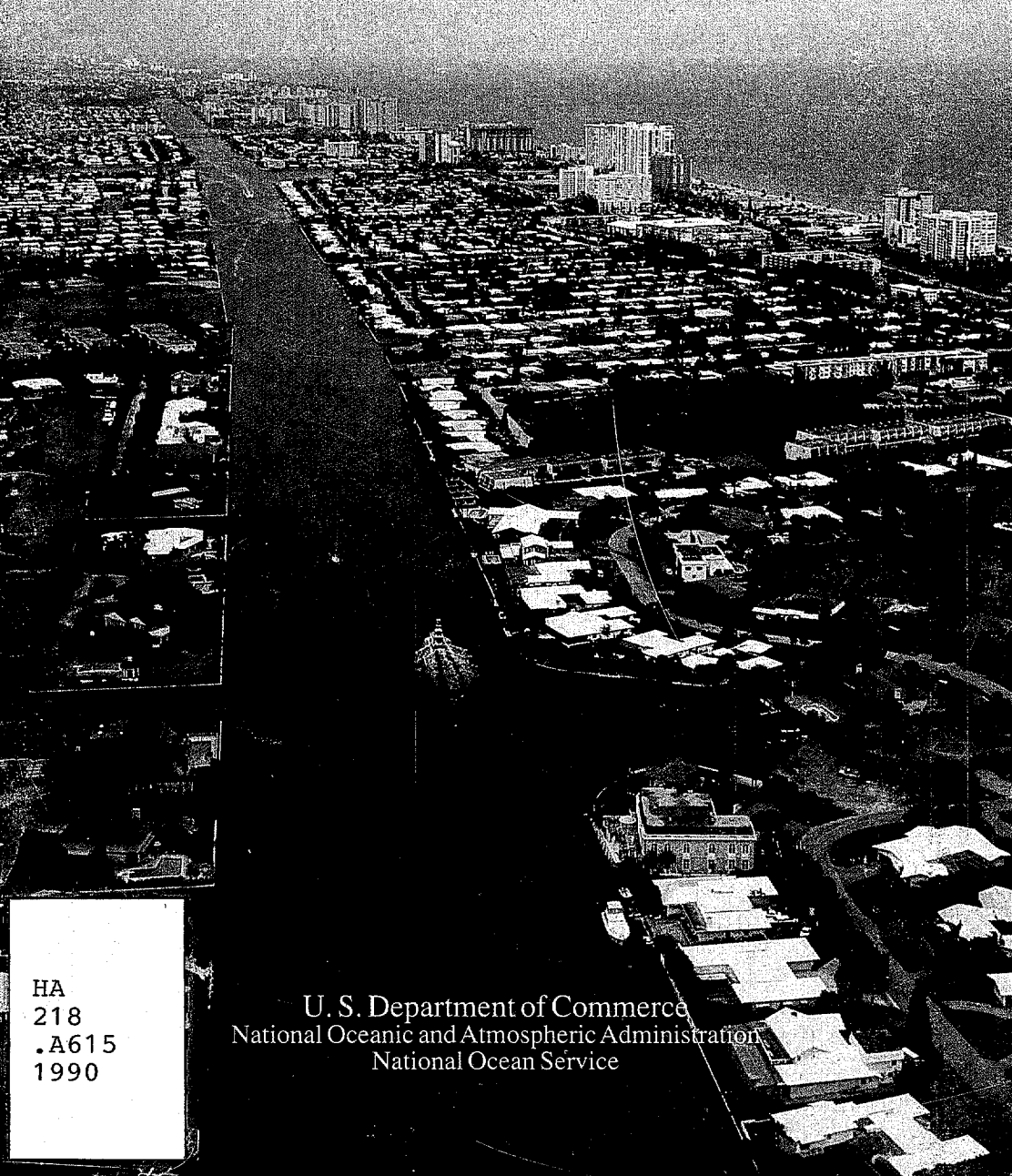
A Special Earth Week Report

50 Years of Population Change along the Nation's Coasts 1960-2010



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Coastal Trends Series

Publication of a coastal trends report series is a new and evolving activity of the Office of Oceanography and Marine Assessment (OMA) of the National Oceanic and Atmospheric Administration (NOAA). The series will investigate and illustrate the effects of current and projected development in the Nation's coastal areas. The series was initiated in 1989 as part of NOAA's program of strategic assessments of the Nation's coastal and ocean resources.

The series presents information on current and future development patterns and their direct and indirect effects upon our national coastal resource base. The reports are a basis for identifying patterns of resource use and environmental quality concerns about the Nation's coastal areas.

The mission of NOAA's Strategic Assessment Program is to organize and synthesize existing information and knowledge of important characteristics of the Nation's coastal and ocean regions, and to communicate this information clearly to decision-makers and their institutions, both in the public and private sectors. The assessments are characterized as "strategic" because they develop information of a nature, and at spatial and temporal scales, appropriate for: (1) setting and modifying national or regional objectives for coastal resource management; (2) identifying various means to achieve these objectives; and (3) evaluating the effects of their implementation. They are intended to complement, not replace, the detailed "tactical" analyses required to make local decisions.

Some of the data used in these reports have been presented in other NOAA publications, particularly its series of regional strategic assessment data atlases. These large-format thematic atlases present information on important features and activities in the Nation's coastal areas. Each atlas contains sections on the physical and biotic environments, living marine resources, economic activities, environmental quality, and jurisdictions of each region. An *East Coast Data Atlas* was published in 1980; an extensive revision and expansion of this atlas will begin in 1990. A *Gulf of Mexico Data Atlas* was published in 1985; a *Bering Chukchi, and Beaufort Seas Data Atlas* in 1989. A *West Coast of North America Data Atlas* is scheduled for completion in 1990.

Additional information on coastal population and NOAA's coastal trends report series is available from: Thomas J. Culliton, Strategic Assessment Branch, Ocean Assessments Division, Office of Oceanography and Marine Assessment, National Ocean Service, National Oceanic and Atmospheric Administration, 6001 Executive Boulevard, Rockville, MD 20852.

The Second Report of a Coastal Trends Series

50 Years of Population Change along the Nation's Coasts 1960-2010

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and cultural features to delineate coastal boundaries. Most recognize that activities miles inland can have a significant impact on the environmental quality of the coast, and have included these areas in their management programs.

The coastal U.S. has been divided into five regions to examine spatial variations of population. Four of the five regions are used by NOAA in its coastal assessment activities, including the National Estuarine Inventory (NEI) program. The Great Lakes region currently is not included in the NEI series, but is included in this report because it is heavily populated and represents a large portion of the Nation's coastal lands and waters, as defined under the Coastal Zone Management Act of 1972.

Six maps in the appendix show the coastal counties and major population centers in each region.

Population Projections

Source. Two Federal agencies, both located in the U.S. Department of Commerce, develop population projections periodically. However, *county-level population projections* are not available nationwide from either the Bureau of the Census or the Bureau of Economic Analysis (BEA). Although BEA county-level projections are available for seven coastal states in the Southeast and Gulf of Mexico, no projections have been made for other coastal states. Consequently, two economic forecasting firms were identified as data sources, National Planning Association Data Services, Inc. (NPA) and Woods and Poole Economics, Inc., both located in Washington, DC.

The NPA and Woods and Poole state-level projections for 2000 were compared with BEA projections for the seven southeastern and Gulf states and with Bureau of the Census projections. The NPA projections, on average, were about two percent greater than the BEA projections, and about two percent less than those developed by the Bureau of the Census. NPA underestimated the Woods and Poole projections by about four percent. Because the NPA projections were closest to the Bureau of the Census projections, and were more conservative than the Woods and Poole projections, the NPA population projections were chosen for this report.

Population projections were not obtained from individual states because of inconsistencies among state projection techniques. Each state may use different assumptions (e.g., economic scenarios, fertility, and mortality) and methods in making their projections. For these reasons, NOAA chose to use a consistent set of population projections developed for all states.

How the Projections are Made. NPA used a three-step process to generate its population projections. First, national economic projections were made for employment and earnings using historical economic data from the BEA. Regional economic projections were then made for 183 Economic Areas (EAs) defined by the BEA. The EAs are aggregates of contiguous counties and represent cohesive economic regions of the U.S. National projections were allocated to the EAs and then to counties to determine the population projection for each county. County population projections were developed using area-spe-

cific ratios of employment to population. These ratios reflect the long-term structural differences among areas in age composition, employment rates, labor force participation, age structure of migration flows, and inter-area commuter flows (Terleckyj and Coleman, 1989).

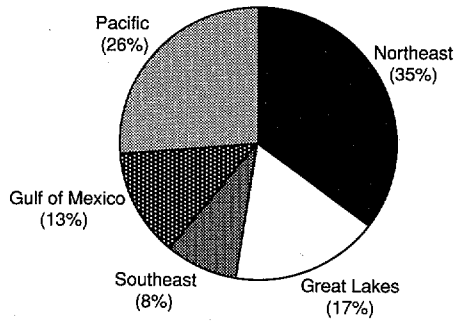
Explanation of the Data. All of the population data for years prior to 1990 are from the Bureau of the Census. Population data for 1990, 2000, and 2010 are NPA projections. Because the most recent county-level population estimates of the Bureau of the Census are for 1988, and are more valid than the NPA's 1990 projections, maps and charts shown in this report that examine changes over the next two decades are for the time period 1988-2010, and not 1990-2010. For the same reason, 1988 is used as the "base year" instead of 1990.

The population projections in this paper only address changes in total population. They do not account for the increased demand placed on coastal tourism or recreational resources by visitors from counties outside of the immediate coastal area. This demand may take the form of increased development of seasonal housing, construction of more hotels and motels, or large and more numerous recreational facilities.

National Overview

The Nation's coastal areas include some of the most rapidly growing and densely populated counties in the U.S. From 1960-2010, the coastal population will have grown from 80 million to more than 127 million people, an increase of almost 60 percent.

Figure 1. *Regional Distribution of the Nation's Coastal Population*



The Northeast and the Pacific regions have the largest coastal populations in the U.S. today. Together they account for about 28 percent of the entire U.S. population. Figure 1 shows the distribution, by region, of the Nation's coastal population.

The 451 coastal counties account for 20 percent of the Nation's total land area. However, if the land area of Alaska is excluded, the coastal county land area comprises only 11 percent of the remaining national total. Continued population growth in coastal areas portends increased crowding of this relatively

Figure 2. *Population Change, 1960-2010*

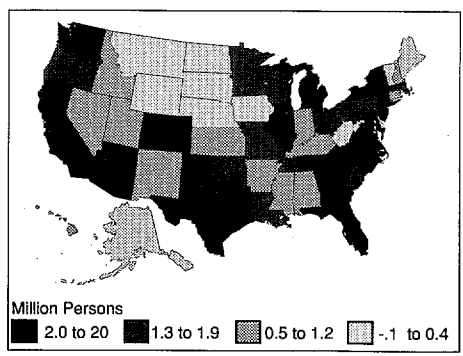


Table 1. *Leading Coastal States in Population Change, 1960-2010*

State	Absolute*	State	Percent
California	19.2	Florida	226
Texas	11.6	Alaska	208
Florida	11.2	New Hampshire	129
Georgia	3.5	California	122
Virginia	3.0	Texas	121

*Million persons

small, but densely populated, portion of the Nation. Coastal population will grow by about 15 percent over the next two decades.

Coastal vs. Non-coastal States. U.S. population during the 50-year period, 1960-2010, has, and is projected to, increase the most in coastal states (Figure 2). *Seventeen of the 20 states with the largest statewide population increases are coastal.* In Florida, which is defined as entirely coastal, the population will increase from five million in 1960 to more than 16 million by 2010, a 226 percent increase. By 2010, Florida's population will rank fourth in the Nation, up from tenth in 1960. California and Texas have and are projected to experience dramatic growth between 1960 and 2010. These states, which are projected to rank first and second respectively in total population in 2010, will increase by 30 million people (statewide) during this 50-year period. Table 1 shows the leading coastal states in absolute and percent population change between 1960 and 2010.

Coastal County Population Change. The decade of maximum coastal population growth during the study period (1960-2010) was the 1960s, when coastal population increased by more than 13 million persons, with California, Florida, and New York accounting for approximately 58 percent of the increase. Coastal growth slowed during the 1970s, but rebounded in the 1980s. An increase of more than 10 million persons is projected between 1980 and 1990. In the 1980s, California, Florida, and Texas will account for 73 percent of the growth in coastal areas. Coastal population growth will slow over the next two decades, but growth rates throughout the Nation will also decrease. Table 2 lists the change in coastal, non-coastal, and total U.S. populations between 1960 and 2010.

Eight coastal counties in California and Florida will be in the top 10 counties in absolute population change between 1988 and 2010. The Southern California counties of Los Angeles, Orange, and San Diego will grow by 2.6 million persons during this period. The Miami area (Dade, Broward, and Palm Beach counties) will also increase rapidly, with about 1.2 million additional persons projected by 2010. Only five percent of coastal counties will decline in population over the next 20 years. The largest declines will occur in the Northeast and Great Lakes regions. Figure 3 shows

Table 2. *U.S. Coastal and Non-coastal Population Change, 1960-2010*

Counties	1960	Percent Change 1960-1970	1970	Percent Change 1970-1980	1980	Percent Change 1980-1990	1990	Percent Change 1990-2000	2000	Percent Change 2000-2010	2010
Coastal	80 *	17	93	9	101	11	112	8	120	6	127
Non-coastal	101	11	112	13	127	9	138	7	148	5	156
Total	181	14	205	11	228	10	249	7	268	6	283

*Million Persons

Figure 3. *Population Change in Coastal Counties, 1988-2010*

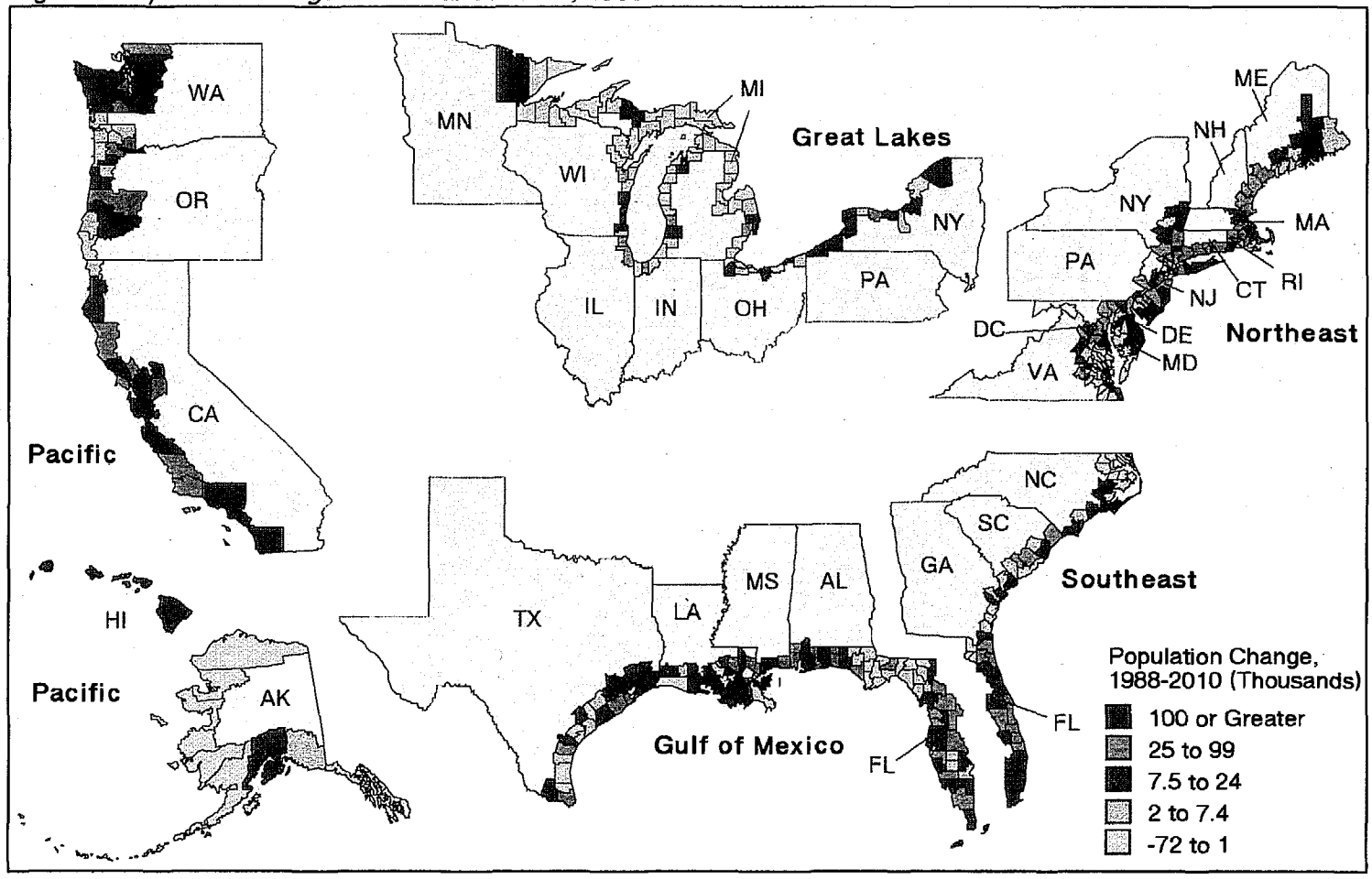
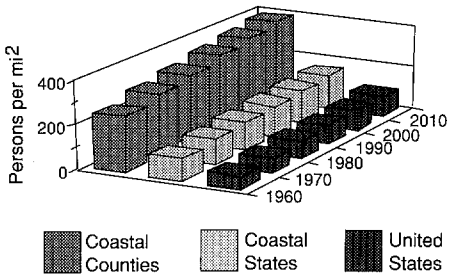


Figure 4. *Population Density, 1960-2010*



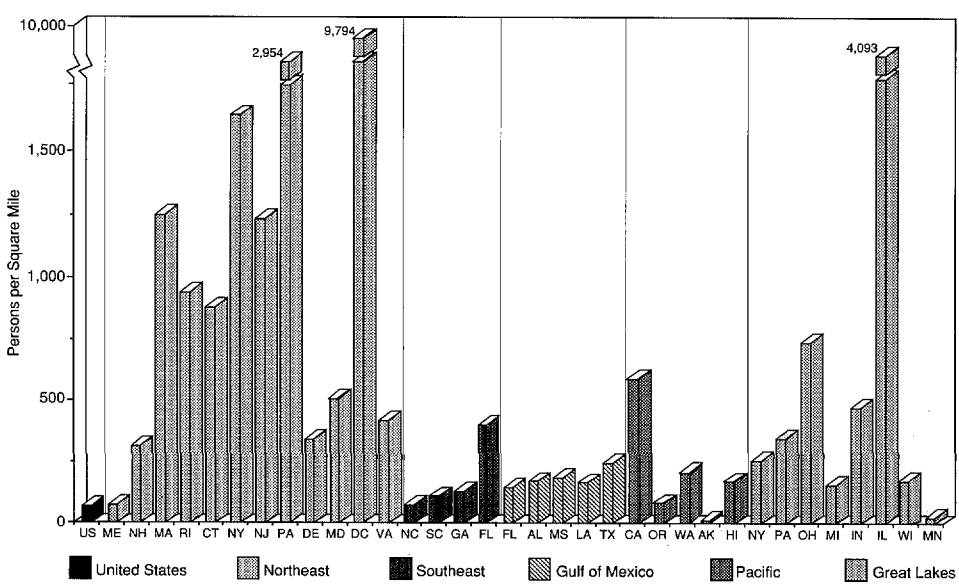
Note: Does not include Alaska.

the projected change in population between 1988 and 2010 in U.S. coastal counties.

Coastal County Population Density. Coastal areas include some of the most densely populated counties in the Nation. Population density in coastal counties (excluding Alaska, since its huge coastal area dilutes the national picture) has increased dramatically since 1960 (Figure 4). While the population density in the U.S. was 61 persons per square mile in 1960, population density in coastal states was 100 persons per square mile, and 248 persons per square mile in coastal counties. By 1988, population density in coastal counties reached 341 persons per square mile, more than four times the U.S. average. Population density in coastal areas is expected to increase as more people continue to move into this limited space. About 68 percent of all coastal counties will have a population density increase of more than 10 percent between 1988 and 2010.

In 1988, 101 counties had a population density greater than 500 persons per square mile. The most densely populated counties, those in which population densities exceed 10,000 persons per square mile, include and/or surround the cities of New York, San Francisco, Boston, and Philadelphia. The largest percent change in population density over the next two decades is

Figure 5. *United States and Coastal Population Density, 1988*



expected in Florida, primarily along the state's Gulf coast. Declines in population density during this same period are projected in 23 counties. The largest declines are expected in the major urban centers of the Great Lakes and Northeast.

The most densely populated portion of the Nation's coastal zone is the Northeast, where four states and the District of Columbia have densities exceeding 1,000 persons per square mile. The Great Lakes region is the second most densely populated area, with Illinois and Ohio having the highest population concentrations in this region. The Southeast region follows, because of the high population density of the Miami metropolitan area. The least densely populated region is the Pacific, largely a result of the diluting effect of Alaska's vast stretches of uninhabited coastline. Otherwise, the Gulf of Mexico has the lowest population density. Figure 5 shows the distribution of coastal county population density by state.

Coastal County Population by Shoreline Mile. Coastal areas are often valued for their aesthetic appeal and are increasingly attractive for commercial and residential development. Waterfront sites are highly prized for housing. These same sites are also sought for a wide variety of recreational activities and tourist attractions. However, the appeal and attractiveness of these areas are being diminished by the pressures of population growth and the requirements of development (New York Water Pollution Control Association, Inc., 1989).

Population per shoreline mile serves as one indicator of "environmental stress" along the Nation's coastline. These figures were developed by dividing the coastal population of each state by tidal shoreline mileage (NOAA, 1975). Coastal areas had a national average of 1,177 persons per shoreline mile in 1988, and a projected ratio of 1,358 in 2010. The coastal states with the highest population-to-shoreline ratios (due primarily to their relatively small shorelines) include: Illinois, 91,740; eastern Pennsylvania, 30,871; Indiana, 15,951; and the District of Columbia, 15,049.

Northeast

The Northeast is the most populated of the five regions, accounting for more than one-third of the Nation's coastal population. *It contains 18 of the 25 most densely populated counties in the entire U.S.* In 1988, the 134 coastal counties in this region, stretching from the northern coast of Maine to the Tidewater region of Virginia, were home to more than 39 million people, about 16 percent of the Nation's total population. The Northeast coastal population is projected to increase by 10 percent over the next two decades, to almost 43 million in 2010. This increase is almost equivalent to the combined current populations of Connecticut and Rhode Island. The major population centers of the region include New York City, Philadelphia, Baltimore, Washington, and Boston.

Population Trends. The coastal population in the Northeast will increase by 30 percent between 1960 and 2010. As a region, the greatest change in population occurred during the 1960s, when the Northeast coastal population increased by 13 percent. The Northeast region will experience lower than aver-

Table 3. *Northeast Population, 1960-2010*

STATE	Land Area (Sq. Mi.)	POPULATION 1960 Absolute*	1960 Density**	1970 Absolute	1970 Density	1980 Absolute	1980 Density	1990 Absolute	1990 Density	2000 Absolute	2000 Density	2010 Absolute	2010 Density
MAINE	30,995	969	31	994	32	1,125	36	1,220	39	1,313	42	1,387	45
Coastal	12,128	655	54	686	57	795	66	879	72	953	79	1,010	83
Coastal Percent	(39%)	(68%)		(69%)		(71%)		(72%)		(73%)		(73%)	
NEW HAMPSHIRE	8,993	607	67	738	82	921	102	1,126	125	1,287	143	1,392	155
Coastal	1,069	159	149	209	196	276	258	353	331	414	388	452	423
Coastal Percent	(12%)	(26%)		(28%)		(30%)		(31%)		(32%)		(32%)	
MASSACHUSETTS	7,824	5,149	658	5,689	727	5,737	733	5,978	764	6,344	811	6,687	855
Coastal	3,535	3,836	1,085	4,260	1,205	4,299	1,216	4,496	1,272	4,784	1,353	5,049	1,428
Coastal Percent	(45%)	(75%)		(75%)		(75%)		(75%)		(75%)		(75%)	
RHODE ISLAND	1,055	859	815	950	901	947	898	1,002	950	1,055	1,001	1,106	1,048
Coastal	1,055	859	815	950	901	947	898	1,002	950	1,055	1,001	1,106	1,048
Coastal Percent	(100%)	(100%)		(100%)		(100%)		(100%)		(100%)		(100%)	
CONNECTICUT	4,872	2,535	520	3,032	622	3,108	638	3,262	670	3,443	707	3,623	744
Coastal	2,284	1,589	695	1,883	825	1,936	848	2,025	887	2,133	934	2,244	982
Coastal Percent	(47%)	(63%)		(62%)		(62%)		(62%)		(62%)		(62%)	
NEW YORK	47,377	16,782	354	18,241	385	17,558	371	17,771	375	18,220	385	18,976	401
Coastal	7,570	11,699	1,545	12,742	1,683	12,082	1,596	12,330	1,629	12,638	1,669	13,191	1,743
Coastal Percent	(16%)	(70%)		(70%)		(69%)		(69%)		(69%)		(70%)	
NEW JERSEY	7,468	6,067	812	7,171	960	7,365	986	7,686	1,029	8,027	1,075	8,433	1,129
Coastal	5,686	5,639	992	6,566	1,155	6,669	1,173	6,934	1,219	7,213	1,269	7,567	1,331
Coastal Percent	(76%)	(93%)		(92%)		(91%)		(90%)		(90%)		(90%)	
PENNSYLVANIA	44,888	11,319	252	11,801	263	11,864	264	11,944	266	12,289	274	12,805	285
Coastal	930	2,864	3,080	2,970	3,194	2,722	2,927	2,717	2,921	2,769	2,978	2,881	3,098
Coastal Percent	(2%)	(25%)		(25%)		(23%)		(23%)		(23%)		(23%)	
DELAWARE	1,932	446	231	548	284	594	307	654	338	691	357	728	377
Coastal	1,932	446	231	548	284	594	307	654	338	691	357	728	377
Coastal Percent	(100%)	(100%)		(100%)		(100%)		(100%)		(100%)		(100%)	
MARYLAND	9,837	3,101	315	3,924	399	4,217	429	4,631	471	4,943	502	5,239	533
Coastal	6,444	2,403	373	2,975	462	3,088	479	3,269	507	3,435	533	3,620	562
Coastal Percent	(66%)	(78%)		(76%)		(73%)		(71%)		(70%)		(69%)	
DIST. OF COLUMBIA	63	764	12,126	757	12,011	638	10,127	621	9,864	636	10,091	665	10,550
Coastal	63	764	12,126	757	12,011	638	10,127	621	9,864	636	10,091	665	10,550
Coastal Percent	(100%)	(100%)		(100%)		(100%)		(100%)		(100%)		(100%)	
VIRGINIA	39,704	3,967	100	4,651	117	5,347	135	6,088	153	6,591	166	6,988	176
Coastal	8,914	2,203	247	2,776	311	3,174	356	3,772	423	4,133	464	4,409	495
Coastal Percent	(22%)	(56%)		(60%)		(59%)		(62%)		(63%)		(63%)	
TOTAL	205,008	52,566	256	58,496	285	59,421	290	61,984	302	64,838	316	68,028	332
Coastal	51,610	33,116	642	37,323	723	37,221	721	39,053	757	40,855	792	42,922	832
Coastal Percent	(25%)	(63%)		(64%)		(63%)		(63%)		(63%)		(63%)	

*Thousand persons **Persons per square mile

age growth over the next two decades when compared to the entire U.S. Given the relatively degraded environmental quality conditions that already exist in this region, any growth is likely to make these problems more severe. Figure 6 shows the percent change in population in Northeast coastal counties between 1988 and 2010.

As shown in Table 3, all but two of the states, Pennsylvania and New Hampshire, in the Northeast region have most of their population in coastal counties. About 63 percent of the region's population resides in the narrow band of coastal counties that border the ocean and estuaries in these states. This relatively high proportion of coastal versus non-coastal population is even more important when one considers that coastal counties account for only one-fourth of the total land area in the region. While almost four million people are expected to be added to the region's coastal population by 2010, the ratio of coastal to non-coastal population should remain roughly the same.

Population Density. Because of the large population and small amount of land area in these coastal counties, this region is the most densely populated in the U.S., with more than 750 persons per square mile. The population density should rise to over 830 persons per square mile by 2010. At that point, the coastal population density will be more than five times that of the region's non-

Figure 6. *Population Change in Northeast Coastal Counties, 1988 - 2010*

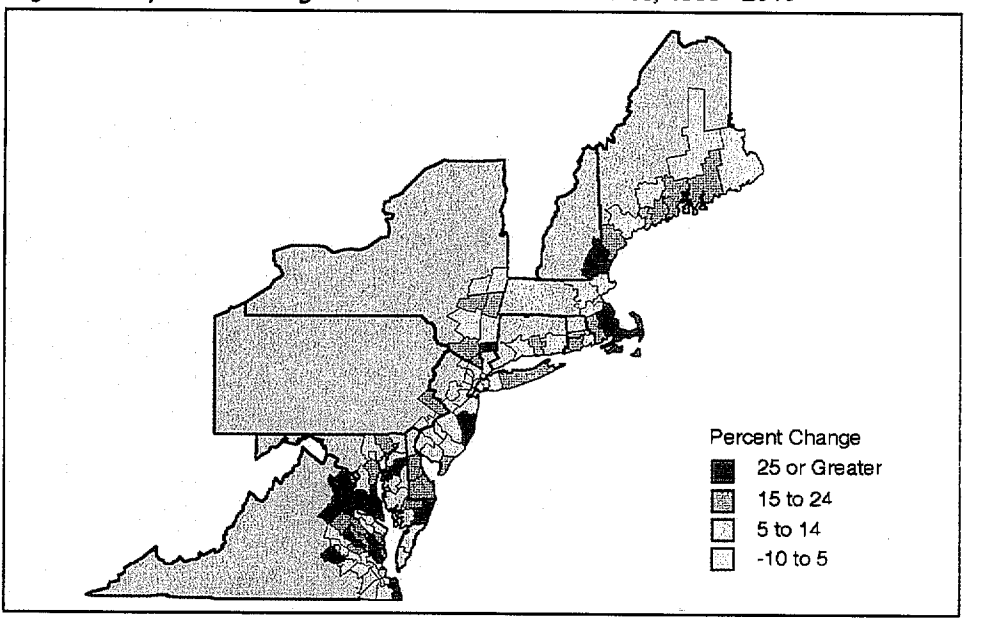


Figure 7. *Population Density in Northeast Coastal Counties, 2010*

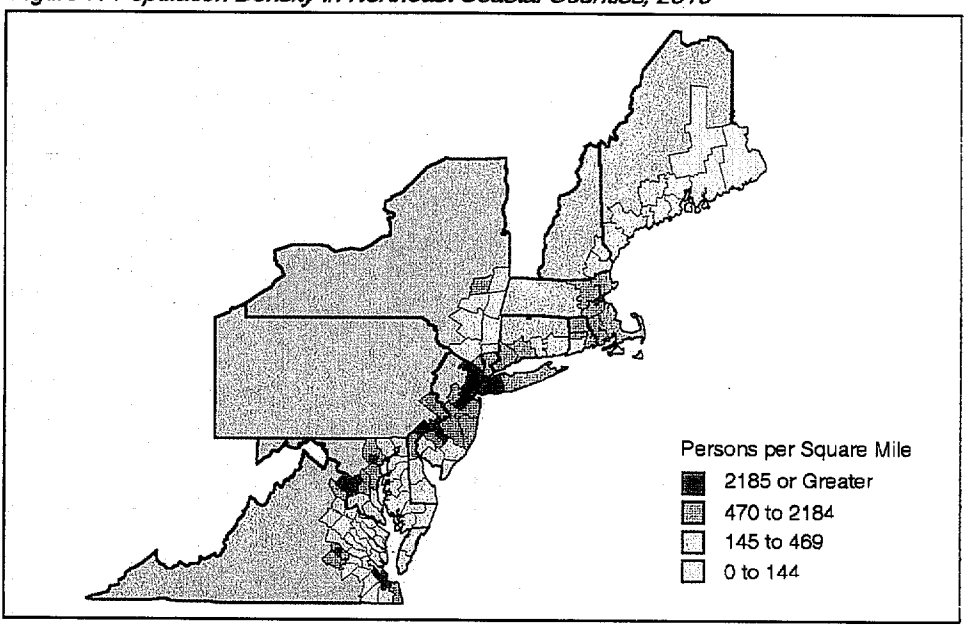
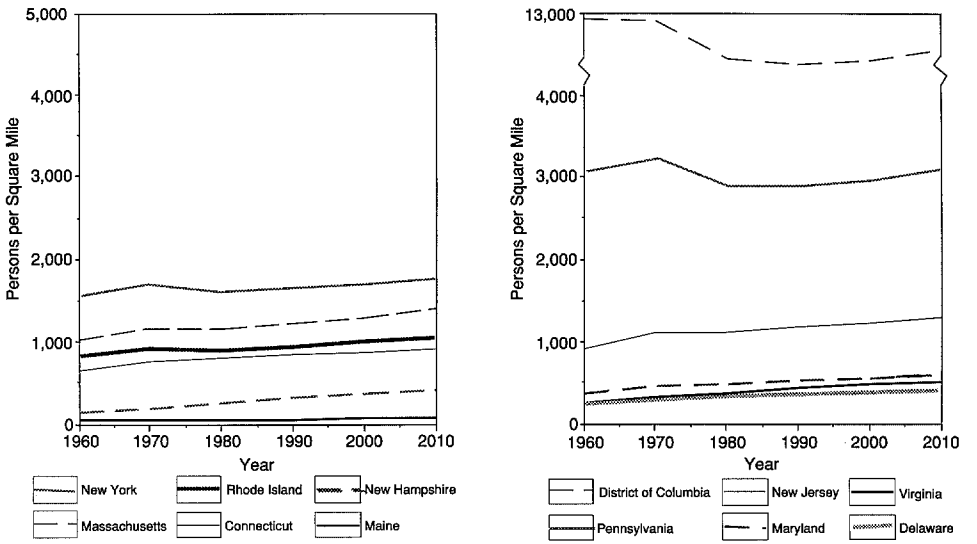


Figure 8. *Northeast Coastal Population Density, 1960-2010*
(a) Maine-New York *(b) New Jersey-Virginia*



coastal counties. Figure 7 shows the population density of coastal counties in the Northeast region in 2010.

Figures 8a and 8b show the trend in population density for the coastal portions of states in the Northeast. The overall trend for the region is one of slow growth, with each state's ranking remaining constant, except for New Hampshire, which is projected to surpass Delaware by 2010. Pennsylvania has a higher density than other states in the region, excluding the District of Columbia, because its counties are almost exclusively urban. *Six of the Nation's seven leading states in coastal county population density are located in the Northeast.*

Population by Shoreline Mile. Table 4 lists the coastal population per shoreline mile for each of the Northeast states. The high value for Pennsylvania is the result of a major population center (Philadelphia) comprising a large portion of the state's coastal zone. In other Northeast states with large coastal population centers, such as Boston, New York City, and Baltimore, there is a greater length of shoreline reaching less populated portions of the state, consequently lowering the overall population per shoreline mile.

"Hot Spots" of Growth. Table 5 lists the top 15 coastal counties in the region for three categories: the counties expected to increase by the most people; the counties projected to increase at the fastest rate; and the counties projected to have the highest population density. The counties with the largest projected increases in population are primarily suburbs of the large cities in the region. Suffolk County, NY, for example, is located on the eastern end of Long Island, and will grow largely due to its proximity to New York City. Queens County, NY, is one of the boroughs of New York City.

Table 4. *Northeast Coastal Population per Shoreline Mile*

State	Year 1960	1988	2010
Maine	188	250	290
New Hampshire	1,212	2,553	3,453
Massachusetts	2,525	2,907	3,324
Rhode Island	2,238	2,585	2,881
Connecticut	2,570	3,235	3,631
New York	6,324	6,738	7,130
New Jersey	3,147	3,898	4,223
Pennsylvania	32,182	30,871	32,375
Delaware	1,171	1,733	1,910
Maryland	753	1,027	1,135
District of Columbia	18,633	15,049	16,212
Virginia	665	1,133	1,330
Northeast	1,973	2,330	2,557

Fairfax County, VA, is located across the Potomac River from Washington, DC. Middlesex County, MA, is west and north of Boston.

A slightly different pattern emerges for counties with large increases in their rate of growth. These counties are located at the edges of the existing areas of urban influence. Instead of being directly adjacent to a major city, they are usually one county beyond the recognized suburban area. This "suburban sprawl" from the central city outward to the surrounding counties has been occurring throughout the U.S., especially since the end of World War II. The percent change map (Figure 6) shows the pattern of more rapid growth at the fringes of current metropolitan regions.

A second pattern emerges due to the influence of an aging population. At least four of the counties with rapid projected growth currently have a large elderly population. These counties (Virginia Beach, VA; Worcester, MD; Ocean, NJ; and Barnstable, MA) are popular retirement and resort areas for people who want to settle on or visit the Atlantic coast.

The Northeast is the most densely populated region in the entire U.S. The 15 northeastern counties listed in Table 5 for population density are also nationwide leaders in population density. Except for San Francisco County, CA, *nine of the 10 most densely populated counties in the U.S. in 1988 were in the Northeast.* In 2010, 56 of the region's counties, or 42 percent, are projected to have a population density larger than 800 persons per square mile, or 10 times the projected national average.

Table 5. *Northeast Leading Counties in Population Change*

County	Population Change, 1988-2010 (1,000 Persons)	County	Percent Population Change, 1988-2010	County	Population per Square Mile, 2010 (1,000 Persons)
Suffolk, NY	225	Spotsylvania, VA	49	New York, NY	71
Fairfax, VA	210	Barnstable, MA	48	Kings, NY	33
Middlesex, MA	144	Charles, MD	43	Bronx, NY	27
Ocean, NJ	124	Dukes, MA	43	Queens, NY	19
Queens, NY	118	Calvert, MD	42	Suffolk, MA	12
Plymouth, MA	114	Falls Church, VA	40	Philadelphia, PA	12
Virginia Beach, VA	105	Rockingham, NH	39	Hudson, NJ	12
Anne Arundel, MD	93	Fredericksburg, VA	34	District of Columbia	11
Rockingham, NH	92	Nantucket, MA	33	Baltimore City, MD	9
Fairfield, CT	91	Gloucester, VA	33	Richmond, NY	8
New Haven, CT	89	Prince William, VA	33	Alexandria, VA	8
Bristol, MA	88	Stafford, VA	33	Essex, NJ	7
Barnstable, MA	86	King George, VA	31	Falls Church, VA	7
Bucks, PA	85	Ocean, NJ	30	Arlington, VA	7
Essex, MA	82	Chesterfield, VA	30	Norfolk, VA	6

Table 6. *Great Lakes Population, 1960-2010*

STATE	Land Area (Sq. Mi.)	POPULATION 1960 Absolute*	1960 Density**	1970 Absolute	1970 Density	1980 Absolute	1980 Density	1990 Absolute	1990 Density	2000 Absolute	2000 Density	2010 Absolute	2010 Density
NEW YORK	47,377	16,782	354	18,241	385	17,558	371	17,771	375	18,220	385	18,976	401
Coastal	9,945	2,500	251	2,704	272	2,611	263	2,551	257	2,596	261	2,685	270
Coastal Percent	(21%)	(15%)		(15%)		(15%)		(14%)		(14%)		(14%)	
PENNSYLVANIA	44,888	11,319	252	11,801	263	11,864	264	11,944	266	12,289	274	12,805	285
Coastal	804	251	312	264	328	280	348	279	347	285	354	295	367
Coastal Percent	(2%)	(2%)		(2%)		(2%)		(2%)		(2%)		(2%)	
OHIO	41,004	9,706	237	10,657	260	10,798	263	10,761	262	11,002	268	11,411	278
Coastal	3,774	2,796	741	3,020	800	2,852	756	2,736	725	2,733	724	2,810	745
Coastal Percent	(9%)	(29%)		(28%)		(26%)		(25%)		(25%)		(25%)	
MICHIGAN	56,954	7,823	137	8,882	156	9,262	163	9,216	162	9,505	167	9,865	173
Coastal	31,477	4,694	149	5,099	162	5,034	160	4,832	154	4,897	156	5,054	161
Coastal Percent	(55%)	(60%)		(57%)		(54%)		(52%)		(52%)		(51%)	
INDIANA	35,932	4,662	130	5,195	145	5,490	153	5,550	154	5,711	159	5,925	165
Coastal	1,519	669	440	739	486	751	495	713	469	722	475	749	493
Coastal Percent	(4%)	(14%)		(14%)		(14%)		(13%)		(13%)		(13%)	
ILLINOIS	55,645	10,081	181	11,110	200	11,427	205	11,560	208	11,846	213	12,331	222
Coastal	1,412	5,423	3,841	5,876	4,162	5,694	4,033	5,704	4,040	5,746	4,070	5,953	4,216
Coastal Percent	(3%)	(54%)		(53%)		(50%)		(49%)		(49%)		(48%)	
WISCONSIN	54,426	3,952	73	4,418	81	4,706	86	4,886	90	5,148	95	5,378	99
Coastal	10,515	1,785	170	1,915	182	1,882	179	1,864	177	1,915	182	1,986	189
Coastal Percent	(19%)	(45%)		(43%)		(40%)		(38%)		(37%)		(37%)	
MINNESOTA	79,548	3,414	43	3,806	48	4,076	51	4,363	55	4,690	59	4,950	62
Coastal	9,590	249	26	237	25	239	25	212	22	216	23	224	23
Coastal Percent	(12%)	(7%)		(6%)		(6%)		(5%)		(5%)		(5%)	
TOTAL	415,774	67,741	163	74,111	178	75,181	181	76,052	183	78,409	189	81,641	196
Coastal	69,036	18,367	266	19,855	288	19,344	280	18,892	274	19,109	277	19,755	286
Coastal Percent	(17%)	(27%)		(27%)		(26%)		(25%)		(24%)		(24%)	

*Thousand persons **Persons per square mile

Great Lakes

The Great Lakes region, the third most populous coastal region, contains 85 of the Nation's coastal counties. The region includes the coastal portions of eight states surrounding the five Great Lakes along the U.S.-Canada border. These lakes, in order of greatest surface water area, are Lake Superior, Lake Huron, Lake Michigan, Lake Erie, and Lake Ontario. The coastal counties in this region contain about 19 million people, or roughly 17 percent of the Nation's coastal population. The region's share of the U.S. coastal population is expected to drop over the next two decades because of relatively slow growth in most of its counties. *Between 1980 and 1986, eight of the Nation's 20 leading counties in population loss were located in this region.*

Population Trends. The Great Lakes coastal population is expected to increase by eight percent between 1960 and 2010. The decade of maximum coastal population growth was the 1960s. However, population declined during the 1970s and 1980s and offset the earlier increase. Although the region is not projected to experience rapid growth over the next two decades, it will remain an important center for industry and commerce. The region contains four of the Nation's 20 most populous counties.

Unlike the Northeast, the Great Lakes region has a relatively small proportion (25 percent) of its population in coastal counties. With only 17 percent of the region's land area in coastal counties, the population density of 275 persons per square mile is much lower than the density in the Northeast. It is, however, much higher than the overall U.S. figure of about 70 persons per square mile.

Figure 9. *Population Change in Great Lakes Coastal Counties, 1988 - 2010*

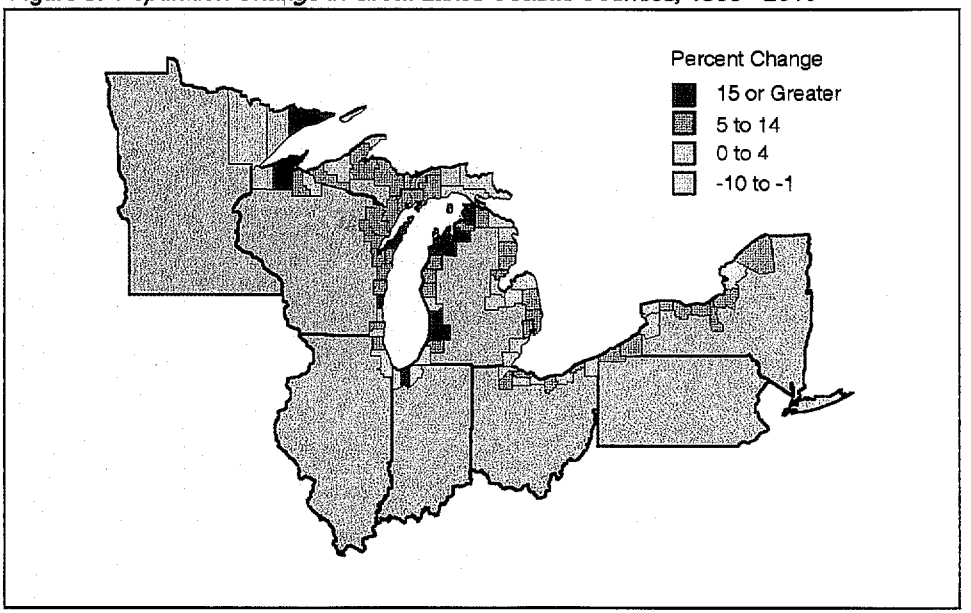


Figure 10. *Population Density in Great Lakes Coastal Counties, 2010*

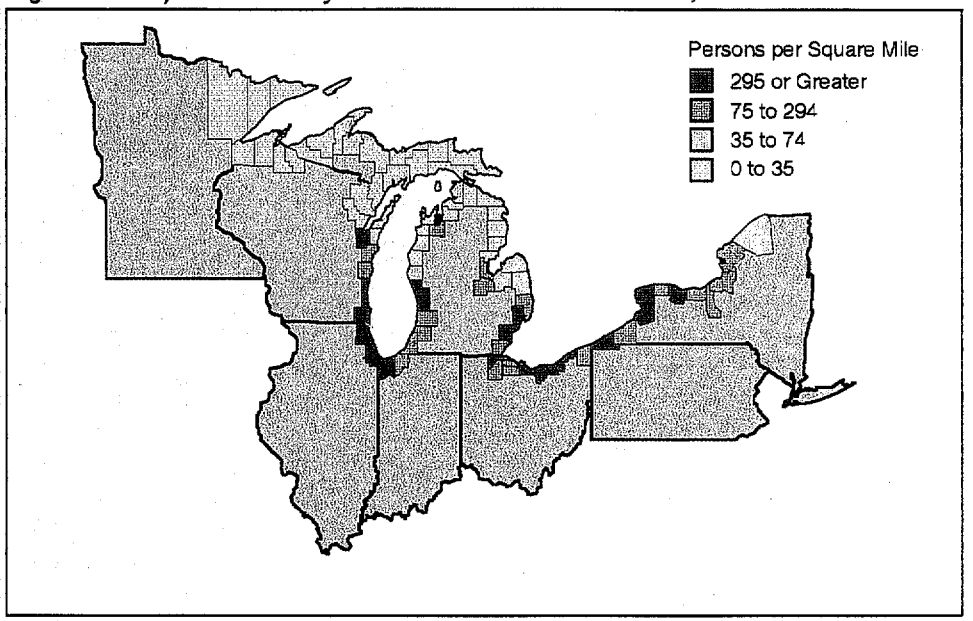


Figure 11. *Great Lakes Coastal Population Density, 1960-2010*

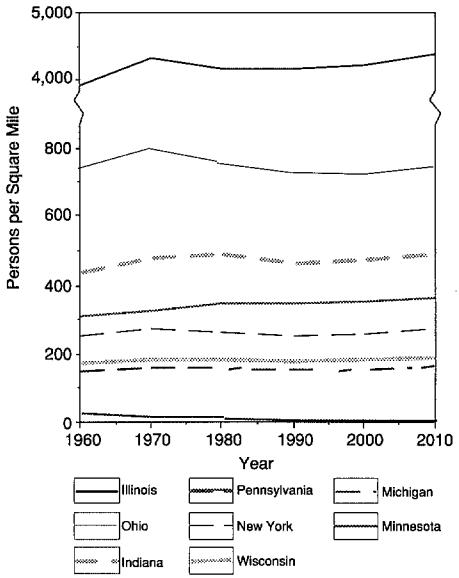


Table 6 summarizes the change in population and population density for each coastal state between 1960 and 2010.

Figure 9 shows the percent change in population between 1988 and 2010. Most of the counties expected to experience rapid growth in the region have relatively small populations. Unlike the Northeast, most of these higher growth counties are not found near metropolitan areas. The region has 12 coastal counties expected to lose population between 1988 and 2010, more than any other coastal region in the Nation.

Population Density. The population densities of the coastal portions of these states through time are shown in Figure 11. Because both Cook and Lake counties are so highly developed, the coastal population density of Illinois is much higher than any other state in the region and, excluding the District of Columbia, the Nation.

Table 7. *Great Lakes Coastal Population per Shoreline Mile*

	Year		
State	1960	1988	2010
New York	6,127	6,273	6,581
Pennsylvania	4,915	5,431	5,785
Ohio	8,963	8,892	9,006
Michigan	1,523	1,579	1,639
Indiana	14,859	15,951	16,646
Illinois	86,085	91,740	94,485
Wisconsin	2,176	2,285	2,422
Minnesota	1,316	1,135	1,186
Great Lakes	3,695	3,835	3,974

Figure 10 shows the population density for the region in 2010. The counties containing the major metropolitan areas in the region (Chicago, Detroit, Cleveland, Milwaukee, and Buffalo) appear in red. In general, population densities are higher along the southern shores of Lakes Michigan, Huron, and Erie.

Population by Shoreline Mile. The coastal population per shoreline mile (Table 7) confirms the high degree of development of the two coastal counties of Illinois. Its population of over 91,000 persons per mile of shoreline is the highest in the Nation. The shoreline mile population of Indiana is also high, 15,951, making it the fourth highest in the U.S. *The regional ratio of 3,835 persons per shoreline mile makes the Great Lakes the highest of the five coastal regions.*

"Hot Spots" of Growth. The slow growth trend expected for this region is evident after comparing the leading growth counties in this region to those in the four other coastal regions. The absolute and percent population change growth figures in Table 8 are lower than the leading counties in the other regions. Most of the counties with large projected population increases between

Table 8. *Great Lakes Leading Counties in Population Change*

County	Population Change, 1988-2010 (100 Persons)	County	Percent Population Change, 1988-2010	County	Population per Square Mile, 2010
Cook, IL	992	Porter, IN	26	Cook, IL	5,620
Macomb, MI	765	Cook, MN	23	Milwaukee, WI	3,960
Lake, IL	737	Leelanau, MI	21	Wayne, MI	3,397
Monroe, NY	566	Grand Traverse, MI	20	Cuyahoga, OH	3,073
Porter, IN	329	Bayfield, WI	19	Macomb, MI	1,625
Ottawa, MI	299	Benzie, MI	18	Lucas, OH	1,361
Brown, WI	255	Door, WI	18	Lake, IL	1,253
Milwaukee, WI	242	Ozaukee, WI	17	Monroe, NY	1,142
Erie, PA	180	Ottawa, MI	17	Lake, OH	998
Lorain, OH	175	Antrim, MI	17	Lake, IN	961
Lake, OH	158	Emmet, MI	16	Erie, NY	927
St. Clair, MI	151	Allegan, MI	16	Lorain, OH	582
Allegan, MI	143	Lake, IL	15	Racine, WI	554
Oswego, NY	136	Houghton, MI	15	Kenosha, WI	458
Grand Traverse, MI	129	Alcona, MI	15	Niagara, NY	427

1988 and 2010 contain, or are near, major cities. Some of these same counties experienced significant declines in population between 1980 and 1988.

The counties expected to grow at the fastest rate are found almost exclusively on the shores of Lakes Michigan and Superior. Porter County, IN, is in the eastern half of the Gary-Hammond metropolitan area. It is expected to experience continued rapid growth, even though the metropolitan area as a whole has been losing population over the last decade. This pattern also holds true for Ozaukee County, WI, part of the Milwaukee-Racine metropolitan area.

The list of high-density counties for 2010 is not very different from a list that would be compiled today. High-density counties are found in every Great Lakes state except Minnesota.

Southeast

The Southeast has the smallest population of the five regions shown, accounting for only eight percent of the U.S. coastal population. In 1988, the 56 counties in this region were home to more than nine million persons. *Four out of five people living in the coastal Southeast were located in eastern Florida.* The Southeast coastal population is projected to increase by 27 percent over the next two decades, to 11 million persons in 2010. The major population centers of the region include Miami, Jacksonville, Savannah, and Charleston.

Population Trends. The coastal population of the Southeast region is projected to increase by 181 percent (the highest of the five regions) between 1960 and 2010. The largest growth occurred between 1970 and 1980, when the Southeast coastal population increased by 36 percent. Table 9 summarizes the change in population and population density for each coastal state between 1960 and 2010.

Eastern Florida has and will dominate population trends in this region. This area has experienced extremely rapid growth; its population increased by 152 percent between 1960 and 1988. Its

Table 9. *Southeast Population, 1960-2010*

STATE	Land Area (Sq. Mi.)	POPULATION 1960 Absolute*	1960 Density**	1970 Absolute	1970 Density	1980 Absolute	1980 Density	1990 Absolute	1990 Density	2000 Absolute	2000 Density	2010 Absolute	2010 Density
NORTH CAROLINA	48,843	4,556	93	5,084	104	5,882	120	6,597	135	7,066	145	7,400	152
Coastal	9,378	474	50	510	54	596	64	699	75	752	80	789	84
Coastal Percent		(10%)		(10%)		(10%)		(11%)		(11%)		(11%)	
SOUTH CAROLINA	30,203	2,383	79	2,591	86	3,122	103	3,534	117	3,812	126	4,010	133
Coastal	7,806	507	65	565	72	724	93	889	114	984	126	1,049	134
Coastal Percent		(21%)		(22%)		(23%)		(25%)		(26%)		(26%)	
GEORGIA	58,056	3,943	68	4,588	79	5,463	94	6,458	111	7,053	121	7,472	129
Coastal	2,887	267	93	281	97	326	113	374	130	399	138	419	145
Coastal Percent		(7%)		(6%)		(6%)		(6%)		(6%)		(6%)	
FLORIDA	54,153	4,952	91	6,791	125	9,746	180	12,837	237	14,811	273	16,143	298
Coastal	17,210	2,744	159	3,901	227	5,513	320	7,169	417	8,230	478	8,957	520
Coastal Percent		(55%)		(57%)		(57%)		(56%)		(56%)		(55%)	
TOTAL	191,255	15,833	83	19,054	100	24,213	127	29,425	154	32,742	171	35,025	183
Coastal	37,281	3,992	107	5,257	141	7,159	192	9,131	245	10,366	278	11,214	301
Coastal Percent		(25%)		(28%)		(30%)		(31%)		(32%)		(32%)	

*Thousand persons **Persons per square mile

population is projected to increase by 226 percent for the entire 50-year period. Population increases in eastern Florida have been, and are projected to be, the largest in the counties containing, or adjacent to Jacksonville, Miami, Fort Lauderdale, West Palm Beach, and Orlando. Rapid growth also is projected to occur around Savannah and Charleston.

Although coastal counties comprise only 19 percent of the land area in the four Southeastern states, they contain more than 31 percent of the population in these states. Between 1988 and 2010, almost one-third (16 of 56) of the coastal counties are projected to have population increases of 35-75 percent. Figures 12 and 13 show, by coastal county, the percent change in population between 1988 and 2010, and the projected population density in 2010.

Population Density. Coastal population densities across the region in 1988 ranged from a low of 73 persons per square mile in North Carolina to a high of 402 persons per square mile in Florida. The average for the region was 237 persons per square mile, well above the U.S. average of 70 persons per square mile. Population density in the Southeast is expected to increase to an average of 301 persons per square mile by 2010. Figure 14 shows that Florida will continue to lead the region in population density, with an increase from 159 persons per square mile in 1960 to slightly more than 520 persons per square mile by 2010, a change of about 227 percent.

Seasonal variations in population density occur even in such low-density areas as coastal North Carolina. Southeast coastal areas attract visitors from major metropolitan centers in the southern U.S., bringing increased seasonal environmental stress in the form of housing, hotels and motels, recreation, and supporting infrastructure.

Population by Shoreline Mile. Table 10 shows that the population-to-shoreline mile ratio in the Southeast will almost triple in size between 1960 and 2010. Florida's ratio of 2,075 raises the regional average because it is much higher than any other Southeastern state. The remaining states are more rural and have a greater number of shoreline miles because of large estuar-

Figure 12. *Population Change in Southeast Coastal Counties, 1988-2010*

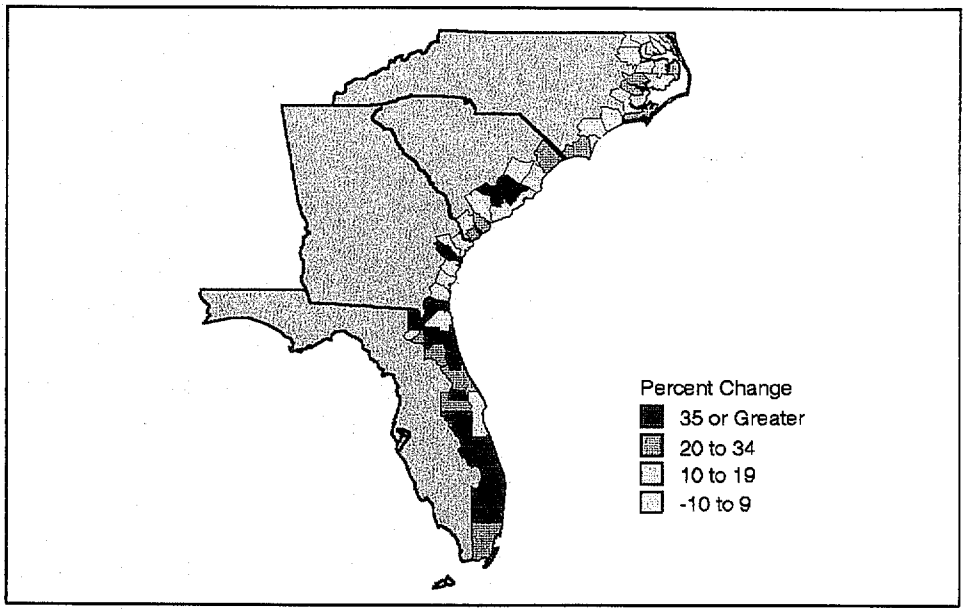


Figure 13. *Population Density in Southeast Coastal Counties, 2010*

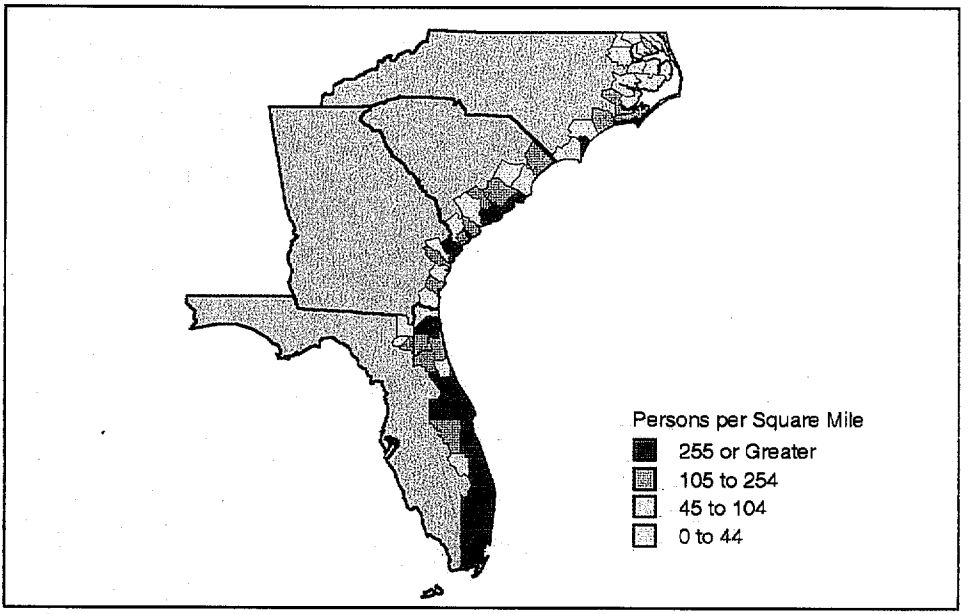
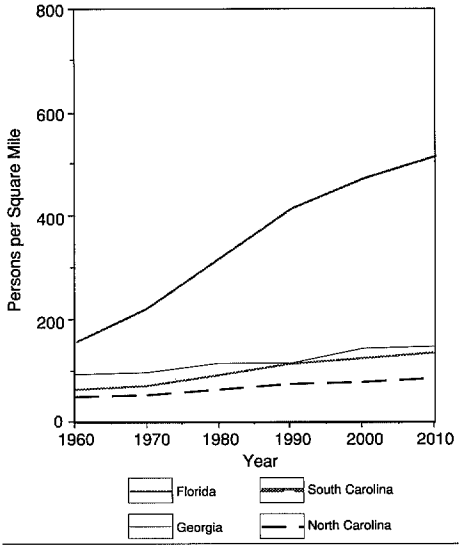


Figure 14. *Southeast Coastal Population Density, 1960-2010*



ine and barrier island systems. Many of these natural systems, especially throughout the Carolinas, are contained within a large network of state and national parks, which limit coastal development opportunities.

"Hot Spots" of Growth. As shown in Table 11, eastern Florida dominates all three categories: the counties expected

Table 10. *Southeast Coastal Population per Shoreline Mile*

	Year		
State	1960	1988	2010
North Carolina	140	202	234
South Carolina	176	303	365
Georgia	114	158	179
Florida	824	2,075	2,689
Southeast	335	741	940

to increase by the most people; the counties projected to increase at the fastest rate; and the counties projected to have the highest population density. This is a reflection of the state's large and rapidly growing population. Partly because they already contain large urban areas (Fort Lauderdale, Miami, Hollywood, Hialeah, and West Palm Beach), Broward, Dade, and Palm Beach counties in Florida are projected to be the three leading counties in population change between 1988 and 2010. Berkeley and Dorchester counties in South Carolina also appear on the list because of their proximity to Charleston.

Coastal counties projected to increase at the fastest rate are led by Osceola, Martin, and Flagler counties in Florida. These are "retirement-oriented" counties, but will also grow as a result of their

Table 11. *Southeast Leading Counties in Population Change*

County	Population Change, 1988-2010 (1,000 Persons)	County	Percent Population Change, 1988-2010	County	Population per Square Mile, 2010
Broward, FL	436	Osceola, FL	72	Seminole, FL	1,391
Dade, FL	366	Martin, FL	61	Broward, FL	1,340
Palm Beach, FL	362	Flagler, FL	59	Dade, FL	1,115
Seminole, FL	145	Seminole, FL	54	Duval, FL	915
Orange, FL	131	Indian River, FL	50	Orange, FL	816
Volusia, FL	103	Berkeley, SC	50	New Hanover, NC	704
Brevard, FL	77	St. Johns, FL	48	Palm Beach, FL	592
Osceola, FL	65	St. Lucie, FL	47	Chatham, GA	546
St. Lucie, FL	64	Okeechobee, FL	47	Brevard, FL	468
Berkeley, SC	63	Clay, FL	46	Volusia, FL	405
Martin, FL	59	Dorchester, SC	45	St. Lucie, FL	345
Clay, FL	46	Palm Beach, FL	44	Charleston, SC	323
Indian River, FL	43	Liberty, GA	42	Martin, FL	279
St. Johns, FL	38	Broward, FL	37	Indian River, FL	262
Dorchester, SC	37	Baker, FL	36	Clay, FL	247

proximity to large urban centers. The only Georgia county on the leading growth list, Liberty, is projected to increase by 42 percent over the next two decades. This is due primarily to its proximity to Savannah, as well as to the effect of Fort Stewart, a large military reservation located almost entirely within the county.

Seminole, Broward, and Dade counties in Florida are projected to be the most densely populated counties in the Southeast by 2010. Broward and Dade counties have large land areas, but contain the entire Miami-Fort Lauderdale metropolitan area. Seminole County has a high density because of its small land area and proximity to Orlando. New Hanover County, NC, also has a small land area and contains numerous beach resorts as well as the city of Wilmington. Chatham County, GA, contains Savannah, the fifth largest city in the region.

Gulf of Mexico

The Gulf of Mexico ranks fourth in total population among the five coastal regions, accounting for 13 percent of the total U.S. coastal population. In 1988, the 99 counties in this region were home to more than 14 million persons. The Gulf coastal population is projected to increase by 22 percent, to almost 18 million by 2010. The major population centers in the Gulf region include Houston, New Orleans, Tampa, and St. Petersburg.

Population Trends. The coastal population in the Gulf of Mexico is projected to increase by 144 percent between 1960 and 2010, the second highest of the five regions. As a region, the greatest change in population occurred between 1970 and 1980, when the Gulf coastal population increased by 33 percent. Western Florida has been and will continue to be the most rapidly growing area in the Gulf; its population is expected to increase by more than 1.5 million over the next two decades. Texas is the next most rapidly growing state; its coastal population is expected to increase by over 1.1 million persons during this same period. Both western Florida and Texas will have the highest

Table 12. *Gulf of Mexico Population, 1960-2010*

		POPULATION											
		1960		1970		1980		1990		2000		2010	
STATE	Land Area (Sq. Mi.)	Absolute*	Density**	Absolute	Density	Absolute	Density	Absolute	Density	Absolute	Density	Absolute	Density
FLORIDA	54,153	4,952	91	6,791	125	9,746	180	12,837	237	14,811	273	16,143	298
Coastal	36,943	2,207	60	2,890	78	4,234	115	5,668	153	6,580	178	7,187	195
Coastal Percent		(68%)	(45%)		(43%)		(43%)		(44%)		(44%)		(45%)
ALABAMA	50,767	3,267	64	3,444	68	3,894	77	4,139	82	4,339	85	4,515	89
Coastal	2,827	363	129	377	133	444	157	484	171	514	182	538	190
Coastal Percent		(6%)	(11%)		(11%)		(11%)		(12%)		(12%)		(12%)
MISSISSIPPI	47,233	2,178	46	2,217	47	2,521	53	2,650	56	2,770	59	2,882	61
Coastal	1,790	189	106	240	134	300	168	344	192	373	209	396	221
Coastal Percent		(4%)	(9%)		(11%)		(12%)		(13%)		(13%)		(14%)
LOUISIANA	44,521	3,257	73	3,645	82	4,206	94	4,548	102	4,880	110	5,160	116
Coastal	16,535	1,912	116	2,211	134	2,592	157	2,821	171	3,053	185	3,240	196
Coastal Percent		(37%)	(59%)		(61%)		(62%)		(62%)		(63%)		(63%)
TEXAS	262,017	9,580	37	11,199	43	14,229	54	17,625	67	19,727	75	21,182	81
Coastal	20,784	2,681	129	3,289	158	4,421	213	5,409	260	6,095	293	6,572	316
Coastal Percent		(8%)	(28%)		(29%)		(31%)		(31%)		(31%)		(31%)
TOTAL	458,691	20,293	44	27,296	60	34,596	75	41,800	91	46,527	101	49,882	109
Coastal	78,879	7,353	93	9,006	114	11,991	152	14,726	187	16,615	211	17,932	227
Coastal Percent		(17%)	(36%)		(33%)		(35%)		(35%)		(36%)		(36%)

*Thousand persons **Persons per square mile

Figure 15. *Population Change in Gulf of Mexico Coastal Counties, 1988-2010*

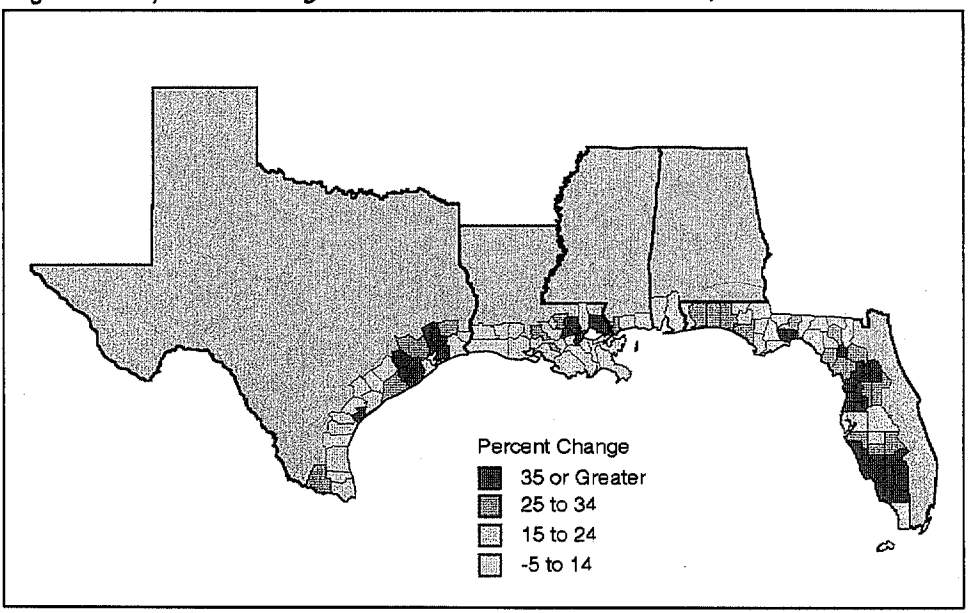


Figure 16. *Population Density in Gulf of Mexico Coastal Counties, 2010*

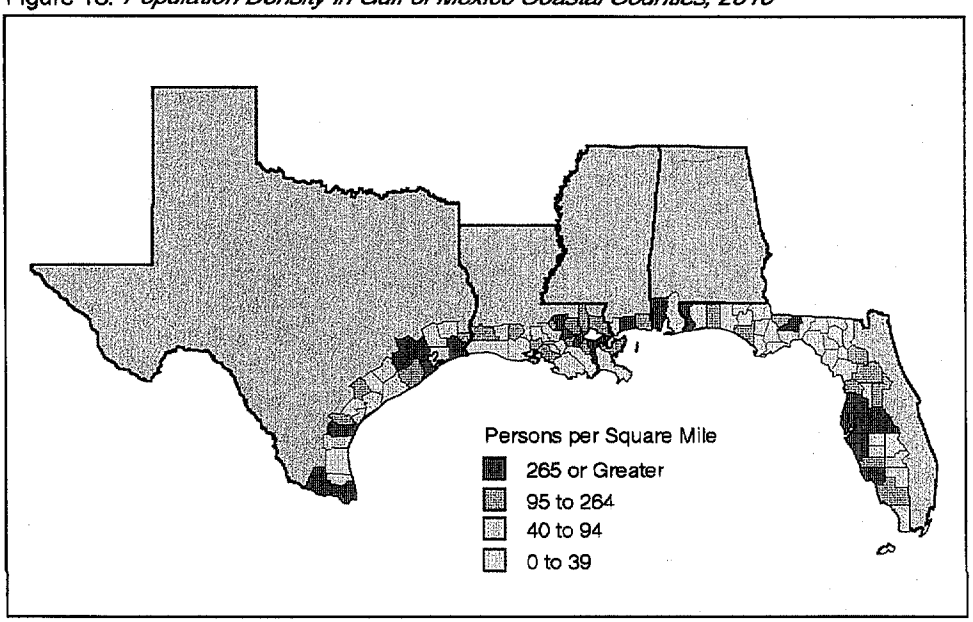
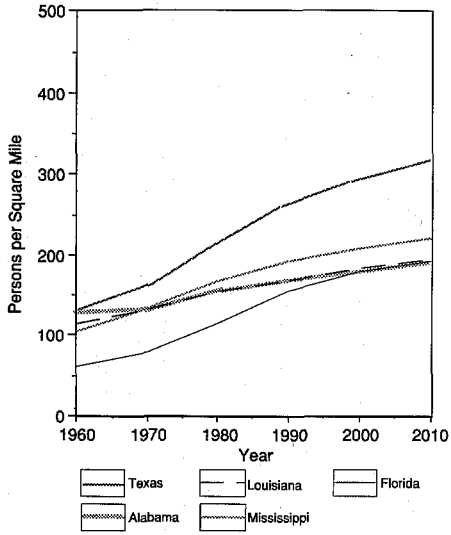


Figure 17. *Gulf of Mexico Coastal Population Density, 1960-2010*



rates of growth in the Gulf, 27 and 22 percent respectively. Table 12 summarizes the change in population and population density for each coastal state between 1960 and 2010.

Although the Gulf of Mexico region is not as densely settled as other regions, it is expected to have the second fastest rate of growth. Almost one-third of all Gulf counties will increase in population by more than 30 percent over the next two decades. Figures 15 and 16 show, by coastal county, the percent change in population between 1988 and 2010, and the projected population density in 2010.

Population Density. Excluding the Pacific (because of Alaska's enormous size), the Gulf of Mexico is currently the least densely populated of the five coastal regions. Population density across the region averages about 187 persons per square mile and is expected to increase to 227 persons per square mile by 2010. As Figure 17 shows, population density in coastal Texas (316 persons per square mile) has and should continue to be the highest in the region. Western Florida, however, is projected to have the most rapid growth in population density, increasing to 195 persons per square mile in 2010, up from 60 persons per square mile in 1960, a 226 percent increase. Alabama, which shared the highest average population density with Texas in 1960, is projected to have the lowest density by 2010 (190 persons per square mile). Louisiana and Mississippi will continue to experience steady increases into 2010.

Population by Shoreline Mile. Table 13 shows that population per shoreline mile in the Gulf of Mexico will more than double between 1960 and 2010. Texas will have the highest ratio, followed by Florida. Florida's ratio will increase at a faster rate than any other Gulf state during this 50-year period. The 17,141 miles of shoreline in the Gulf region are highly valued for residential and seasonal housing, especially in Florida as its population increases into the next century.

"Hot Spots" of Growth. Table 14 lists the region's top 15 coastal counties in three categories: the counties projected

Table 13. *Gulf of Mexico Coastal Population per Shoreline Mile*

	Year		
State	1960	1988	2010
Florida	433	1,064	1,411
Alabama	599	800	886
Mississippi	527	928	1,102
Louisiana	248	352	420
Texas	798	1,517	1,956
Gulf of Mexico	429	820	1,046

Table 14. *Gulf of Mexico Leading Counties in Population Change*

County	Population Change, 1988-2010 (1,000 Persons)	County	Percent Population Change, 1988-2010	County	Population per Square Mile, 2010
Harris, TX	909	Citrus, FL	81	Pinellas, FL	3,619
Pinellas, FL	192	Hernando, FL	73	Orleans, LA	2,707
Pasco, FL	182	Pasco, FL	69	Harris, TX	2,132
Lee, FL	161	Collier, FL	63	Jefferson, LA	1,654
Hillsborough, FL	158	Charlotte, FL	62	East Baton Rouge, LA	1,082
Fort Bend, TX	113	Fort Bend, TX	55	Hillsborough, FL	924
East Baton Rouge, LA	111	Lee, FL	52	Sarasota, FL	633
Jefferson, LA	104	Chambers, TX	45	Galveston, TX	615
Sarasota, FL	102	Marion, FL	44	Pasco, FL	606
Hidalgo, TX	102	Brazoria, TX	41	Lee, FL	585
Polk, FL	91	Glades, FL	41	Escambia, FL	495
Collier, FL	87	Livingston, LA	40	Nueces, TX	410
Marion, FL	84	Hendry, FL	40	Fort Bend, TX	363
Brazoria, TX	76	St. John the Baptist, LA	39	Cameron, TX	361
Citrus, FL	75	Sarasota, FL	39	Leon, FL	356

to increase by the most people; the counties projected to increase at the fastest rate; and the counties projected to have the highest population density. The counties with the largest projected increases in absolute population are located primarily in Florida, from the Florida Keys to north of the Tampa area. Hillsborough and Pinellas counties, which include Tampa and St. Petersburg, are already heavily populated and large population increases are expected. Counties with large elderly populations such as Collier, Lee, and Pasco are also projected to have major increases over the next two decades. Projections indicate that these populations will increase by at least one-half in each county. In Harris County, TX, the projected population increase of over 900,000 represents about one-third of the county's current population.

Coastal counties in southwestern Florida will also have the largest percent increases in population over the next two decades. *Ten of the 15 most rapidly growing counties in the coastal zone of the Gulf of Mexico are located in this area.* The counties surrounding Houston (Brazoria, Chambers, and Fort Bend) will also have high growth rates during this period. The areas of lowest growth are in the northwestern corner of Florida, including several inland counties, the Louisiana-Texas border area, and parts of southeastern Texas.

Although coastal populations are increasing rapidly throughout the region, Gulf coastal counties will not be as densely settled in the near future as the major urban areas in the Northeast, Great Lakes, or Pacific regions. Only two of the 50 most densely populated counties in the U.S. coastal zone in 2010 will be in the Gulf of Mexico. However, 38 Gulf counties are projected to have a population density greater than 160 persons per square mile, or twice the national average in 2010. While Gulf counties do not have densities comparable to the most densely settled counties in the U.S., they do have some of the most rapidly increasing densities anywhere in the Nation.

Pacific Region

The Pacific region, the second most populated U.S. coastal region, contains 77 coastal counties and such major population centers as Los Angeles, San Diego, San Francisco, Seattle, Honolulu, Portland, and Anchorage. In 1988, the coastal population of this region was over 29 million, *with 77 percent of the population living in California.* By 2010, the population will have increased by 22 percent to over 35 million persons.

Population Trends. The coastal population in the Pacific region is expected to more than double between 1960 and 2010, the third highest growth rate among the five regions. By 2010, the coastal population is expected to increase by over six million persons, the largest of any coastal region. *Table 15 shows that by 2010, all states except for Oregon will have at least doubled their coastal population. Alaska's coastal population is expected to increase by 380 percent.*

The greatest changes in coastal county population occurred during the 1960s. From 1960 to the present, and projected to 2010, Alaska had the largest population growth rate. Between 1960 and 1970, Alaska's population almost doubled, while other Pacific states saw increases of only 17-28 percent. California had the second largest rate of population increase, followed closely by Washington.

Growth in the region slowed considerably between 1970 and 1980. Although Alaska's population grew by over one-third, California had the smallest population growth rate (15 percent). Average growth across the region was approximately 17 percent. Estimates of population growth for the 1980s are similar to the growth that occurred during the 1960s. Growth in Alaska will exceed 40 percent. California follows with over 20 percent growth. The smallest growth rate is anticipated in Oregon.

Population projections for the next two decades reflect a slower rate of growth. Alaska's rate will be the largest, followed by Washington, California, Ha-

Table 15. *Pacific Population, 1960-2010*

		POPULATION											
		1960		1970		1980		1990		2000		2010	
STATE	Land Area (Sq. Mi.)	Absolute*	Density**	Absolute	Density	Absolute	Density	Absolute	Density	Absolute	Density	Absolute	Density
CALIFORNIA	156,299	15,717	101	19,971	128	23,668	151	29,040	186	32,482	208	34,901	223
Coastal	38,188	13,073	342	16,662	436	19,238	504	23,091	605	25,605	671	27,429	718
Coastal Percent	(24%)	(83%)		(83%)		(81%)		(80%)		(79%)		(79%)	
OREGON	96,184	1,769	18	2,092	22	2,633	27	2,808	29	3,042	32	3,222	34
Coastal	19,669	1,107	56	1,300	66	1,552	79	1,612	82	1,721	88	1,815	92
Coastal Percent	(20%)	(63%)		(62%)		(59%)		(57%)		(57%)		(56%)	
WASHINGTON	66,511	2,853	43	3,413	51	4,132	62	4,733	71	5,235	79	5,593	84
Coastal	20,645	1,992	97	2,523	122	3,045	148	3,548	172	3,962	192	4,253	206
Coastal Percent	(31%)	(70%)		(74%)		(74%)		(75%)		(76%)		(76%)	
ALASKA	570,833	226	0	303	1	402	1	555	1	641	1	698	1
Coastal	380,161	125	0	245	1	334	1	472	1	549	1	600	2
Coastal Percent	(67%)	(55%)		(81%)		(83%)		(85%)		(86%)		(86%)	
HAWAII	6,425	633	98	770	120	965	150	1,118	174	1,222	190	1,307	203
Coastal	6,425	633	98	770	120	965	150	1,118	174	1,222	190	1,307	203
Coastal Percent	(100%)	(100%)		(100%)		(100%)		(100%)		(100%)		(100%)	
TOTAL	896,252	21,198	24	26,548	30	31,800	35	38,254	43	42,623	48	45,721	51
Coastal	465,088	16,930	36	21,500	46	25,134	54	29,840	64	33,061	71	35,404	76
Coastal Percent	(52%)	(80%)		(81%)		(79%)		(78%)		(78%)		(77%)	

*Thousand persons **Persons per square mile

Figure 18. *Population Change in Pacific Coastal Counties, 1988-2010*

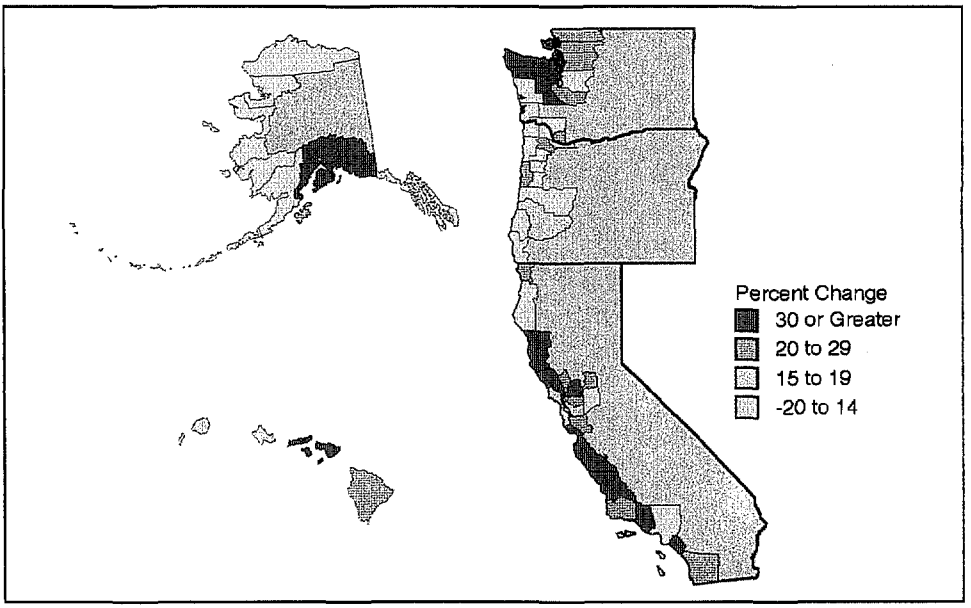


Figure 19. *Population Density in Pacific Coastal Counties, 2010*

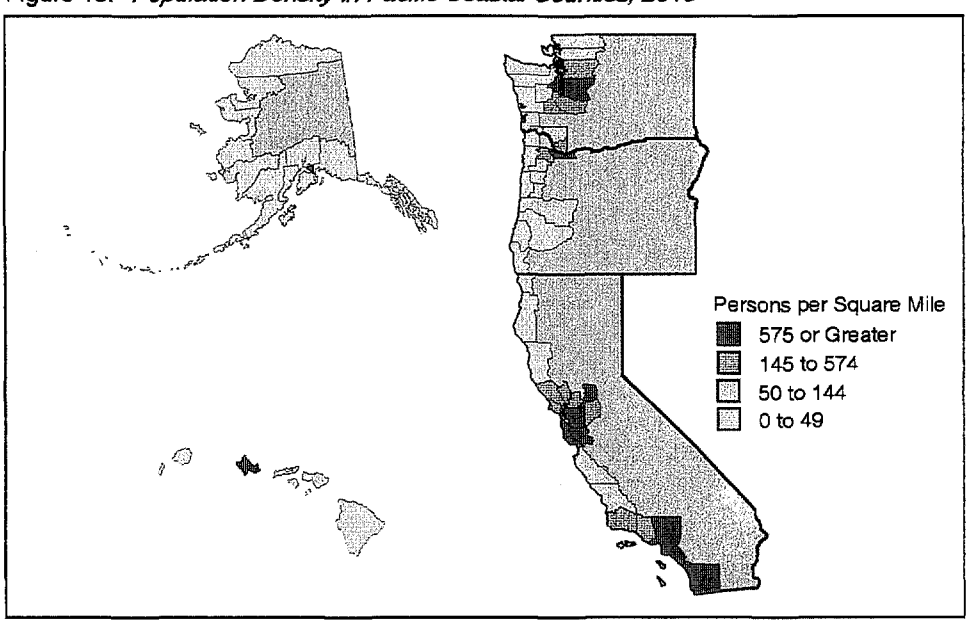
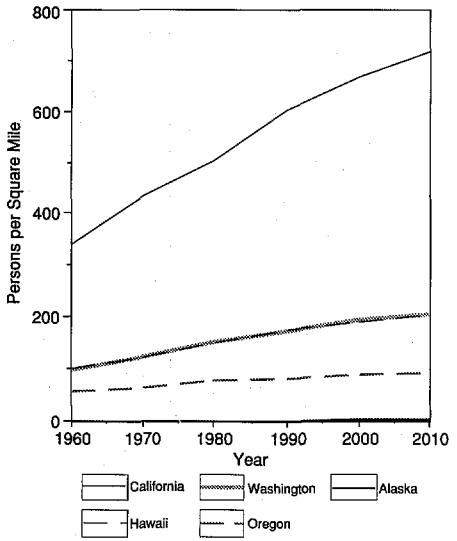


Figure 20. *Pacific Coastal Population Density, 1960-2010*



waii, and Oregon (Figure 18). Overall, the rate of growth in the Pacific region is, and will continue to be, higher than in the Northeast and Great Lakes, but lower than for the Southeast and the Gulf of Mexico.

Population Density. The Pacific (including Alaska) is the least densely populated coastal region. Population density in the Pacific region averages 36 persons per square mile, well below the national average. However, population density across the region is highly variable, ranging from the sparsely populated state of Alaska to the densely populated coastal areas of California (particularly southern California), as well as Hawaii. Between 1960-2010, population densities in California are consistently the highest of all the states in the region, followed by Hawaii, Washington, Oregon, and Alaska (Figure 20). Increases in population density since the 1960s have been relatively consistent;

Table 16. *Pacific Coastal Population per Shoreline Mile*

	Year		
State	1960	1988	2010
Calfornia	3,815	6,551	8,004
Oregon	785	1,140	1,287
Washington	658	1,163	1,405
Alaska	4	13	18
Hawaii	601	1,044	1,242
Pacific	395	680	827

projections for the next two decades show smaller increases in density. By 2010, population density is projected to increase to 76 persons per square mile, just above the national average. The total increase is only 40 persons per square mile over the 50-year period.

Excluding Alaska, the population density for the Pacific region is dramatically different. The Pacific would rank third in population density in 1960 (148 persons per square mile), after the Northeast and Great Lakes, and second only after the Northeast in 2010.

Coastal California population density will more than double, from 342 persons per square mile in 1960 to an estimated 718 persons per square mile in 2010. Washington and Hawaii follow, with increases of 109 persons per square mile and 104 persons per square mile, respectively, over the same 50 year period.

Population by Shoreline Mile. Population-to-shoreline ratios shown in Table 16 indicate that the Pacific currently has the lowest ratio of all the regions. California currently has the highest ratio, and projections suggest that it will more than double from 1960 to 2010. Alaska's population-to-shoreline ratio is so low that it distorts the regional perspective. The average regional ratio will not increase as dramatically as in the Gulf of

Table 17. *Pacific Leading Counties in Population Change*

County	Population Change, 1988-2010 (1,000 Persons)	County	Percent Population Change, 1988-2010	County	Population per Square Mile, 2010
Los Angeles, CA	1,271	Kenai Peninsula, AK	65	San Francisco, CA	18,913
Orange, CA	704	Matanuska-Susitna, AK	57	Orange, CA	3,710
San Diego, CA	620	San Juan, WA	51	Los Angeles, CA	2,422
Santa Clara, CA	428	Santa Cruz, CA	50	Alameda, CA	1,998
Alameda, CA	229	Thurston, WA	47	San Mateo, CA	1,657
Ventura, CA	222	San Luis Obispo, CA	46	Honolulu, HI	1,627
Sacramento, CA	202	Anchorage, AK	45	Santa Clara, CA	1,439
Contra Costa, CA	199	Jefferson, WA	44	Multnomah, OR	1,359
King, WA	186	Mason, WA	43	Contra Costa, CA	1,320
Sonoma, CA	153	Sonoma, CA	42	Sacramento, CA	1,214
San Francisco, CA	138	Solano, CA	40	King, WA	764
Honolulu, HI	131	Mendocino, CA	39	Santa Cruz, CA	760
Solano, CA	124	Island, WA	39	San Diego, CA	710
Pierce, WA	117	Kitsap, WA	36	Kitsap, WA	627
San Mateo, CA	112	Maui, HI	35	Solano, CA	526

Mexico, Southeast, or Northeast. The very high concentration of population along the shoreline, particularly in California, reflects the desirability of shoreline property for residential housing.

"Hot Spots" of Growth. Table 17 lists the top 15 coastal counties for three categories: the counties projected to increase by the most people; the counties projected to increase at the fastest rate; and the counties projected to have the highest population density. With respect to increasing population sizes between 1988 and 2010, 12 of the counties are located in California. Not surprisingly, Los Angeles, Orange, and San Diego counties top the list, with Los Angeles County expecting an increase of 1.3 million persons. The other California counties in this ranking are part of the Southern California and San Francisco Bay metropolitan areas. King and Pierce counties, WA, and Honolulu also make this list.

Population density projections for 2010 show a similar pattern. Eleven of the leading coastal counties are in California, concentrated around San Francisco, Los Angeles, and San Diego. In 1960, almost one-half of California's total population, and almost 60 percent of the state's coastal population, were concentrated in the three southernmost counties. By 2010, 15.8 million persons will reside in these counties. Although these counties are already densely populated, significant growth is still expected into the next century. King and Kitsap counties (located around Puget Sound), Honolulu, and Multnomah (where Portland is located), are also densely populated.

The top 10 counties on the list all have population densities greater than 1,000 persons per square mile. San Francisco is the most densely populated, with over 18,900 persons per square mile. Orange County is second, with over 3,700 persons per square mile, and Los Angeles County third, with over 2,400 persons per square mile. The ranking changes dramatically in terms of percent population change during this same period. Growth of the leading counties ranges from 35-75 percent. Two of the top three counties are lo-

cated in south-central Alaska and reflect the growth anticipated out from Anchorage. Two of the top five are in Washington. As expected, the greatest growth will occur in less densely populated places, where there is more capability for expansion of a small population base (Figure 19).

Summary

Population projections are inherently imprecise and do not provide the "final picture" because of unforeseen economic or social changes. In addition, projections are much less certain as the geography becomes smaller, e.g., at the county level, and with increases in the time horizon. The summary data presented in this paper should be interpreted cautiously, but not to the extent that they diminish the existing and growing importance of coastal areas.

As coastal populations increase across the U.S., the management of this growth and its direct and indirect effects from this growth will be even more important than today. The Nation's large and growing coastal population already has indirectly resulted in significant losses of habitat and living resources, increased demands on water, energy, and waste treatment and disposal, and diminished environmental quality in many areas. Although population increases are an indicator of economic development, the concomitant side-effects of this growth create new environmental challenges to both public and private interests.

Acknowledgements

We would like to thank Charles N. Ehler, Director, Office of Oceanography and Marine Assessment, and Daniel J. Basta, Chief, Strategic Assessment Branch, for their guidance and support of this report and the coastal trends series. Kevin D. McMahon and Mitchell J. Katz provided editorial support. The Bureau of the Census provided all pre-1990 population data.

References

Bureau of Economic Analysis. 1986a. *County-level projections of economic activity and population: Alabama, 1990-2035.* Washington, DC: U.S. Department of Commerce. Prepared as part of interagency agreements with the U.S. Army Corps of Engineers and the Tennessee Valley Authority. 153 p.

Bureau of Economic Analysis. 1986b. *County-level projections of economic activity and population: Florida, 1990-2035.* Washington, DC: U.S. Department of Commerce. Prepared as part of interagency agreements with the U.S. Army Corps of Engineers and the Tennessee Valley Authority. 153 p.

Bureau of Economic Analysis. 1986c. *County-level projections of economic activity and population: Georgia, 1990-2035.* Washington, DC: U.S. Department of Commerce. Prepared as part of interagency agreements with the U.S. Army Corps of Engineers and the Tennessee Valley Authority. 337 p.

Bureau of Economic Analysis. 1986d. *County-level projections of economic activity and population: Mississippi, 1990-2035.* Washington, DC: U.S. Department of Commerce. Prepared as part of interagency agreements with the U.S. Army Corps of Engineers and the Tennessee Valley Authority. 183 p.

Bureau of Economic Analysis. 1986e. *County-level projections of economic activity and population: North Carolina, 1990-2035.* Washington, DC: U.S. Department of Commerce. Prepared as part of interagency agreements with the U.S. Army Corps of Engineers and the Tennessee Valley Authority. 218 p.

Bureau of Economic Analysis. 1986f. *County-level projections of economic activity and population: South Carolina, 1990-2035.* Washington, DC: U.S. Department of Commerce. Prepared as part of interagency agreements with the U.S. Army Corps of Engineers and the Tennessee Valley Authority. 108 p.

Bureau of Economic Analysis. 1986g. *County-level projections of economic activity and population: Virginia, 1990-2035.* Washington, DC: U.S. Department of Commerce. Prepared as part of interagency agreements with the U.S. Army Corps of Engineers and the Tennessee Valley Authority. 291 p.

Bureau of the Census. 1988. *County and city data book, 1988.* U.S. Department of Commerce. Washington, DC: U.S. Government Printing Office. 797 p. + appendices.

Bureau of the Census. 1989a. *Current population reports, population estimates and projections. Series p-26, No. 88-a. County population estimates: July 1, 1988, 1987, and 1986.* U.S. Department of Commerce. Washington, DC: U.S. Government Printing Office. 45 p.

Bureau of the Census. 1989. *Statistical abstract of the United States, 1989.* U.S. Department of Commerce. Washington, DC: U.S. Government Printing Office. 956 p.

Edwards, S. F. 1989. Estimates of future demographic changes in the coastal zone. *Coastal Management.* 17(3): 229-240.

GESAMP (Group of Experts on the Scientific Aspects of Marine Pollution). 1990. *The state of the marine environment.* UNEP Regional Seas Reports and Studies No. 115. Nairobi, Kenya: United Nations Environment Programme. 111p.

Lewis, J. 1989. Trouble in paradise. *EPA Journal.* 15(5): 3-7.

National Oceanic and Atmospheric Administration. 1975. *The coastlines of the United States.* US Department of Commerce. Washington, DC: US Government Printing Office. 2 p.

National Planning Association Data Services, Inc. 1988. *Key indicators of county growth 1970-2010* (data base). Washington, DC: National Planning Association Data Services, Inc.

New York Water Pollution Control Association, Inc. 1989. Who's minding the shore? *Clearwaters* 19(3): 6-9.

O'Connor, Thomas P. and Charles N. Ehler. 1990. Results from the NOAA National Status and Trends Program on distributions and effects of chemical contamination in the coastal and estuarine United States. *Environmental Monitoring and Assessment.* (in press).

Slater Hall Information Products, Inc. 1987. *County statistics* (data base). Washington, DC: Slater Hall Information Products, Inc.

Slater Hall Information Products, Inc. 1988. *Population statistics* (data base). Washington, DC: Slater Hall Information Products, Inc.

Terleckyj, N.E. and C.D. Coleman. 1989. Data and methods. In: *Regional economic growth in the United States: Projections for 1989-2010, summary volume I.* Washington, DC: National Planning Association Data Services, Inc.

West, N. 1987. Population changes in coastal jurisdictions with barrier beaches: 1960-1980. In: *Cities on the beach: Management issues of developed coastal barriers,* R. H. Platt, S. G. Pelczarski, and B. K. R. Burbank (eds.). Department of Geography Research Paper No. 224. Chicago, IL: University of Chicago Press. pp. 55-63.

Wetrogan, S. I. 1988. *Current population reports, population estimates and projections. Series p-25, No. 1017. Projections of population of states, by age, sex, and race: 1988 to 2000.* Bureau of the Census, U.S. Department of Commerce. Washington, DC: U.S. Government Printing Office. 124 p.

Woods and Poole Economics, Inc. 1987. *CEDDS 1987. The complete economic and demographic data source (vols. 1-3).* Washington, DC: Woods and Poole Economics, Inc. 1,447 p.

Personal Communication

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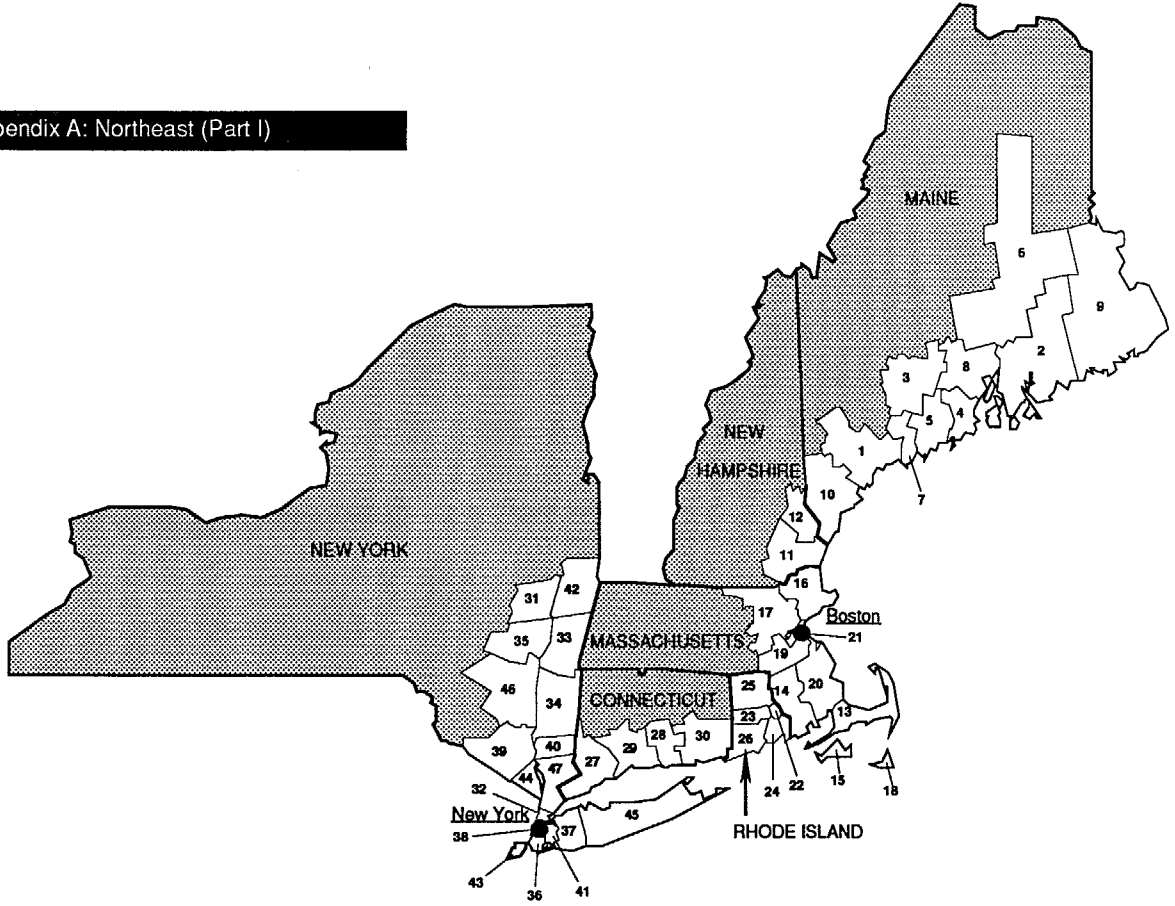
Appendix A: Northeast (Part I)



Coastal Counties

Maine

1 Cumberland
2 Hancock
3 Kennebec
4 Knox
5 Lincoln
6 Penobscot
7 Sagadahoc
8 Waldo
9 Washington
10 York

New Hampshire

11 Rockingham
12 Strafford

Massachusetts

13 Barnstable
14 Bristol
15 Dukes
16 Essex
17 Middlesex
18 Nantucket
19 Norfolk
20 Plymouth
21 Suffolk

Rhode Island

22 Bristol
23 Kent
24 Newport
25 Providence
26 Washington

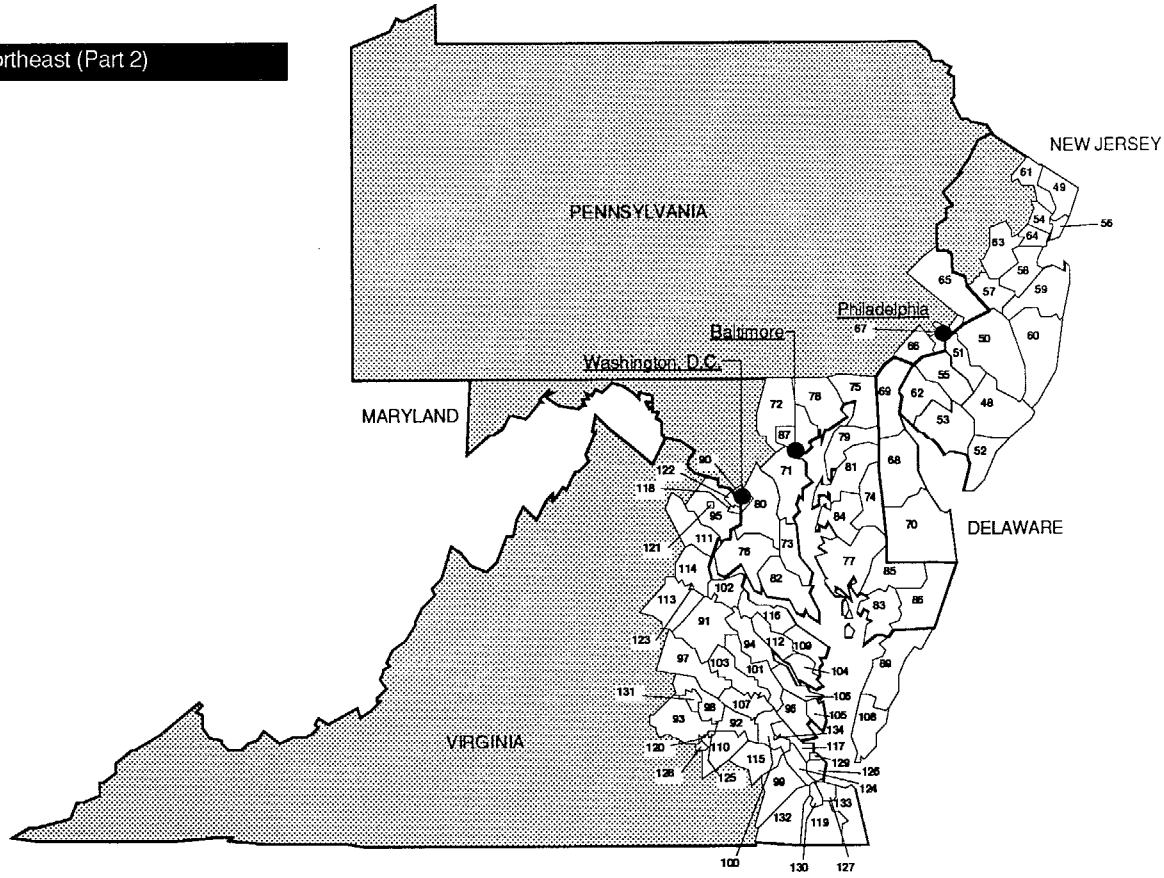
Conneticut

27 Fairfield
28 Middlesex
29 New Haven
30 New London

New York

31 Albany
32 Bronx
33 Columbia
34 Dutchess
35 Greene
36 Kings
37 Nassau
38 New York
39 Orange
40 Putnam
41 Queens
42 Rensselaer
43 Richmond
44 Rockland
45 Suffolk
46 Ulster
47 Westchester

Appendix A: Northeast (Part 2)



Coastal Counties

New Jersey

48 Atlantic
49 Bergen
50 Burlington
51 Camden
52 Cape May
53 Cumberland
54 Essex
55 Gloucester
56 Hudson
57 Mercer
58 Middlesex
59 Monmouth
60 Ocean
61 Passaic
62 Salem
63 Somerset
64 Union

Pennsylvania

65 Bucks
66 Delaware
67 Philadelphia

Delaware

68 Kent
69 New Castle
70 Sussex

Maryland

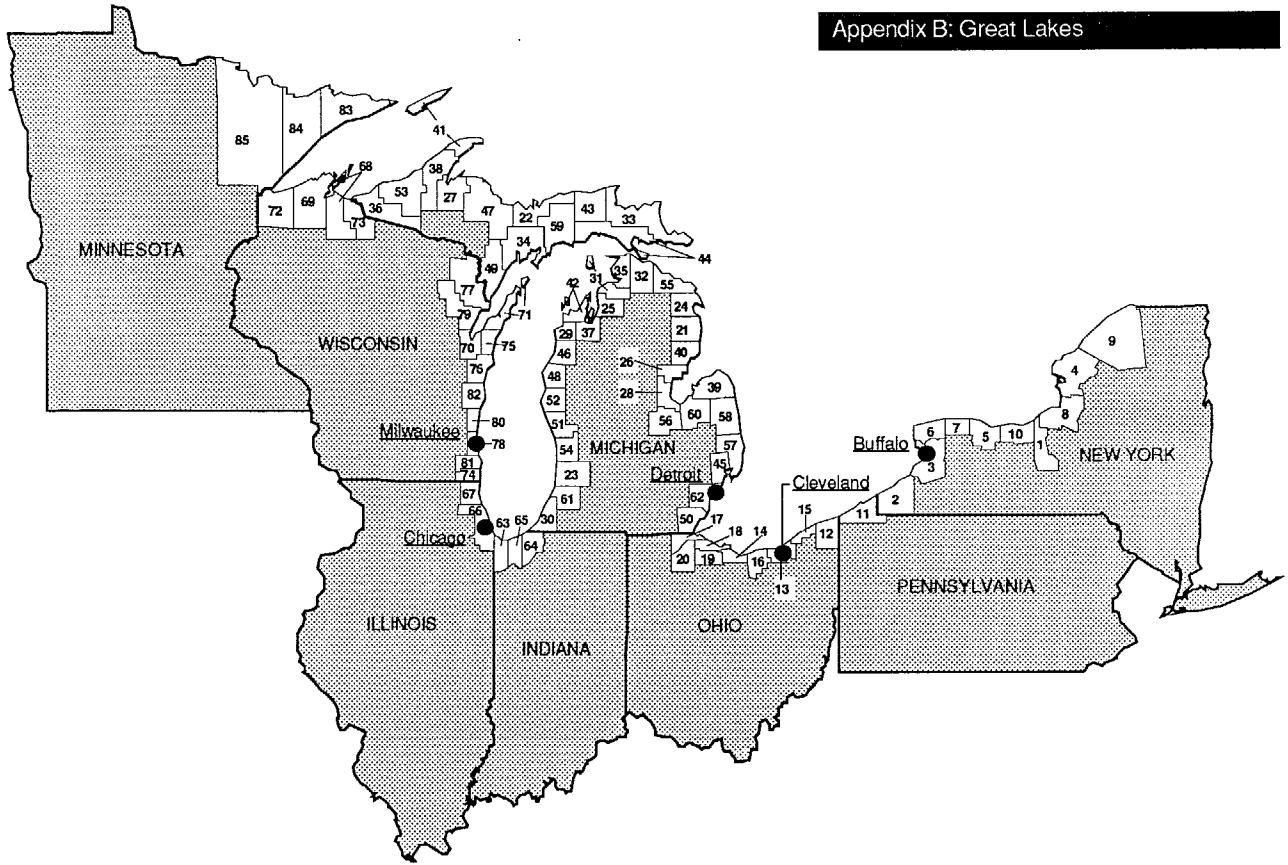
71 Anne Arundel
72 Baltimore
73 Calvert
74 Caroline
75 Cecil
76 Charles
77 Dorchester
78 Harford
79 Kent
80 Prince George's
81 Queen Anne's
82 St. Mary's
83 Somerset
84 Talbot
85 Wicomico
86 Worcester
87 Baltimore City

88 *District of Columbia*

Virginia

89 Accomack
90 Arlington
91 Caroline
92 Charles City
93 Chesterfield
94 Essex
95 Fairfax
96 Gloucester
97 Hanover
98 Henrico
99 Isle of Wight
100 James City
101 King and Queen
102 King George
103 King William
104 Lancaster
105 Mathews
106 Middlesex
107 New Kent
108 Northampton
109 Northumberland
110 Prince George
111 Prince William
112 Richmond
113 Spotsylvania
114 Stafford
115 Surry
116 Westmoreland
117 York
118 Alexandria
119 Chesapeake
120 Colonial Heights
121 Fairfax
122 Falls Church
123 Fredericksburg
124 Hampton
125 Hopewell
126 Newport News
127 Norfolk
128 Petersburg
129 Poquoson
130 Portsmouth
131 Richmond
132 Suffolk
133 Virginia Beach
134 Williamsburg

Appendix B: Great Lakes



Coastal Counties

New York

1 Cayuga
2 Chautauqua
3 Erie
4 Jefferson
5 Monroe
6 Niagara
7 Orleans
8 Oswego
9 St. Lawrence
10 Wayne

Pennsylvania

11 Erie

Ohio

12 Ashtabula
13 Cuyahoga
14 Erie
15 Lake
16 Lorain
17 Lucas
18 Ottawa
19 Sandusky
20 Wood

Michigan

21 Alcona
22 Alger
23 Allegan
24 Alpena
25 Antrim
26 Arenac
27 Baraga
28 Bay
29 Benzie
30 Berrien
31 Charlevoix
32 Cheboygan
33 Chippewa
34 Delta
35 Emmet
36 Gogebic
37 Grand Traverse
38 Houghton
39 Huron
40 Iosco
41 Keweenaw
42 Leelanau
43 Luce
44 Mackinac
45 Macomb
46 Manistee
47 Marquette
48 Mason
49 Menominee
50 Monroe
51 Muskegon
52 Oceana
53 Ontonagon
54 Ottawa
55 Presque Isle
56 Saginaw
57 St. Clair
58 Sanilac
59 Schoolcraft
60 Tuscola
61 Van Buren
62 Wayne

Indiana

63 Lake
64 La Porte
65 Porter

Illinois

66 Cook
67 Lake

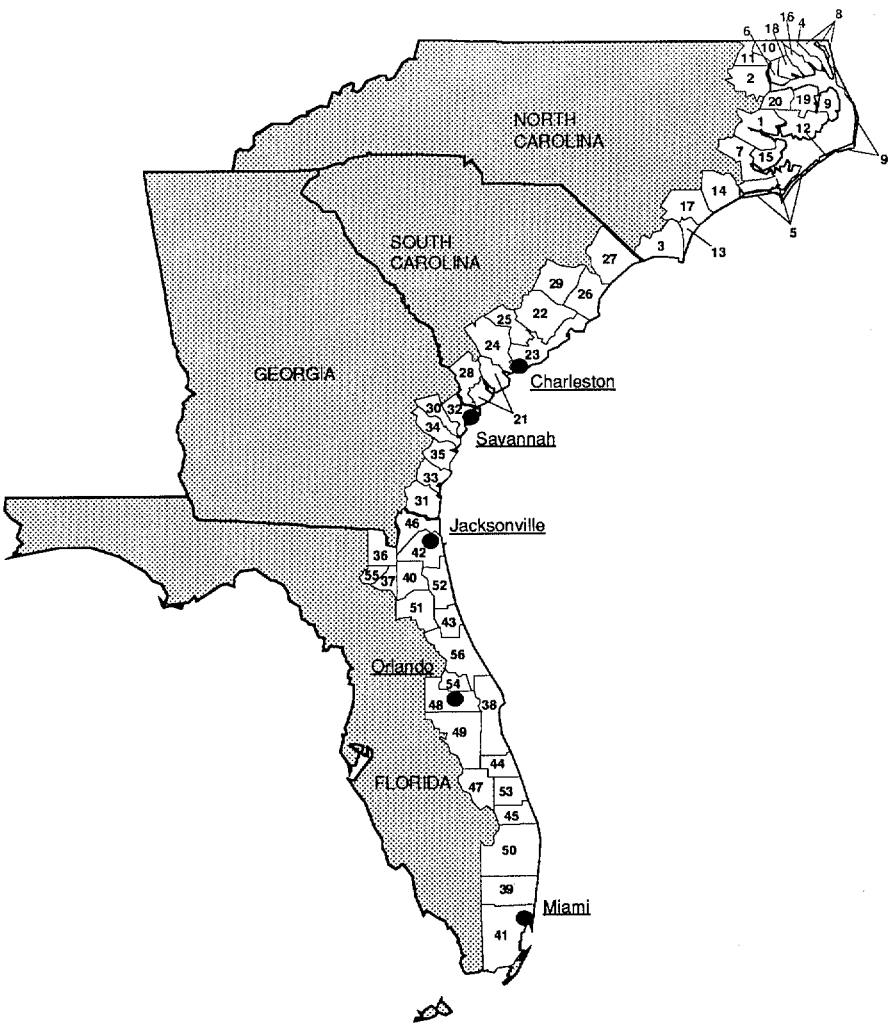
Wisconsin

68 Ashland
69 Bayfield
70 Brown
71 Door
72 Douglas
73 Iron
74 Kenosha
75 Kewaunee
76 Manitowoc
77 Marinette
78 Milwaukee
79 Oconto
80 Ozaukee
81 Racine
82 Sheboygan

Minnesota

83 Cook
84 Lake
85 St. Louis

Appendix C: Southeast



Coastal Counties

North Carolina

1 Beaufort
2 Bertie
3 Brunswick
4 Camden
5 Carteret
6 Chowan
7 Craven
8 Currituck
9 Dare
10 Gates
11 Hertford
12 Hyde
13 New Hanover
14 Onslow
15 Pamlico
16 Pasquotank
17 Pender
18 Perquimans
19 Tyrrell
20 Washington

South Carolina

21 Beaufort
22 Berkeley
23 Charleston
24 Colleton
25 Dorchester
26 Georgetown
27 Horry
28 Jasper
29 Williamsburg

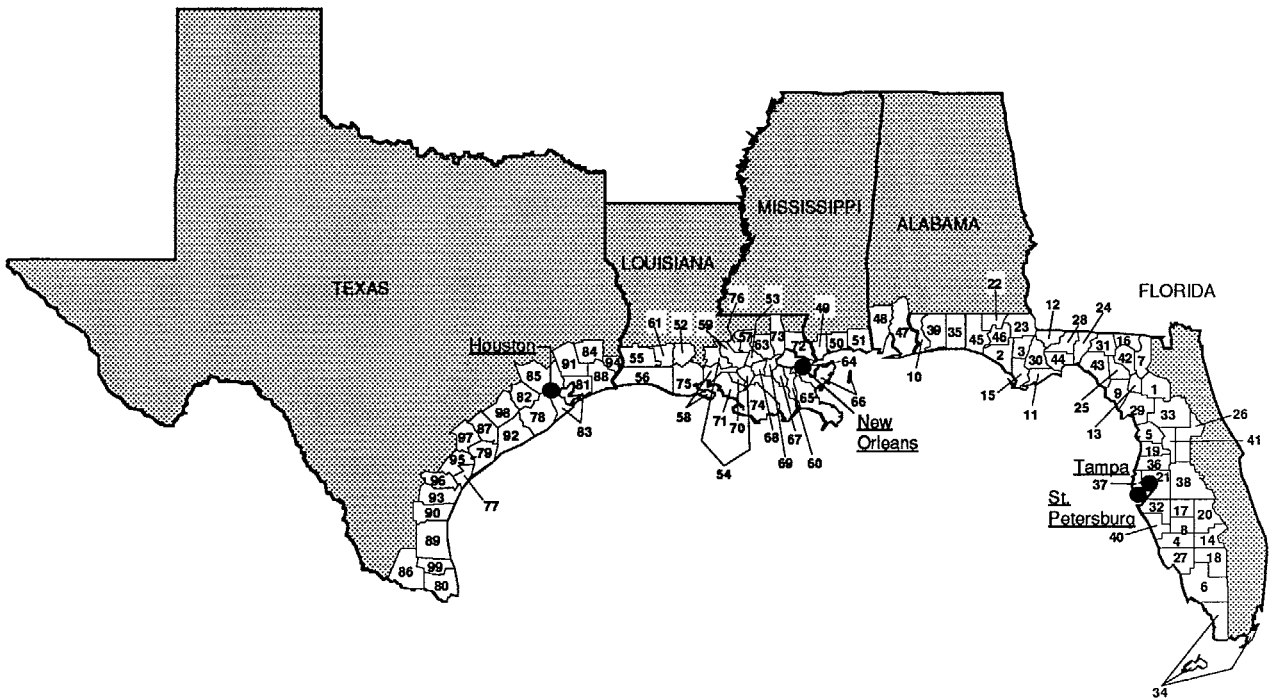
Georgia

30 Bryan
31 Camden
32 Chatham
33 Glynn
34 Liberty
35 McIntosh

Florida

36 Baker
37 Bradford
38 Brevard
39 Broward
40 Clay
41 Dade
42 Duval
43 Flagler
44 Indian River
45 Martin
46 Nassau
47 Okeechobee
48 Orange
49 Osceola
50 Palm Beach
51 Putnam
52 St. Johns
53 St. Lucie
54 Seminole
55 Union
56 Volusia

Appendix D: Gulf of Mexico



Coastal Counties

Florida

1 Alachua
2 Bay
3 Calhoun
4 Charlotte
5 Citrus
6 Collier
7 Columbia
8 De Soto
9 Dixie
10 Escambia
11 Franklin
12 Gadsden
13 Gilchrist
14 Glades
15 Gulf
16 Hamilton
17 Hardee
18 Hendry
19 Hernando
20 Highlands
21 Hillsborough
22 Holmes
23 Jackson
24 Jefferson
25 Lafayette
26 Lake
27 Lee
28 Leon
29 Levy
30 Liberty
31 Madison
32 Manatee
33 Marion
34 Monroe
35 Okaloosa
36 Pasco
37 Pinellas
38 Polk
39 Santa Rosa
40 Sarasota
41 Sumter
42 Suwannee
43 Taylor
44 Wakulla
45 Walton
46 Washington

Alabama

47 Baldwin
48 Mobile

Mississippi

49 Hancock
50 Harrison
51 Jackson

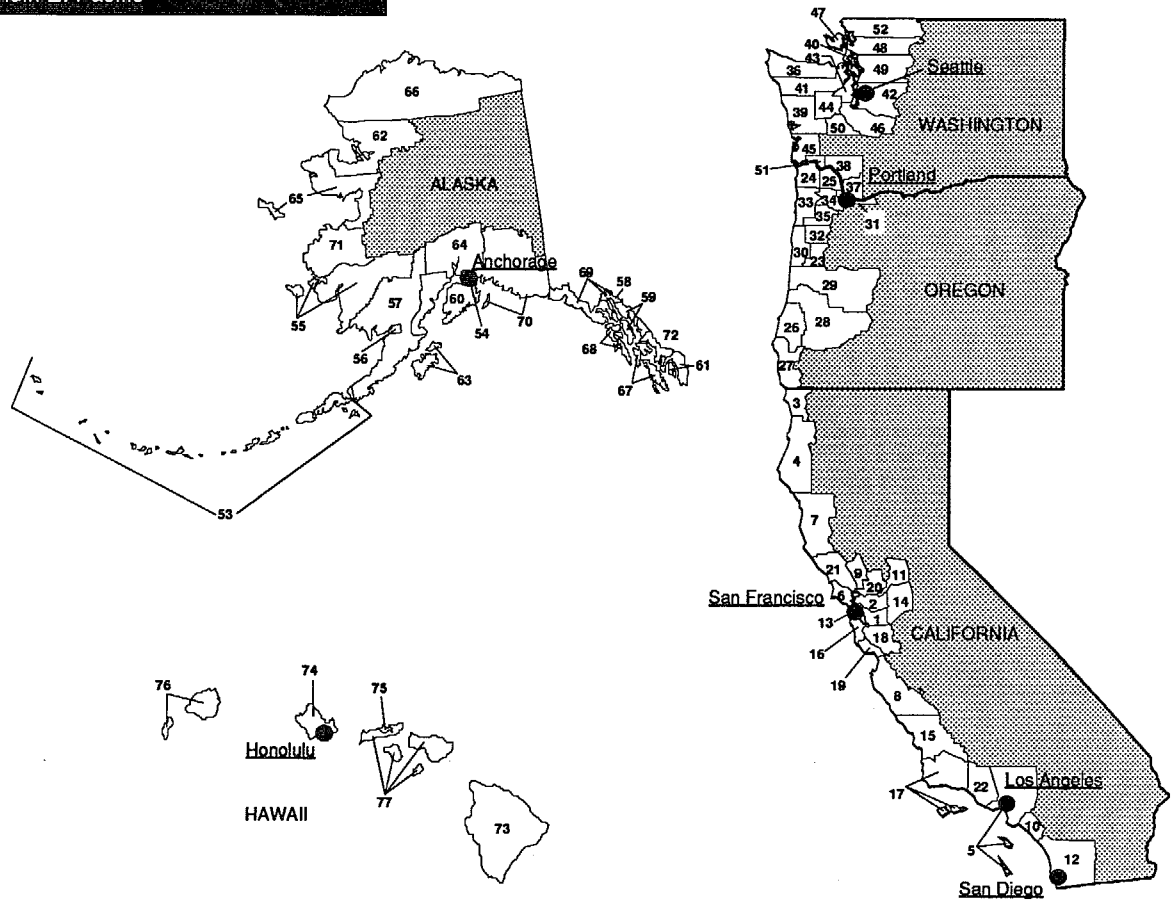
Louisiana

52 Acadia
53 Ascension
54 Assumption
55 Calcasieu
56 Cameron
57 East Baton Rouge
58 Iberia
59 Iberville
60 Jefferson
61 Jefferson Davis
62 Lafourche
63 Livingston
64 Orleans
65 Plaquemines
66 St. Bernard
67 St. Charles
68 St. James
69 St. John the Baptist
70 St. Martin
71 St. Mary
72 St. Tammany
73 Tangipahoa
74 Terrebonne
75 Vermilion
76 West Baton Rouge

Texas

77 Aransas
78 Brazoria
79 Calhoun
80 Cameron
81 Chambers
82 Fort Bend
83 Galveston
84 Hardin
85 Harris
86 Hidalgo
87 Jackson
88 Jefferson
89 Kenedy
90 Kleberg
91 Liberty
92 Matagorda
93 Nueces
94 Orange
95 Refugio
96 San Patricio
97 Victoria
98 Wharton
99 Willacy

Appendix E: Pacific



Coastal Counties

California

1 Alameda
2 Contra Costa
3 Del Norte
4 Humboldt
5 Los Angeles
6 Marin
7 Mendocino
8 Monterey
9 Napa
10 Orange
11 Sacramento
12 San Diego
13 San Francisco
14 San Joaquin
15 San Luis Obispo
16 San Mateo
17 Santa Barbara
18 Santa Clara
19 Santa Cruz
20 Solano
21 Sonoma
22 Ventura

Oregon

23 Benton
24 Clatsop
25 Columbia
26 Coos
27 Curry
28 Douglas
29 Lane
30 Lincoln
31 Multnomah
32 Polk
33 Tillamook
34 Washington
35 Yamhill

Washington

36 Clallam
37 Clark
38 Cowlitz
39 Grays Harbor
40 Island
41 Jefferson
42 King
43 Kitsap
44 Mason
45 Pacific
46 Pierce
47 San Juan
48 Skagit
49 Snohomish
50 Thurston
51 Wahkiakum
52 Whatcom

Alaska

53 Aleutian Islands
54 Anchorage
55 Bethel
56 Bristol Bay
57 Dillingham
58 Haines
59 Juneau
60 Kenai Peninsula
61 Ketchikan Gateway
62 Kobuk
63 Kodiak Island
64 Matanuska-Susitna
65 Nome
66 North Slope
67 Prince of Wales-Outer Ketchikan
68 Sitka
69 Skagway-Yakutat-Angoon
70 Valdez-Cordova
71 Wade Hampton
72 Wrangell-Petersburg

Hawaii

73 Hawaii
74 Honolulu
75 Kalawao
76 Kauai
77 Maui

DATE DUE

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