rates, decisions considered county unit voting, multi-member districts, weighted voting, and other forms of At-Large Election. As county variance increased, large proportions of counties failed to attain population thresholds to qualify for single county district allocations. Even so, a few states, such as Wyoming and West Virginia chose a modified county district plan, with most counties having a single district allocated or only a small number of counties combined into a single district. Inasmuch these two state examples maintained a county district plan until 1990, by allocating either single county districts or a merger of two or three counties into single districts. By the time of the 1990 Census, there were only a few states, with small numbers of counties, that could guarantee at least one Assembly District per-county.

Given the decline in county districts, the full implementation of the method of proportionality implies choices of district plans consistent with population ratios equal to a division of the state population by the size of the legislative chamber. By imposing this method of apportionment, the issue of mal-apportionment becomes solved based on some condition of the population equality of the districts. As a consequence, any remaining district population inequality is the result of district mis-allocation from a redistricting process. The supposed end of apportionment politics has therefore been replaced by a politics of redistricting and voting rules and procedures that may be implemented by the choice of a district plan.

District mis-allocation may occur for the purposes of strategic manipulation of district boundaries. The politics of redistricting suggests the primary goals for manipulability are to attain increased partisan shares of The Legislatures, chances of reelection to The Legislatures, and for the purposes of creating majority-minority districts. Any advantages in redistricting politics equate manipulability with choice of a district plan by strategies in boundary setting in the redistricting process. As a consequence, any redistricting plan is manipulable, and any choice of a district plan is the result of strategic boundary manipulation during imposed time lines for planning election districts. Because the strategic aspects vary in priority, marginal gerrymandering of all district boundaries produces substantial and sometimes unexpected changes in the choice of a district plan.

Any mal-apportionment that exists is therefore considered the result of district mis-allocation and is therefore caused by the gerrymandering of a redistricting plan. This outcome may be corrected by adjustments to the district boundaries. In other instances, the outcomes from manipulation may require changes to an approved district plan. In settings where these require changes in only a few districts, with contiguous boundaries, boundary adjustments may be made in isolation from the adoption and enactment of a comprehensive district plan. The adjustments to individual districts can be substantial in either a redistricting process or any additional litigation that produces changes in a redistricting plan. Some of these changes may involve county district plans that change delegation sizes and produce changes in district boundaries contained within an individual county district plan. This study of district planning analyzes the evolving patterns of adjustment in apportionment and district allocation producing an outcomes space with the choice of intact boundaries and county division and subdivision districts.

Formal Model and Analysis

Definition 1.1 number of local jurisdictions ≡ J = {1, ..., j}, a finite integer set.

Definition 1.2 number of districts ≡ d = {1, ..., m}, a finite integer set.

Definition 1.3 size of the legislative chamber ≡ n = {1, ..., n}, a finite integer set.

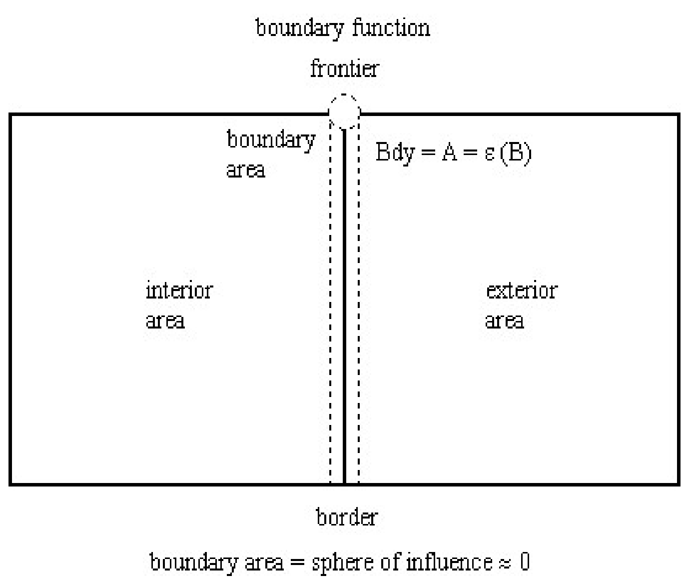
Definition 2.1 A boundary function, B, divides any coordinate space into an interior (int Å = e | A), exterior (ext Å = Γ - ℂ | A), and bounded set (B(d)) consisting of a Bdy = Å = Fr A ∪ Bdr A.

Definition 2.2 frontier, Fr A ≡ boundary function, B(d), for any open set, A & Γ - A.

Definition 2.3 border, Bdr A ≡ boundary function, B(d), for any closed set, (ℂ | A = Å).

Theorem 1.0 Boundary function ≡ B(d) has Banach measure space for any bounded set. Proof. For any set of well defined and continuous boundaries B(∩d), the area of the boundaries, Å = B(d), has Banach measure space (see FIGURE 1.0). Given the set of boundaries are contained in a Hausdorff Space, B(d) ⊂ ℋ, the areas of the boundaries equal zero, Å = B(d) = 0.

FIGURE 1.0



Definition 3.0	District Plan, $\phi(D) \equiv$ district planning map.
Theorem 2.1	District planning is a mapping for any finite integer set of districts. Proof. Definition 1.2 & 3.0. $\phi(D) \equiv$ district planning map. $d = \{1, ..., m\} \equiv$ number of districts. Given $d = I = \{1, ..., m\}$, $\phi(d) = d$ is a mapping of a finite integer set. Setting $\phi(d) = \phi(D)$ for the whole set of districts, $\phi(D) = D$, equals the numbers of districts mapped for the set of districts. $B(d) = \phi(D)$ is the district planning required to map the district plan. Boundary functionality in the district plan requires $B(d) = d$ are the district boundaries for the number of districts in the plan. $\phi(D) = d$ is therefore the district plan map for any finite integer set of districts.
Theorem 2.2	The choice of a district plan represents the selection of a district plan from a set of (district planning) alternatives. Proof. $Å = [D, B(d)]$. $\mathbb{C}(Å) = Å = \lambda \bullet D$. $B(d) = d$. $\lambda \bullet D = d$. Remarks. The choice set of district boundaries is selected from a set of district planning alternatives. The choice of the district plan is equal to the number of mapped districts.
Theorem 2.3	A (comprehensive) redistricting plan is a remapping of district boundaries. Proof. Redistricting $\equiv$ B\`(d). Given $SQ(D) = \underline{d}$, $B(d) = \underline{d}$. $\lambda \bullet D = d$. $\phi'(\underline{d}) = B`(d)$. $B`(d) = d$.
Theorem 3.0	Given constituency areas satisfy the Hausdorff condition, the choice of the district plan is limited and restricted to non-overlapping districts. Proof. Theorem 1.0. $\cap A_d = \varnothing$. $\lambda \bullet D = \cap A_d$. $A = B(d) = 0$. $\mathbb{C}(Å) = Å = \{d_1, ..., d_m\} = \Sigma A_d = A_1 + A_2 + ... + A_d$. $B(d) = d = \lambda \bullet D$.
Proposition 1.0	The States have territorial integrity of jurisdictional boundaries, $\Gamma(A) \sqsubseteq B$.
Definition 4.0	The number of jurisdictions contained within State boundaries is equal to the number of major and minor civil districts, $J \subseteq B(N) = A$. $J = \Sigma d_j$.
Proposition 2.0	fragmentation number, $F(j) \Rightarrow$ finite integer solution, $\mathbb{I}(J) \cap \mathbb{I}(\mathcal{P}) = J$.
Proposition 3.0	number of partitions, $\mathcal{P} \Rightarrow$ fragmentation solution, j^*.
Theorem 4.1	The number of local jurisdictions equals a fragmentation solution. Proof. The number of local jurisdictions $\equiv J = \{1, ..., j\}$, a finite integer set. $B \equiv J(N) = \mathcal{P}$, a partition of state territory. Assuming territorial integrity of state boundaries, $J(N) =$ an open and complete covering of state territory. Any partition segmentation equal to the number of local jurisdictions, is therefore a fragmentation solution $\mathscr{F}(J) = j^*$.

Theorem 4.2 A jurisdictional fragmentation solution is a structure induced equilibrium. Proof. For any finite integer set of local jurisdictions $\equiv J = \{1, ..., j\}$, a majority of the jurisdictions can be determined for an odd or even number of jurisdictions. For example, define county unit voting as a simple majority of counties. A simple majority of counties equal the number of counties divided by two plus one for an even number of counties. For an odd number of counties, a simple majority of counties equal the number of counties plus one, divided by two. For any form of local jurisdiction, a simple majority of local jurisdictions equal an even division of the major or minor civil districts plus one additional district. A structure induced voting equilibrium exists for any finite integer set of local jurisdictions.

Theorem 5.1 Any set of district boundaries is a Hausdorff Space.
Proof. $\mathrm{B}(\cap d) = \varnothing \Rightarrow \mathcal{H}$.

Theorem 5.2 Any set of local jurisdictional boundaries is a Hausdorff Space.
Proof. $\phi(\cap J) = \varnothing \Rightarrow \mathcal{H}$.

Theorem 5.3 Any district plan is a Hausdorff Space.
Proof. $\mathrm{B}(d) = d$. $\mathrm{B}(d) = \phi(d)$ and $\phi(\cap d) = \varnothing \Rightarrow \mathcal{H}$. $\mathrm{B}(d) = \phi(J)$ and $\phi(\cap J) = \varnothing \Rightarrow \mathcal{H}$.

Theorem 5.4 District planning selects a finite covering.
Proof. $D \cap \mathcal{P} = \mathbb{C} \Leftrightarrow \mathbb{I}(D) \cap \mathbb{I}(\mathcal{P})$.

Theorem 5.5 District planning selects a unique finite integer covering.
Proof. $\mathrm{B}(d) = \phi(J)$. $\mathrm{B}(\cap d) = \phi(\cap J) = \varnothing \Rightarrow \mathcal{H}$. $\mathcal{H} \Rightarrow \mathbb{C} \Leftrightarrow \mathbb{I}(D) \cap \mathbb{I}(\mathcal{P})$. $D \cap \mathcal{P} = \mathbb{I}(D) \cap \mathbb{I}(\mathcal{P}) \Leftrightarrow \mathbb{C}$.

Theorem 5.6 Any set of local jurisdictions is a finite open cover of state territory.
Proof. $J = m_j = I = \{1, ..., j, ..., m\}$. $A_1 + A_2 + ... + A_j. = \Sigma A_J$. $A_J \subseteq A$. $J(N) \subset \mathrm{B}(A) = \mathcal{P}$. $J \cap \mathcal{P} = \mathbb{I}(J) \cap \mathbb{I}(\mathcal{P}) \Leftrightarrow \mathbb{C}$. $\mathbb{C} \subset A$.
Remarks. The number of jurisdictions contained within State boundaries is equal to the number of major and minor civil districts. The number of major and minor civil districts compose a finite integer set. Given The States have territorial integrity total state area is contained within jurisdictional boundaries. Even so, only a proportion of total state area is delegated charter authority, forming incorporated local jurisdiction.

Theorem 5.7 Any choice of the district plan is a finite and complete cover of state territory.

Proof. $\lambda \bullet D = d$. $\lambda \bullet D = \cup A_d$. $A_1 + A_2 + ... + A_{d}. = \Sigma A_d = A$. $A = \phi(D)$. $\mathbb{C}(\mathring{A}) = \mathring{A} = A$.

Remarks. Any choice of a district plan is required to cover the total state area for apportionment and division. Any m-districts adopted and enacted in a district plan equal the choice of a planning alternative containing total state area.

Theorem 5.8 Any set of legislative district boundaries is a finite and complete cover of state territory.

Proof. $B(d) = \lambda \bullet D$. $\lambda \bullet D = d = \cup A_d$. $\cup A_d = \mathring{A} = A$. $A = \phi(D)$.

Theorem 6.1 (Classification of District Planning) Choice of a District Plan

- $N = SC$
- $N = MC$
- $N = \lambda \bullet SC$
- $N = \lambda \bullet MC$
- $N = SC + MC$
- $N = SC + \lambda \bullet MC$
- $N = \lambda \bullet SC + MC$
- $N = \lambda \bullet SC + \lambda \bullet MC$

Theorem 6.2 (Classification of District Planning) Choice of a District Plan

- $N = SMD$, single member district plan
- $N = MMD$, multi-member district plan
- $N = \lambda \bullet SMD$
- $N = \lambda \bullet MMD$
- $N = SMD + MMD$, mixed representation plan
- $N = SMD + \lambda \bullet MMD$
- $N = \lambda \bullet SMD + MMD$
- $N = \lambda \bullet SMD + \lambda \bullet MMD$

Theorem 6.3 (Classification of District Planning I) District Planning outcomes I

	SMD	MMD
SC	single county district	single county unified district
MC	multi-county consolidated district	multi-county, regional district

Theorem 6.4 (Classification of the District Planning II) District Planning (ESS) evolutionary stable strategies

	SMD	MMD
SC	single county district = one district per-county allocation ≈ 0	single county unified district → 0 ⇔ single county subdivision districts
MC	multi-county consolidated district → increasing number of counties per-district allocation	multi-county, multi-member district ≈ 0

Theorem 6.5 (Classification of the District Planning III) District Planning outcomes II

	SMD	MMD
SC	SCSMD = 0	county subdivision districts
MC = j ≤ 3	county division districts	MCMMD = 0
MC = j ≥ 4	regional districts	MCMMD = 0

Theorem 6.6 (Classification of the District Planning IV) District Planning outcomes III

	SMD	MMD
SC	single county districts = 0	county subdivision districts
MC	regional county division districts	multi-county, multi-member districts = 0

Theorem 6.7 There are four district planning outcomes.
Proof. (SC, SMD); (MC, SMD); (SC, MMD); (MC, MMD).

Proposition 4.1 (ESS I) The number of counties per-district allocation is increasing.

Proposition 4.2 (ESS II) The number of multi-county consolidated districts is increasing.

Proposition 4.3 (ESS III) The number of county division districts is increasing.

Proposition 4.4 (ESS IV) The number of multi-county single member districts consolidated in small numbers of whole county units, by pairings or groupings of counties, is decreasing.

Proposition 4.5 (ESS V) The number of multi-county single member districts consolidated with a large number of counties, into a regional district, is increasing.

Proposition 4.6 (ESS VI) The number of regional county division districts is increasing.

Proposition 4.7 (ESS VII) The number of multi-county consolidated multi-member districts is decreasing.

Proposition 4.8 (ESS VIII) The number of multi-member districts is decreasing.

Proposition 4.9 (ESS IX) The use of floterial districts and fractional representation is decreasing or these districts have been eliminated.

Proposition 4.10 (ESS X) The use of temporary districts for a fraction of a decade and proportionate representation is decreasing or these districts have been eliminated.

Proposition 4.11 (ESS XI) Permanent district plans, not frozen districts, are limited to a decennial period.

Proposition 4.12 (ESS XII) The use of additional districts and mixed representation plans are decreasing at the state level, and increasing at the local level.

Proposition 4.13 (ESS XIII) The use of additional or floterial districts and partial representation plans are decreasing or these districts have been eliminated.

Proposition 4.14 (ESS XIX) Any redistricting plan implies the adoption and enactment of non-overlapping single member districts.

Proposition 4.15 (ESS XX) The ESS under county unit apportionment and division equaled, (SC, MMD) = 2 Assembly Districts allocated and (MC, SMD) = 2 counties allocated one Senate District as the apportionment and fragmentation solution.

Proposition 5.1 Single county district = single population ratio.

Proposition 5.2 County district = $\lambda\bullet$population ratio = threshold range for a single district allocation = apportionment solution.

Proposition 5.3 County district = $\lambda\bullet$population ratio = (density or frequency) classification of (the number of) local jurisdictions for a single district allocation = apportionment solution.

Proposition 5.4 Single county district plan = district allocation = structured induced equilibrium (simple majority of counties).

Proposition 5.5 District allocation = number of districts = a multiple of a population ratio.

Proposition 5.6 Single district allocation = number of counties = a single population ratio.

Proposition 5.7 as $t \rightarrow T$, limit (number of single county districts) = 0.

Lemma 1.0 Any county district plan is an apportionment solution and a district allocation guaranteeing the existence of a structure induced voting equilibrium.
Proof. Propositions 4.1 - 4.6.

Lemma 2.0 Any county district plan satisfying the conditions of an evolutionary stable strategy guarantee that no structured induced voting equilibrium exists.
Proof. Proposition 4.7. Given an initial adoption and enactment of a county district plan, the ESS converges in the limit to a district plan where the number of single county districts equals zero. The number of single county districts equal to zero implies prohibition of the single county district plan and no structured induced equilibrium in existence based on a simple majority of counties.

Theorem 7.1 Any county district plan guarantees the existence of a structure-induced voting equilibrium in county unit voting.
Remarks. The apportionment solution and district allocation produces a simple majority in the number of jurisdictions.

Theorem 7.2 Given a fragmentation solution, in the number of local jurisdictions, any county district plan guarantees the existence of a unique structure-induced voting equilibrium.

Theorem 7.3 County unit voting guarantees the existence of a structure-induced equilibrium.

Proposition 6.1 Single county districts with additional representation = mixed representation plan.

Proposition 6.2 Single county districts with additional representation = the choice of a partial district allocation and representation plan.

Proposition 6.3 Single county districts with thresholds for additional representation = fractional multi-member districts = multiples of population ratios = district magnitude = average delegation size for the legislative chamber.

Proposition 6.4 Floterial districts = the choice of a partial representation plan.

Proposition 6.5 Additional representation districts = integer multi-member districts = delegation size = integer multiples of population ratios.

Lemma 3.0 Single county multi-member district allocations equal an apportionment solution in delegation size.

Theorem 8.1 Any county MMD plan guarantees the existence of a structure-induced voting equilibrium.

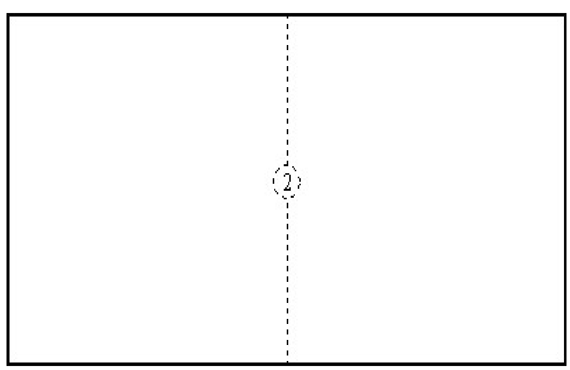
Theorem 8.2 Any county MMD plan is a weighted voting solution.

Theorem 8.3 Unified single county district allocations d = {0, 1, 2, 3, 4,...., m} imply district classification = {0, 1, 2, 3, ..., σ} = range solution for the number of county districts in each category = δ = {0, 1, 2, 3, ..., J} = density solution in numbers of counties.

FIGURE 2.0

district boundary function

frontier



At-Large Election, Group Pairing or Place of Residency

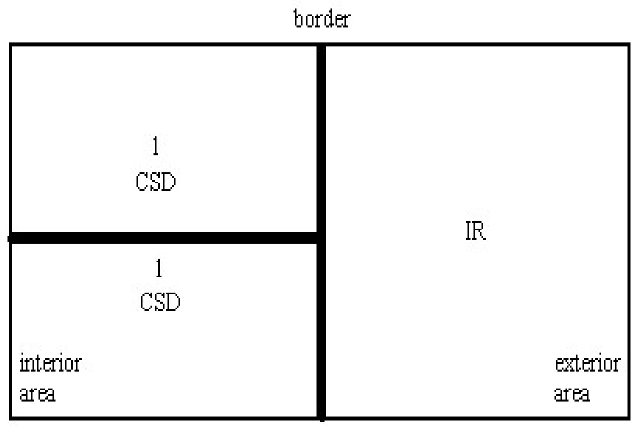
Theorem 8.4 Any unified county plan implies single county unit voting.

- At-Large Election, countywide ATL
- At-Large Election, group ballot ATL-G
- At-Large Election, place of residency ATL-P

Theorem 8.5 Any fragmented county plan implies single county subdivision districts.

FIGURE 3.0

district boundary function



County Subdivision Districts

Proposition 7.1 A finite integer district allocation = consolidation of the whole county units into a single district ⇔ multi-county single consolidated district.

Proposition 7.2 A fractional district allocation = consolidated single county division district ⇔ multi-county single consolidated district.

Proposition 7.3 Any multi-county single consolidated district = either consolidation of whole county units into a single district or a county division district.

Proposition 7.4 Local jurisdictional boundaries remain intact with any county unified district plan.

Proposition 7.5 Local jurisdictional boundaries remain intact with consolidation of whole county units into a single multi-county district.

Lemma 4.0 Local jurisdictional boundaries remain intact for any limitations on the number of county units. Proof. Given county units, limitations = (0,1), $j = 1$, $j \leq 1$; $j \geq 1$, $j = 2$, $j = 3$, $j \geq 4$ maintain existing county boundaries.

Theorem 9.0 County boundary lines remain intact for any limitations on a finite integer limitation on the number of counties consolidated into a single district.

- one district allocation per-county
- no more than one district allocation per-county
- one district allocation per-multi-county consolidated district
- one district allocation per-pairings of counties
- one district allocation per-three or more groupings of counties
- one district allocation per-small finite integer numbers of counties
- one district allocation per-regional district containing a large number of counties
- one district allocation per-zone (= large proportion of the total number of counties)

Theorem 10.0 Structure-induced voting equilibria exist in district allocation.

- one district allocation per-county
- no more than one district allocation per-county
- one district allocation per-multi-county consolidated district
- one district allocation per-pairings of counties
- one district allocation per-three or more groupings of counties
- one district allocation per-small finite integer numbers of counties
- one district allocation per-regional district containing a large number of counties
- one district allocation per-zone (= large proportion of the total number of counties)

Lemma 5.1 (District Magnitude I) Any redistricting plan implies the adoption of county division districts.

Lemma 5.2 (District Magnitude II) Any redistricting plan implies the adoption of multi-county consolidated single member districts.

Lemma 5.3 (District Magnitude III) Any redistricting plan implies the adoption of multi-county single member division districts.

Lemma 5.4 (District Magnitude IV) Any redistricting plan implies the adoption of regional districts or a regional division district consolidating a large number of counties.

Lemma 5.5 (District Magnitude V) Any redistricting plan implies the adoption of single county subdivision districts.

Lemma 5.6 (District Magnitude VI) No redistricting plan implies the choice of a district plan with local jurisdictional division = 1.

Lemma 5.7 (District Magnitude VII) No redistricting plan implies district boundaries are prohibited from crossing local jurisdictional boundaries.

Theorem 11.1 (Transitivity) Weighted Population Ratios $\Rightarrow$ Delegation Size Limitations $\Rightarrow$ Limited District Magnitude.

Theorem 11.2 District Magnitude = Average Delegation Size.

Theorem 12.1 No county division implies consolidation of whole county units for any single multi-county district.

Theorem 12.2 (Classification of districts with no county division) The classification of no county division district outcomes:

- single county districts
- single member county district
- single member multi-county district combinations with county units
- single member regional districts with county units
- single county unified districts
- single county districts with additional representation
- single county multi-member districts
- single county At-Large-G
- single county fragmented districts
- single county At-Large-P
- single county single member districts
- county subdivision

Theorem 12.3 Single county MMD plan and county subdivision = intact county boundary lines and a single county SMD plan.

Theorem 13.1 County division $\neq$ intact county boundary lines.

Theorem 13.2 County division district = the intersection of two or more counties such that the district contains less than the total area of counties consolidated into a single county division district.

Theorem 13.3 County division = county boundary lines are divided into independent (remainders) and semi-autonomously separable districts.
Proof. Figure 1. Figure 4.

Theorem 13.4 County division districts = division of county boundary lines.

Conjecture 1.0 No county division = county boundary lines remain intact.

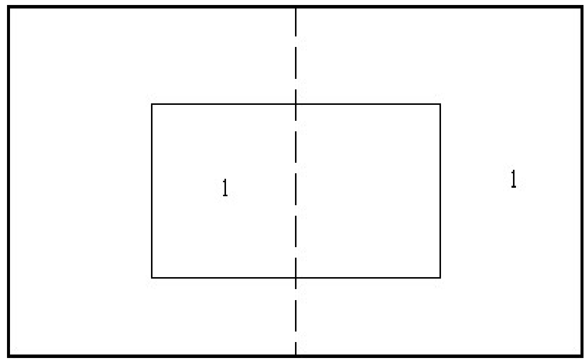
Conjecture 2.0 No county division exists with either a single point boundary intersection or coterminus and overlapping boundaries, such as those generated by additional, partial, or mixed representation plans.

Conjecture 3.0 County division exists with either multiple point boundary intersections forming an n-gon or a range boundary division intersection of regular boundary lines.

FIGURE 4.0

district boundary function

frontier



County Division Districts

Theorem 14.1 No county division implies an area bounded by local jurisdiction.
Proof. Given no county division $\Leftrightarrow$ intact county boundary lines. No county division and intact boundary lines = local jurisdiction with local jurisdictional boundary lines $\sqsubseteq$ Bdy = $A_j + \epsilon(A) \equiv$ sphere of influence. Assuming no county division and intact boundary lines equals area of local jurisdiction. Assuming no county division and intact boundary lines, the local jurisdiction equals a bounded area. Given no county division = intact boundary lines $\Rightarrow$ a bounded set of local jurisdiction.

Theorem 14.2 No division of local jurisdiction and intact boundary lines for local division imply local jurisdictional boundaries form a bounded set.

Theorem 14.3 District boundaries congruent with local jurisdiction satisfy the contiguity requirement and form a closed set.
Proof. Setting $\phi(J) = \wp$ and $\wp = B(d)$. Partition $\subseteq$ boundary points. Boundary points $\cap$ with adjacency boundary areas = $B(\cap d)$ and $\phi(J) = B(d)$. $B(\cap d)$ and $\phi(J) = B(d) \Rightarrow [\phi(J) \Rightarrow \mathbb{C}$ and $\mathbb{C} \Rightarrow B(d)]$.

Theorem 14.4 Any mapping of district allocations of local jurisdiction is a closed and bounded set in two dimensional, coordinate spaces.

Theorem 14.5 (Jurisdictional Basis Theorem) The sum of the units is a compact set.
Proof. The sum of the jurisdictional units is a fixed number, so that for any partition, the jurisdictional basis is closed, bounded $\Rightarrow$ compact set.

Theorem 14.6 Any mapping of district allocations on local jurisdiction is a closed and bounded set of districts.

Theorem 14.7 Any mapping of apportionment and local division is a closed and bounded set of districts.

Theorem 14.8 Any mapping of local jurisdiction is a closed and bounded set of major and minor civil districts.

Theorem 14.9 Any mapping of district allocations of local jurisdiction is a closed and bounded areal set with local division.

Theorem 14.10 Any mapping of major and minor civil districts is a closed and bounded set with local jurisdiction.

Theorem 14.11 (Jefferson Plan: statehood) Any mapping of state allocations of territory is a closed and bounded areal set.

Theorem 14.12 (Northwest Ordinance I: organic act) Any mapping of state territory is a closed and bounded areal set from local division.

Theorem 14.13 (Northwest Ordinance II: northwest ordinance) Any mapping of state territory is a closed, bounded, and compact set of local jurisdiction with division.

Theorem 14.14 (Northwest Ordinance III: county-township plan) Any mapping of local jurisdiction is a closed, bounded, and compact set with local division.

Theorem 14.15 (Northwest Ordinance IV: land division) Any mapping of state territory is a closed and bounded area in Euclidean space.

Theorem 14.16 (Northwest Ordinance V: local division) Any mapping of counties and townships is a convex set by local division.

Theorem 14.17 (Northwest ordinance VI: regular platted shape) Any county-township mapping forms a convex set of local jurisdiction.

Theorem 15.1 Any apportionment to local division is a closed, bounded, and compact set.

Theorem 15.2 Any district allocation to local jurisdiction is a closed, bounded, and compact set.

Theorem 15.3 Any district plan based on local jurisdiction is a closed, bounded, and compact set.

Theorem 15.4 Any district plan based on major and minor civil districts is a closed, bounded, and compact set.

Theorem 15.5 Any district plan based on local division is a closed, bounded, compact, and convex set.

Theorem 16.1 Closed, bounded, and compact combinations of local jurisdiction guarantee the existence of convex district planning alternatives.

- distribution of population centers
- range-circular distribution from extremal points
- range-division circle
- distribution of Soddy circular areas
- two dimensional, county-township grid division
- contiguous combinations of convex areas
- convex combinations of contiguous local jurisdictions

Theorem 16.2 Convex district allocations produce an apportionment solution in two dimensional coordinate spaces.

Theorem 16.3 Convex apportionment and division produce a unique district plan.

Theorem 16.4 Convex combinations of local jurisdictions produce a general equilibrium in apportionment and division.

Theorem 16.5 Convex combinations in district allocations produce a general equilibrium in apportionment.

Theorem 16.6 Convex local jurisdictions produce a general equilibrium in apportionment and division.

Theorem 16.7 No division in local jurisdiction produces a general equilibrium in apportionment and division.

Theorem 16.8 A well-defined boundary function guarantees the existence of a general equilibrium in apportionment and division.

Theorem 16.9	A well-defined boundary function guarantees the existence of a general equilibrium in apportionment and district planning.
Theorem 16.10	A well-defined boundary function guarantees the existence of a general equilibrium in apportionment.
Theorem 16.11	A well-defined boundary function guarantees the existence of a structure-induced voting equilibrium.
Theorem 17.1	County division generates non-convexities in district plans.
Theorem 17.2	Local jurisdiction generates non-convexities in district plans.
Theorem 17.3	Non-compact district allocations generate non-convexities in district plans.
Theorem 17.4	Non-convex district boundaries generate non-convex district plans.
Theorem 18.1	County division generates non-convexities in apportionment and district plans.
Theorem 18.2	(Manipulability condition I) Strategic manipulation generates non-convexities in district planning.
Theorem 18.3	(Manipulability condition II) Strategic manipulation generates non-convexities in apportionment and division.
Theorem 19.1	No county division $\Rightarrow$ bounded set.
Theorem 19.2	No division of local jurisdiction $\Rightarrow$ bounded set.
Theorem 19.3	Intact boundary lines $\Rightarrow$ bounded set.
Theorem 19.4	Constituency boundaries $\Rightarrow$ open set.
Theorem 19.5	District boundaries $\Rightarrow$ closed set.
Theorem 19.6	Local jurisdiction $\Rightarrow$ closed set.
Theorem 19.7	County boundaries form a closed and bounded set of (county) territory.

Theorem 19.8 (Cutting Theorem I: boundary point) County division generates a cutting across local jurisdiction.

Proof. Local jurisdictional boundaries form a closed and bounded set if there is no division of local jurisdiction and local jurisdictional boundaries form a closed set of land area. Given a closed and bounded set of land area, local jurisdiction forms a regular shaped territory. For any boundary point, expand around the point of intersection of two counties within a local neighborhood of the boundary point. For the purposes of county division, construct a range division line from a point in the interior (of county territory) to exterior territory (in an adjacent county). Equate the intersection of the range division line with county boundaries equal to the boundary point of intersection. The range division line represents an extension from the interior to an exterior point. The extension of territory from one county to another, from county territory to an adjacent county territory, is defined by the length of the range division line. The intersection of the range division line with the local jurisdictional boundary equals the boundary point intersection. As a result, the division line extends from the interior to the exterior of the bounded set through a boundary point of intersection.

Theorem 19.9 (Cutting Theorem II: local jurisdiction) The intersection of a district boundary line with a local jurisdictional boundary equal a cutting across local jurisdiction.

Proof. If district boundary line(s) crosses local jurisdiction, at a boundary point, then local jurisdictional boundary lines are divided by the district boundary line. At any point of boundary intersection, if district boundary lines form a range division line, extending from the interior to the exterior of the bounded set, then local jurisdictional boundary lines do not remain intact. The jurisdictional boundaries are cut by the non-congruence of district and local jurisdictional boundaries.

Theorem 19.10 (Cutting Theorem III: local boundary division) The intersection and extension of a district boundary line across local jurisdiction equals dividing or cutting local jurisdictional boundaries.

Proof. Assume district boundary line(s) cross a local jurisdiction, at a boundary point, and extend from the interior to the exterior of the bounded set. For any point of boundary intersection, form a range division line extending the distance from a point in the interior to the exterior of the bounded set. The range division line intersects at a boundary point and cuts the boundary lines so that the boundary lines do not remain intact. At the boundary point, the range division line cuts the boundary line and therefore divides the boundary line into segments. By splitting boundary lines, the range division line guarantees the existence of a local boundary division.

Theorem 19.11 (Cutting Theorem IV: county division) The intersection of a district boundary line with a county line equal county division
Proof. Assume district boundaries split local jurisdictional boundary lines. By splitting boundary lines, local jurisdictional boundaries do not remain intact. The cutting of boundary lines guarantees the existence of county division.

Theorem 19.12 (Cutting Theorem V: jurisdictional basis) The district boundaries are congruent with local jurisdictional boundaries.
Proof. Assume boundary lines remain intact, and there is no division of local jurisdiction by district allocation. Boundary line congruence exists between district and jurisdictional boundaries. Given boundaries are coterminous, local jurisdiction provides a basis for both district allocation and boundaries.

Theorem 19.13 (Cutting Theorem VI: jurisdictional basis) Any district allocation congruent with local jurisdiction guarantees the existence of an apportionment plan.
Proof. Assume boundary line congruence exists between district and jurisdictional boundaries. Given boundaries are coterminous, local jurisdiction provides a basis for apportionment and district planning.

Theorem 20.0 The boundary area is equal to a sphere of influence.
Proof. Setting the boundary area = border, the border area = 0. Assuming the bounded area > border, border area + sphere of influence = sphere of influence. Setting the bounded area = frontier that is not a closed set = sphere of influence + border area = sphere of influence. The recognized frontier = bounded set.

Theorem 21.1 A division is equal to a fragmentation solution in numbers of districts.
Proof. Given a measure space in division equal to a zero to one range, set the division = 1 / D = one divided by the number of districts a local jurisdiction is contained in. For any division = 1/J = {1/1, ½, 1/3, ... ,1/j}. $j \subseteq D \Rightarrow$ a range of division exists from (1 / D), with D equal to the total number of districts to (1 / 1) = a single district.

Theorem 21.2 A delegation size is equal to an apportionment solution in numbers of districts.
Proof. A delegation size is defined as d = {1, 2, 3, 4, 5, 6, ..., m} = σ. Setting the number of districts = a range of districts, σ. The district allocation ranges from σ = 1 / (2•N) to (m / N). The apportionment solution exists in the range from ½ of a district allocation to m/N or the maximum delegation size.

Theorem 21.3 County division implies a partial representation number.

Proof. The division is equal to a fragmentation solution in fractional numbers of districts. For any $C = \{1, 2, 3, ..., c\} \equiv$ the total number of counties. For any fixed number of counties, one divided by the number of districts a local jurisdiction is contained in, $c \subseteq D \Rightarrow$ county division exists $= (1 / D)$. A single county district exists with D equal to the total number of districts to $(1 / 1)$.

Theorem 21.4 County subdivision implies a fragmentation solution.

Proof. Given an apportionment to a single county in delegation size, the number of districts allocated are then divided within a single county's territory. A subdivision is defined equal to the number of county partitions. The number of county subdivision districts equals the number of districts allocated to a single county. The division of $(1 / d)$, $d =$ a county delegation size defines a fragmentation solution for any given number of county subdivision districts.

Theorem 21.5 No county division implies an apportionment solution in delegation size.

Proof. No county division $\Rightarrow$ numbers of districts, $D =$ finite integers cover. Given a finite integer set of districts, $D = I = \{1, ..., m\}$, the range of delegation size = the range of apportionment to local jurisdiction. Assuming no county division implies no partial representation equal to a continuous district magnitude. The apportionment solutions are a finite integer number of the districts allocated to each county. The number of districts allocated by county equals the county delegate size.

Theorem 22.1 Probability(Division) = 1 $\rightarrow$ division = 1.

Proof. For any unified, single county district, there is no division. No division implies unity = 1 and therefore a unified district = 1. On this basis, no county division implies division = 1.

Theorem 22.2 Probability(Division) = 0 $\rightarrow$ division = 0.

Proof. For any county subdivision district, the districts are contained within a single county. The number of county subdivision districts equals $1/d$ with $d \equiv$ a county delegation size. In the limit $j \rightarrow 1$, a single county district and limit $1/d \approx 0$, as $d \rightarrow N$, the size of the legislature.

Theorem 22.3 Probability(Division) = .5 $\rightarrow$ division = ½.

Proof. Given a county division district, such as the general example demonstrated in **FIGURE 4.0**, a division district requires at least two counties and each district area less than the total area of the two counties. The amount of division equals $1/j$ = Probability(Division). In the case of two local jurisdictions, the amount of division = ½.

The Formation of County Division Districts

The traditional methods of state apportionment included requirements for no county division. This provision had a great influence on the evolution of local jurisdiction, and both district and jurisdictional boundaries. More generally, the unwillingness to allow municipal governments to annex county territory and separate from their existing ward divisions, prevented municipal extension into counties throughout the United States. Secondly, these provisions were generally the home rule basis for preventing municipal annexation across county boundaries because of the implications for apportionment to local jurisdiction and any formation of district boundaries across counties. Lastly, the provision for no county division implies keeping boundaries intact for the purposes of apportionment and division. As a consequence, changes to these provisions allowed for the formation of county division districts.

As the method of apportionment changed, that included no county division provisions, apportionment and fragmentation solutions changed in response from the greater manipulability of district boundaries. This transition from traditional methods of apportionment produced substantial amounts of county division, by increasing formation of county division districts created with redistricting. In this transition from apportionment to redistricting politics, the methods of apportionment and district planning shifted to the current emphasis on district boundary planning. These adjustments did not occur until after the 1972 apportionment that produced record numbers of county division districts. The 1972 apportionment should be considered the critical break point, in the sequence of apportionment and district plans adopted and enacted by The States. The reasons for why this occurred involve suburban development in metropolitan areas and the use of multi-county districts in less populated sub-state regions.

However, prior to 1963, 25 state legislative chambers had requirements prohibiting county division. The no county division condition was imposed in 16 upper chambers and 9 lower chambers in the construction of boundaries for Senate and Assembly Districts. Among the 25 states with boundary restrictions, 5 states placed restrictions on both chambers (CA, IA, KY, OK, PA), 11 states combined whole county units to form senate districts (CO, CT, LA, MA, MO, NY, NC, ND, OR, TN, UT), with 4 states placing limitations on house districts (AL, ID, IL, MT). Additionally, both ID and MT allocated one senate district per-county with minor exceptions, so that the Senate Districts were all single county districts.

TABLE 1.1 County Boundary Lines by Legislative Chamber

LINES		CHAMBER		TOTAL
Boundary Lines		House	Senate	
0	Count	41	34	75
County Division	% within CHAMBER	82.0%	68.0%	75.0%
1	Count	**9**	**16**	**25**
No County Division	% within CHAMBER	18.0%	32.0%	25.0%
STATE TOTAL	Count	50	50	100
	% within CHAMBER	100.0%	100.0%	100.0%

After 1935, the Nebraska Senate contained 43 members, including the 10 additional Assembly districts reallocated from the lower chamber. Under the 1923 apportionment plan, the Legislature consisted of 33 Senators and 100 House members from 93 Counties. Most of this previous House apportionment and district plan allocated single and multi-member delegations on a county basis. There were mostly multi-county districts in the Senate, and many multi-county Assembly Districts with boundary lines intact from consolidation. County subdivision districts also emerged in apportionment, with Senate and House districts formed contained in Douglas County and the more urbanized counties in eastern Nebraska. The 1954 Nebraska Plan contained both county division and subdivision districts, with fewer county boundaries intact.

TABLE 1.2 Boundary Provisions by Legislative Chamber

BOUNDARY SCOPE		CHAMBER House	Senate	TOTAL
0	Count	30	23	53
	% within CHAMBER	60.0%	46.0%	53.0%
1	Count	7	5	12
	% within CHAMBER	14.0%	10.0%	12.0%
2	Count	9	16	25
	% within CHAMBER	18.0%	32.0%	25.0%
3	Count	4	6	10
	% within CHAMBER	8.0%	12.0%	10.0%
STATE TOTAL	Count	50	50	100
	% within CHAMBER	100.0%	100.0%	100.0%

The findings in **TABLE 1.2** describe the scope of the provisions to use county units in apportionment and division. The findings indicate 10 States adopted three boundary provisions regulating district boundary formation. These provisions required keeping boundary lines intact, contiguous joining of whole units of local jurisdiction, and compactness of districts allocated by apportionment and district planning. In summary, a 53% majority of the State legislative chambers had no boundary regulations imposed for maintaining county units in apportionment and redistricting. Of the nine states with all three boundary regulations, only Pennsylvania adopted these regulations for both House and Senate District Plans.

TABLE 1.3 States with the most encompassing boundary regulations

STATE	LINES INTACT	CONTIGUITY & COMPACTNESS		CHAMBER	SCOPE
1 CA	1	1	1	House	3
2 CO	1	1	1	Senate	3
3 IL	1	1	1	House	3
4 MO	1	1	1	Senate	3
5 MT	1	1	1	House	3
6 NY	1	1	1	Senate	3
7 ND	1	1	1	Senate	3
8 OK	1	1	1	Senate	3
9 PA	1	1	1	Senate	3
10 PA	1	1	1	House	3

TABLE 1.4 States with no county division and contiguity requirements

STATE	LINES INTACT	CONTIGUITY & COMPACTNESS		CHAMBER	SCOPE
1 CA	1	1	0	Senate	2
2 CT	1	1	0	Senate	2
3 ID	1	1	0	House	2
4 IA	1	1	0	Senate	2
5 IA	1	1	0	House	2
6 KY	1	1	0	Senate	2
7 KY	1	1	0	House	2
8 MA	1	1	0	Senate	2
9 NC	1	1	0	Senate	2
10 OR	1	1	0	Senate	2
11 TN	1	1	0	Senate	2
12 UT	1	1	0	Senate	2

Amongst these state boundary regulations, the states of California, Iowa, and Kentucky also provided for no county division *and* contiguity of districts. For these twenty-two states, the boundary regulations required jurisdictional boundary lines remain intact and that districts be formed from contiguous local jurisdiction. The Table Analysis reveals no significant differences between legislative chambers, neither in terms of the stringency of the boundary regulation nor the scope of boundary regulations. There were fifteen State Senates, and only seven State Houses, in these two categories of greater boundary regulation. These findings indicate somewhat greater regulation of the Senate District boundaries, as a result of district allocations too multi-county consolidated districts and county subdivision districts. In the absence of single county district allocations, these results indicate the use of these boundary regulations to maintain a jurisdictional, if not a county, basis for apportionment and district planning. The greater potential for multi-county Senate Districts suggests the concern for regulating boundary lines in the formation of Senate Districts. The greater chance for county division in Senate redistricting implies a larger scope for boundary regulation to prevent county Senate division districts.

By prohibiting county division, in the legislative chamber where division districts were most likely to be adopted, these results indicate boundary regulations were supposed to strengthen multi-county consolidation with whole units. By consolidating whole county units, these provisions reduced incentives to provide for partial representation and division districts. Even so, any construction of division and subdivision districts implies what presently consists of redistricting single member districts. As a consequence, the regulations and district planning for portions of two counties may be less complicated than consolidating two to six counties into multi-county and regional districts. As these results suggest, any incentive to form these districts, and "break" county unit apportionment and district planning was therefore regulated against by the use of boundary provisions.

In the six states with more stringent House District regulations, these may have been intended to strengthen apportionment and division to county districts without guaranteeing single district allocation. Because the states have had varying apportionment and division, boundary regulations may have been imposed to prevent county division in House Districts, because of Senate district allocations guaranteeing minimal fragmentation of local jurisdiction. In California, for example, the strengthening of the county basis for Assembly Districts reduced the potential for multi-county division and county subdivision districts. The protection of the county basis for district allocation prevented Assembly District boundary manipulation to somehow offset the Senate provision for no more than one Senate District per-county. In Illinois, House Districts were contained within (51-58) Senate Districts, and the voting rules and procedures encouraged (a 2-1) partisan division of the three-member House delegations. By this rationale the boundary regulations protected district-based cumulative voting by Senate District.

In Montana and Idaho, each county was allocated a single district and each county generally received at least one House District. Even with the Senate provision, there were multi-county House Districts in both Montana and Idaho, resulting from the pairing of the smallest counties with more populated adjacent counties. In California, the number of counties ranged from one to three counties in House District allocation. To prevent greater fragmentation, and the use of county division, the boundary regulations provided an incentive to consolidate whole counties, a result that continues to the present with the construction of large, multi-county regional districts in northern and central California. The district allocation in Iowa guaranteed at least one House District per-county, before the 1964 legislative redistricting, where the old system guaranteed an additional or second district for the largest nine counties and one district per-county for ninety counties. The Senate provisions varied from House district allocations by combining two to four counties into Senate Districts. By forming multi-county Senate Districts, using whole county units, the Senate district allocations allowed for a greater number of single county districts. Until 1972, there were very few county divisions or subdivision districts. The changes after 1964 increased the number of multi-county districts, and this did produce county division and subdivision in the 1972 apportionment and district plan. The Kentucky House had also provided for quite a few multi-county House Districts, by combining from two to four rural counties into a single House District. Prior to 1963, these districts contained whole counties and permitted a greater number of districts to be allocated to the most urbanized counties. In these counties, multi-member districts (elected AT-Large) were changed to county subdivision districts that resemble single member districts created in a number of states with similar provisions. More generally, the states' boundary requirements slowed the transition to county division districts.

TABLE 1.5 States with no district boundary provisions

STATE		LINES INTACT	CONTIGUITY & COMPACTNESS		CHAMBER	SCOPE
1	AL	0	0	0	Senate	0
2	AK	0	0	0	Senate	0
3	AK	0	0	0	House	0
4	AZ	0	0	0	Senate	0
5	AR	0	0	0	Senate	0
6	AR	0	0	0	House	0
7	CO	0	0	0	House	0
8	CT	0	0	0	House	0
9	DE	0	0	0	Senate	0
10	DE	0	0	0	House	0
11	FL	0	0	0	House	0
12	GA	0	0	0	Senate	0
13	GA	0	0	0	House	0
14	HI	0	0	0	Senate	0
15	HI	0	0	0	House	0
16	ID	0	0	0	Senate	0
17	KS	0	0	0	Senate	0
18	KS	0	0	0	House	0
19	LA	0	0	0	House	0
20	ME	0	0	0	Senate	0
21	MD	0	0	0	Senate	0
22	MD	0	0	0	House	0
23	MN	0	0	0	House	0
24	MS	0	0	0	Senate	0
25	MS	0	0	0	House	0
26	MT	0	0	0	Senate	0
27	NV	0	0	0	Senate	0
28	NV	0	0	0	House	0
29	NH	0	0	0	Senate	0
30	NH	0	0	0	House	0
31	NJ	0	0	0	Senate	0
32	NJ	0	0	0	House	0
33	NM	0	0	0	Senate	0
34	NM	0	0	0	House	0
35	NC	0	0	0	House	0
36	ND	0	0	0	House	0
37	OH	0	0	0	Senate	0
38	OH	0	0	0	House	0
39	OR	0	0	0	House	0
40	SC	0	0	0	Senate	0

41	SC	0	0	0	House	0
42	SD	0	0	0	Senate	0
43	SD	0	0	0	House	0
44	TX	0	0	0	House	0
45	UT	0	0	0	House	0
46	VT	0	0	0	Senate	0
47	VT	0	0	0	House	0
48	VA	0	0	0	Senate	0
49	VA	0	0	0	House	0
50	WA	0	0	0	House	0
51	WV	0	0	0	House	0
52	WY	0	0	0	Senate	0
53	WY	0	0	0	House	0

Among the 35 states with no boundary provisions, there were 18 states with no boundary regulations for both legislative chambers. Many of these states retained traditional constitutional apportionment provisions and enacted apportionment bills through The State Legislatures. In some states, constitutional amendments were enacted through initiative petitions that were voted on by statewide majority. In others, constitutional conventions were held that revised apportionment and division including statements related to home rule provision for local jurisdiction and the incorporation status of major and minor civil districts. The procedures for district allocation devolved from methods of apportionment (constitutional provision and legislation), to apportionment and local jurisdictions (governor, cabinet, state legislature, state legislative committee), and to apportionment and district planning (boards of legislative apportionment, state boundary commissions, local district planning boards). After 1963, apportionment provisions generally describe criteria, with statements describing population, contiguity, compactness, boundary lines and local jurisdiction, and other considerations pertaining to district allocation within state territory. Many of the provision statements also included descriptions of apportionment and district allocations by legislative chambers.

In the period from the 1930 and 1960 Censuses, the states made an increasing use of guarantees to provide at least one Assembly District per-county and to otherwise prevent county division in the construction of Senate Districts. As the number of district allocations to urbanized counties increased, the sizes of the multi-member districts either increased to a large number or were limited in delegation size to prevent a concentration of the legislature being elected from far less than a majority of the counties. In the states with large multi-member districts, some counties elected large delegations of House members. For instance, these house delegations equaled 22 in Wayne County (in Detroit, and the Detroit suburbs in Wayne County), 17 in Orleans Parish (New Orleans and consolidated cities), and 15 in the City of St Louis. In the City of Baltimore, 36 House Districts were elected from 6 magistrate court districts that also provided for election of one Senator per-district. In Providence, Portland, Oregon, Seattle, and Denver, similar district allocations produced large delegation sizes with countywide election. In some states, these county delegations were subdivided into single member districts based on major and minor civil districts. These included city districts, and ward to town representation plans with some additional representation for the larger districts. In the urban counties or cities district plans, county subdivision plans emerged in the form of single member districts. In other states, limitations were placed on the total size of the delegations, frequently to prevent more than 1/3 to a simple majority of districts being elected from a single county or more generally, a metropolitan area consisting of a small number of adjacent counties. What is more important, some states already had town and ward division throughout state territory. In states like Delaware, Massachusetts, New Hampshire, Rhode Island, Pennsylvania, and Wisconsin these county subdivision districts began to resemble single member district plans.

The changes in apportionment and division required a transition in the use of local jurisdiction as the basis for organizing legislative districts. The primary change adjusted district allocations from multi-member districts and large delegation sizes to county subdivision and single member districts. The other changes may have been less substantively important, in terms of changes in apportionment and district planning. Even so, there appears to have been a secondarily important increase in the number of county division districts, in urbanized counties such as Los Angeles and Chicago, Cook County, where city districts began to extend to suburban major and minor civil districts. Additionally, as individual counties decreased below a single population ratio, in 1910-1960 period, states began to construct county division districts to combine the more urbanized major and minor civil districts into multi-county districts. These changes also influenced the planning for district allocation to two or three county districts that had traditionally consolidated whole county units.

Thirdly, the largest substantive change may have evolved from the use of local jurisdiction in division to district planning (for allocations) to zonal, regional, and major and minor civil districts. As district planning changed in emphasis from planning county delegation sizes to district allocation, this produced an adjustment toward county division and subdivision districts, single member district allocation, and planning district boundaries. In some states, this resulted in a bicameral equilibrium, with very different district allocations in the Senate and House or Assembly. In these states, the bicameral equilibrium established little federal plan differences between Senate and Assembly Districts, ratios of House to Senate seats, and plans for Senate Districts only with House District delegations elected within Senate District allocations by containing House within Senate Districts.

In summary, the transition from local jurisdiction to district allocation decreased the importance of apportionment and increased the importance of redistricting and district planning. For example, as county populations increase, the most urbanized counties all had difficulties with single county multi-member districts. In this setting, apportionment politics was administered by County Boards of Supervisors that were based on major and minor civil districts. At the local level, this produced county subdivision on the basis of city districts, ward and town division, and district allocations to unincorporated county territory. In the transitions after 1963, the apportionments of multi-member districts are generally to House Districts contained within Senate District Plans. In these settings, multi-member districts are allocated to single districts, for the purposes of electing members of one of the chambers of the Legislature. As a result, these district allocations may prevent maintaining county boundary lines and subdivision districts using traditional methods of apportionment and division to major and minor civil districts.

Empirical Analysis of Apportionment and Division

This section provides a basic test of the relationship between apportionment (in delegation size) and division (in local jurisdiction) derived in **Theorems 21.1 & 21.2** above. To summarize, the basic theory derives four outcomes in apportionment and district planning, shown above in **Theorems 6.1 - 6.7**. The verification of these results confirms the adjustment from county-based apportionment to redistricting by county division and subdivision.

The district plans used for this empirical analysis are considered transitional from the status quo of no county division to an evolving pattern of single county subdivision districts and large numbers of counties in what may be described as multi-county division districts. In this transition,

- as $t \rightarrow T$, limit (the number of multi-county, multi-member districts) $\rightarrow 0$.
- as $t \rightarrow T$, limit (the number of single county districts) $\rightarrow 0$.
- as $t \rightarrow T$, limit (the number of single county multi-member districts) $\rightarrow 0$.
- [limit $t \rightarrow T$ (the number of single county subdivision districts)] + [limit $t \rightarrow T$ (the number of multi-county division districts)] $\rightarrow 1$.
- limit $t \rightarrow T$ (the number of multi-county division districts with intact county boundary lines) $\rightarrow 0$.
- limit $t \rightarrow T$ (the number of single member districts) $\rightarrow 1$.

The district plans selected are a non-random sample selection of transitional plans in Western States. The sample size is described below in numbers of county districts.

TABLE 2.1 State Sample Sizes by County Apportionment and Division

State	Frequency	Percent	Cumulative Percent
Colorado	673	25.1	25.1
Oregon	156	5.8	30.9
California	624	23.3	54.2
Nevada	161	6.0	60.2
Washington	759	28.3	88.5
New Mexico	307	11.5	100.0
Total	2680	100.0	

The apportionment and district plans vary in age by states, covering a time frame from 1951 to 1972. Some of the plans were considered for legislation, some were enacted as legislation, and a few were replaced by subsequent legislation in less than a decade. Most of the planning alternatives allowed for a maximum intactness of boundary lines, so that these included varying mixtures of single county guarantees for a minimum district allocation, county subdivision districts contained and covering a single county, and multi-county districts consolidated from whole county units.

TABLE 2.2 State Sample Size by Legislative Chamber

Count	CHAMBER		
STATE	House	Senate	Total
Colorado	370	303	673
Oregon	78	78	156
California	220	404	624
Nevada	86	75	161
Washington	416	343	759
New Mexico	172	135	307
Total	1342	1338	2680

The apportionment and district plans selected generate a balanced bicameral sample. As reported in **TABLE 2.2**, the Senate and House district allocations vary by State and Chamber with each apportionment and division adopted and enacted by State. The district allocations also varied by chamber apportionment and division, in addition to state variation in the relative numbers of single urbanized counties and consolidated, multi-county districts.

TABLE 2.3 Descriptive Statistics on County Division

. summarize division, detail

Percentiles		Smallest		
1%	.032	.032		
5%	.056	.032		
10%	.071	.032	Obs	2680
25%	.333	.032	Sum of Wgt.	2680
50%	1		Mean	.720
		Largest	Std. Dev.	.378
75%	1	1		
90%	1	1	Variance	.143
95%	1	1	Skewness	-.745
99%	1	1	Kurtosis	1.784

The division measure describes the fraction of how many different districts each county is divided into. Between these transitional apportionment and district plans, the distribution of county division is generally skewed toward no county division. The average amounts of division equals .720, between 1/4 and 1/3 county division. The standard deviation indicates that these planning alternatives varied generally between no county division and a full range of division.

TABLE 2.4 Descriptive Statistics on County Apportionment in Delegation Sizes

. summarize delegation, detail

Percentiles		Smallest		
1%	.071	.067		
5%	.125	.067		
10%	.2	.067	Obs	2680
25%	.333	.067	Sum of Wgt.	2680
50%	1		Mean	.946
		Largest	Std. Dev.	1.040
75%	1	13		
90%	2	14	Variance	1.081
95%	2	17	Skewness	6.881
99%	4	18	Kurtosis	82.417

In this sample, single county districts comprise 41.6% of the data, with a median equal to 1 district per-county, and an average delegation size equal to .946. Inasmuch the standard deviation is also equal to 1.081, there is substantial variation in delegation size and evidence of mixed representation plans from both multi-county districts to either single county multi-member districts or single county subdivision districts. As reported in **TABLE 2.4**, the standard deviation reveals most of the delegation sizes range from 0 to 2 districts allocated, with the largest county delegations positively skewing the results to average delegation size larger than 1. In the division results, the kurtosis coefficient indicates a strong concentration of districts with division equal to 1, or no county division. Unlike the division results, the findings on delegation sizes describe a range of apportionments from ½ , 1, 2, to 4 districts allocated per-county.

The findings in **TABLE 2.5** provide additional analysis of the asymmetry and concentration of districts in the county division and delegation size data. The findings reveal that neither the division nor the delegation size samples are normally distributed. The Jacque-Bera test indicates strongly significant skewness and kurtosis and these results are similar for the findings testing the distributions individually and jointly.

TABLE 2.5 Tests for the Normality of the Distributions: County Division and Delegation Sizes

.swilk division delegation

Shapiro-Wilk W test for normal data

Variable	Obs	W	V	z	Prob>z
division	2680	0.95869	63.907	10.687	0.00000
delegation	2680	0.56778	668.588	16.722	0.00000

. sfrancia division delegation

Shapiro-Francia W' test for normal data

Variable	Obs	W'	V'	z	Prob>z
division	2680	0.95912	67.127	10.256	0.00001
delegation	2680	0.56721	710.626	16.008	0.00001

. mvtest normal division delegation, bivariate

Doornik-Hansen test for bivariate normality

Pair of variables		chi2	df	Prob>chi2
division	delegation	24980.83	4	0.0000

The results in **TABLE 2.5** indicate significant asymmetries from single district allocations to counties. These results also reveal significant variations in the concentrations of apportionment and division to a single county district allocation and a full range of division and delegation sizes. The choice structure to these apportionment and divisions suggests that once the adjustments were made to any guarantee of at least one (Senate or Assembly) district per-county, the district allocations were equated to mixed representation plans with additional representation guaranteeing from a fraction of a district to 2 districts per-county.

TABLE 2.6 Inequality in the Distributions of Apportionment and Division

. inequal division

inequality measures of division

relative mean deviation	.24356916
coefficient of variation	.52506514
standard deviation of logs	.99486904
Gini coefficient	.2627783
Mehran measure	.44229485
Piesch measure	.17302004
Kakwani measure	.10643196
Theil entropy measure	.18218295
Theil mean log deviation measure	.31301358

. inequal delegation

inequality measures of delegation

relative mean deviation	.28092608
coefficient of variation	1.0993529
standard deviation of logs	.87792886
Gini coefficient	.41478114
Mehran measure	.55784131
Piesch measure	.3432511
Kakwani measure	.1609954
Theil entropy measure	.35087431
Theil mean log deviation measure	.35752632

The analysis of measures of inequality, reported in **TABLE 2.6**, indicates some asymmetries and concentration of districts in the division data. These measures also reveal substantial variation and asymmetries in the delegation size data, consistent with a transition in apportionment from single county district allocations to varying sized delegations and district allocations. As a consequence of eliminating guarantees of at least one district, per-county, the changes in district allocations generated more variation in apportionment and district plans.

TABLE 3.0 Regression Analysis and Diagnostic Tests of (County) Division by County Delegation Size, Legislative Chamber (Senate = 1, House = 0), Trend Sequence of Apportionment and District Plan, Single or Multi-County District

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics R Square Change	F Change	df1	df2	Sig. F Change
1	.186	.035	.034	.37131	.035	96.070	1	2678	.000
2	.219	.048	.047	.36877	.014	37.982	1	2677	.000
3	.244	.059	.058	.36665	.011	32.032	1	2676	.000
4	.517	.267	.266	.32373	.208	757.660	1	2675	.000

a Predictors: (Constant), County Delegation Size
b Predictors: (Constant), County Delegation Size, Legislative Chamber (Senate = 1, House = 0)
c Predictors: (Constant), County Delegation Size, Legislative Chamber, Linear Trend
d Predictors: (Constant), County Delegation Size, Legislative Chamber, Linear Trend, SCMC (Single County District = 1, Multi-County District = 0)

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	13.245	1	13.245	96.070	.000
	Residual	369.211	2678	.138		
	Total	382.456	2679			
2	Regression	18.410	2	9.205	67.689	.000
	Residual	364.046	2677	.136		
	Total	382.456	2679			
3	Regression	22.716	3	7.572	56.327	.000
	Residual	359.740	2676	.134		
	Total	382.456	2679			
4	Regression	102.118	4	25.530	243.605	.000
	Residual	280.338	2675	.105		
	Total	382.456	2679			

a Predictors: (Constant), County Delegation Size
b Predictors: (Constant), County Delegation Size, Legislative Chamber (Senate = 1, House = 0)
c Predictors: (Constant), County Delegation Size, Legislative Chamber, Linear Trend
d Predictors: (Constant), County Delegation Size, Legislative Chamber, Linear Trend, SCMC (Single County District = 1, Multi-County District = 0)
e Dependent Variable: (COUNTY) DIVISION

Coefficients

Model		Coefficients B	Std. Error	Standardized Coefficients Beta	t-statistic	Sig.	95% Confidence Interval for B Lower Bound	Upper Bound
1	(Constant)	.784	.010		80.804	.000	.765	.803
	DELEGATION	-.06762	.007	-.186	-9.802	.000	-.081	-.054
2	(Constant)	.728	.013		55.097	.000	.702	.754
	DELEGATION	-.05660	.007	-.156	-7.994	.000	-.070	-.043
	CHAMBER	.09074	.015	.120	6.163	.000	.062	.120
3	(Constant)	.766	.015		51.771	.000	.737	.796
	DELEGATION	-.05464	.007	-.150	-7.752	.000	-.068	-.041
	CHAMBER	.106	.015	.140	7.106	.000	.077	.135
	TREND	-.02344	.004	-.108	-5.660	.000	-.032	-.015
4	(Constant)	.910	.014		64.662	.000	.883	.938
	DELEGATION	.03851	.007	.106	5.437	.000	.025	.052
	CHAMBER	.09473	.013	.125	7.209	.000	.069	.120
	TREND	-.03424	.004	-.158	-9.310	.000	-.041	-.027
	SCMC	-.399	.014	-.527	-27.526	.000	-.427	-.370

a Dependent Variable: DIVISION

```
. estat hettest
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
        Ho: Constant variance
        Variables: fitted values of division
        chi2(1)      =   315.15
        Prob > chi2  =   0.0000

. estat hettest, iid
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
        Ho: Constant variance
        Variables: fitted values of division
        chi2(1)      =   517.74
        Prob > chi2  =   0.0000

. estat hettest, fstat
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
        Ho: Constant variance
        Variables: fitted values of division
        F(1 , 2678)  =   641.23
        Prob > F     =   0.0000

. estat imtest, white
White's test for Ho: homoskedasticity
        against Ha: unrestricted heteroskedasticity
        chi2(12)     =    629.36
        Prob > chi2  =    0.0000
```

Cameron & Trivedi's decomposition of IM-test

Source	chi2	df	p
Heteroskedasticity	629.36	12	0.0000
Skewness	339.06	4	0.0000
Kurtosis	125.97	1	0.0000
Total	1094.38	17	0.0000

. estat ovtest

Ramsey RESET test using powers of the fitted values of division

Ho: model has no omitted variables

F(3, 2672) = 26.52

Prob > F = 0.0000

. estat vif

Variable	VIF	1/VIF
delegation	1.39	0.720864
scmc	1.34	0.746663
chamber	1.10	0.905827
trend	1.04	0.957329
Mean VIF	1.22	

. estat esize, omega

Effect sizes for linear models

Source	Omega-Squared	df	[95% Conf.	Interval]
Model	.2658998	4	.2381072	.291574
delegation	.0105584	1	.0041072	.0196867
chamber	.0186826	1	.0097722	.0301324
trend	.030998	1	.0193066	.0450247
scmc	.2204309	1	.1942591	.2465255

```
. estat ic, n(2680)
Akaike's information criterion and Bayesian information criterion
-----------------------------------------------------------------------------
       Model |    Obs    ll(null)   ll(model)     df          AIC         BIC
-------------+---------------------------------------------------------------
           . |   2680   -1193.735   -777.5254      5     1565.051    1594.519
-----------------------------------------------------------------------------
               Note:  N=2680 used in calculating BIC

.sureg (division = delegation chamber trend scmc) (delegation = division chamber
trend scmc), corr cformat(%9.3f) pformat(%5.3f) sformat(%8.2f)

Seemingly unrelated regression
--------------------------------------------------------------------------------
Equation        Obs  Parms     RMSE    "R-sq"      chi2       P
--------------------------------------------------------------------------------
division       2680      4   .3251214   0.2592   1063.74   0.0000
delegation     2680      4   .8824904   0.2795   1166.39   0.0000
--------------------------------------------------------------------------------
--------------------------------------------------------------------------------
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+------------------------------------------------------------------
division     |
  delegation |      0.076      0.007    10.82   0.000        0.062       0.090
     chamber |      0.109      0.013     8.34   0.000        0.084       0.135
       trend |     -0.036      0.004    -9.82   0.000       -0.043      -0.029
        scmc |     -0.435      0.014   -30.13   0.000       -0.464      -0.407
       _cons |      0.890      0.014    63.30   0.000        0.862       0.917
-------------+------------------------------------------------------------------
delegation   |
    division |      0.561      0.052    10.82   0.000        0.460       0.663
     chamber |     -0.436      0.035   -12.43   0.000       -0.505      -0.367
       trend |      0.067      0.010     6.65   0.000        0.047       0.087
        scmc |      1.179      0.039    30.04   0.000        1.102       1.256
       _cons |      0.019      0.061     0.31   0.759       -0.100       0.138
--------------------------------------------------------------------------------
Correlation matrix of residuals:
              division  delegation
  division      1.0000
delegation     -0.1045      1.0000
Breusch-Pagan test of independence: chi2(1) =    29.287, Pr = 0.0000
```

The estimated results from regression analysis of apportionment and division are reported in **TABLE 3.0**. Because of the importance of the estimated model, both the regression diagnostics and a comparison seemingly unrelated regression model are reported in addition to the basic equation estimation(s). The model goodness of fit tests reports a low r-square and the existence of significant heteroskedastic variation across the full range of county division and apportionment in delegation size. As the tests for a normal shaped distribution indicate, neither division nor delegation size variables are normally distributed and any regression analysis of these variables also indicates significant skewness in the residuals attributable to the concentration of division in the district allocations and asymmetries and inequalities in the delegation sizes. More generally, the variations in the apportionment and division variables exhibit somewhat similar properties, in terms of their averages and the skewness of the distributions. Even so, the variations in apportionment and division determine a significant, but only 25 percent variation in county division and delegation sizes.

The bivariate relationship between apportionment and division is estimated to be negative for planning alternatives selected in the data. As the delegation sizes increased, the amount of division decreased, indicating increases in numbers of multi-member single county districts and single county districts with large numbers of subdivision districts. As the larger county effect is controlled for, the bivariate relationship is estimated to be positive, so that as the number of multi-county division districts increased, on a county basis, the amount of division increased. The coefficient estimated equals -.067, -.057, -.055, and .039 for apportionment and division for the bivariate to full model. Analysis of the beta coefficients indicates that delegation size is the most influential determinant of division, until controlling for single and multi-county districts.

The findings also indicate the Senate Districts were more likely to contain whole units for either single or multi-county districts. The fact that more State Senates had boundary regulations suggests the planning alternatives selected were more likely to adopt apportionment and district plans with multi-county consolidated districts. These districts were also more likely to involve the combination of whole county units, so that boundary lines remained intact and there was no county division by forming multi-county districts. The instances of county division were more likely to occur with portions of two counties contained in a single district. In these divisions, the resulting apportionment is a ½ district allocation that may be described as partial representation. In the full model, the bicameral effect has greater influence than delegation size in explaining variation in county division. Using the intercept estimated in the full model, the Senate averaged approximately 1 district allocated per-county, with the House average equal to .91. In both chambers the averages were approximately equal to 1, however, the Assembly Districts were significantly below 1 indicating some county division in House Districts.

The linear trend effects indicate significant declines in no county division. In the sequence of apportionment and district allocations, there was a strong increase in the proportion of county division districts. As an evolutionary stable strategy emerged in apportionment and district planning, these transition plans indicate a steady linear sequence of adjustment from no division and intact boundary lines to county division districts. The findings suggest a transition from guarantees of 1 Senate or Assembly district per-county, to district allocations of one district for two whole counties consolidated into a single district. As the proportion of county division districts increased, this trend effect results in either combinations of three or more counties per-district or county division districts combining portions of two counties.

The dichotomous single/multi-county variable explains the most variation in county division. This result confirms the importance of county division and subdivision districts in the transition from single county districts to single member districts. As county subdivision districts became more prevalent, this produce -.399 increase in division, producing a decline from single counties, no division districts (with division = 1) down to ½ = (.910 - .399) from adopting two county division districts. On this basis, the adjustment process is estimated to begin with division equal to 1, and then a decline too approximately ½ for the apportionment and district plans selected for analysis in this state data.

The regression diagnostic tests imply not only are the four variables significantly related and explain variation in county division, but the existence of increasing common variation suggests that as the number of no county division districts eroded in transition, the full range of county division increased the amount of variation significantly. These results verify an initial point of division = 1 with a guarantee of a single county district with no county division under the traditional, if not status quo, apportionment and division. The kurtosis coefficient tests indicate a concentration of single county districts in the planning alternatives selected for this analysis. As this erodes, the transition produces increased asymmetries and inequality in the distribution of apportionment and division. Not only does the variation in county division increase but the full range expands from zero to four in delegation size and from 0 to 1 in division. The seemingly unrelated regression analysis reveals that a two-equation model of apportionment and division estimates different, but still significant coefficients, and the same explanatory power for both equations consistent with the single equation estimation.

The coefficient estimates differ between the single regression equation and the seemingly unrelated regression model. In the latter estimation, the delegation size effect is twice as strong as the coefficient estimated by a single equation regression method. In comparison, the bicameral effect estimated is very similar in the two models. The negative trend toward greater county division is also similar in both the one and two equation models. The estimated difference between single and multi-county districts is marginally larger in the two equation models, again, indicating the additive increase in county division through the use of multi-county districts. Using the intercepts in both equations (division = 91.0% in the single equation model, division = 89.0% in the two equation models), the trends indicate a linear sequence moving toward ½ or .5, equal to 50% of the counties allocated division districts. The additive difference between single and multi-county districts, equals .890 -.399 = .491 or 49.1% of the districts in the single equation model. A similar result is obtained in the two equation models, subtracting .435 from .910 = .475 or 47.5% county division districts. These findings indicate a strengthening of the apportionment and division relationship, with similar results for the variables controlling for bicameral, trend, and additive single or multi-county district effects.

The second equation, in the two equation models, provides estimates of the coefficients resulting from fragmentation instead of the apportionment solution. These findings reveal a similar model goodness of fit, and a strongly positive relationship between county division and apportionment. The coefficient is estimated to be equal to .568 that is marginally different from .5 or ½. These findings demonstrate that as county division increased, the amount of division erodes from the previous convergent point equal to 1, converging toward ½ or 50% of the districts with county division.

The other effects confirm the adjustments in apportionment and division in this transition data, from a status quo to another planning alternative. In this second equation, the bicameral effect = -.436 that indicates the Senate District Plans had less county division, partially because of the use of more than two-county, multi-county districts. In those settings, the states tended to combine whole unit counties into these 3 counties or more Senate Districts. In comparison, the Assembly Districts began to be changed, in some cases to allow for the extension of city districts into county territory, and from urban counties to suburban major and minor civil districts. In metropolitan areas, the states tended to elongate what had been county subdivision districts contained within single urbanized counties. The aftermath of the 1972 redistricting produced a larger number of multi-county Senate and House Districts, from a large number of division districts in both chambers (for a summary of the county results in 6 states, see **Appendix II**).

The strongly positive trend effect indicates an increase in the average delegation size, as the most urbanized counties gained in district allocation. Not only did the delegation sizes of these counties increase, but the number of county subdivision districts increased to the point that most of the remaining single county districts were allocated as single county subdivision districts. The trend of eliminating the guarantee for a single county district, produced a large increase in the number of county subdivision districts contained within a single county. Since 1992, there has been a gradual reduction in the number of county division districts that were initially constructed from subdivision districts on county edges. The trends from county subdivision to county division, and then back toward single county subdivision are not estimated in this 1950 to 1972 data. Even so, the trend effect indicates both a strongly positive increase in average delegation sizes and a change in district allocation from single county to subdivision districts.

The estimated difference equal 1.179, between single and multi-county districts, indicates a district allocation equal 1, for single county districts, and 0 for multi-county districts. These significant differences imply the stability of the status quo, single county district allocations and guarantees for at least one district in the transition data. These results confirm there were very few multi-county, division districts and that county subdivision was still in use in only a few urbanized county and metropolitan areas. The fact that 41.6 of the districts were single county districts demonstrates the remaining support for county unit district allocation, no county division, and generally provisions for maintaining boundary lines intact.

Simulation of Planning Alternatives & State Apportionment & District Plans

The simulation of planning alternatives elaborates any choice of a district plan. The model of apportionment and district allocation describes the range of combinations of single member, additional representation, and multi-member district possibilities available for a choice of a district plan. The range of districts is limited to a finite integer set $D = \{1, 2, 3\}$, with the choice set $\mathbb{C} = [1, (1, 2), 2, 3]$. The choice set $\mathbb{C} = [1, (1, 2), 2, 3] = 1$ is defined as a single member district plan, and $\mathbb{C} = [1, (1, 2), 2, 3] = Pr(1) + Pr(2)$ = an additional representation plan with a mixture of single and double-member districts. A multi-member district plan may be defined as either $\mathbb{C} = [1, (1, 2), 2, 3] \geq 2$ or $\mathbb{C} = [1, (1, 2), 2, 3] = Pr(2) + Pr(3)$, for this range bound on the number of districts allocated. Three state examples are selected for this analysis: California, Nevada, and Oregon. The purpose of the simulation is to determine the number of planning alternatives for each size of the legislative chamber (California Senate = 40, Assembly = 80); [Nevada Senate = 20 (1910), 17 (1950), 21 (1990), House = 49 (1910), 47(1950), 42 (1990)]; (Oregon Senate = 30, House = 60).

Given a fixed size of the California Legislature, the number of possibilities is constant for each of the three decades selected: 1910, 1950, 1990. The total numbers of planning alternatives, for these three decades equals 1845 potential choices for an Assembly District Plan. For the State Senate equal to 40 members, the number of potential choices equals 525 numerical combinations that may be added together to attain a 40-member legislative chamber. The planning alternatives used combinations of single member district allocations, double member districts, and MMD = 3 member allocations. These planning alternatives generated 545 and 1845 choices of a district plan consisting of SMD = 1, AR = 1 or 2, MMD = 2 or 3, and mixed representation plans = D = {1, 2, 3}.

Amongst three census decades, there are 6 combinations of an 80-member SMD plan comprising 0.3 % of the 1845 planning alternatives. Inasmuch the choice of an SMD = 1 plan would occur by chance 0.3% of the time. The California Senate results are equal to: Pr(SMD = 1) = 1.1% = 6/525 for a State Senate = 40 members, from 1910-1990. By random selection, the choice of these district plans is equal to 1.1% and 0.3% for the upper and lower chambers in the California Legislature.

Additionally, the simulation results also reveals Pr(MMD| Senate) = 4.6% and Pr(MMD| Assembly) = 2.4% that are greater than the probabilities for the choice of an SMD plan only. Interestingly enough, the probabilities of 40 double member districts only equal the probabilities of choosing a single member district plan only (1.1% and 0.3%). Assume, for the purposes of analysis, California apportioned 60 Assembly Districts, with 40 single member districts and 20 double member districts. This would obviously attain the Assembly = 80 members, but this would reduce the number of districts involved in redistricting with boundary changes.

Secondly, assume California apportioned 80 Assembly Districts, with 60 single member districts and 20 double member districts. This apportionment would generate a 100-member lower chamber with the same Assembly District allocation. Even so, any redistricting would require the redrawing of 80 district boundaries. Third, assume California apportioned 80 Assembly Districts, with 40 single member districts and 40 double member districts. This district allocation would generate an Assembly with 120 members.

In the first example, the size of the legislative chamber remains the same but the number of districts requiring a decennial change in district boundaries would be reduced by 20 districts. In the second and third examples, the number of Assembly Districts allocated remains the same but the size the legislative chamber could be increased from 80 to 100 or 120. By considering these planning alternatives, these results demonstrate the potential for changes in redistricting without changes in the size of the legislature or by maintaining the same number of districts. This flexibility may not be of use given the seemingly fixed size of the legislative chambers and the fact that the 80 Assembly Districts are not contained in the 40 Senate Districts. Given the fixed size and lack of containment, redistricting in California involves apportionment and division of 120 districts and therefore decennial changes to boundaries in 120 districts.

Prior to 1965, no more than a single Senate District was allocated to each county and county boundary lines were regulated to remain intact. This method of apportionment and division existed from 1927 in the State Senate and 1850 in the State House. The 1927 provision allowed for multi-county Senate Districts, with some districts having more than three counties. There were also multi-county Assembly Districts, but with only a few exceptions, there were no county division districts until the 1966-1972 adjustments in 120 district allocations.

The 1982 redistricting created county subdivision districts that elongated outside of county boundaries in urban counties. This formed the largest number of county division districts from amongst the urban counties, so that both Senate and Assembly Districts extended from Los Angeles County into adjacent San Bernardino and Orange County. As a result, the choice of a district plan created a large number of county subdivision districts that permitted county division. The 1992 redistricting marginally reduced the number of counties combined into single member, multi-county districts, even though the 1992 districts maintained county boundary lines with a reduction in the number of county division districts. The 1992 plan reduced the number of county division districts among urban counties, and generally followed county boundary lines throughout California so that there were large multi-county districts without county division. In comparison, both the 2002 and 2012 redistricting allowed for greater county division in the more rural counties, by creating regional districts in northern California with a large number of counties. So much so that unlike earlier redistricting, the choice of these district plans created multi-county division districts, by combining portions of usually one urban county and more than 4 smaller counties. The 2002 and 2012 apportionment and division produced at least three regional districts and generated some opposition to the choice of a district plan.

Given the simulation results, it may have been desirable to either have decreased the number of Assembly Districts or increased the size of the State Assembly. For example, assuming SMD = 40 and 20 double member districts in the Assembly, and the Senate Districts could be elected from 20 double member districts, these planning alternatives would reduce the number of districts' boundary changes from 120 districts to 80. By adopting one of the other planning alternatives, it would also have been possible to increase the size of the Legislature.

Analysis of California choices of district plans is summarized by three results. First, a state regression model is estimated using a bicameral state time series, from 1849-2001, of apportionment and division. Second, this study reports an analysis of bicameral effects for the State historical sequence of choices of district plans. Third, the findings are summarized by county to provide a measure of the amount of county division.

TABLE 4.0 Regression Analysis and Diagnostic Tests of California Time Series: (County) Division by County Delegation Size, Legislative Chamber (Senate = 1, House = 0), Trend Sequence of Apportionment and District Plan, Single or Multi-County District

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics R Square Change	F Change	df1	df2	Sig. F Change
1	.003	.000	.000	.38789	.000	.039	1	3356	.843
2	.258	.066	.066	.37485	.066	238.653	1	3355	.000
3	.560	.313	.313	.32157	.247	1204.797	1	3364	.000
4	.693	.481	.480	.27961	.168	1083.037	1	3353	.000

a Predictors: (Constant), County Delegation Size
b Predictors: (Constant), County Delegation Size, Legislative Chamber (Senate = 1, House = 0)
c Predictors: (Constant), County Delegation Size, Legislative Chamber, Linear Trend
d Predictors: (Constant), County Delegation Size, Legislative Chamber, Linear Trend, SCMC (Single County District = 1, Multi-County District = 0)

Generally, the full model fit better in the California historical time series than the transitional, 1950-1972 data ($R^2 = .481 > .267$) and produces a more complex explanation of apportionment effects. The findings indicate a weaker effect in delegation size (.02894 < .03851), a larger bicameral difference (.113 > .095), a weaker historical trend effect (-.0261 < -.03424), and a marginally smaller difference between single and multi-county districts (-.376 < -.399). Both intercepts provide an estimate of the county unit, no county division status quo. In the California State Time Series, the initial point is equal to (1.179 > 1), in comparison to an intercept equal to (.910 < 1) in the transitional data indicating the county boundaries remained more intact for the longer historical time series.

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.059	1	.059	.039	.843
	Residual	504.942	3356	.150		
	Total	504.948	3357			
2	Regression	33.539	2	16.769	119.347	.000
	Residual	471.409	3355	.141		
	Total	504.948	3357			
3	Regression	158.123	3	52.708	509.712	.000
	Residual	346 825	3354	.103		
	Total	504.948	3357			
4	Regression	242.798	4	60.700	776.372	.000
	Residual	262.149	3353	.078		
	Total	504.948	3357			

a Predictors: (Constant), County Delegation Size
b Predictors: (Constant), County Delegation Size, Legislative Chamber (Senate = 1, House = 0)
c Predictors: (Constant), County Delegation Size, Legislative Chamber, Linear Trend
d Predictors: (Constant), County Delegation Size, Legislative Chamber, Linear Trend, SCMC (Single County District = 1, Multi-County District = 0)
e Dependent Variable: (COUNTY) DIVISION

Coefficients

		Coefficients		Standardized Coefficients	t-statistic	Sig.	95% Confidence Interval for B	
Model		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	.708	.009		77.146	.000	.690	.726
	DELEGATION	-.00150	.008	-.003	-0.198	.843	-.016	.013
2	(Constant)	.599	.011		52.785	.000	.576	.621
	DELEGATION	.02269	.008	.052	3.023	.003	.008	.037
	CHAMBER	.20600	.013	.263	15.448	.000	.180	.232
3	(Constant)	1.210	.020		60.142	.000	1.170	1.249
	DELEGATION	-.07600	.007	-.173	-10.791	.000	-.090	-.062
	CHAMBER	.136	.012	.173	11.668	.000	.113	.159
	TREND	-.03230	.001	-.545	-34.710	.000	-.034	-.020
4	(Constant)	1.179	.018		67.321	.000	1.145	1.213
	DELEGATION	.02894	.007	.066	4.193	.000	.015	.042
	CHAMBER	.113	.010	.144	11.155	.000	.093	.133
	TREND	-.0261	.001	-.440	-31.388	.000	-.028	-.024
	SCMC	-.376	.011	-.470	-32.910	.000	-.398	-.353

a Dependent Variable: DIVISION

The next findings describe the dynamics from the 1850 to 2001 apportionment and division in the California Legislature. With each choice of a district plan, there were changes in th initial number of counties to the present 58 counties (57 counties + 1 consolidated city-county). By 1857, there were 44 organized counties, with the last county established in 1907.

Amongst these choices of district plans, there were also changes in the types of districts allocated to counties during this long-run sequence of apportionment and division. The large number of district allocations to counties included 1) multi-county districts, 2) multi-county, multi-member districts, 3) large multi-county, regional districts, 4) two-county division districts, and 5) single county multi-member districts. All of these five types of districts were eliminated from 1849-1888, and 1911. Firstly, in place of these district types, urban counties were allocated county subdivision districts to prevent formation of large scale multi-member districts in San Francisco, Los Angeles, Alameda, and San Diego counties and a few additional subdivision districts were formed in counties allocated two districts. These county subdivision districts were generally allocated by minor civil districts. Specifically, the subdivision was apportioned by township division, that was consistent with the formation of Board of Supervisors Districts in these counties. In San Francisco, this involved a combination of town and ward division within the City District. The use of precinct-townships and towns, replaced the absence of ward division within the City of Los Angeles and the other cities incorporated in Los Angeles County.

The dynamics in **FIGURES 5 & 6** reveal the influence of changes in apportionment and division resulting from changes in the types of districts allocated and the imposition of no more than one Senate District per-county. Unlike some of the other states in the transition data, there have always been very few single county districts in California. Even so, the provision rules enacted favored apportionment to local jurisdiction and the minimization of county division districts. By adopting rules to maintain county boundary lines intact, the choice of district plans evolved toward either multi-county districts or county subdivision districts, *with no county division permitted in the district allocation*.

FIGURE 5.1

CHAMBER: 0 House

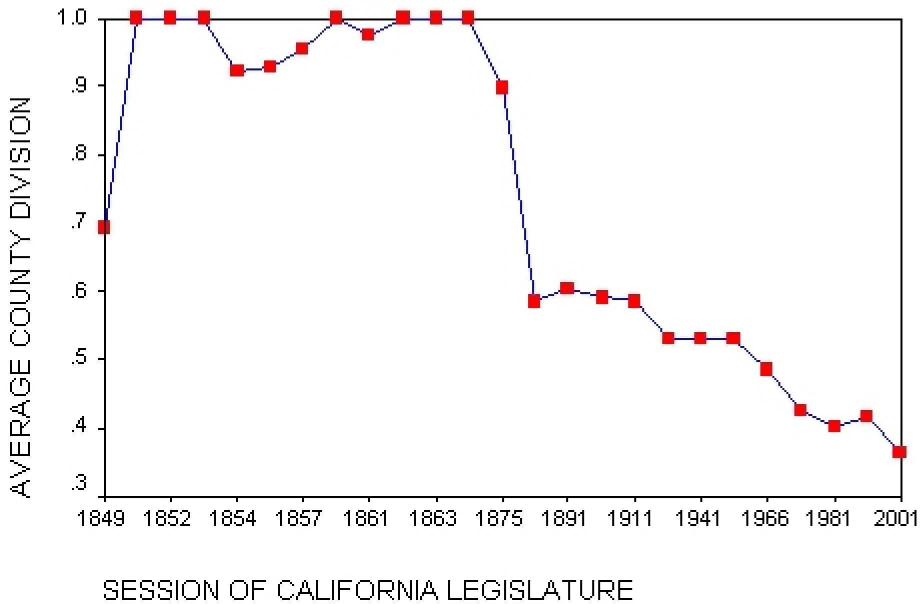


FIGURE 5.2

CHAMBER: 0 House

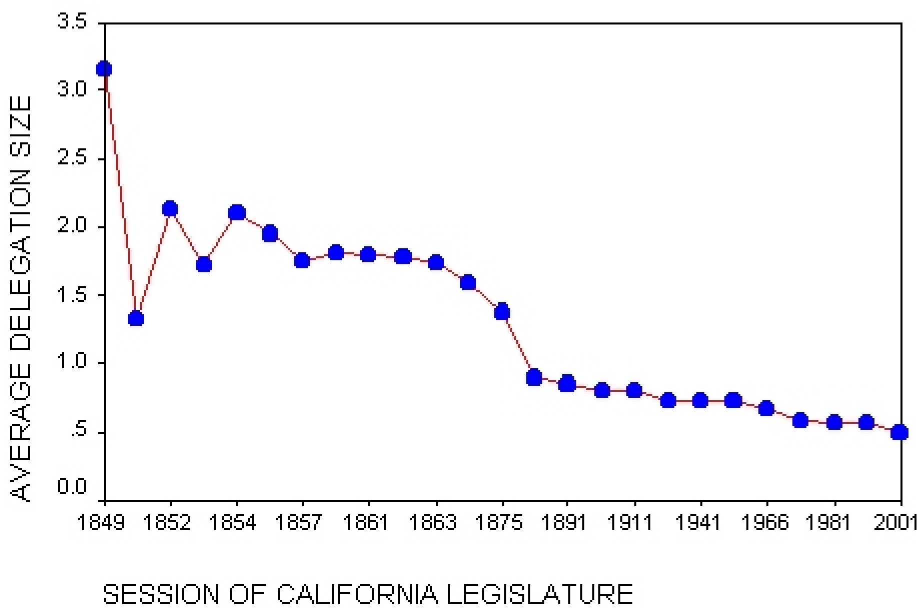


FIGURE 6.1

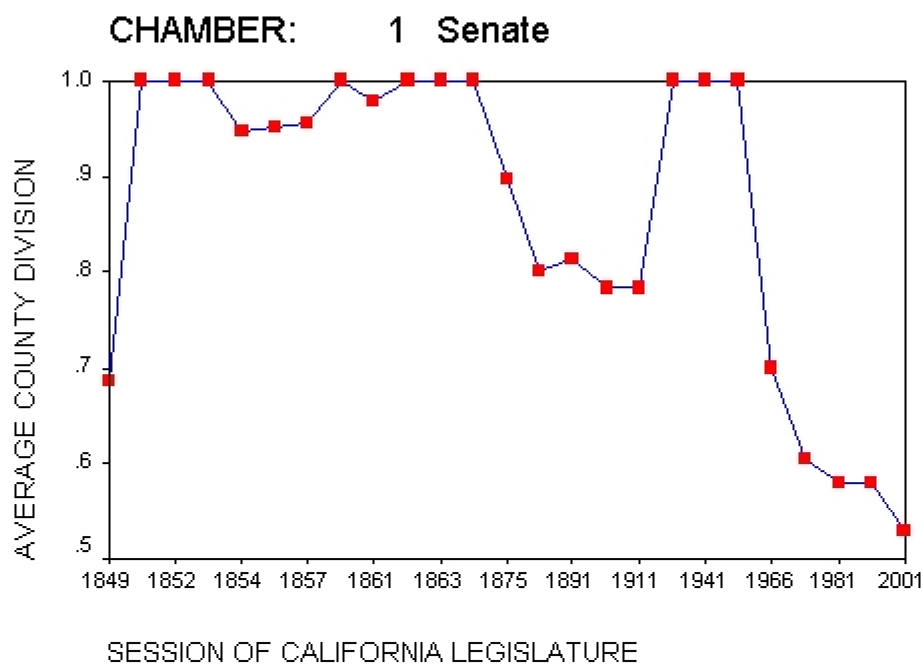
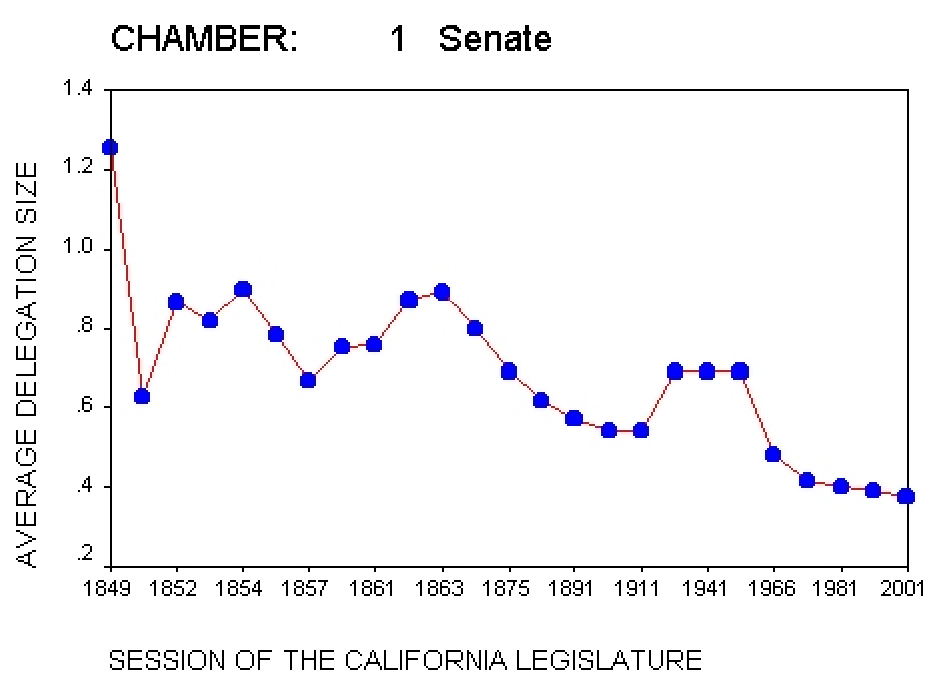


FIGURE 6.2



As demonstrated in **FIGURES 5 & 6**, the increase in county division begins in 1888 by the choice of Assembly District plans. As a result of the 1927 provision, for no more than a single Senate District per-county, the increase in county division begins in 1966 in the Senate. The findings on average delegation size demonstrate the long-run, trend toward a reduction in delegation sizes and an increasing county division converging toward ½ division. These results are consistent with the expansion in the number of multi-county division districts, county division = .5 or less, and two or more counties consolidated into a single multi-county district. These results demonstrate that after 1966-1973, the choice of a district plan mostly involved adoption of county division districts. During this period, the only no county districts were allocated to either large multi-county districts or single county subdivision districts. Thereafter, these whole unit districts were replaced by county division districts in the 1982 redistricting through the most recent, 2012 redistricting. Generally speaking, the emphasis in choosing a district plan is now placed on municipal, city districts and the formation of regional legislative districts. Almost all of the district allocations involve a choice of district plans consisting of county division districts with varying minimization of splitting boundary lines to maintain local jurisdiction in either Senate or Assembly Districts.

At issue, is the fate of the single county districts and the multi-county districts with no division. As these are replaced with county division districts, especially in northern California, there is a common sense loss of representation in apportionment and division. This loss becomes reasonable given the average division and delegation size results over the long-run. As the number of counties increases in these multi-county districts, the districts seem be less effective in representing interests over such a fragmentation of local jurisdictions.

Additionally, the larger the number of counties the more the districts become regional districts allocated to represent a whole subregion of the State. The effectiveness of allocating only a single district then comes into question as those deliberate the results of strategic planning by region of the State. As county division becomes more likely in the choice of a district plan, any redistricting becomes unbalanced, for example, as the northern region receives only 2-4 Senate Districts and portions 4-8 Assembly Districts. Because these are county division districts, the district allocations provide to a large number of counties equal to 4 or more, a single district with at least one of the counties divided into (an)other district(s). This loss of representation was particularly at issue in northern California, where some of the pre-1888 apportionment and district plans allocated multi-county, member districts to counties that presently are combined with 4, 6, and 12 other counties in a single district. The apportionment and division for these historic districts involved 4 counties allocated 3 districts in comparison to the current single member, multi-county districts.

In summary, the California time series varies somewhat from the transitional data for six states including California for a much briefer time period. The findings reveal significant bicameral effects are explaining differences in the choice of a district plan. The following **TABLE 5** summarizes the data on no county division = 1, county division = .5, and county subdivision = 0 for both the California and six western state data. The no county division = 1 remains the initial point in the analysis, with transitions suggesting county division emergence in California, Colorado, Nevada, New Mexico, Oregon and Washington. The findings in **TABLE 5** demonstrate significant bicameral effects, with Senate Districts and the transitional data more likely to predict no county division districts and therefore intact boundary lines.

TABLE 5.1 CDDCSD BY LEGISLATIVE CHAMBER IN CALIFORNIA, 1849-2001

		CHAMBER		Total
CDDCSD	Statistic	House	Senate	
subdivision	Count	429	73	502
	% within CHAMBER	22.5%	5.0%	14.9%
division	Count	645	445	1090
	% within CHAMBER	33.9%	30.6%	32.5%
intact	Count	831	935	1766
	% within CHAMBER	43.6%	64.3%	52.6%
Total	Count	1905	1453	3358
	% within CHAMBER	100.0%	100.0%	100.0%

TABLE 5.2 CDDCSD BY LEGISLATIVE CHAMBER IN CA, CO, NV, NM, OR, WA, 1950-1973

		CHAMBER		Total
CDDCSD	Statistic	House	Senate	
subdivision	Count	498	319	817
	% within CHAMBER	37.1%	23.8%	30.5%
division	Count	101	88	189
	% within CHAMBER	7.5%	6.6%	7.1%
intact	Count	743	931	1674
	% within CHAMBER	55.4%	69.6%	62.5%
Total	Count	1342	1338	2680
	% within CHAMBER	100.0%	100.0%	100.0%

TABLE 5.3 Chi-Square Tests

	California			Western States		
Statistic	Value	df	Asymp. Sig. (2-sided)	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	238.769	2	.000	61.220	2	.000
Likelihood Ratio	261.590	2	.000	61.585	2	.000
Linear-by-Linear Association	225.577	1	.000	61.156	1	.000
N = Sample Size	3358			2680		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 217.21.
b 0 cells (.0%) have expected count less than 5. The minimum expected count is 94.36.

TABLE 5.4 Symmetric Measures

Nominal by Nominal	California		Western States	
Statistic	Value	Approx. Sig.	Value	Approx. Sig.
Phi	.267	.000	.151	.000
Cramer's V	.267	.000	.151	.000
Contingency Coefficient	.258	.000	.149	.000
N = Sample Size	3358		2680	

a Not assuming the null hypothesis.
b Using the asymptotic standard error assuming the null hypothesis.

State Examples of Division = 1, 1-0, 0 and the Choice of a District Plan

The spatial relationship between boundary lines and redistricting can also be demonstrated by the choice of an apportionment or a district plan. The sequence of maps in this section describes the transition from apportionment and division to methods of proportionality and district planning for county division districts, by multi-county or regional districts, and county subdivision into single member districts. The findings indicate the substantial use of county division to attain population equality and to otherwise manipulate district boundaries.

In comparison to the traditional methods of apportionment, the current election laws emphasize boundary descriptions and agenda setting control over redistricting processes. Because of these changes, boundaries and local division are established as a minor goal to attain, but the maintenance of existing local jurisdiction is seldom attained by choice of a district plan. In many instances the choice of a district plan reveals some efforts to reduce county division by minimizing the number of boundary lines crossed or split in district allocation. Even so, the results indicate only minor reductions toward attaining better fitting district allocations with local jurisdiction(s). The use of major and minor civil districts in redistricting implies that many districts will contain whole units of local jurisdiction as the building blocks for choice of a district plan. In summary, the apportionment law permits' division of these units and the choice of a district plan more generally fails to prevent county division in the selection of planning alternatives and therefore adoption of an apportionment and district plan. As a consequence, redistricting frequently produces oddly shaped districts through county subdivision and in the construction of large multi-county districts. On this basis, the boundary lines minimally attain contiguity and usually fail to attain maximally compact design of legislative districts.

The 1947-51 Nevada District Plan provides for an example of what was the status quo in apportionment and division. The choice of this district plan, shown in **FIGURE 7.0**, involves a redistricting to population changes from previous district allocations. This redistricting expanded the size of the Legislature, by increasing the number of Assembly Districts. The Senate District apportionment also reveals the guarantee of one Senate District allocated per-county. In 1951, the population of the State was still concentrated in northern counties, so that the Apportionment Plan Assembly Districts added districts to the population centers, increased the size of the Assembly, and maintained a guarantee of at least one House District per-county. As a result, the choice of this district plan involved substantive changes from previous apportionment and division and this district allocation required no county division among the 17 counties.

This choice of a district plan reveals the redistricted apportionment to the population centers in Reno and Las Vegas, in western (“little California) and southern (“little Arizona”) subregions. Because the formative counties were organized beginning in eastern Nevada, the traditional division of the State territory is from east to west. However, the growth in the Capitol Center and northern counties has been generally concentrated in the most western counties. Any growth in the southern region of Nevada, since this 1951 District Plan, is in the City of Las Vegas, and the suburban cities, towns and townships of Clark County.

The 1951 district allocation provided for the enactment of a redistricting with zero (county) division. The district allocation to single counties also provided for a generalized apportionment and division, apportioning a larger number of districts to population centers than previous redistricting. The plan attained goals of zero division, but the Senate District allocation was not on a population basis.

FIGURE 7.0 NEVADA APPORTIONMENT--SENATORS AND ASSEMBLY, 1951

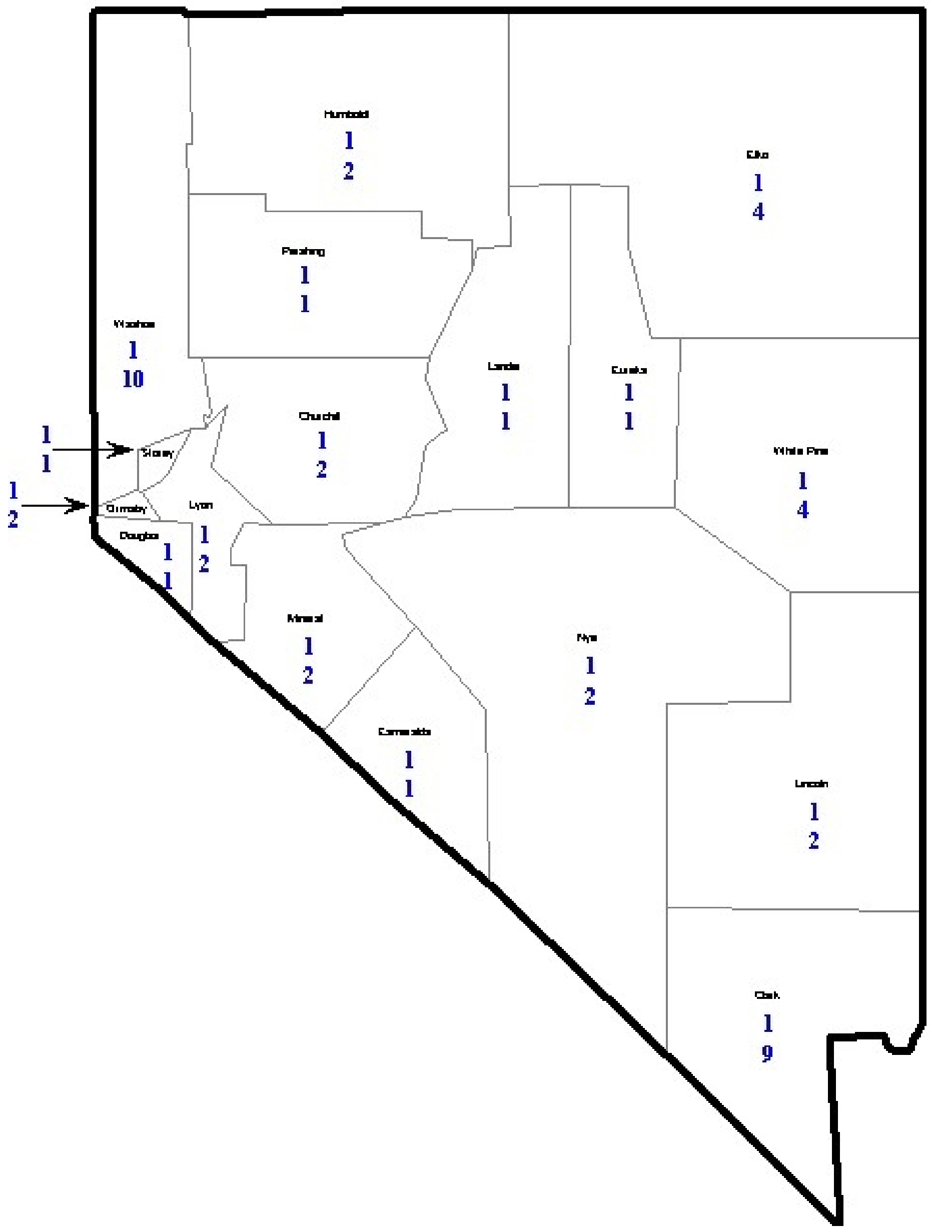
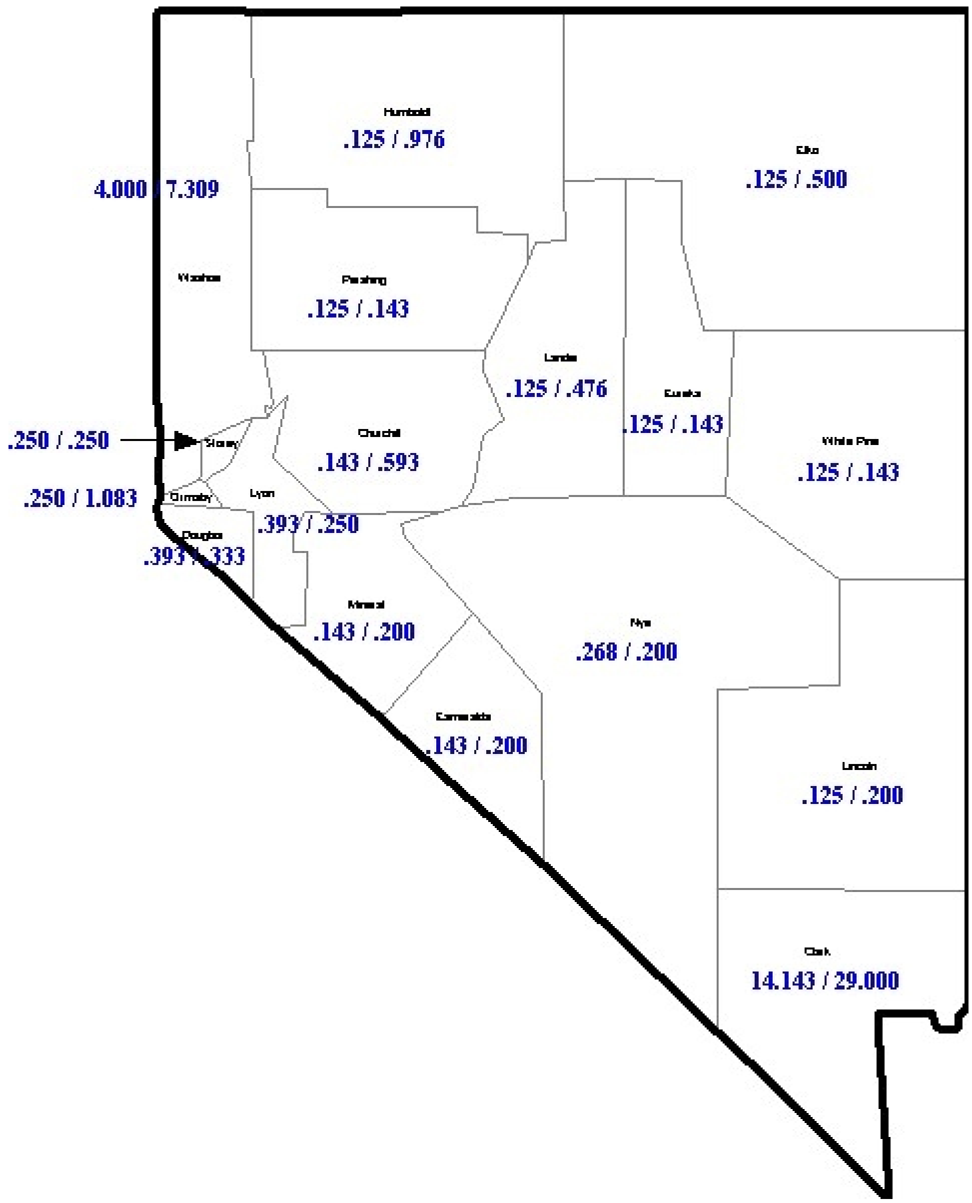


FIGURE 8.0 2001 NEVADA SENATE AND HOUSE APPORTIONMENT PLAN



Under the 2001 Apportionment Plan, shown in **FIGURE 8.0**, there were both multi-county division districts and single county subdivision districts. For examples, the total district allocation to Clark County was 14.143 Senate Districts and 29.000 Assembly Districts. One of the Senate Districts was a shared, multi-county district elongated from Clark County on the diagonal State boundary. In northern Nevada, additional Senate Districts were allocated from the greater Reno area toward the Capitol Center. The district allocation to Carson City–Ormsby County equaled one quarter of a Senate District and proportions of Assembly districts accumulating to one plus a portion of a contiguous regional district. In summary, the choices of the district plan reveal the effects of implementing methods of proportionality and district planning in the adoption of multi-county and single county, division districts. The 2001 redistricting involved the current size of the legislative chambers equal to 21 Senate Districts and 42 Assembly Districts, in comparison to the 17 Senators and 47 Assembly Districts allocated under the 1951 District Plan. The 2001 demonstrates an example of non-zero division, measurable between zero and one, in an apportionment and division, that contrasts from the status quo division, for any selection of proportionality in district planning alternatives

The Nevada example does not include any transitional data that tended to minimize county division. The choice of a district plan in Arizona (1966, 1966-1972) describes an example of a District Plan, with redistricting from the status quo division toward greater county division. This provision consists of 30 Senate Districts, with 2 Assembly Districts contained within each Senate District. The redistricting began in 1965, with this Apportionment Plan in use for the 1968, 1970, and 1972 State elections. The historical apportionment and district allocations were similar to the 1951 Nevada Apportionment Plan, with (14) county districts.

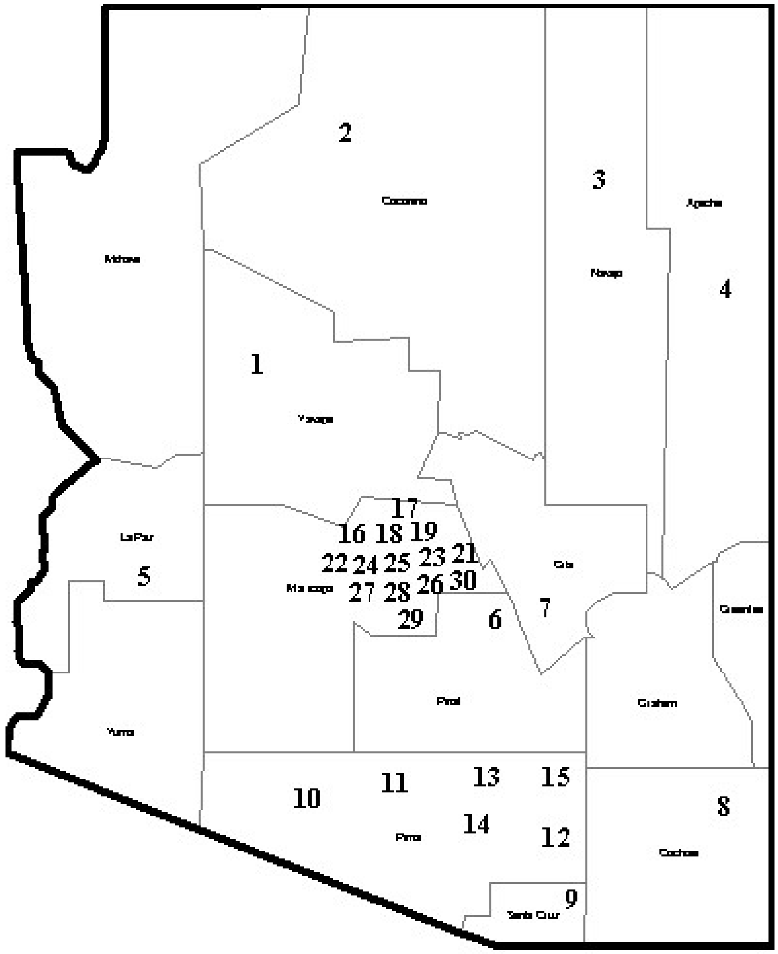


FIGURE 9.0 ARIZONA LEGISLATIVE DISTRICTS, 1970

As reported in **FIGURE 9.0**, the 1966-72 Arizona redistricting produced a Senate District Plan with allocations to 15 counties. As shown in **FIGURE 9.0**, this transitional plan concentrated Senate Districts in the central part of the State in Maricopa and Pima counties. In comparison to previous redistricting, the District Plan allocated proportionally more districts to the population centers in the cities of Phoenix, Maricopa County and Tucson, Pima County. The District Plan made use of multi-county districts, for the first time in Arizona, and allowed even greater single county subdivision than what had occurred before with allocation of single county subdivision districts by the County Boards of Supervisors. Even with multi-county districts, and a larger number of single county subdivision districts, the 1970 District Plan permitted no county division in the formation of districts.

The State reallocation of districts to two urban counties produced somewhat different results, establishing a 2/3 majority from Clark County in the Nevada Senate and a simple majority in the Arizona Senate from Maricopa County. In both States, redistricting changed the Apportionment Plan from allocating 1 or 2 Senate Districts per-county and any guarantee of at least one Assembly District per-county. In Arizona, the 1970 (1966-72) District Plan provided for no county division, keeping boundaries intact, and maintaining both local jurisdiction and jurisdictional boundaries in the Apportionment Plans (reported in **FIGURES 10.0 & 11.0**). This example demonstrates that it is possible to redistrict and maintain no county division by the method of apportionment and district planning. In both examples, the selection of planning alternatives involves a range of possible apportionment and division. Even so, these States adopted District Plans varying in (county) division, with the Nevada example describing the long-run outcome versus the short-run example of transitional redistricting in Arizona.

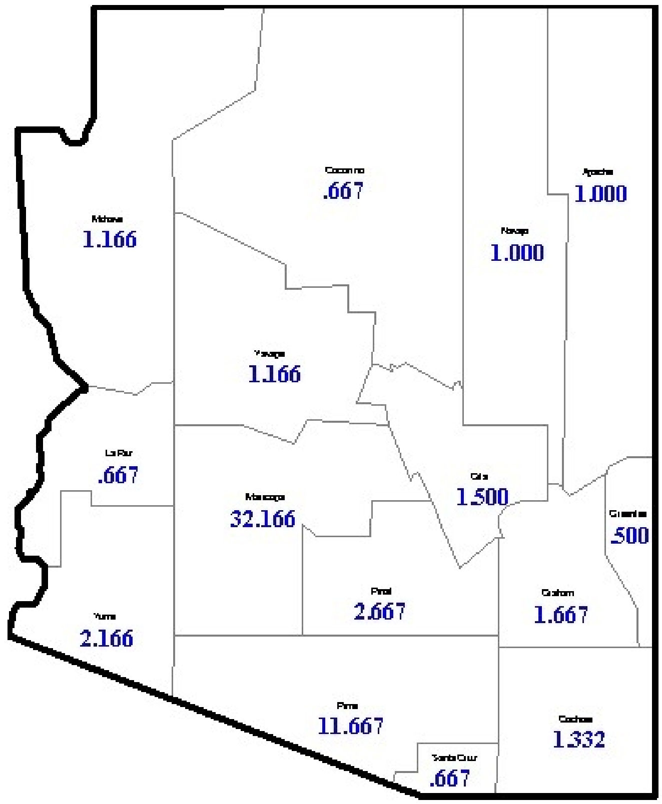


FIGURE 10.0 ARIZONA HOUSE APPORTIONMENT, 1970

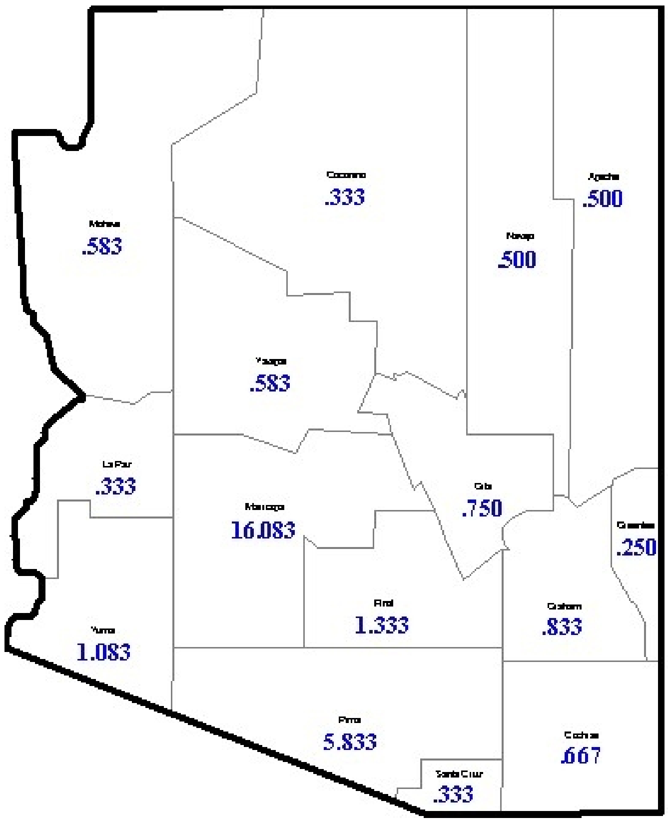
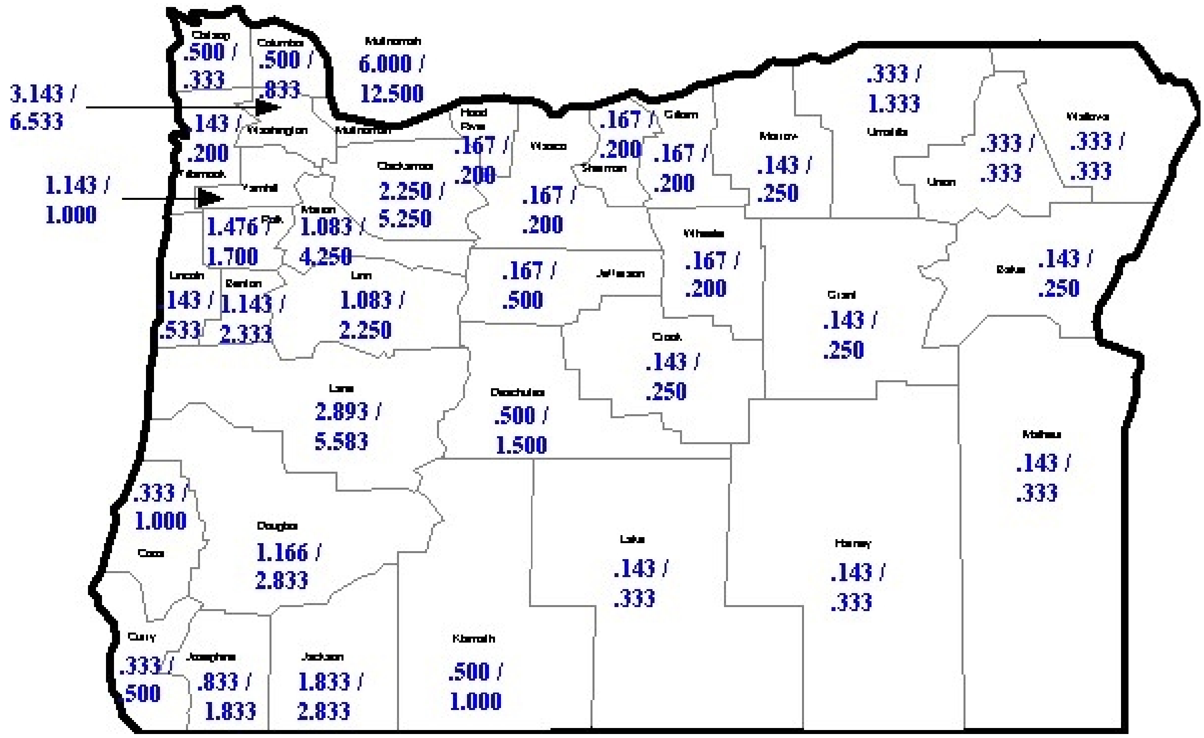


FIGURE 11.0 ARIZONA SENATE APPORTIONMENT, 1970

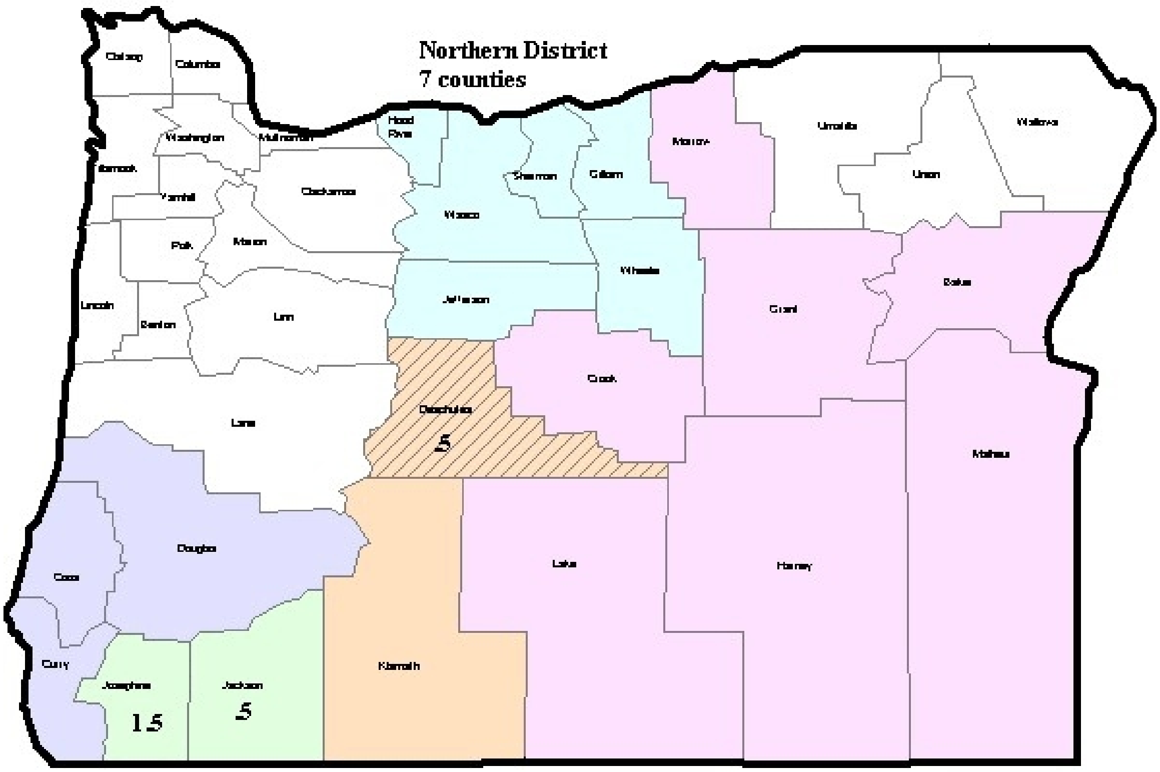
FIGURE 12.0 1991 OREGON SENATE AND HOUSE APPORTIONMENT PLAN



The Oregon Legislature has the same size of the Legislature as Arizona, so that redistricting involves 30 Senate Districts and 60 House Districts. The issue of county division was raised in 1950-53, with a proposal for intact county boundaries defeated as a planning alternative. By the 1991 redistricting, the tradition of multi-county House and Senate Districts extended to the use of county division. The transition began among the multi-county districts, as counties were added to these districts, pairings were changed in eastern and western Oregon, and multi-county division districts were constructed from north too south in apportionment. This transition continued with 1/3 concentration of districts in Portland, Multnomah County, that had retained AT-Large Election and therefore a multi-member district plan. County subdivision of these MMDs created single member districts and increased the number of single county districts.

1991 SENATE APPORTIONMENT AND DISTRICT PLAN

3 County Division Districts
2 Regional, Large County, Multi-County Districts
1 Consolidated, 3-County District



Western District
7 Counties

County Division, Subdivision, and Boundaries Intact by Single and Multi-County Districts

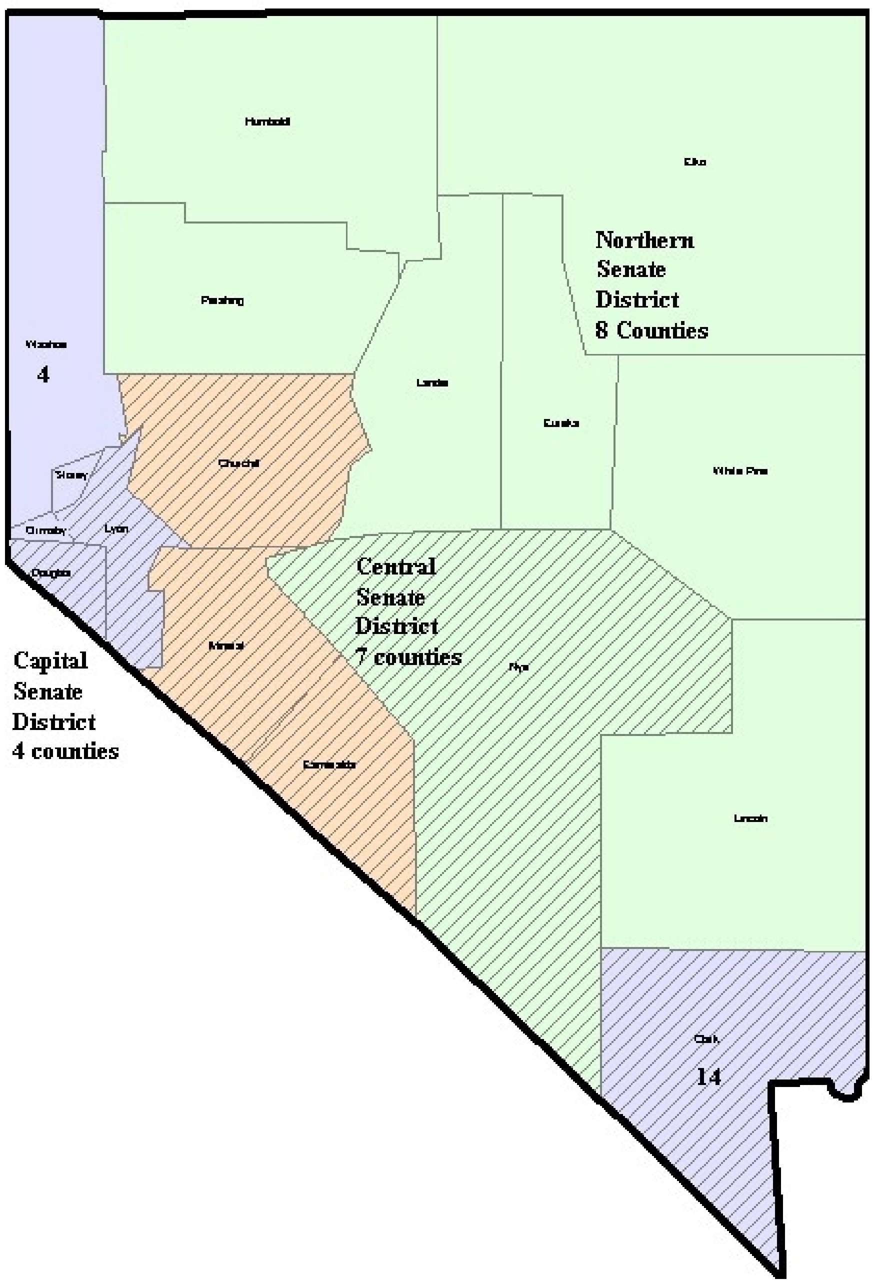
1991 Senate	SCMC	MC	SC	TOTAL
CDDCSD	SUBDIVISION	0	0	0
	DIVISION	45	12	57
J = 36	INTACT	12	0	12
N = 30	TOTAL	57	12	69

The Greater Portland Area consists of Multnomah, Clackamas, and Washington Counties. This tri-county area has a Metropolitan Planning District since 1956. By the 1991 redistricting, approximately 1/3 of the Senate Districts were allocated to the Greater Portland Area. The choice of a Senate District Plan involved 36 counties, 30 Senate Districts, and produced 45 county divisions in multi-county districts in addition to 12 counties that were included in both single county subdivision districts and multi-county division districts. As shown in **FIGURE 13.0**, this constitutes 57 county divisions or boundary line splits for 30 single member Senate Districts. Among the districts with intact jurisdictional boundary lines, there were 12/30 = 40% of the districts with no county division.

For a medium sized legislative chamber, these results indicate both substantial county division and protection of county boundary lines in some of the Senate Districts. In the present era of redistricting, this would generally be considered keeping the county boundaries intact relative to the choices of other district plans. Of the 1/3 of the counties intact within districts boundaries, all twelve were contained in large, multi-county districts. This District Plan had no county subdivision districts implying that all of the districts elongated from the population centers into contiguous counties. Most of the districts allocated were county division districts, and the amount of county division in the other 24 counties appears to have divisions throughout the District Plan adopted. As a result of the 1991 redistricting, the size of the district allocations also began increasing to a large number of more than four counties per-district. The formation of a 7 county northern District was somewhat of a surprise, at the time, and this was coupled with objections to both a Senate District with territory contiguous from the northern to southern boundaries of the State, multiple county divisions and a 3-county combination in eastern Oregon.

2001 SENATE APPORTIONMENT AND DISTRICT PLAN

3 County Division Districts
2 Regional, Large County, Multi-County Division Districts
18 Single County Subdivision Districts



The map of the 1991 Oregon Senate District describes six district allocations with varying county division. In **FIGURE 13.0**, starting with eastern Oregon, there is a three-county combination where one of the counties preferred allocation to a more northerly district. The adjacent two districts involve a single county (subdivision) district and a county division district with contiguous territory in two counties. Because the combined area of the portions of two Senate Districts equals only a portion of the total area for each Senate District, both districts are described as county division districts.

The other county division districts involve a central Oregon County divided into a pairing with a southern boundary county and a combination of northern counties. This apportionment and division not only allowed for the formation of multi-county division districts, but this created almost a boundary division of the State into three subregions consisting of eastern, central, and western Senate Districts. None of these district allocations had been enacted before, so that this choice of a District Plan in 1991 was substantially different from previous redistricting.

The 2001 Nevada Senate and House Apportionment and District Plan produces similar findings to the 1991 Oregon Senate Plan. New district allocations provided for a very different set of districts than what had been enacted in previous redistricting. As reported in **FIGURE 14.0** provided for single county subdivision districts, multi-county regional districts, and generally less county division than most of the redistricting since 1972. Unlike the Oregon Senate District Plan, the Nevada Apportionment and District Plan provided for single county subdivision in the most urbanized counties: Clark, Washoe, and Carson City. What is important is that two large multi-county districts were created, with the District Plan allocated regional districts to 8, 7, and 4 counties in northern, central, and western Nevada.

The findings for California, Nevada, and Oregon strongly indicate the transition toward the use of regional districts in legislative apportionment and district planning. These findings demonstrate the transition from multi-county districts, with no county division, to what is best described as a regional district covering a sub-state area. In California, the initial adoption of regional districts allocated House, and then much more recently, Senate Districts too northern and central (valley) California counties. In sum, the 1991 & 2001 California redistricting created multiple multi-county division districts. Similarly, the 1991 Oregon Senate Plan reveals the construction and enactment of multi-county division districts throughout Oregon. In addition, both the 2001 Nevada House and Senate Apportionment contained multi-county division districts. For Nevada, this represents the largest numbers of counties combined into a single Senate or Assembly District. In Oregon, the extent of the county division in most of the counties was also greater than had been the case in any previous redistricting. Besides allowing for multi-county division districts, elongated between the State boundaries, the apportionment provided for divisions from the districts created from extending city districts into suburban counties in the Greater Portland area. As a consequence, this adoption of regional districts and extensive county division, produced significant adjustments the choice of District Plans in 1991 and 2001 from any previous apportionment and district allocation in these Western States.

These District Plan results demonstrate the number of counties consolidated into single multi-county districts. In the transition data, MC districts were adopted with no county division. Inasmuch the 1991 and 2001 MC districts were adopted and extended from single county subdivision districts to multi-county division districts. These results indicate an extension of single county subdivision to multi-county and regional districts by county division.

The Choice of a District Plan from among District Planning Alternatives

The implication of no county division has seemingly been a violation of strict population equality. By relaxing conditions somewhat, it may be possible to apportion and plan for districts that keep county boundary lines intact and attain population modifications in redistricting. At the very least, minimizing the number of boundary line divisions, splits, or crossings may be achievable through boundary line planning and regulation. Essentially, the better the local jurisdictional boundary lines, the easier and more likely it is to construct better district boundaries. Because apportionment and district planning uses major and minor civil districts to construct district boundaries, it is also possible to adopt apportionment and district plans that satisfy both the conditions of population equality and local jurisdiction.

This study contains many examples of zero (county) division plans enacted in six Western States. The more detailed information on California demonstrates that any county division = 1 plans are not the same thing as protections for local jurisdictional boundaries or requirements for any boundary line division, crossings, or splitting for the purposes of apportionment and district planning. Even so, the point of county division may not be that this provides for diminishing representation to local jurisdiction. In some examples, local jurisdiction may improve because county division consolidates areas into districts that these areas would not have otherwise had been combined through redistricting. In the examples of California, Nevada, and Oregon, the use of county division was controversial and there were objections to the apportionment and district plans enacted. Specifically, the California redistricting produced four large, multi-county division districts that not only divided counties that had not been divided before, but combined portions of counties not frequently combined.

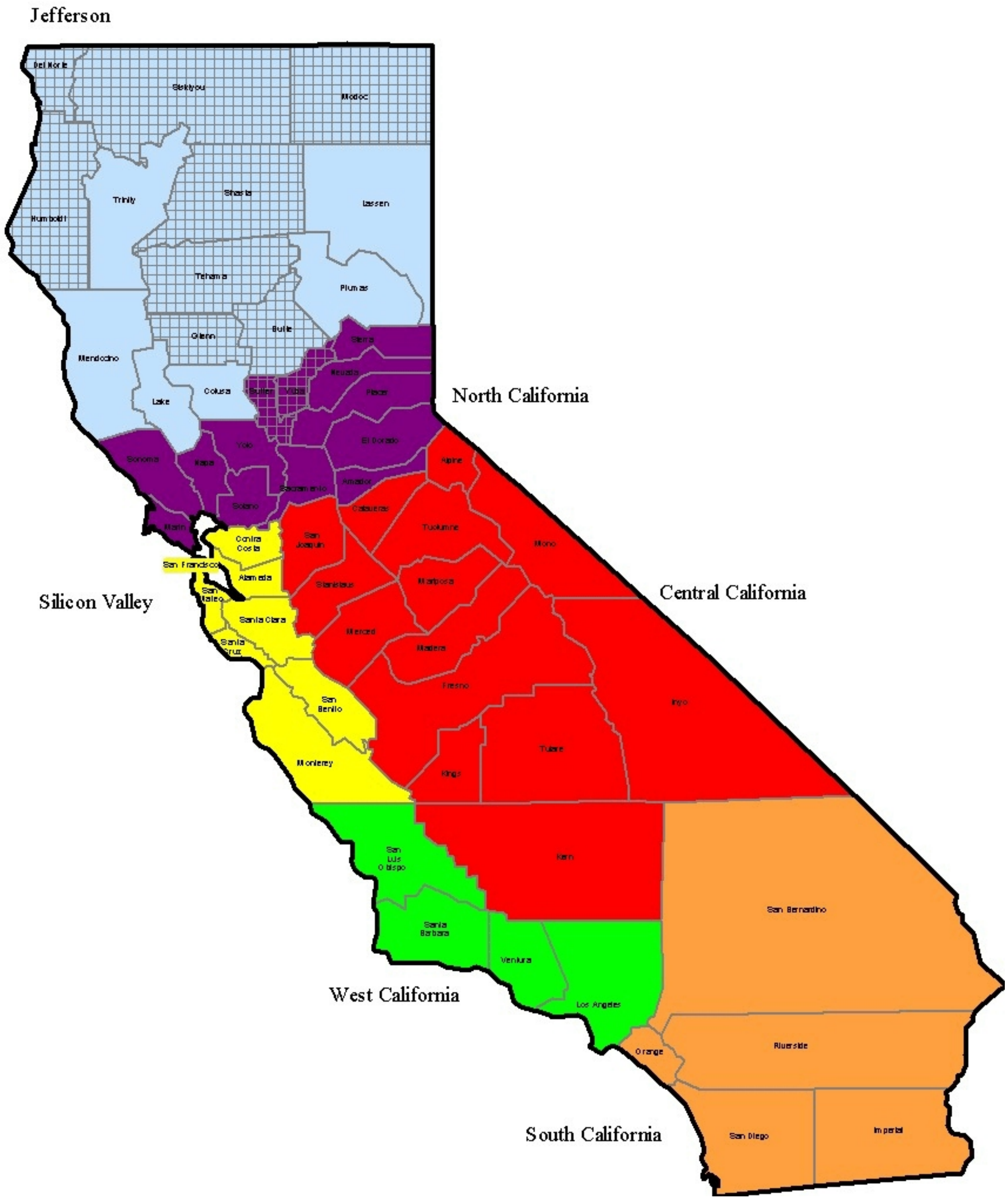
These objections involve a sequence of adjustments in district allocations from

- single county districts
- guarantees of a single county district
- guarantees of a minimum of a single county district
- limitations of no more than a single district
- single county, multi-member district plans
- single county, county subdivision districts
- ***two county pairings, county division districts***
- two county pairings, whole county consolidated districts
- three or four county combinations, multi-county consolidated districts, no county division
- more than four county combinations, large multi-county districts, no county division
- ***more than four county combinations, large multi-county, county division districts***
- six or more counties combined, regional districts, no county division
- ***six or more counties combined, regional districts, county division***

In the three highlighted instances, the selection of these district planning alternatives generates transition in the choice of districts adopted and also provides for adjustments from the status quo in apportionment and district planning. In some cases, the objections to these districts involve adjustments to the pairings to groupings of counties in the apportionment and division. In other cases, the objection is to the number of counties consolidated into a single district. As the number of city to suburban, elongated districts is reduced, there has been an emergence of suburban to suburban county corridor districts, that require pairings of counties that have not been combined in previous redistricting. As a consequence, the numbers of counties consolidated and pairings of fractions of suburban counties generate some of the current objections to apportionment and district planning to allocate county division districts.

Given the drift toward regional county division districts, what are some of the possible district planning alternatives to the regional subdivision districts emerging in California, Nevada, and Oregon? One solution may be to establish regional planning areas for groups of counties. The second solution requires an organization state territory by zonal districts and not by counties.

FIGURE 15.0 COUNTY PLANNING ALTERNATIVES



First, the county planning alternatives may be described by some proposals to organize counties in California for establishing multiple planning districts. This recent division, shown in **FIGURE 15.0**, is based on the 2010 Census. The analysis reveals six economic development regions, with varying population sizes and many other significant differences in what may be described as communities of interest. The 2010 redistricting was administered by a Citizens' Committee that held multiple strategic planning sessions in what they described as six regions of the California. The regions used for holding these charettes are not the same as those measurable by combinations of Census data. Regardless, the redistricting process set goals for strategic planning that imply some division of State territory into regions for the purposes of planning legislative districts. Whether any planning areas continue as part of the process, remains an issue for the 2020 redistricting. The point being that six regions, such as these may become part the redrawing of district boundaries because of population changes.

Second, as this study finds, county division appears to be the greatest problem in northern California. All four of the regional county division districts are located within the northernmost subregion shown in **FIGURE 15.0**. Because of agreements made, by constitutional provision, some of these counties have the option of voting on a separate, 51^{st} State. The proposal for a State of Jefferson requires counties approve the petition and then win a statewide referendum. Some of the proponents believe that a Legislature of this State would be similar to the average population size of legislative districts in Oregon. In the past, proponents for county secession have won approval from some of counties along Oregon–California boundary. As reported by this study, redistricting also produced regional division districts in this area of Oregon and Nevada contiguous with the California counties that have a local option vote on statehood.

Any proposals for county secession from California *and* Oregon involve an unconstitutional joining of existing State territory to attain Statehood. Because the Oregon territorial boundary has also had importance in the determination of the boundary between the United States and Canada, any combination of these counties into a single state is both unconstitutional and not likely to be supported by majorities at any level. However, the provisions do exist to allow some the California counties to opt out and vote on forming a new State. As reported in **FIGURE 15.0**, the crosshatched areas have already submitted proposals to voters that have approved the pursuit of this option.

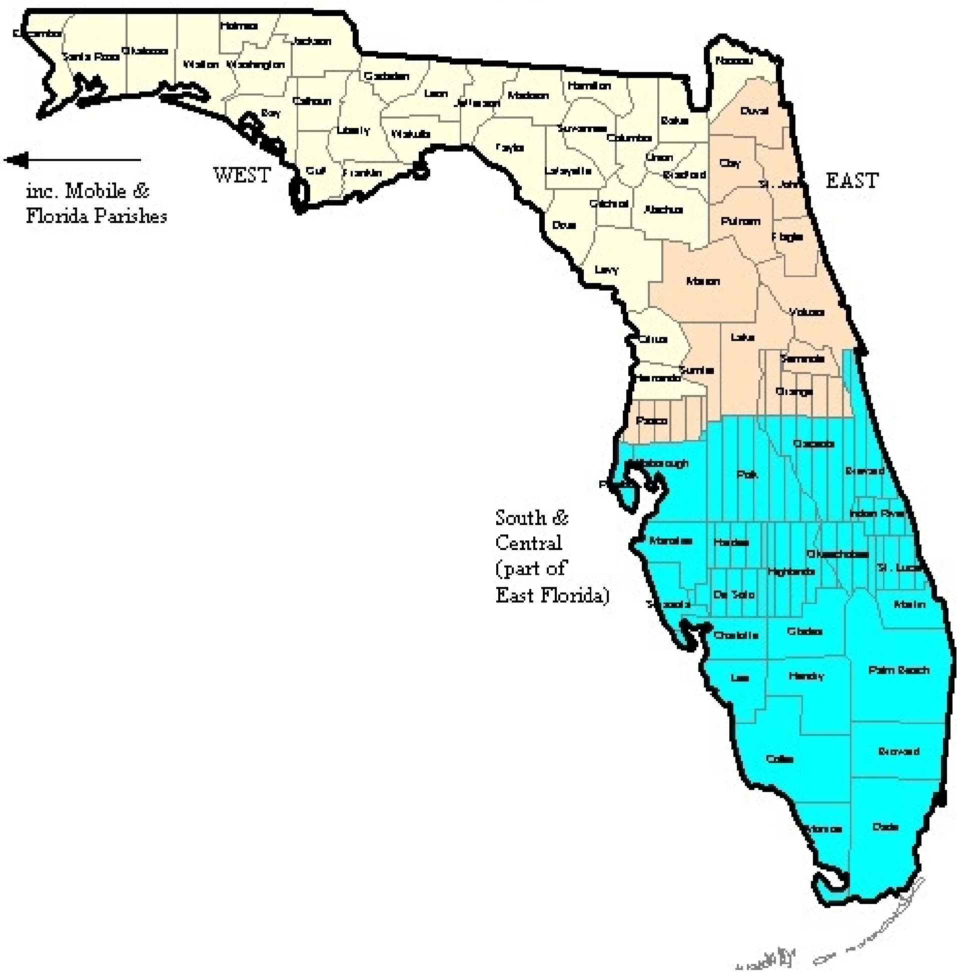
The findings indicate majority support, so far, in 8 of the 14 counties in the northernmost California region. Additionally, two more counties have voted for the proposal in support of forming a separate State Legislature. In each county, the primary issue has been the lack of representation in the California State Legislature. Amidst the deliberations there is a constant theme of opposing redistricting, with the districts constructed and allocated to northern California. As the local campaign continues, some of the counties have voted against opting out (Del Norte County), whereas others have postponed votes, to wait for further study and to allow for campaigning at a time contemporaneous with the redistricting process. There is some uncertainty about what the outcome would be if the other six counties approve by countywide vote. After redistricting, the objections to districts wane somewhat because ½ of the State Senate is elected every two years. Given this voting rule and procedure, the support for county option may have to wait four years to go through a single election cycle for these Senate Districts. Because local issues come to the forefront in the California Legislature, there may also be a surge in support given concerns with development projects that are a matter of local affairs.

The issue of county secession is a complicated process that requires a consensus for these northern California counties and then a favorable Statewide vote of some kind indicating State support to form an independent state from these counties. At this time, it seems unlikely that all of the counties in the "State of Jefferson" will approve a county option. In the past, one county has defeated this proposal and a similar proposal. Another has voted no on this proposal once, so that there are at least two counties that have voted no on this county opt-out. Several of the other counties have had active campaigns for a ballot proposal, but these organizations have failed to gather enough signatures (fast enough) to place an opt-out proposal on county ballots. By voting no twice in one county, the campaign for county option votes would have to get enough signatures in other counties to put proposals on the ballot sooner, than what they had intended for requiring a Statewide vote. Even so, the issue has become more complicated by two facts: 1) counties in the "north" California region have approved the proposal and this proposal not only is familiar to voters in these two regions, but throughout the State with support increasing in this "second" region; 2) the 2010 redistricting created Legislative Districts that connect these counties, from Sacramento to Del Norte, that provide Senate and Assembly district examples consistent with promoting support for permitting a county option vote. Given the ongoing sequence of adjustments in apportionment and district planning, the population trends have not been with these northern counties, such that the expectations are that future redistricting will provide districts with even larger numbers of counties and amounts of county division (for a county summary of the historical results, refer to **Appendix I**). For favorable voters in Southern California, shown as south & west California, there is no support for once again providing for larger district allocations, with Silicon Valley supporters seeking to gain these few districts.

Two of the most populated States, Florida and Texas, have also dealt with the issue of county secession. Based on the precedent of West Virginia, where the 55 counties of the western reserve of Virginia voted for secession, the State of California provided for a county option because this seemingly involved a territory too large to become a single state. The State of Florida represents a consolidation of territory from colonial East and West Florida that were governed as independent territories. The establishment of Saint Augustine (East Florida) and Pensacola (West Florida) enhanced the goals for territorial annexation by Spain in the quest for control of the Mississippi Valley. Other localities existed in these "States," such as Key West (south Florida: the counties of Monroe, Miami-Dade, Broward, the Palm Beaches), Tampa Bay (central and southern Florida, Gulf Coast counties), Mobile Bay (Alabama counties), and the Florida Parishes of eastern Louisiana. Because of the development in Florida since 1920, there has been an emergence of multiple regions in the State, for the purposes of establishing planning and service districts. Because of the development of South, Central, and the West or Gulf Coast of Florida, most of the priorities involve the formation of inter-local cooperation and coordination, and not any form of regionalism consistent with the East-West Florida division.

In Texas, the famous provision for the establishment of 4 or 5 States is more a matter of talking points for governing what is seemingly too large, to be a single state. When the issues come up, the present State clearly exists and the provision allows for the formation of one to four States. The next part to any consideration is where the Capitol Districts would be located, and this may be summarized by the population centers in East, North, South, and West Texas. The counties involved suggest the problems with attempting any formation of independent States: Houston, Harris County; Dallas; San Antonio, Bexar County; and either Midland or Lubbock.

FIGURE 16.0 FLORIDA



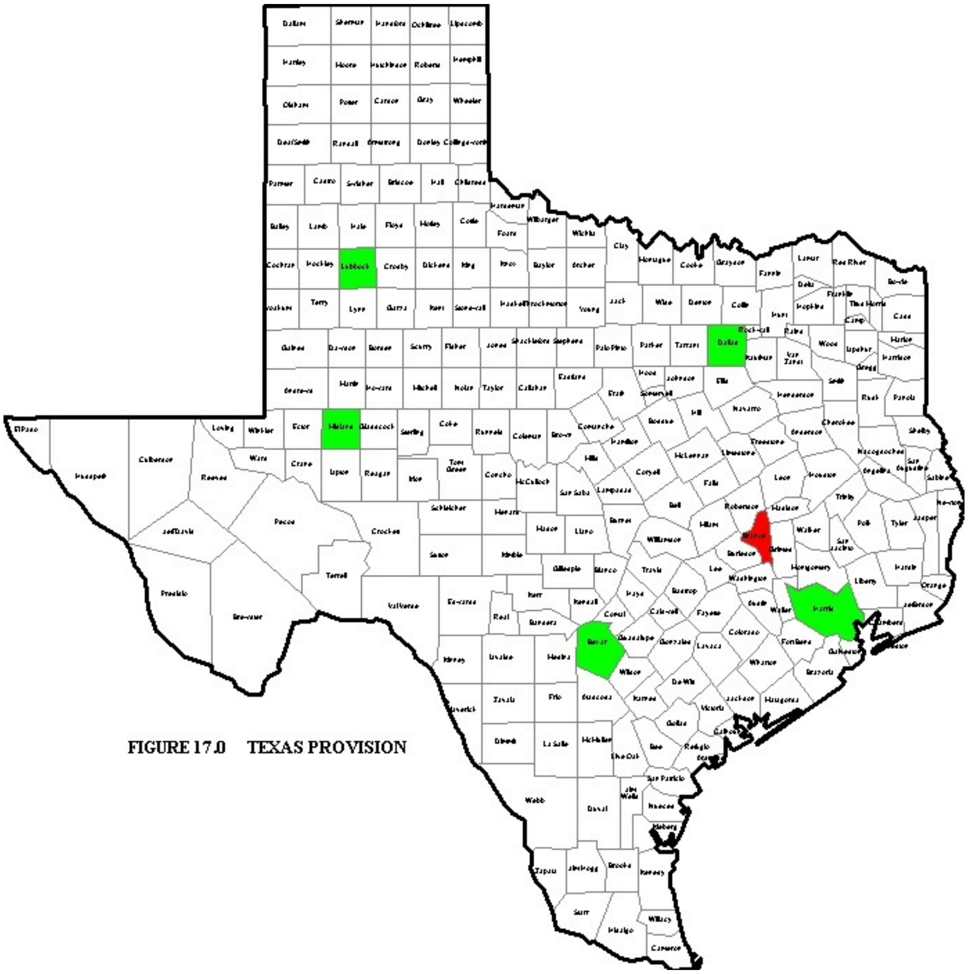


FIGURE 17.0 TEXAS PROVISION

The center point of the State, Brazoria County is somewhat of a division point for the purposes of creating additional states. First, there are additional population centers, in these areas, so that this is not a precise set of counties, regions, or population centers, for the purposes of grouping counties into planning or service districts. Secondly, Bexar County originally included territory from the San Antonio area to Pueblo, Colorado, so that historically the division between the southern and northern counties did not exist until later settlement and the organization of counties and town sectional development in the northern counties. Even though the eastern and southern counties may form somewhat distinct regions, these areas involve a large number of counties. After 1945, the development of the northern counties, in the metropolitan Dallas area increased support for a third region, in terms of apportionment and district planning. The trends in development, therefore, produce an environment with a long-standing provision, two distinct regions, a third region added through 20th century development, and less economically developed western sets of counties.

Given the issues' concern redistricting, county options to form regional planning and service districts seem an unlikely solution to apportionment and district planning. Yet the presence of these provisions implies the existence of a county option, and this provides for consideration of failures in apportionment and district planning. As reported in this study, these failures concern county subdivision districts that produce an excessive fragmentation of local jurisdiction, in states such as Arizona (Maricopa) and Nevada (Clark). In these counties, the number of legislative districts exceeds the formation of local jurisdiction by incorporation of major and minor civil districts. This over-division produces a greater number of districts than what has been established, within counties, for providing local public goods and services.

Another failure involves the formation of regional division districts, and the general problem of county division that produces excessive consolidation of State territory. In this study, these examples describe the redistricting of northern California, rural Nevada, and southern and western Oregon. As a result of not wanting to be reduced to between 1 and 4 Senate Districts, this opposition to regional division districts is likely to continue, particularly given the existence of a county option provision.

As a consequence of sub-state regionalism, there are examples of planning and service districts organized by county throughout The States and therefore State experience with regionalism is not generally for the purposes of statehood. In fact, there were very few regional provisions limiting apportionment and district planning. The States with the regional balance provisions included Arizona (4 zonal districts), Illinois (City of Chicago, Cook County outside of the City of Chicago, downstate or the rest of the Counties in Illinois), Kentucky (10 districts containing varying numbers of counties), Maryland (eastern and western shore), Mississippi (3 districts with eastern, western, and southern counties), New York (4 zonal districts, New York Metropolitan County and the rest of the State), New Mexico (4 zonal districts), and Virginia (5 State regions). In other States, Congressional Districts (1911-1931) and physical geography has created informal sub-state regions of varying importance for redistricting, apportionment, and division. As this study finds, the issues raised by excessive county division are somewhat complicated by the presence of local jurisdiction, and not just the use of regional division districts. The adoption of even more excessive county division, subdivision, and regional divisions implies some consideration of apportionment and district allocation to better organize local jurisdiction and prevent failures of local jurisdiction through lack of representation.

By implication, the issues considering redistricting are not easily solved by organization of counties. Among The States that have had regional balance requirements, the common experience involves 4 zonal districts, that contain varying numbers of counties. Other States provided for apportionment and district allocations to 3 zonal districts, frequently in an attempt to limit concentrations of The Legislatures being elected from population centers. In an absence of counties, town representation generally existed with apportionment and district allocation to town, city, and township or other minor civil district units. In some States, the origins of counties were determined by either ward (and town) division (Maryland, Pennsylvania, New Hampshire, Connecticut, Rhode Island, Vermont and Delaware) or ward and parish division (Louisiana and the Carolinas). In the Western States, the absence of town units was substituted for by the use of precinct-townships.

Given the State experience with 3 or 4 zonal districts, can these zones be designed to organize counties for a more generalized apportionment and division, consistent with the drift toward regional division districts. The potential exists for designing zones for apportionment and district allocations independent of the number of counties contained within these zonal districts. Because the State requirements for 3 zones usually provided for relatively equal numbers of districts, the State use of this requirement was intended to balance the apportionment and district allocation to major and minor civil districts. In contrast, the expansion of territory from initial settlements frequently resulted in the formation of 4 judicial zonal districts. These zonal districts provided the basis for organizing counties and extending State territory. Given the rationale, four zonal districts are seemingly enough to determine the allocation of regional division districts and any strategic planning for apportionment and redistricting.

The State of Alaska has no counties and 4 zonal (judicial) districts that were historically used for apportionment and division. Additionally district allocation to these 4 zones began with an equal apportionment and division. As reported in **Appendix III**, Alaska redistricting begins in 1931 with the reallocation of a single district from the Central to the Northwestern District. By 1967, the South Central District elected a majority of the Alaska Legislature, and this majority expanded to 60% of the (20S, 40H) Legislature in 1983. Prior to the 2010 Census, the South Central District contained 38/60 Districts = 63.3% of the Legislature. Even though district allocation is no longer on the basis of these 4 districts, the findings in **TABLE 6.0** demonstrate that district allocation by zonal districts does not guarantee regional balance within States.

TABLE 6.0 ALASKA JUDICIAL DISTRICT BY LEGISLATIVE CHAMBER, 1913- 2009

			CHAMBER		Total
ZONAL			House	Senate	
DISTRICT	Southeastern	Count	272	142	414
		% within CHAMBER	18.6%	18.7%	18.6%
	Northwestern	Count	153	99	252
		% within CHAMBER	10.5%	13.0%	11.3%
	South Central	Count	724	341	1065
		% within CHAMBER	49.5%	44.9%	47.9%
	Central	Count	315	178	493
		% within CHAMBER	21.5%	23.4%	22.2%
Total		Count	1464	760	2224
		% within CHAMBER	100.0%	100.0%	100.0%

The zonal districts may prove useful for state apportionment and district planning. The findings in **Appendix III** describe the drift toward a concentration of apportionment and districts in the South Central District. These results also suggest the larger zonal districts provide a range of planning alternatives and apportionment within each district. The findings indicate most of the districts were contained in City of Anchorage and the Anchorage "suburbs." Because any district is potentially a regional division district within these 4 zones, these results imply the zonal district solution eliminates the adoption of unpopular choices in a district plan.

References

Alaska, Secretary of State. **Alaska Political History**. 2009. State of Alaska, Secretary of State.

Allen, Don A. **Legislative Sourcebook: The California Legislature and Reapportionment**. 1965. State of California Assembly.

Arizona Elections. 2012. State of Arizona, Secretary of State, elections data.

Arizona Manual. 1966. State of Arizona, Secretary of State.

Baker, Gordon. **The Politics of Reapportionment in Washington State**. 1960. Eagleton Institute of Politics.

California Elections. 2012. State of California, Secretary of State, elections data.

Cain, Bruce E. **The Reapportionment Puzzle**. 1984. University of California Press.

Colorado Elections. 2012. State of Colorado, Secretary of State, elections data.

Colorado Legislative Council. **Report to the Colorado General Assembly**: Summary of Congressional Districting and Legislative Reapportionment Action in Colorado, 1961-1967.

Dubin, Michael J. **Party Affiliations in the State Legislatures**. 2007. MacFarland.

Folmer, Richard. **Legislative Apportionment in New Mexico, 1844-1966**. 1966. New Mexico Legislative Council Service.

Heller, Dean. **Political History of Nevada**. 2005. State of Nevada, Secretary of State.

League of Women Voters. **2014 Guide of Elected Officials**. League of Women Voters of Seattle-King County.

Mack, Effie M., Anderson, Idel, and Beulah E. Singleton. **Nevada Government**. 1953. The Caxton Printors Ltd. Caldwell, Idaho.

Morrill, Richard L. **Political Redistricting and Geography Theory**. 1981. Resource Publications in Geography.

Oregon Elections. 2012. State of Oregon, Secretary of State, elections data.

Portland City Club Bulletin. **Constitutional Amendment for Legislative Representation and Reapportionment**. 1950.

State of Washington. **2013-2014 Legislative Manual**.

Washington Elections. 2012. State of Washington, Secretary of State, elections data.

APPENDIX I No County Division, Division, and Subdivision by Senate & Assembly Districts in the California Legislature

TABLE 1.0 COUNTY DIVISION BY LEGISLATIVE CHAMBER IN CALIFORNIA, 1849-2001

CHAMBER	COUNTY		CDDCSD subdivision	division	intact	Total
House	Alameda	Count	51	22	7	80
		% within COUNTY	63.8%	27.5%	8.8%	100.0%
	Alpine	Count		3	11	14
		% within COUNTY		21.4%	78.6%	100.0%
	Amador	Count		3	17	20
		% within COUNTY		15.0%	85.0%	100.0%
	Butte	Count	2	9	18	29
		% within COUNTY	6.9%	31.0%	62.1%	100.0%
	Calaveras	Count		3	21	24
		% within COUNTY		12.5%	87.5%	100.0%
	Colusa	Count		5	19	24
		% within COUNTY		20.8%	79.2%	100.0%
	Contra Costa	Count	2	13	19	34
		% within COUNTY	5.9%	38.2%	55.9%	100.0%
	Del Norte	Count		5	13	18
		% within COUNTY		27.8%	72.2%	100.0%
	El Dorado	Count		4	21	25
		% within COUNTY		16.0%	84.0%	100.0%
	Fresno	Count	11	15	8	34
		% within COUNTY	32.4%	44.1%	23.5%	100.0%
	Glenn	Count		5	6	11
		% within COUNTY		45.5%	54.5%	100.0%
	Humboldt	Count	6	6	13	25
		% within COUNTY	24.0%	24.0%	52.0%	100.0%
	Imperial	Count		6	4	10
		% within COUNTY		60.0%	40.0%	100.0%
	Inyo	Count		4	10	14
		% within COUNTY		28.6%	71.4%	100.0%
	Kern	Count	2	15	8	25
		% within COUNTY	8.0%	60.0%	32.0%	100.0%
	Kings	Count		7	5	12
		% within COUNTY		58.3%	41.7%	100.0%
	Klamath	Count			10	10
		% within COUNTY			100.0%	100.0%
	Lake	Count		6	10	16
		% within COUNTY		37.5%	62.5%	100.0%
	Lassen	Count		5	9	14
		% within COUNTY		35.7%	64.3%	100.0%
	Los Angeles	Count	157	109	13	279
		% within COUNTY	56.3%	39.1%	4.7%	100.0%
	Madera	Count		9	5	14
		% within COUNTY		64.3%	35.7%	100.0%
	Marin	Count		5	19	24
		% within COUNTY		20.8%	79.2%	100.0%
	Mariposa	Count		4	20	24
		% within COUNTY		16.7%	83.3%	100.0%
	Mendocino	Count		5	19	24

	% within COUNTY		20.8%	79.2%	100.0%
Merced	Count		7	15	22
	% within COUNTY		31.8%	68.2%	100.0%
Modoc	Count		5	8	13
	% within COUNTY		38.5%	61.5%	100.0%
Mono	Count		3	13	16
	% within COUNTY		18.8%	81.3%	100.0%
Monterey	Count		11	19	30
	% within COUNTY		36.7%	63.3%	100.0%
Napa	Count		5	19	24
	% within COUNTY		20.8%	79.2%	100.0%
Nevada	Count	2	4	18	24
	% within COUNTY	8.3%	16.7%	75.0%	100.0%
Orange	Count	6	35	3	44
	% within COUNTY	13.6%	79.5%	6.8%	100.0%
Placer	Count		6	20	26
	% within COUNTY		23.1%	76.9%	100.0%
Plumas	Count		5	15	20
	% within COUNTY		25.0%	75.0%	100.0%
Riverside	Count		18	6	24
	% within COUNTY		75.0%	25.0%	100.0%
Sacramento	Count	17	20	13	50
	% within COUNTY	34.0%	40.0%	26.0%	100.0%
San Benito	Count		4	9	13
	% within COUNTY		30.8%	69.2%	100.0%
San Bernardino	Count	8	25	12	45
	% within COUNTY	17.8%	55.6%	26.7%	100.0%
San Diego	Count	19	31	14	64
	% within COUNTY	29.7%	48.4%	21.9%	100.0%
San Francisco	Count	102	10	12	124
	% within COUNTY	82.3%	8.1%	9.7%	100.0%
San Joaquin	Count	14	13	13	40
	% within COUNTY	35.0%	32.5%	32.5%	100.0%
San Luis Obispo	Count		6	20	26
	% within COUNTY		23.1%	76.9%	100.0%
San Mateo	Count	2	15	12	29
	% within COUNTY	6.9%	51.7%	41.4%	100.0%
Santa Barbara	Count		10	20	30
	% within COUNTY		33.3%	66.7%	100.0%
Santa Clara	Count	17	28	10	55
	% within COUNTY	30.9%	50.9%	18.2%	100.0%
Santa Cruz	Count		9	18	27
	% within COUNTY		33.3%	66.7%	100.0%
Shasta	Count		5	19	24
	% within COUNTY		20.8%	79.2%	100.0%
Sierra	Count		5	17	22
	% within COUNTY		22.7%	77.3%	100.0%
Siskiyou	Count		5	17	22
	% within COUNTY		22.7%	77.3%	100.0%
Solano	Count	2	7	19	28
	% within COUNTY	7.1%	25.0%	67.9%	100.0%
Sonoma	Count	9	16	15	40
	% within COUNTY	22.5%	40.0%	37.5%	100.0%
Stanislaus	Count		9	15	24

		% within COUNTY		37.5%	62.5%	100.0%
	Sutter	Count		5	19	24
		% within COUNTY		20.8%	79.2%	100.0%
	Tehama	Count		5	13	18
		% within COUNTY		27.8%	72.2%	100.0%
	Trinity	Count		5	19	24
		% within COUNTY		20.8%	79.2%	100.0%
	Tulare	Count		15	16	31
		% within COUNTY		48.4%	51.6%	100.0%
	Tuolumne	Count		4	20	24
		% within COUNTY		16.7%	83.3%	100.0%
	Ventura	Count		13	9	22
		% within COUNTY		59.1%	40.9%	100.0%
	Yolo	Count		9	19	28
		% within COUNTY		32.1%	67.9%	100.0%
	Yuba	Count		4	20	24
		% within COUNTY		16.7%	83.3%	100.0%
	Total	Count	429	645	831	1905
	COUNTY	% within COUNTY	22.5%	33.9%	43.6%	100.0%
Senate	Alameda	Count	14	13	12	39
		% within COUNTY	35.9%	33.3%	30.8%	100.0%
	Alpine	Count		3	11	14
		% within COUNTY		21.4%	78.6%	100.0%
	Amador	Count		3	17	20
		% within COUNTY		15.0%	85.0%	100.0%
	Butte	Count		4	21	25
		% within COUNTY		16.0%	84.0%	100.0%
	Calaveras	Count		3	21	24
		% within COUNTY		12.5%	87.5%	100.0%
	Colusa	Count		4	20	24
		% within COUNTY		16.7%	83.3%	100.0%
	Contra Costa	Count		8	21	29
		% within COUNTY		27.6%	72.4%	100.0%
	Del Norte	Count		4	14	18
		% within COUNTY		22.2%	77.8%	100.0%
	El Dorado	Count		3	21	24
		% within COUNTY		12.5%	87.5%	100.0%
	Fresno	Count		10	14	24
		% within COUNTY		41.7%	58.3%	100.0%
	Glenn	Count		4	7	11
		% within COUNTY		36.4%	63.6%	100.0%
	Humboldt	Count		4	17	21
		% within COUNTY		19.0%	81.0%	100.0%
	Imperial	Count		5	5	10
		% within COUNTY		50.0%	50.0%	100.0%
	Inyo	Count		5	9	14
		% within COUNTY		35.7%	64.3%	100.0%
	Kern	Count		9	10	19
		% within COUNTY		47.4%	52.6%	100.0%
	Kings	Count		4	7	11
		% within COUNTY		36.4%	63.6%	100.0%
	Klamath	Count			10	10
		% within COUNTY			100.0%	100.0%
	Lake	Count		5	11	16

	% within COUNTY		31.3%	68.8%	100.0%
Lassen	Count		2	12	14
	% within COUNTY		14.3%	85.7%	100.0%
Los Angeles	Count	18	77	15	110
	% within COUNTY	16.4%	70.0%	13.6%	100.0%
Madera	Count		7	6	13
	% within COUNTY		53.8%	46.2%	100.0%
Marin	Count		5	19	24
	% within COUNTY		20.8%	79.2%	100.0%
Mariposa	Count		5	19	24
	% within COUNTY		20.8%	79.2%	100.0%
Mendocino	Count		4	20	24
	% within COUNTY		16.7%	83.3%	100.0%
Merced	Count		5	14	19
	% within COUNTY		26.3%	73.7%	100.0%
Modoc	Count		2	11	13
	% within COUNTY		15.4%	84.6%	100.0%
Mono	Count		4	12	16
	% within COUNTY		25.0%	75.0%	100.0%
Monterey	Count		5	21	26
	% within COUNTY		19.2%	80.8%	100.0%
Napa	Count		6	18	24
	% within COUNTY		25.0%	75.0%	100.0%
Nevada	Count		3	21	24
	% within COUNTY		12.5%	87.5%	100.0%
Orange	Count		19	6	25
	% within COUNTY		76.0%	24.0%	100.0%
Placer	Count		3	21	24
	% within COUNTY		12.5%	87.5%	100.0%
Plumas	Count		2	18	20
	% within COUNTY		10.0%	90.0%	100.0%
Riverside	Count		12	6	18
	% within COUNTY		66.7%	33.3%	100.0%
Sacramento	Count		14	20	34
	% within COUNTY		41.2%	58.8%	100.0%
San Benito	Count		4	9	13
	% within COUNTY		30.8%	69.2%	100.0%
San Bernardino	Count		16	16	32
	% within COUNTY		50.0%	50.0%	100.0%
San Diego	Count		22	19	41
	% within COUNTY		53.7%	46.3%	100.0%
San Francisco	Count	35	16	15	66
	% within COUNTY	53.0%	24.2%	22.7%	100.0%
San Joaquin	Count		7	20	27
	% within COUNTY		25.9%	74.1%	100.0%
San Luis Obispo	Count		4	21	25
	% within COUNTY		16.0%	84.0%	100.0%
San Mateo	Count		9	14	23
	% within COUNTY		39.1%	60.9%	100.0%
Santa Barbara	Count		8	21	29
	% within COUNTY		27.6%	72.4%	100.0%
Santa Clara	Count	6	17	17	40
	% within COUNTY	15.0%	42.5%	42.5%	100.0%
Santa Cruz	Count		5	20	25

	% within COUNTY		20.0%	80.0%	100.0%
Shasta	Count		4	20	24
	% within COUNTY		16.7%	83.3%	100.0%
Sierra	Count		2	20	22
	% within COUNTY		9.1%	90.9%	100.0%
Siskiyou	Count		3	19	22
	% within COUNTY		13.6%	86.4%	100.0%
Solano	Count		8	19	27
	% within COUNTY		29.6%	70.4%	100.0%
Sonoma	Count		10	20	30
	% within COUNTY		33.3%	66.7%	100.0%
Stanislaus	Count		6	16	22
	% within COUNTY		27.3%	72.7%	100.0%
Sutter	Count		4	20	24
	% within COUNTY		16.7%	83.3%	100.0%
Tehama	Count		4	15	19
	% within COUNTY		21.1%	78.9%	100.0%
Trinity	Count		3	21	24
	% within COUNTY		12.5%	87.5%	100.0%
Tulare	Count		7	17	24
	% within COUNTY		29.2%	70.8%	100.0%
Tuolumne	Count		4	20	24
	% within COUNTY		16.7%	83.3%	100.0%
Ventura	Count		8	9	17
	% within COUNTY		47.1%	52.9%	100.0%
Yolo	Count		5	19	24
	% within COUNTY		20.8%	79.2%	100.0%
Yuba	Count		3	21	24
	% within COUNTY		12.5%	87.5%	100.0%
Total	Count	73	445	935	1453
	% within COUNTY	5.0%	30.6%	64.3%	100.0%

APPENDIX II No County Division, Division, and Subdivision by Senate & Assembly Districts in CA, CO, NV, NM, OR, & WA

TABLE 1.0 COUNTY DIVISION BY STATE LEGISLATURE, 1949-1973

			CDDCSD			
STATE			subdivision	division	intact	Total
Colorado	Adams	Count	18	2	2	22
		% within COUNTY	81.8%	9.1%	9.1%	100.0%
	Alamosa	Count			8	8
		% within COUNTY			100.0%	100.0%
	Arapahoe	Count	17	1	2	20
		% within COUNTY	85.0%	5.0%	10.0%	100.0%
	Archuleta	Count			8	8
		% within COUNTY			100.0%	100.0%
	Baca	Count			8	8
		% within COUNTY			100.0%	100.0%
	Bent	Count			8	8
		% within COUNTY			100.0%	100.0%
	Boulder	Count	13	2	2	17
		% within COUNTY	76.5%	11.8%	11.8%	100.0%
	Chaffee	Count			8	8
		% within COUNTY			100.0%	100.0%
	Cheyenne	Count			8	8
		% within COUNTY			100.0%	100.0%
	Clear Creek	Count			8	8
		% within COUNTY			100.0%	100.0%
	Conejos	Count			8	8
		% within COUNTY			100.0%	100.0%
	Costilla	Count			8	8
		% within COUNTY			100.0%	100.0%
	Crowley	Count			8	8
		% within COUNTY			100.0%	100.0%
	Custer	Count			7	7
		% within COUNTY			100.0%	100.0%
	Delta	Count			8	8
		% within COUNTY			100.0%	100.0%
	Denver	Count	81		2	83
		% within COUNTY	97.6%		2.4%	100.0%
	Dolores	Count			8	8
		% within COUNTY			100.0%	100.0%
	Douglas	Count	1		5	6
		% within COUNTY	16.7%		83.3%	100.0%
	Eagle	Count			8	8
		% within COUNTY			100.0%	100.0%
	El Paso	Count	23		2	25
		% within COUNTY	92.0%		8.0%	100.0%
	Elbert	Count			7	7
		% within COUNTY			100.0%	100.0%
	Fremont	Count			8	8
		% within COUNTY			100.0%	100.0%
	Garfield	Count			8	8
		% within COUNTY			100.0%	100.0%

Gilpin	Count			8	8
	% within COUNTY			100.0%	100.0%
Grand	Count			8	8
	% within COUNTY			100.0%	100.0%
Gunnison	Count			8	8
	% within COUNTY			100.0%	100.0%
Hinsdale	Count			8	8
	% within COUNTY			100.0%	100.0%
Huerfano	Count			8	8
	% within COUNTY			100.0%	100.0%
Jackson	Count			8	8
	% within COUNTY			100.0%	100.0%
Jefferson	Count	20	1	2	23
	% within COUNTY	87.0%	4.3%	8.7%	100.0%
Kiowa	Count			8	8
	% within COUNTY			100.0%	100.0%
Kit Carson	Count			8	8
	% within COUNTY			100.0%	100.0%
La Plata	Count		2	7	9
	% within COUNTY		22.2%	77.8%	100.0%
Lake	Count			8	8
	% within COUNTY			100.0%	100.0%
Larimer	Count	6		5	11
	% within COUNTY	54.5%		45.5%	100.0%
Las Animas	Count			8	8
	% within COUNTY			100.0%	100.0%
Lincoln	Count			8	8
	% within COUNTY			100.0%	100.0%
Logan	Count			8	8
	% within COUNTY			100.0%	100.0%
Mesa	Count	6		5	11
	% within COUNTY	54.5%		45.5%	100.0%
Mineral	Count			8	8
	% within COUNTY			100.0%	100.0%
Moffat	Count			8	8
	% within COUNTY			100.0%	100.0%
Montezuma	Count		2	7	9
	% within COUNTY		22.2%	77.8%	100.0%
Montrose	Count		2	7	9
	% within COUNTY		22.2%	77.8%	100.0%
Morgan	Count			8	8
	% within COUNTY			100.0%	100.0%
Otero	Count			8	8
	% within COUNTY			100.0%	100.0%
Ouray	Count			8	8
	% within COUNTY			100.0%	100.0%
Park	Count			8	8
	% within COUNTY			100.0%	100.0%
Phillips	Count			8	8
	% within COUNTY			100.0%	100.0%
Pitkin	Count			8	8
	% within COUNTY			100.0%	100.0%
Prowers	Count			8	8
	% within COUNTY			100.0%	100.0%

	Pueblo	Count	18	2	2	22
		% within COUNTY	81.8%	9.1%	9.1%	100.0%
	Rio Blanco	Count			8	8
		% within COUNTY			100.0%	100.0%
	Rio Grande	Count			8	8
		% within COUNTY			100.0%	100.0%
	Routt	Count			7	7
		% within COUNTY			100.0%	100.0%
	Saguache	Count			8	8
		% within COUNTY			100.0%	100.0%
	San Juan	Count			8	8
		% within COUNTY			100.0%	100.0%
	San Miguel	Count			8	8
		% within COUNTY			100.0%	100.0%
	Sedgewick	Count			8	8
		% within COUNTY			100.0%	100.0%
	Summit	Count			8	8
		% within COUNTY			100.0%	100.0%
	Teller	Count			8	8
		% within COUNTY			100.0%	100.0%
	Washington	Count			8	8
		% within COUNTY			100.0%	100.0%
	Weld	Count	13	2	2	17
		% within COUNTY	76.5%	11.8%	11.8%	100.0%
	Yuma	Count			8	8
		% within COUNTY			100.0%	100.0%
	Total	Count	216	16	441	673
		% within COUNTY	32.1%	2.4%	65.5%	100.0%
Oregon	Baker	Count			4	4
		% within COUNTY			100.0%	100.0%
	Benton	Count			4	4
		% within COUNTY			100.0%	100.0%
	Clackamas	Count	2	2	2	6
		% within COUNTY	33.3%	33.3%	33.3%	100.0%
	Clatsop	Count	1	1	3	5
		% within COUNTY	20.0%	20.0%	60.0%	100.0%
	Columbia	Count	1	1	3	5
		% within COUNTY	20.0%	20.0%	60.0%	100.0%
	Coos	Count	1	1	3	5
		% within COUNTY	20.0%	20.0%	60.0%	100.0%
	Crook	Count			4	4
		% within COUNTY			100.0%	100.0%
	Curry	Count			4	4
		% within COUNTY			100.0%	100.0%
	Deschutes	Count	1	1	3	5
		% within COUNTY	20.0%	20.0%	60.0%	100.0%
	Douglas	Count			4	4
		% within COUNTY			100.0%	100.0%
	Gilliam	Count			4	4
		% within COUNTY			100.0%	100.0%
	Grant	Count			4	4
		% within COUNTY			100.0%	100.0%
	Harney	Count			4	4
		% within COUNTY			100.0%	100.0%

	Hood River	Count			4	4
		% within COUNTY			100.0%	100.0%
	Jackson	Count			4	4
		% within COUNTY			100.0%	100.0%
	Jefferson	Count			4	4
		% within COUNTY			100.0%	100.0%
	Josephine	Count			4	4
		% within COUNTY			100.0%	100.0%
	Klamath	Count			4	4
		% within COUNTY			100.0%	100.0%
	Lake	Count			4	4
		% within COUNTY			100.0%	100.0%
	Lane	Count	1	1	3	5
		% within COUNTY	20.0%	20.0%	60.0%	100.0%
	Lincoln	Count			4	4
		% within COUNTY			100.0%	100.0%
	Linn	Count	1	1	3	5
		% within COUNTY	20.0%	20.0%	60.0%	100.0%
	Malheur	Count			4	4
		% within COUNTY			100.0%	100.0%
	Marion	Count			4	4
		% within COUNTY			100.0%	100.0%
	Morrow	Count			4	4
		% within COUNTY			100.0%	100.0%
	Multnomah	Count	2	2	2	6
		% within COUNTY	33.3%	33.3%	33.3%	100.0%
	Polk	Count			4	4
		% within COUNTY			100.0%	100.0%
	Sherman	Count			4	4
		% within COUNTY			100.0%	100.0%
	Tillamook	Count			4	4
		% within COUNTY			100.0%	100.0%
	Umatilla	Count	1	1	3	5
		% within COUNTY	20.0%	20.0%	60.0%	100.0%
	Union	Count		2	3	5
		% within COUNTY		40.0%	60.0%	100.0%
	Wallowa	Count			4	4
		% within COUNTY			100.0%	100.0%
	Wasco	Count			4	4
		% within COUNTY			100.0%	100.0%
	Washington	Count			4	4
		% within COUNTY			100.0%	100.0%
	Wheeler	Count			4	4
		% within COUNTY			100.0%	100.0%
	Yamhill	Count			4	4
		% within COUNTY			100.0%	100.0%
	Total	Count	11	13	132	156
		% within COUNTY	7.1%	8.3%	84.6%	100.0%
California	Alameda	Count	17		3	20
		% within COUNTY	85.0%		15.0%	100.0%
	Alpine	Count			8	8
		% within COUNTY			100.0%	100.0%
	Amador	Count			8	8
		% within COUNTY			100.0%	100.0%

Butte	Count			8	8
	% within COUNTY			100.0%	100.0%
Calaveras	Count			8	8
	% within COUNTY			100.0%	100.0%
Colusa	Count			8	8
	% within COUNTY			100.0%	100.0%
Contra Costa	Count	2		7	9
	% within COUNTY	22.2%		77.8%	100.0%
Del Norte	Count			8	8
	% within COUNTY			100.0%	100.0%
El Dorado	Count			8	8
	% within COUNTY			100.0%	100.0%
Fresno	Count	4		6	10
	% within COUNTY	40.0%		60.0%	100.0%
Glenn	Count			8	8
	% within COUNTY			100.0%	100.0%
Humboldt	Count			8	8
	% within COUNTY			100.0%	100.0%
Imperial	Count			7	7
	% within COUNTY			100.0%	100.0%
Inyo	Count			8	8
	% within COUNTY			100.0%	100.0%
Kern	Count	4		6	10
	% within COUNTY	40.0%		60.0%	100.0%
Kings	Count			8	8
	% within COUNTY			100.0%	100.0%
Lake	Count			8	8
	% within COUNTY			100.0%	100.0%
Lassen	Count			8	8
	% within COUNTY			100.0%	100.0%
Los Angeles	Count	107		2	109
	% within COUNTY	98.2%		1.8%	100.0%
Madera	Count			8	8
	% within COUNTY			100.0%	100.0%
Marin	Count			8	8
	% within COUNTY			100.0%	100.0%
Mariposa	Count			8	8
	% within COUNTY			100.0%	100.0%
Mendocino	Count			8	8
	% within COUNTY			100.0%	100.0%
Merced	Count			7	7
	% within COUNTY			100.0%	100.0%
Modoc	Count			8	8
	% within COUNTY			100.0%	100.0%
Mono	Count			8	8
	% within COUNTY			100.0%	100.0%
Monterey	Count			8	8
	% within COUNTY			100.0%	100.0%
Napa	Count			8	8
	% within COUNTY			100.0%	100.0%
Nevada	Count			8	8
	% within COUNTY			100.0%	100.0%
Orange	Count	10	1	3	14
	% within COUNTY	71.4%	7.1%	21.4%	100.0%

Placer	Count			8	8
	% within COUNTY			100.0%	100.0%
Plumas	Count			8	8
	% within COUNTY			100.0%	100.0%
Riverside	Count			8	8
	% within COUNTY			100.0%	100.0%
Sacramento	Count	5	1	6	12
	% within COUNTY	41.7%	8.3%	50.0%	100.0%
San Benito	Count			8	8
	% within COUNTY			100.0%	100.0%
San Bernardino	Count	6		5	11
	% within COUNTY	54.5%		45.5%	100.0%
San Diego	Count	15	1	3	19
	% within COUNTY	78.9%	5.3%	15.8%	100.0%
San Francisco	Count	17		3	20
	% within COUNTY	85.0%		15.0%	100.0%
San Joaquin	Count	2		7	9
	% within COUNTY	22.2%		77.8%	100.0%
San Luis Obispo	Count			8	8
	% within COUNTY			100.0%	100.0%
San Mateo	Count	4		6	10
	% within COUNTY	40.0%		60.0%	100.0%
Santa Barbara	Count			8	8
	% within COUNTY			100.0%	100.0%
Santa Clara	Count	11		3	14
	% within COUNTY	78.6%		21.4%	100.0%
Santa Cruz	Count			7	7
	% within COUNTY			100.0%	100.0%
Shasta	Count			8	8
	% within COUNTY			100.0%	100.0%
Sierra	Count			8	8
	% within COUNTY			100.0%	100.0%
Siskiyou	Count			8	8
	% within COUNTY			100.0%	100.0%
Solano	Count			9	9
	% within COUNTY			100.0%	100.0%
Sonoma	Count			8	8
	% within COUNTY			100.0%	100.0%
Stanislaus	Count			8	8
	% within COUNTY			100.0%	100.0%
Sutter	Count			8	8
	% within COUNTY			100.0%	100.0%
Tehama	Count			8	8
	% within COUNTY			100.0%	100.0%
Trinity	Count			8	8
	% within COUNTY			100.0%	100.0%
Tulare	Count			8	8
	% within COUNTY			100.0%	100.0%
Tuolumne	Count			8	8
	% within COUNTY			100.0%	100.0%
Ventura	Count			8	8
	% within COUNTY			100.0%	100.0%
Yolo	Count			7	7

		% within COUNTY			100.0%	100.0%
	Yuba	Count			8	8
		% within COUNTY			100.0%	100.0%
	Total	Count	204	3	417	624
		% within COUNTY	32.7%	.5%	66.8%	100.0%
Nevada	Churchill	Count			8	8
		% within COUNTY			100.0%	100.0%
	Clark	Count	17		5	22
		% within COUNTY	77.3%		22.7%	100.0%
	Douglas	Count			8	8
		% within COUNTY			100.0%	100.0%
	Elko	Count			8	8
		% within COUNTY			100.0%	100.0%
	Esmeralda	Count			8	8
		% within COUNTY			100.0%	100.0%
	Eureka	Count			8	8
		% within COUNTY			100.0%	100.0%
	Humboldt	Count			8	8
		% within COUNTY			100.0%	100.0%
	Lander	Count			8	8
		% within COUNTY			100.0%	100.0%
	Lincoln	Count			8	8
		% within COUNTY			100.0%	100.0%
	Lyon	Count			8	8
		% within COUNTY			100.0%	100.0%
	Mineral	Count		2	7	9
		% within COUNTY		22.2%	77.8%	100.0%
	Nye	Count			8	8
		% within COUNTY			100.0%	100.0%
	Ormsby	Count			8	8
		% within COUNTY			100.0%	100.0%
	Pershing	Count			8	8
		% within COUNTY			100.0%	100.0%
	Storey	Count		5	6	11
		% within COUNTY		45.5%	54.5%	100.0%
	Washoe	Count	6	5	4	15
		% within COUNTY	40.0%	33.3%	26.7%	100.0%
	White Pine	Count			8	8
		% within COUNTY			100.0%	100.0%
	Total	Count	23	12	126	161
		% within COUNTY	14.3%	7.5%	78.3%	100.0%
Washington	Adams	Count			11	11
		% within COUNTY			100.0%	100.0%
	Asotin	Count			11	11
		% within COUNTY			100.0%	100.0%
	Benton	Count	5	2	8	15
		% within COUNTY	33.3%	13.3%	53.3%	100.0%
	Chelan	Count			11	11
		% within COUNTY			100.0%	100.0%
	Clallam	Count			11	11
		% within COUNTY			100.0%	100.0%
	Clark	Count	11	8	3	22
		% within COUNTY	50.0%	36.4%	13.6%	100.0%
	Columbia	Count			9	9

	% within COUNTY			100.0%	100.0%
Cowlitz	Count	2	2	9	13
	% within COUNTY	15.4%	15.4%	69.2%	100.0%
Douglas	Count			11	11
	% within COUNTY			100.0%	100.0%
Ferry	Count			11	11
	% within COUNTY			100.0%	100.0%
Franklin	Count		2	10	12
	% within COUNTY		16.7%	83.3%	100.0%
Garfield	Count			11	11
	% within COUNTY			100.0%	100.0%
Grant	Count		6	5	11
	% within COUNTY		54.5%	45.5%	100.0%
Grays Harbor	Count	4	12	2	18
	% within COUNTY	22.2%	66.7%	11.1%	100.0%
Island	Count		4	9	13
	% within COUNTY		30.8%	69.2%	100.0%
Jefferson	Count			11	11
	% within COUNTY			100.0%	100.0%
King	Count	160	6		166
	% within COUNTY	96.4%	3.6%		100.0%
Kitsap	Count	4		10	14
	% within COUNTY	28.6%		71.4%	100.0%
Kittitas	Count			11	11
	% within COUNTY			100.0%	100.0%
Klickitat	Count			11	11
	% within COUNTY			100.0%	100.0%
Lewis	Count			11	11
	% within COUNTY			100.0%	100.0%
Lincoln	Count			11	11
	% within COUNTY			100.0%	100.0%
Mason	Count			11	11
	% within COUNTY			100.0%	100.0%
Okanogan	Count		4	9	13
	% within COUNTY		30.8%	69.2%	100.0%
Pacific	Count	2	2	9	13
	% within COUNTY	15.4%	15.4%	69.2%	100.0%
Pend O'Reille	Count			11	11
	% within COUNTY			100.0%	100.0%
Pierce	Count	53	6		59
	% within COUNTY	89.8%	10.2%		100.0%
San Juan	Count			11	11
	% within COUNTY			100.0%	100.0%
Skagit	Count			11	11
	% within COUNTY			100.0%	100.0%
Skamania	Count			11	11
	% within COUNTY			100.0%	100.0%
Snohomish	Count	18	10	2	30
	% within COUNTY	60.0%	33.3%	6.7%	100.0%
Spokane	Count	53	2		55
	% within COUNTY	96.4%	3.6%		100.0%
Stevens	Count			9	9
	% within COUNTY			100.0%	100.0%
Thurston	Count	4	4	9	17

		% within COUNTY	23.5%	23.5%	52.9%	100.0%
	Wahkiakum	Count			9	9
		% within COUNTY			100.0%	100.0%
	Walla Walla	Count			9	9
		% within COUNTY			100.0%	100.0%
	Whatcom	Count	16	4	1	21
		% within COUNTY	76.2%	19.0%	4.8%	100.0%
	Whitman	Count	2	2	9	13
		% within COUNTY	15.4%	15.4%	69.2%	100.0%
	Yakima	Count	25	6		31
		% within COUNTY	80.6%	19.4%		100.0%
	Total	Count	359	82	318	759
		% within COUNTY	47.3%	10.8%	41.9%	100.0%
New Mexico	Bernalillo	Count		1	9	10
		% within COUNTY		10.0%	90.0%	100.0%
	Catron	Count			7	7
		% within COUNTY			100.0%	100.0%
	Chaves	Count	2		9	11
		% within COUNTY	18.2%		81.8%	100.0%
	Colfax	Count		2	8	10
		% within COUNTY		20.0%	80.0%	100.0%
	Curry	Count			9	9
		% within COUNTY			100.0%	100.0%
	DeBaca	Count			7	7
		% within COUNTY			100.0%	100.0%
	Dona Ana	Count	2		9	11
		% within COUNTY	18.2%		81.8%	100.0%
	Eddy	Count			9	9
		% within COUNTY			100.0%	100.0%
	Grant	Count		2	8	10
		% within COUNTY		20.0%	80.0%	100.0%
	Guadalupe	Count		7	6	13
		% within COUNTY		53.8%	46.2%	100.0%
	Harding	Count			7	7
		% within COUNTY			100.0%	100.0%
	Hidalgo	Count			7	7
		% within COUNTY			100.0%	100.0%
	Lea	Count			7	7
		% within COUNTY			100.0%	100.0%
	Lincoln	Count		6	6	12
		% within COUNTY		50.0%	50.0%	100.0%
	Los Alamos	Count			3	3
		% within COUNTY			100.0%	100.0%
	Luna	Count		1	8	9
		% within COUNTY		11.1%	88.9%	100.0%
	McKinley	Count			9	9
		% within COUNTY			100.0%	100.0%
	Mora	Count		1	8	9
		% within COUNTY		11.1%	88.9%	100.0%
	Otero	Count		6	6	12
		% within COUNTY		50.0%	50.0%	100.0%
	Quay	Count			9	9
		% within COUNTY			100.0%	100.0%
	Rio Arriba	Count		5	7	12

	% within COUNTY		41.7%	58.3%	100.0%
Roosevelt	Count			9	9
	% within COUNTY			100.0%	100.0%
San Juan	Count		1	8	9
	% within COUNTY		11.1%	88.9%	100.0%
San Miguel	Count		7	6	13
	% within COUNTY		53.8%	46.2%	100.0%
Sandoval	Count		6	6	12
	% within COUNTY		50.0%	50.0%	100.0%
Santa Fe	Count		4	7	11
	% within COUNTY		36.4%	63.6%	100.0%
Sierra	Count		1	8	9
	% within COUNTY		11.1%	88.9%	100.0%
Socorro	Count		7	6	13
	% within COUNTY		53.8%	46.2%	100.0%
Taos	Count			9	9
	% within COUNTY			100.0%	100.0%
Torrance	Count		5	6	11
	% within COUNTY		45.5%	54.5%	100.0%
Union	Count		1	8	9
	% within COUNTY		11.1%	88.9%	100.0%
Valencia	Count			9	9
	% within COUNTY			100.0%	100.0%
Total	Count	4	63	240	307
	% within COUNTY	1.3%	20.5%	78.2%	100.0%

TABLE 2.0 NO COUNTY DIVISION, DIVISION, & SUBDIVISION BY STATE

STATE	Statistic	CDDCSD subdivision	division	intact	State Sample
Colorado	Count	216	16	441	673
	% within STATE	32.1%	2.4%	65.5%	100.0%
Oregon	Count	11	13	132	156
	% within STATE	7.1%	8.3%	84.6%	100.0%
California	Count	204	3	417	624
	% within STATE	32.7%	.5%	66.8%	100.0%
Nevada	Count	23	12	126	161
	% within STATE	14.3%	7.5%	78.3%	100.0%
Washington	Count	359	82	318	759
	% within STATE	47.3%	10.8%	41.9%	100.0%
New Mexico	Count	4	63	240	307
	% within STATE	1.3%	20.5%	78.2%	100.0%
N = Sample Size	Count	817	189	1674	2680
	% within STATE	30.5%	7.1%	62.5%	100.0%

Chi-Square Tests

Statistic	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	438.394	10	.000
Likelihood Ratio	522.388	10	.000
Linear-by-Linear Association	5.392	1	.020
N = Sample Size	2680		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.00.

Symmetric Measures

Nominal by Nominal	Value	Approx. Sig.
Phi	.404	.000
Cramer's V	.286	.000
Contingency Coefficient	.375	.000
N = Sample Size	2680	

a Not assuming the null hypothesis.

b Using the asymptotic standard error assuming the null hypothesis.

APPENDIX III ALASKA CONSTITUENCIES & DISTRICTS, 1913-2009

TABLE 1.0 ELECTION YEAR BY ZONAL (JUDICIAL) DISTRICT

		DISTRICT				Total
YEAR		Southeastern	Northwestern	South Central	Central	
1913	Count	6	6	6	6	24
	% within YEAR	25.0%	25.0%	25.0%	25.0%	100.0%
1915	Count	6	6	6	6	24
	% within YEAR	25.0%	25.0%	25.0%	25.0%	100.0%
1917	Count	6	6	6	6	24
	% within YEAR	25.0%	25.0%	25.0%	25.0%	100.0%
1919	Count	6	6	6	6	24
	% within YEAR	25.0%	25.0%	25.0%	25.0%	100.0%
1921	Count	6	6	6	6	24
	% within YEAR	25.0%	25.0%	25.0%	25.0%	100.0%
1923	Count	6	6	6	6	24
	% within YEAR	25.0%	25.0%	25.0%	25.0%	100.0%
1925	Count	6	6	6	6	24
	% within YEAR	25.0%	25.0%	25.0%	25.0%	100.0%
1927	Count	6	6	6	6	24
	% within YEAR	25.0%	25.0%	25.0%	25.0%	100.0%
1929	Count	6	6	6	6	24
	% within YEAR	25.0%	25.0%	25.0%	25.0%	100.0%
1931	Count	6	7	6	5	24
	% within YEAR	25.0%	29.2%	25.0%	20.8%	100.0%
1933	Count	6	6	6	6	24
	% within YEAR	25.0%	25.0%	25.0%	25.0%	100.0%
1935	Count	6	6	6	6	24
	% within YEAR	25.0%	25.0%	25.0%	25.0%	100.0%
1937	Count	6	6	6	6	24
	% within YEAR	25.0%	25.0%	25.0%	25.0%	100.0%
1939	Count	6	6	6	6	24
	% within YEAR	25.0%	25.0%	25.0%	25.0%	100.0%
1941	Count	6	6	6	6	24
	% within YEAR	25.0%	25.0%	25.0%	25.0%	100.0%
1943	Count	6	6	6	6	24
	% within YEAR	25.0%	25.0%	25.0%	25.0%	100.0%
1945	Count	12	8	11	9	40
	% within YEAR	30.0%	20.0%	27.5%	22.5%	100.0%
1947	Count	12	8	11	9	40
	% within YEAR	30.0%	20.0%	27.5%	22.5%	100.0%
1949	Count	12	8	11	9	40
	% within YEAR	30.0%	20.0%	27.5%	22.5%	100.0%
1951	Count	12	8	11	9	40
	% within YEAR	30.0%	20.0%	27.5%	22.5%	100.0%
1953	Count	10	7	14	9	40
	% within YEAR	25.0%	17.5%	35.0%	22.5%	100.0%
1955	Count	10	7	14	9	40
	% within YEAR	25.0%	17.5%	35.0%	22.5%	100.0%
1957	Count	10	7	14	9	40
	% within YEAR	25.0%	17.5%	35.0%	22.5%	100.0%
1959	Count	14	9	23	14	60
	% within YEAR	23.3%	15.0%	38.3%	23.3%	100.0%

1961	Count	14	9	23	14	60
	% within YEAR	23.3%	15.0%	38.3%	23.3%	100.0%
1963	Count	12	7	28	13	60
	% within YEAR	20.0%	11.7%	46.7%	21.7%	100.0%
1965	Count	12	7	28	13	60
	% within YEAR	20.0%	11.7%	46.7%	21.7%	100.0%
1967	Count	10	4	32	14	60
	% within YEAR	16.7%	6.7%	53.3%	23.3%	100.0%
1969	Count	10	4	32	14	60
	% within YEAR	16.7%	6.7%	53.3%	23.3%	100.0%
1971	Count	10	4	32	14	60
	% within YEAR	16.7%	6.7%	53.3%	23.3%	100.0%
1973	Count	9	3	34	14	60
	% within YEAR	15.0%	5.0%	56.7%	23.3%	100.0%
1975	Count	9	3	34	14	60
	% within YEAR	15.0%	5.0%	56.7%	23.3%	100.0%
1977	Count	9	4	34	13	60
	% within YEAR	15.0%	6.7%	56.7%	21.7%	100.0%
1979	Count	9	3	34	14	60
	% within YEAR	15.0%	5.0%	56.7%	23.3%	100.0%
1981	Count	9	3	34	14	60
	% within YEAR	15.0%	5.0%	56.7%	23.3%	100.0%
1983	Count	9	3	36	12	60
	% within YEAR	15.0%	5.0%	60.0%	20.0%	100.0%
1985	Count	9	3	36	12	60
	% within YEAR	15.0%	5.0%	60.0%	20.0%	100.0%
1987	Count	9	3	36	12	60
	% within YEAR	15.0%	5.0%	60.0%	20.0%	100.0%
1989	Count	9	3	36	12	60
	% within YEAR	15.0%	5.0%	60.0%	20.0%	100.0%
1991	Count	9	3	36	12	60
	% within YEAR	15.0%	5.0%	60.0%	20.0%	100.0%
1993	Count	7	3	37	13	60
	% within YEAR	11.7%	5.0%	61.7%	21.7%	100.0%
1995	Count	7	3	37	13	60
	% within YEAR	11.7%	5.0%	61.7%	21.7%	100.0%
1997	Count	8	3	36	13	60
	% within YEAR	13.3%	5.0%	60.0%	21.7%	100.0%
1999	Count	8	3	36	13	60
	% within YEAR	13.3%	5.0%	60.0%	21.7%	100.0%
2001	Count	7	3	37	13	60
	% within YEAR	11.7%	5.0%	61.7%	21.7%	100.0%
2003	Count	7	3	38	12	60
	% within YEAR	11.7%	5.0%	63.3%	20.0%	100.0%
2005	Count	8	3	38	11	60
	% within YEAR	13.3%	5.0%	63.3%	18.3%	100.0%
2007	Count	8	3	38	11	60
	% within YEAR	13.3%	5.0%	63.3%	18.3%	100.0%
2009	Count	8	3	38	11	60
	% within YEAR	13.3%	5.0%	63.3%	18.3%	100.0%
TOTAL	Count	414	252	1065	493	2224
	% within YEAR	18.6%	11.3%	47.9%	22.2%	100.0%

TABLE 2.0 LOCATION OF ALASKA CONSTITUENCIES

Constituency	Frequency	Percent
Akiak	3	.1
Alakanuk	1	.0
Anchor Point	1	.0
Anchorage-Cordova	1	.0
Anchorage	620	27.9
Angoon	7	.3
Aniak	3	.1
Barrow	11	.5
Beaver	3	.1
Bethel	40	1.8
Candle	7	.3
Chatanika	1	.0
Chicken	3	.1
Chitina	1	.0
Chudiak	1	.0
Chugiak	16	.7
Clear	2	.1
College	5	.2
Cooper Landing	1	.0
Cordova	21	.9
Council	2	.1
Craig	9	.4
Deering	2	.1
Delta Junction	5	.2
Dillingham	13	.6
Douglas	8	.4
Eagle	2	.1
Eagle River	40	1.8
Emmonak	4	.2
Ester	1	.0
Ester Creek-Fairbanks	1	.0
Ester Creek	1	.0
Fairbanks	307	13.8
Flat-Iditarod	1	.0
Flat	1	.0
Fort Richardson	1	.0
Fort Yukon	9	.4
Fox	3	.1
Galena	5	.2
Girdwood	4	.2
Haines	12	.5
Halibut Cove	5	.2
Haycock	4	.2
Healy Forks	1	.0
Homer	20	.9
Hoonah	2	.1
Hope	4	.2
Hot Springs	1	.0
Hyder	3	.1
Iditarod	1	.0
Juneau	149	6.7
Kake	5	.2

Kasilof	7	.3
Katalia	1	.0
Kenai	22	1.0
Kennecott	1	.0
Ketchikan	89	4.0
King Cove	1	.0
Klawock	11	.5
Knik	2	.1
Kobuk	1	.0
Kodiak	50	2.2
Kotzebue	40	1.8
Kwethluk	4	.2
Kwiguk	1	.0
Larsen Bay	1	.0
Livengood	3	.1
McCarthy	6	.3
McGrath	2	.1
McKinley Park	1	.0
Mountain View	1	.0
Naknek	9	.4
Nenana	15	.7
Nikiski	5	.2
Nikolski	1	.0
Nikolski Village	1	.0
Ninilchik	4	.2
Nome	161	7.2
Noorvik	1	.0
North Pole	35	1.6
Palmer	46	2.1
Pedro Bay	3	.1
Pelican	1	.0
Petersburg	16	.7
Point Barrow	1	.0
Port Moller	1	.0
Rampart	7	.3
Ruby	17	.8
Sand Point	3	.1
Saxman	6	.3
Seldovia	1	.0
Seward	24	1.1
Shungnak	1	.0
Sitka	50	2.2
Skagway	6	.3
Sleetmute	3	.1
Soldotna	20	.9
Solomon	1	.0
Spenard	7	.3
St. Mary's	2	.1
Sulzer	2	.1
Tanana	3	.1
Teller	5	.2
Tok	5	.2
Uganik Bay	4	.2
Unalakleet	3	.1

Unalaska	11	.5
Valdez	45	2.0
Wales	3	.1
Wasilla	34	1.5
Willow	5	.2
Wrangell	38	1.7
Total	2224	100.0