Rhode Island Land Use Trends and Analysis (Including Land Use Surveys for the Period 1970-1995)

Technical Paper 149

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ABSTRACT

TITLE:	*Rhode Island Land Use Trends and Analysis (Including Land Use Surveys for the Period 1970-1995)*
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ABSTRACT:	This technical paper examines and analyzes demographic, economic, and land use development patterns in Rhode Island.

PREFACE

The Statewide Planning Program is preparing an update of State Guide Plan Element 121, *Land Use 2010: State Land Use Policies and Plan*, published 1989. This technical paper is intended to be a source for the updated land use plan. It is a companion piece to Technical Paper 146, *Land Use Trends in Rhode Island 1961 - 1988*, published July 1998 and Technical Paper 147, *An Analysis of Rhode Island Land Use*, published July 1999.

Many different sources were used in gathering the data for this report. Some sources, such as the U.S. Bureau of the Census, have detailed data reaching back to the origin of Rhode Island as a State. Other sources only had reliable data reaching back a decade. Rather than be constrained by the weakest link in the data chain, we chose to report whatever we could reasonably obtain and have confidence in. We note in the text those areas where data had to be extrapolated or estimated. We should note that some of the population data from the 1990 census has been questioned for undercounting inner-city residents. While this may be so, it is the best that is currently available. We would appreciate any corrections, comments, or other thoughts that you may have. Messages can be forwarded to knelson@state.ri.us or mailed to the address listed on the cover.

This report was prepared by Kevin J. Nelson, Principal Planner. Supervision and direction was given by Grace J. Beiser, Supervising Planner, and John P. O'Brien, Chief Statewide Planning. The final word processing was completed by Kim A. Gelfuso.

SUMMARY OF FINDINGS

Rhode Island's land use patterns have changed as the societies that created them have changed.

In our previous report analyzing Rhode Island land use trends (*Technical Paper Number 146: Land Use Trends in Rhode Island 1961-1988*), we reported twelve important growth and development trends. Our analysis of the 1995 land use data reinforces our findings for each of these trends.

In other words, a comparison of observable land use patterns in the 25 year period of 1970 to 1995 does not alter the direction of any of the trends observed in the period from 1961 to 1988. The only change is one of degree, reflected in the wording of Trend 3: from 1970 to 1995 developed land in the state increased nine time faster than population, whereas for the earlier time period development increased eight times faster than population.

This paper finds that from 1970 to 1995 the following trends relating to land use and development have taken place in Rhode Island:

- Population has increased at a slow rate but the rate of household formation has increased much faster.
- Rhode Island has become more developed.
- Development has increased nine times faster than population.
- The largest source of development is residential land use.
- Population has migrated toward the rural parts of the state.
- Employment centers have expanded away from central cities.
- Industrial land use has increased and moved farther into the suburbs.
- The most visible source of development has been commercial land use.
- The amount of land dedicated to transportation has increased.
- Agricultural use of land has been in long-term decline.
- Protection of undeveloped land has increased.
- The state is increasing urban and there is a qualitative difference between the traditional central cities and the newly urbanized suburbs.

Rhode Island's population growth rate was moderate from the beginning of the 20th century through 1970. From 1970 to the present, the growth rate overall has been almost flat. Despite this, development of land has been high. The major categories of developed land use – residential, commercial, industrial – have each increased at a much faster rate than population.

Residential building permit data indicate a slowing of the pace of residential construction since 1988. Residential uses are the chief component of developed land in the state. Whether this building permit trend will continue and eventually be reflected in a leveling off in the consumption of land per person remains to be seen.

The findings in this paper have significant implications for the future of Rhode Island. The data and narrative accompanying each finding provide a starting point as the state, its 39 communities, and our citizenry begin the task of preparing a state land use plan for 2020.

PART 1: INTRODUCTION

A full understanding of our development patterns is vital to promoting long-range plans that preserve and enhance Rhode Island's environment, economy, and quality of life. The purpose of this paper is to provide a basis for updating the state's 1989 land use plan. It joins Statewide Planning's two previous publications *Technical Paper Number 146: Land Use Trends in Rhode Island 1961-1988* and *Technical Paper Number 147: An Analysis of Rhode Island Land Use*. In many respects this paper simply updates the *Analysis of Rhode Island Land Use* by including additional land use data (1989 through 1995) that was not available at the time of publication. Accordingly, the first three sections of this report (Introduction, Historical Overview, and Definitions) are almost identical to the *Analysis of Rhode Island Land Use* paper.

This report is intended to present information related to statewide development trends such as residential population shifts, economic and employment patterns, preservation of open space, and transportation patterns. The analysis concentrates on trends over time. Due to inconsistencies in the availability of historical data, some trends can be examined over a much greater time period than other trends.

Land is a limited natural resource and this paper seeks to identify the intended and unintended choices that Rhode Island is making in committing this limited resource to certain uses. There will be no attempt to evaluate the appropriateness of those choices in this report. The state land use plan is the proper forum for making value judgments as to whether those choices are wise.

PART 2: BRIEF HISTORICAL OVERVIEW

Almost from its inception, Rhode Island has been characterized by comparatively dense development. By 1774, Rhode Island was the most densely populated of the colonies. Two hundred and seventeen years later, the U.S. Bureau of the Census ranked Rhode Island as the second most densely populated state in the nation. Although our density ranking has changed only slightly, our total population has changed dramatically. There is an important qualitative difference between 65 persons per square mile (1790 census) and the 1990 census count of nearly 950 persons per square mile.

Rhode Island is considered the birthplace of the American Industrial Revolution. The industrial age led to increasing material wealth among a growing middle class. It also led to crowded and heavily polluted urban areas. The antecedent to what is now known as the suburbs dates back to the 1800's. Urban residents wanted better living conditions and had sufficient affluence to afford purchases beyond the basic necessities. As transportation systems improved, people could move to the outer fringe of the urban area and still commute to work. The "streetcar suburbs" exemplified this pattern as houses were built along streetcar routes with the intent of living as far away from the urban core as was possible. When affordable assembly-line produced automobiles were added to this mix, the limitation of having to locate near a transit line was removed and a new development pattern, regarded as a better solution to the urban problem, was born.

By the 1930's, Rhode Island's urban population had essentially stagnated, and by the 1940's, people began a net emigration from polluted and crowded cities for a more pleasant life in suburbia. In recent years the quality of life that drew people to suburbs has changed to the point where in 1989 the Providence Sunday Journal Magazine ran a feature article entitled, *How the American Dream Turned into Suburban Nightmare!*[1]. The article began with the warning, "Warwick has become synonymous with uncontrolled growth. Other communities had better look out – the same pressures that transformed Warwick are headed your way." Apparently they arrived. Nine years later, the Providence Journal ran another major article entitled, "*Sprawling all over Rhode Island*"[2]. Less than one year later, the Journal's headline read, "*Sprawl brawl: Suburban R.I. is ground zero in the battle over managing growth"*[3] The "battle" was captured nicely in a description of Richmond:

> "Farm fields gave way to lawns and driveways, quiet country lanes started to buzz with traffic, and tax bills rose to pay for new teachers and classrooms for all the new children.
>
> At first bewildered by their sudden popularity, many of these towns are now beginning to say, Enough is enough. In just the past few years they have enacted tough – critics would say draconian – limits on growth."

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[1] Peter Lord, Sunday Journal Magazine, July 30, 1989.

[2] Peter Lord, Providence Sunday Journal, February 22, 1998.

[3] Ariel Sabar, Providence Sunday Journal, December 12, 1999.

Rhode Island is faced with significant land use related challenges. Development patterns over the past fifty to sixty years have been characterized by diffuse residential construction, declining forests and farmland, automobile centered transportation systems, commercial strips and malls, and other land use patterns that are commonly described as development sprawl. These patterns of low-density scattered development, while beneficial in many respects, have also exacted unintended social, environmental, and economic costs. Degraded water resources, air pollution, diminished biodiversity, congested roadways, and increased infrastructure costs are all linked to poorly planned development.

A striking perspective illustrating the extent of this development was noted in *The Costs of Suburban Sprawl and Urban Decay in Rhode Island*:[4]

> Rhode Island developed more residential, commercial, and industrial land in the last 34 years than in its first 325 years. Only 65,000 acres of residential, commercial, and industrial land was developed between 1636 and 1961, but 1½ times that amount—96,000 acres—was developed between 1961 and 1995.

Sprawl is the catch-all term that is commonly used to describe the negative effects of low-density, scattered development. To paraphrase Justice Stuart, we may find it difficult to define sprawl, but we know it when we see it. As a weed is just a plant that is growing where we don't want it, perhaps we can consider sprawl as growth where we don't want it. Sprawl typically encompasses environmental degradation, excessive demands on infrastructure capacity, and a loss of the character that defines a particular community's quality of life.

Landmark legislation, the *Rhode Island Comprehensive Planning and Land Use Regulation Act of 1988*, established a process to promote orderly growth and development that recognizes the natural characteristics of the land, its suitability for various uses, and the availability of existing or proposed public and/or private services and facilities. All of Rhode Island's cities and towns have adopted Comprehensive Plans establishing goals for each individual community.

More recently, on February 17, 2000, Governor Lincoln Almond issued Executive Order 00-2, titled Creation of the Growth Planning Council. The council was established to examine Rhode Island's current development patterns and recommend ways of encouraging growth in "economically and environmentally sound locations." The executive order begins by stating a crucial truism, "WHEREAS, the quality of life of the citizens of Rhode Island is inextricably linked to a balance of social, economic, and environmental values;" It also notes that:

- Our ability to attract businesses and employees to our State is interdependent with our efforts to preserve our environmental, cultural, and historic resources;
- Local communities must plan for both an adequate tax base and preservation of environmental resources; and

[4] Grow Smart Rhode Island, *The Costs of Suburban Sprawl and Urban Decay in Rhode Island*, December 1999. Prepared by H.C. Planning Consultants, Inc. and Planimetrics, LLP.

- Public investments to reuse, revitalize, or enhance existing infrastructure and resources can promote the preservation of natural resources as part of a long-term economic strategy.

> "In a headlong rush to spread ourselves diffusely across the land we never paused sufficiently to contemplate the implications such patterns would have for our landscape or for our lives."
> *~ A Greener Path...Greenspace and Greenways for RI's Future*

At the heart of the issue is the quintessential American dream; to live in a single-family home of ones' own. Strongly associated with well-being, open space increases property values and is frequently a prime factor in business location decisions. However, as spreading development adds to the desire for additional open space, it decreases the total amount of open space available. It seems ironic that the quest for improved quality of life is one of the biggest threats to it.

Someone recently suggested that the concept of the American dream be broadened and coined the term the "double dream." This encompasses the desire to live in the ideal home and adds the notion that the ideal home be located within the ideal community. Individuals can create the ideal home but only collectively can we create the ideal community.

Evaluations of land use is at times personal and subjective. While aware of the importance of personal values in shaping land use policy, this paper places its primary focus on objective data. The following pages present the data and identify major trends that have emerged from the state's major land use surveys of 1970, 1988, and 1995.

PART 3: DEFINITIONS

Traditionally, land use has been characterized as either urban or rural. However, the definitions of "urban" and "rural" are not necessarily consistent between agencies and time periods. Prior to 1950, the U.S. Census Bureau defined urban as *incorporated* places of 2,500 or more persons. With the 1950 census, the Bureau expanded the definition to include *unincorporated* places of 2,500 or more persons.

There is an additional problem, the Bureau of the Census definition of urban is designed for large states that are characterized by population centers surrounded by hinterlands. Since the total area of Rhode Island is only equivalent to a typical county in most other states, a statistical anomaly occurs. The Census Bureau classified 86% of the Rhode Island population as residing in urban areas (1990). This may be a useful statistic when comparing Rhode Island to other states but it can be very misleading when comparing intermunicipal population trends within the state. For example, the Census Bureau ranks Cumberland, Middletown, and Warren as being 80 to 90 percent urban, just below communities like Central Falls, Pawtucket, and Providence. These seemingly misidentified categorizations are based on factors relating to population densities, incorporation status, and other parameters nestled within the Census' definition of Urban Areas. For the Bureau of the Census, the percentage of a community defined as urban or rural is not defined by, nor does it define, the geography of the land. Communities defined as being predominantly urban may actually contain urban centers with densely populated areas surrounding the core, and still maintain the majority of land in rural uses.

In 1998, the Rhode Island Public Expenditure Council published a report proposing an urban strategy for the state[5]. In seeking a more appropriate characterization of urban, the Urban Strategy Project's first step was to define "What is 'urban' in Rhode Island?" Six indicators were selected. Communities had to meet three of the indicators:

1. *Urban Land Uses* - More than 45% of the land area is classified as an urban land use (see definition of developed land).
2. *Population Density* - The municipality contains 2,000 or more persons per square mile.
3. *Economic Activity* - The ratio of jobs to residents exceed the state average (i.e. the municipality is an employment center).
4. *Mixed Housing Types* - The percentage of multifamily housing units exceeds the state average of 42.4%.
5. *Ethnic Diversity* - The percentage of the 1990 non-white population equals or exceeds the state average of 8.6%.
6. *Population Stability* - Population growth that is less than the state average (5.9%) during the last census decade.

While this was a very useful exercise, the six *indicators* should not be viewed as a true *definition*. For example, population stability (or instability) is not inherently connected to the urban or non-urban character of a community.

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[5] Rhode Island Public Expenditure Council, *Strengthening Cities: A Report of the Urban Strategy Project,* January 1998

Many land use terms are matters of degree and interpretation. In the post World War II period, the division between urban and rural became a division between urban, suburban, and rural. Some analysts have added the category of "exurban". It has become difficult to discern where one ends and another begins. Ideally, political boundaries should not be a factor in this determination. Practically, we cannot ignore municipal borders in our designations. So, in order to provide a relatively objective definition that emphasizes population patterns and land uses, we will use the following definitions:

Urban: A municipality with a population density of 2,500 or more persons per square mile *and* 50% or more of the land area within the municipality is classified as developed land (see definition of developed land, below). Based on the 1990 census and the State's 1988 land use survey, ten communities are considered urban. (Interestingly, the Urban Strategy Project's urban indicators criteria resulted in the same ten municipalities being designated as urban.)

They are:

Central Falls	North Providence	Warwick
Cranston	Pawtucket	West Warwick
East Providence	Providence	Woonsocket
Newport		

If the preceding ten municipalities are classified as urban then it follows that Rhode Island's other twenty-nine municipalities are non-urban. These non-urban communities can be subdivided into suburban and rural.

Suburban: A municipality with a population density of 500 to 2,499 persons per square mile *and* 25% or more of the land area is classified as developed. Based on this standard, fourteen communities are considered suburban.

They are:

Barrington	Johnston	Portsmouth
Bristol	Lincoln	Smithfield
Cumberland	Middletown	Warren
East Greenwich	Narragansett	Westerly
Jamestown	North Kingstown	

Rural: A municipality with a population density of less than 500 persons per square mile *or* a developed land area of less than 25%. Based on this standard, fifteen communities are considered rural.

They are:

Burrillville	Glocester	Richmond
Charlestown	Hopkinton	Scituate
Coventry	Little Compton	South Kingstown
Exeter	New Shoreham	Tiverton
Foster	North Smithfield	West Greenwich

Insert map 1

Agricultural Land: Agricultural land includes tillable cropland, pasture, orchards, turf farms, and nurseries. It is important to note that since the classification of land use and land cover in RIGIS uses photo interpretation rather than ground surveys, errors will inevitably occur. See Part 4: Accuracy of Data for further details.

Community Type: For purposes of analysis, several charts presented in this report divide communities into Older Central Cities (Central Falls, Newport, Pawtucket, Providence, and Woonsocket), New Urban communities (Cranston, East Providence, North Providence, Warwick, and West Warwick), Established Suburbs (see "Suburban" in definition above), and Rural (see "Rural" in definition above).

Developed Land: Rhode Island uses a modified version of Anderson's Level II land classification system. Developed land use categories consist of residential, commercial, industrial, infrastructure (e.g. highways, airports, water and sewerage facilities, etc.), developed recreation, institutions such as colleges and hospitals, cemeteries, quarries, waste disposal areas, and vacant land located in urban areas.

Greenspace: Land and water permanently protected from development.

Open Space: Land and water that is currently undeveloped or is developed for certain recreational uses such as golf courses, but has no permanent protection from future development.

Spatial Zone: A descriptive framework in which Rhode Island's municipalities are geographically categorized according to roughly concentric zones from a major urban nucleus. The spatial zones used in this report are: Older Central Cities, Inner Ring, Outer Ring, Western, and Coastal.

Sprawl: A land use pattern characterized by low-density development, usually consisting of single-family homes on large lots; strip commercial development; and scattered development where residential, commercial, and retail developments are not integrated or close together.

Total State Area: The Rhode Island Geographic Information System calculates the state's total area as 691,212 acres (1995). The U.S. Census Bureau calculates a smaller figure, 650,016 acres, by excluding certain inland water bodies.

PART 4: ACCURACY OF DATA

Before making conclusions about land use trends, it is important to note limitations of the data.

A caveat must be made regarding the photo interpretation technique used in the land use surveys. Some of the apparent changes in land use from one survey to another can be explained by human error in the process of panchromatic photo interpretation. Photo interpreters cannot be 100 percent correct. For example, in the 1970 survey, discerning whether a particular cluster of buildings is light industrial or commercial using only an aerial photo required an educated guess. (The 1988 and 1995 surveys tried to minimize that guess by establishing a new category of land use entitled "mixed commercial / industrial".) In grids containing multiple land uses, classification is a matter of the individual interpreter's opinion as to which use is predominant. The 1970 survey used three-acre grids while the 1988 and 1995 surveys used ½-acre, and therefore more precise, measuring grids.

Changes in definitions (such as what constitutes a wetland) can result in what appear to be enormous changes in land use when in fact there may be very little change. The 1970 land use study used a classification system that included 22 land use categories and 65 subcategories. It is notably different from the Anderson Level II modified system used in the 1988 and 1995 studies that used 37 land use and land cover categories. While we have endeavored to provide realistic cross-referencing and comparisons between the two systems, readers should be aware that in certain categories, part of the difference between 1970 and later studies is due to reclassification rather than actual land use changes. These classification anomalies are footnoted in the land use tables.

A particularly difficult problem occurs with waterbodies. Land use surveys must decide what waterbodies should be included in the measurements. For example, the U.S. Soil Conservation Service excluded waterbodies greater than 40 acres from all states' measurements in its series of soil survey publications[6]. In Rhode Island, whether to include Narragansett Bay (and the associated question of where rivers end and the bay begins and where the bay ends and the ocean begins) significantly affects the measurement of total state area as well as water area.

Another factor is that numerous scales were used in the mapping process. For example, the 1970 survey began with aerial photos at a 1:12,000 scale, transferred the identified land uses to USGS maps at a 1:24,000 scale and then produced color-coded land use maps at a 1:63,360 scale. Inevitably a certain amount of error will enter into such a multi-staged process.

[6] For Rhode Island it is the *Soil Survey of Rhode Island*

It is safe to assume that the physical area of Rhode Island remained constant from 1970 to 1995. Yet the total land area found in each of the surveys is slightly different.

1970 total acres - 693,960
1988 total acres - 691,610
1995 total acres - 691,212 (based on a statewide interpretation)
1995 total acres - 689,189 (based on a municipality-by-municipality interpretation)

The matter is no clearer on the federal level. In Bulletin #212, the U.S. Geological Survey cites that Rhode Island contains 677,120 acres. The U.S. Census Bureau citation is 650,016 acres.

It should be clear by now that while the total amount of land in the state is fixed, the measurement of that land varies, often considerably. Even with the above-mentioned caveats, there are still a number of trends that we can discern with confidence.

PART 5: THE LAND USE SURVEYS

Rhode Island conducted major land use / land cover surveys in 1961, 1970, 1988, and 1995. For purposes of this report, we concentrate the surveys for 1970, 1988, and 1995. Part 6 will use the survey results to detect major land use trends. While some of the material in Part 6 uses information from the 1961 survey, significant differences in methodologies limits our ability to reliably compare much of the 1961 data to the later surveys, therefore it is not included here. More information on the 1961 survey can be found in Technical Paper 146, *Land Use Trends in Rhode Island 1961-1988.*

Detailed explanations of the 1970, 1988, and 1995 land use / land cover classifications can be found in the appendix at the end of this report.

5-1 1970 LAND USE

Compilation of Data

These data resulted from an inventory funded by agencies participating in the Southeastern New England Water and Related Land Resources (SENE) Study. The objectives of this study were to: (1) make a detailed land use and vegetative cover map of Rhode Island that would show agricultural land, forests, wetlands, mining and waste disposal areas, urban areas, and outdoor recreation sites; (2) provide area statistics of 65 land use types by towns, counties, and for the state; and (3) provide training in the use of these materials to resource planners, foresters, wildlife biologists, watershed managers, and others interested in the environment.

Aerial photos were divided into three-acre parcels, each parcel was coded for a land use type, and the results were transferred to paper maps.

The results of the survey were published in 1974 by the URI Cooperative Extension Service in Bulletin No. 200, *Remote Sensing Land Use and Vegetative Cover In Rhode Island*. The accompanying land use maps, known as Rhode Island Map-Down, were produced at a 1:63,360 scale (1 inch = 1 mile). The 65 land use types were aggregated into 22 categories and each category was assigned a specific color for identification on the map.

Overall Land Use in 1970

For purposes of tracking general changes in land use patterns for the state, it can be useful to aggregate some data while leaving other data more specific. The 1970 Land Use Survey identified 65 land use types (see appendix) which is far more detailed than is useful for reporting on general land use and land cover in the state. The decision on which categories to combine for trend analysis is based on the experience of planning staff. We have also taken into consideration the desire to easily compare multiple land use surveys side-by-side. Accordingly, the data for 1970 on a statewide level was grouped into 15 categories as follows:

Table 5-1

Land Use, 1970

Ranking	Land Use / Cover Type	Total Acres*	% of Total Land
1	Forest	410,640	59.2
2	Residential[7]	89,142	12.8
3	Agricultural[8]	62,120	9.0
4	Water[9]	37,998	5.5
5	Open Land[10]	26,336	3.8
6	Wetlands[11]	13,316	1.9
7	Institutional & Cemeteries[12]	10,012	1.4
8	Recreational[13]	9,624	1.4
9	Commercial	7,050	1.0
10	Urban Open Land[14]	5,780	0.8
11	Roads	5,483	0.8
12	Industrial	5,344	0.8
13	Transportation & Utilities[15]	4,877	0.7
14	Gravel Pits & Quarries[16]	4,708	0.7
15	Waste Disposal[17]	1,155	0.2

*693,960 acres

City and town data for all 65 land use / land cover classifications are summarized in the appendix.

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7 Comprised of High-Density Residential and Low-Density Residential. Land use codes UA, UT, URH, URM, URL, URO, URF, UCR, and UE.

8 Comprised of Intensive Agriculture, Extensive Agriculture, and Woody Perennials. Land use codes T, TU, P, O, N, and CB

9 Comprised of Open Freshwater and Deep Marsh. Land use codes W and DM.

10 Comprised of Open Areas and Heath Land. Land use codes AF, AO, S, and H.

11 Comprised of Shallow Freshwater, Bogs, and Saltwater Marshes. Land use codes SS, M, SM, SF, B, TSM, ISM, and DSM.

12 Land use codes UP and ✝.

13 Comprised of Water-based Recreation, Participation Recreation, Spectator Recreation, and Environmental Recreation. Land use codes RM, RFB, RSB, RS, RC, RG, RD, RPG, RSK, RT, RA RAP, RFG, RI, and RP.

14 Land use code UO.

15 Comprised of airports (UTA), railroads (UTR), water-based transportation facilities (UTW), terminal freight and storage facilities (UTT), power lines with rights-of-way of at least 100 feet (PL), and filter beds (FB).

16 Land use codes SG and OM.

17 Land use codes D and DA.

5-2 1988 LAND USE

Compilation of Data

These figures were generated from the Rhode Island Geographic Information System (RIGIS), a statewide, computer-based, mapped data program that is maintained by a consortium of agencies and coordinated by the Statewide Planning Program. The statewide coverage of land use and land cover data in RIGIS was delineated from 1:24,000 scale stereo aerial photography.

Thirty-seven land use and land cover categories were delineated from the photographs for areas at least ½ acre in size. Two of the land cover categories, wetlands and open water, were obtained from the RIGIS wetland data set (also from the 1988 aerial photography).

The delineations on the photographs were recompiled to USGS quadrangle Mylar maps. Land use and land cover polygons were copied from the maps into pre-existing RIGIS coverages containing road, hydrographic, state boundary, and coastline data. Wetland and open water polygon categories were merged from the RIGIS wetland data set. The 37 quadrangles were appended and edge-matched into a seamless statewide land use and land cover data set.

The fact that the 1970 study used 65 land use types as opposed to 37 land use types for the 1988 and 1995 classification system means that direct comparisons are not always possible. The appendix presents the 1988/1995 land use classification system and a cross-reference to its 1970 counterpart(s).

Overall Land Use in 1988

Although the 1988 survey used fewer land use/cover categories than the 1970 survey, the 37 land use types identified is still more detailed than is useful for reporting on general land use and land cover in the state. As with the 1970 survey, the decision on which categories to combine is based on the experience of planning staff. Additionally, we have also taken into consideration the desire to easily compare multiple land use surveys side-by-side. Accordingly, the data for 1988 on a statewide level was grouped into 16 categories[18] and is summarized in Table 5-2 on the following page:

[18] The one additional classification added to the 1988 table from the 1970 table is “mixed commercial and industrial”

Table 5-2
Land Use, 1988

Ranking	Land Use / Cover Type	Total Acres*	% of Total Land
1	Forest[19]	310,856	44.9
2	Residential[20]	129,002	18.7
3	Wetland[21]	90,410	13.1
4	Agricultural[22]	50,583	7.3
5	Water[23]	26,547	3.8
6	Open Land[24]	13,904	2.0
7	Commercial[25]	12,553	1.8
8	Institutional & Cemeteries[26]	11,374	1.6
9	Developed Recreation[27]	10,934	1.6
10	Industrial[28]	7,231	1.0
11	Transportation & Utilities[29]	6,826	1.0
12	Roads[30]	6,277	0.9
13	Urban Vacant [31]	5,679	0.8
14	Quarries & Gravel Pits[32]	5,378	0.8
15	Waste Disposal[33]	2,611	0.4
16	Mixed Commercial & Industrial[34]	1,427	0.2

*691,610 acres

City and town data for all 37 land use / land cover classifications are summarized in the appendix.

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19 RIGIS land use codes 310 thru 340.

20 RIGIS land use codes 111 thru 115.

21 RIGIS land use code 600.

22 RIGIS land use codes 210 thru 250.

23 RIGIS land use code 500.

24 Includes brushland (code 400), beaches (code 710), sandy non-beach areas (code 720), rock outcrops (code 730), and mixed barren areas (code 760).

25 RIGIS land use code 120.

26 RIGIS land use codes 170 and 163

27 RIGIS land use code 161.

28 RIGIS land use code 130.

29 Includes airports (code 142), railroads (code 143), water & sewer treatment facilities (code 144), other transportation e.g. water-based transportation facilities (code 147), and power lines with rights-of-way of at least 100 feet (code 146).

30 RIGIS land use code 141.

31 RIGIS land use codes 162 and 750.

32 RIGIS land use code 740.

33 RIGIS land use code 145.

34 RIGIS land use code 150.

5-3 1995 LAND USE

Compilation of Data

The 1995 dataset is an update of the 1988 dataset which was used as the source data. Digital orthophotography obtained by the USGS in the spring of 1995 was used for the majority of the state. The exception was areas along the Connecticut border for which 1992 USGS digital orthophotos were used. All original features and attributes of the 1988 dataset were maintained unless physical changes on the ground were detected on the most recent orthophotos. In instances where physical changes were detected, spatial polygon features were modified and attribute coding was attached as appropriate.

Classification System

The classification system used for the 1995 survey was the same Anderson Level II modified classification system used in the 1988 survey (see appendix).

Overall Land Use in 1995

As with the 1988 survey, the 37 land use types is more detailed than is useful for reporting on general land use and land cover in the state. Accordingly, the data for 1995 on a statewide level was grouped into the same 16 categories used in the 1988 land use table and is summarized in Table 5-3:

Table 5-3
Land Use, 1995

Ranking	Land Use /Cover Type	Total Acres*	% of Total Land
1	Forest	301,026	43.6
2	Residential	138,632	20.0
3	Wetland	89,595	13.0
4	Agricultural	49,094	7.1
5	Water	27,640	4.0
6	Open Land	14,299	2.0
7	Commercial	13,224	1.9
8	Developed Recreation	11,038	1.6
9	Institutional & Cemeteries	10,665	1.5
10	Industrial	8,588	1.2
11	Transportation & Utilities	6,847	1.0
12	Roads	6,518	0.9
13	Quarries & Gravel Pits	5,363	0.8
14	Urban Vacant	4,388	0.6
15	Waste Disposal	2,795	0.4
16	Mixed Commercial & Industrial	1,501	0.2

*691,212 acres

City and town data for all 37 land use / land cover classifications are summarized in the appendix.

PART 6: GROWTH AND DEVELOPMENT ANALYSIS

Trend 1: Population has increased at a slow rate but the rate of household formation has increased much faster.

Demographics is the foundation on which land use analysis is built. The societal importance of how land is used is directly related to the size of the population residing on the unit of land. A hog farm in an isolated countryside is not likely to engender much opposition. A hog farm in a city would cause outrage.

Rhode Island's population increased by an average of 14% per decade from 1900 to 1970. The decade of the 1970's witnessed a decrease in population, largely due to the closure of significant U.S. Navy installations in the state. While the population rebounded somewhat during the 1980's, increasing by 6%, the growth was less than previous decades. Low population growth is a trend anticipated to continue into the foreseeable future.

During the same time that the state has experienced only a modest increase in total population, it has also experienced a rapid increase in the rate of household creation (see Table 6-1 and Figure 6-3). This is due to the fact that households became smaller than ever before. The number of persons per household has been declining steadily since the 1950's. The major reasons for this have been declining fertility rates, an increase in the number of single-parent households, greater longevity of the population, and a general increase in single-person households.[35] A greater proportion of Rhode Islander's are in age groups associated with household formation or are part of the large elderly population living independently, "aging in place." The simple equation is that total households will increase at a faster rate of growth than total population if the average household size declines. The significance of this fact will be examined in Trends 3 and 4.

Table 6-1

Population and Household Growth Rates
1970-2000

	1970	1980	1990	2000 (est.)	change '70-'80	change '80-'90	change '90-00	change '70-00
Population	949,723	947,154	1,003,464	1,011,960	-0.3%	6%	1%	6.5%
Households	291,965	338,590	377,977	387,774	16%	12%	3%	33%

Source: U.S. Bureau of the Census and RI Statewide Planning Program

[35] David Ames and Robert Dean, *Projected Population Growth and the New Arithmetic of Development in Delaware,* 1997. University of Delaware, Center for Historic Architecture and Design.

Figure 6-1
Rhode Island Population, 1900-2000

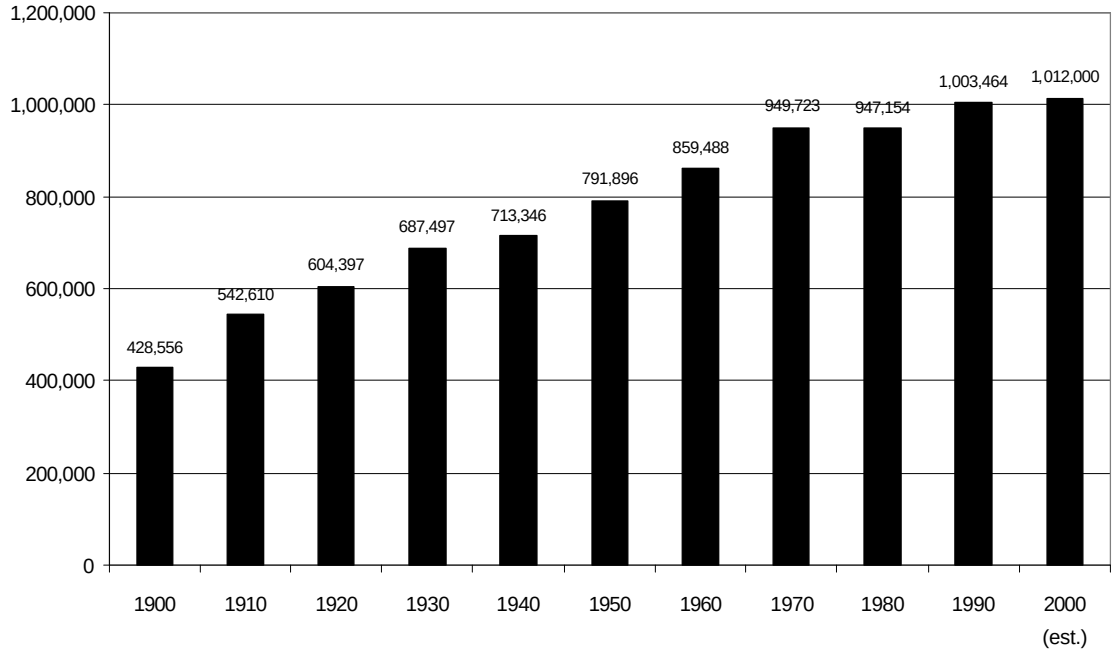
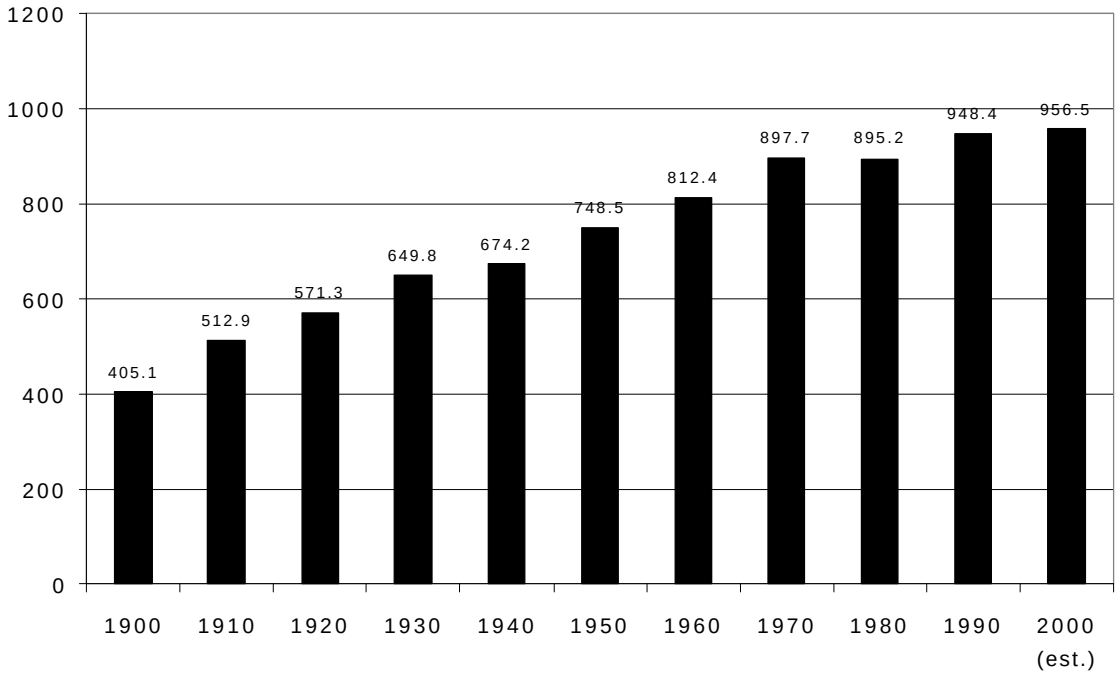


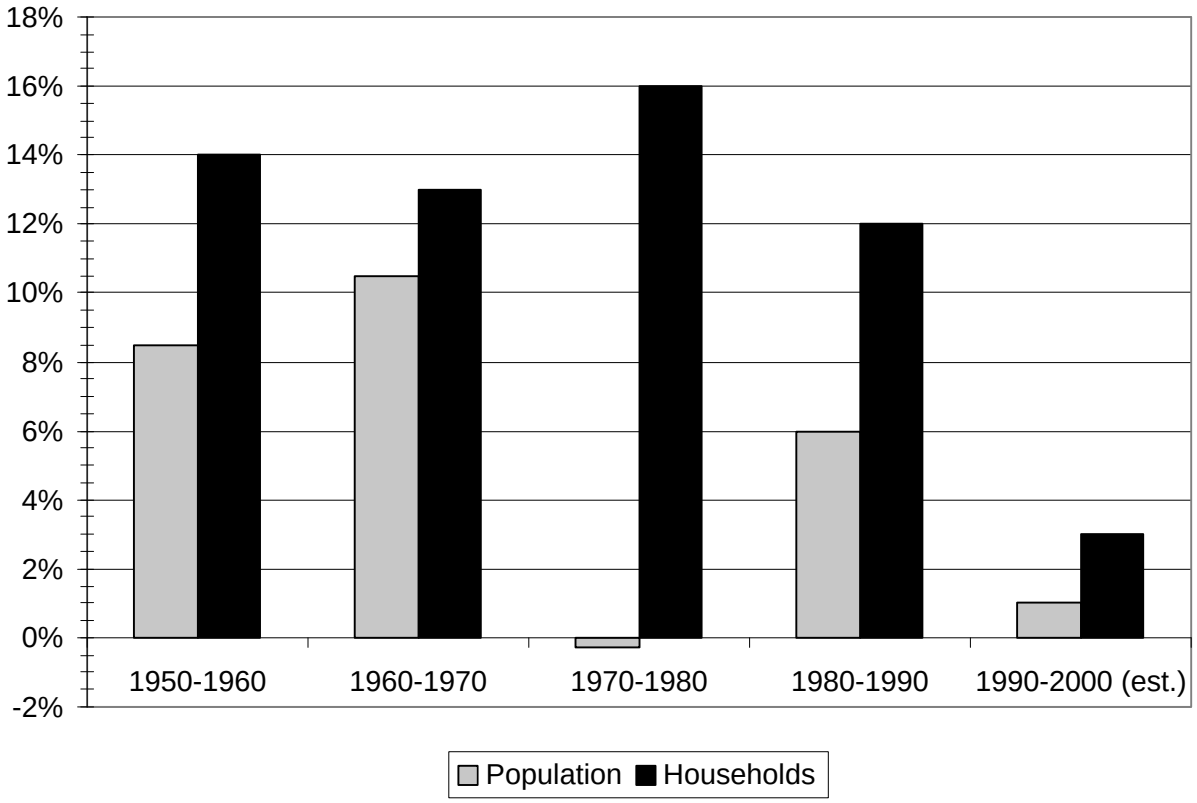
Figure 6-2
Population Density per Square Mile,* 1900-2000



Source: U.S. Bureau of the Census and RI Statewide Planning Program
* 1058 square miles of *land*, waterbodies are excluded from this calculation

Figure 6-3

Population and Household Growth Rates, 1950-2000



Source: U.S. Bureau of the Census and RI Statewide Planning Program

Trend 2: Rhode Island has become more developed

Extensive land use surveys for the state were conducted in 1970, 1988, and 1995. During this twenty-five year period, the portion of Rhode Island's land area in developed uses increased by more than 67,000 acres, an area equal to South Kingstown and Hopkinton combined. Development increased from approximately 143,000 acres to 211,000 acres, a 47 percent increase. The total acreage of major land uses is shown in Table 6-2.

Table 6-2
Land Use Comparison for 1970, 1988, and 1995

LAND USE/TYPE	**1970**	**1970**	**1988**	**1988**	**1995**	**1995**	**change '70-'95**
	(in acres)	(by %)	(in acres)	(by %)	(in acres)	(by %)	(by %)
Residential	89,142	*12.8*	129,002	*18.7*	138,632	*20.0*	+55.5
Commercial	7,050	*1.0*	12,553	*1.8*	13,224	*1.9*	+87.6
Industrial	5,344	*0.8*	7,231	*1.0*	8,588	*1.2*	+60.7
Commercial/Industrial Mixed	n/a	*n/a*	1,427	*0.2*	1,501	*0.2*	+5.2
Roads[36]	5,483	*0.8*	6,277	*0.9*	6,518	*0.9*	+18.9
Transportation & Utilities[37]	6,414	*1.0*	6,826	*1.0*	6,847	*1.0*	+6.7
Developed Recreation[38]	9,624	*1.4*	12,276	*1.8*	12,447	*1.8*	+29.3
Institutions & Cemeteries	10,012	*1.4*	11,374	*1.6*	10,665	*1.5*	+6.5
Urban Vacant[39]	5,780	*0.8*	5,679	*0.8*	4,388	*0.6*	-24.0
Gravel Pits & Quarries	3,328	*0.5*	5,378	*0.8*	5,363	*0.8*	+61.1
Waste Disposal	1,380	*0.2*	2,611	*0.4*	2,795	*0.4*	+102
Total Developed	**143,557**	***20.7***	**200,634**	***29.0***	**210,968**	***30.5***	**+47.0**
Forest	410,640	*59.2*	310,856	*44.9*	301,026	*43.6*	-26.7
Agriculture	62,120	*9.0*	50,583	*7.3*	49,094	*7.1*	-21.0
Barren, Brush, Wetlands, Water, Other Undeveloped[40]	77,643	*11.1*	129,519	*18.8*	130,124	*18.8*	
Total Undeveloped	**550,403**	***79.3***	**490,958**	***71.0***	**480,244**	***69.5***	**-12.8**
Total State Acres	**693,960**		**691,610**		**691,212**		

Source: URI Cooperative Extension Service, *Remote Sensing Land Use and Vegetative Cover in Rhode Island* Bulletin No. 200, 1974 and RI Statewide Planning Program RIGIS data for 1988 and 1995.

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[36] Defined as divided highways with 200 feet or more of right-of-way for 1970 and as divided highways with 100 feet or more of right-of-way for 1988 and 1995.

[37] The 1970 total includes airports, railroads, terminal facilities for truck freight, land based facilities for water transportation and fishing, and power lines. The 1988 and 1995 totals includes airports, railroads, water & sewer treatment facilities, water-based transportation facilities, and power lines with rights-of-way of at least 100 feet.

[38] Includes water based, participation, environmental, and spectator recreation from the 1970 study, and developed recreation (land use code 161) and beaches (land use code 710) from the 1988 and 1995 studies.

[39] Total of urban vacant land (land use code 162) and urban open transitional land (land use code 750).

[40] Includes abandoned orchards and fields, sandy non-beach areas, and heath covered land from the 1970 study, and brushland (land use code 400), sandy non-beach areas (land use code 720), and rock outcrops (land use code 730) from the 1988 and 1995 studies. Brushland areas were included in the forest category in the 1970 study.

Trend 3: Development has increased nine times faster than population

While developed land increased by 47 percent from 1970 to 1995, state population increased by only five percent over the same period. The implications of this are quite significant. Science has long recognized that land has a certain "carrying capacity." Carrying capacity was originally defined as the largest number of any given species that a habitat can support indefinitely. When the carrying capacity is exceeded, the species population either crashes or expands into new regions. Urban planners have adapted the concept of carrying capacity to include the ability of natural and human engineered systems to absorb population growth or physical development without significant degradation or breakdown.[41]

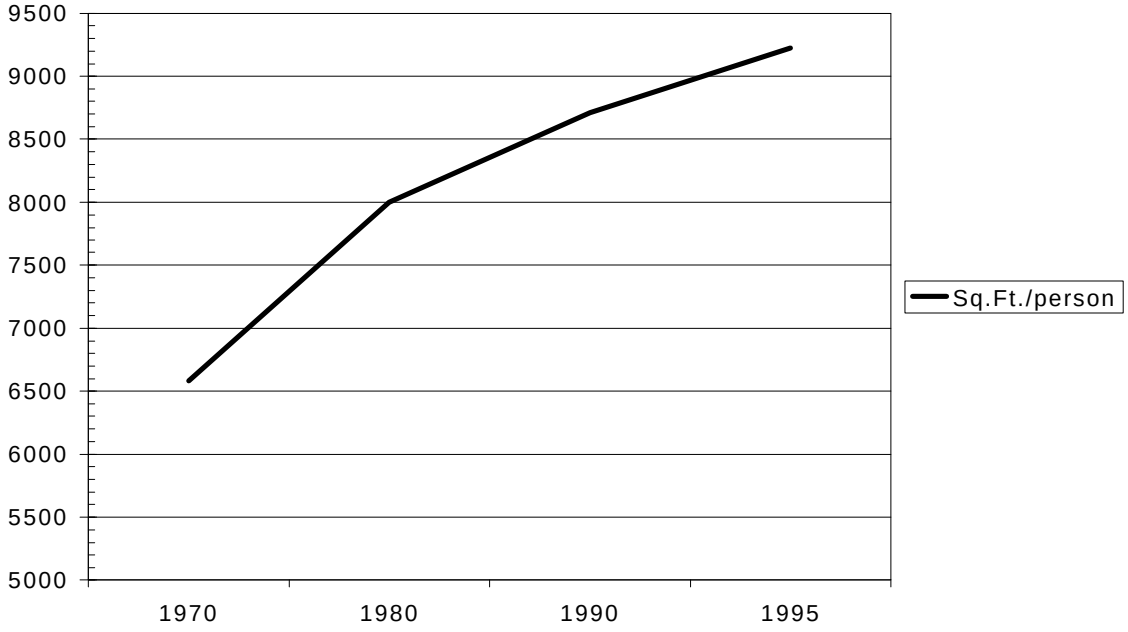
Rhode Island contains approximately 691,000 acres of land and water, and each resident inevitably uses a certain amount of these resources for their very existence. We require land to build our homes, to purchase goods and services, to earn our living, to enjoy recreation, to dispose of our wastes, and to provide food and water. The acceleration of development over population growth, if continued into the future, means that the state's carrying capacity will be reached much sooner than would be expected by population growth alone.

Figure 6-4 displays the increasing proportion of developed land required by each resident and by each household. Figure 6-5 superimposes the developed square feet per person graph over the population chart. The important trend to notice is that developed square feet per person maintains a relatively steady rate of increase regardless of change in the population size. Figure 6-6 displays the data presented in 6-5 in terms of percentage change. As with Figure 6-5, the important trend to notice is that developed square feet per person continued to increase despite slow or negative population growth.

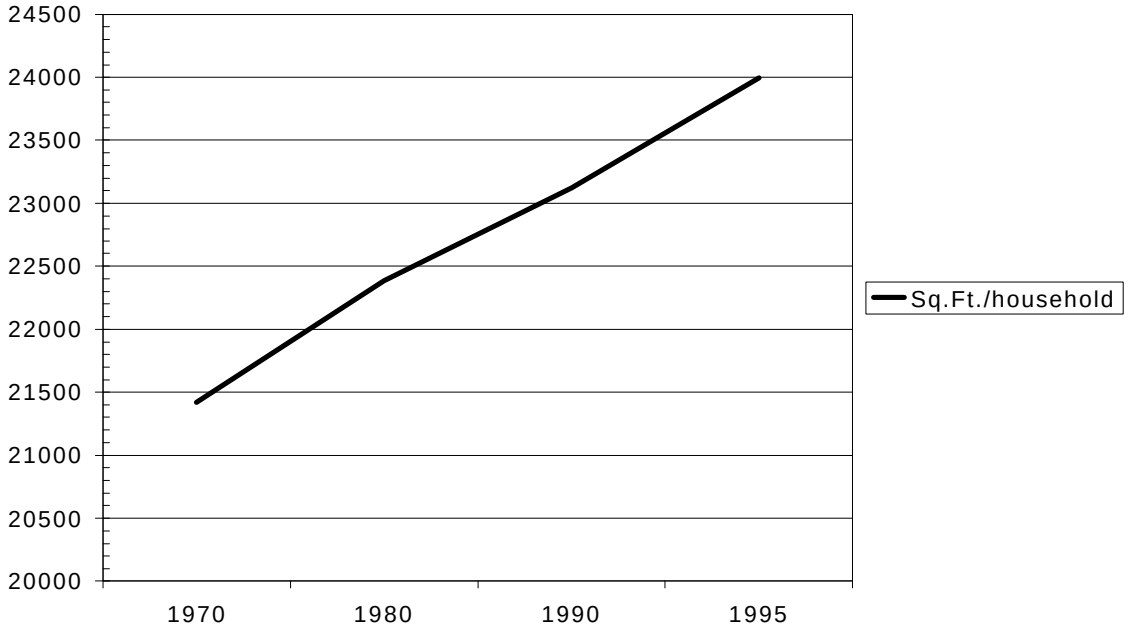
41 Sierra Club, *Saving for the Future, A Sierra Club Guide to Local Carrying Capacity*, 1995.

Figure 6-4

Developed Square Feet Per Person, 1970-1995



Developed Square Feet Per Household, 1970-1995



Source: U.S. Bureau of the Census and RI Statewide Planning Program.

Figure 6-5
Developed Square Feet Per Person and Population, 1970-1995

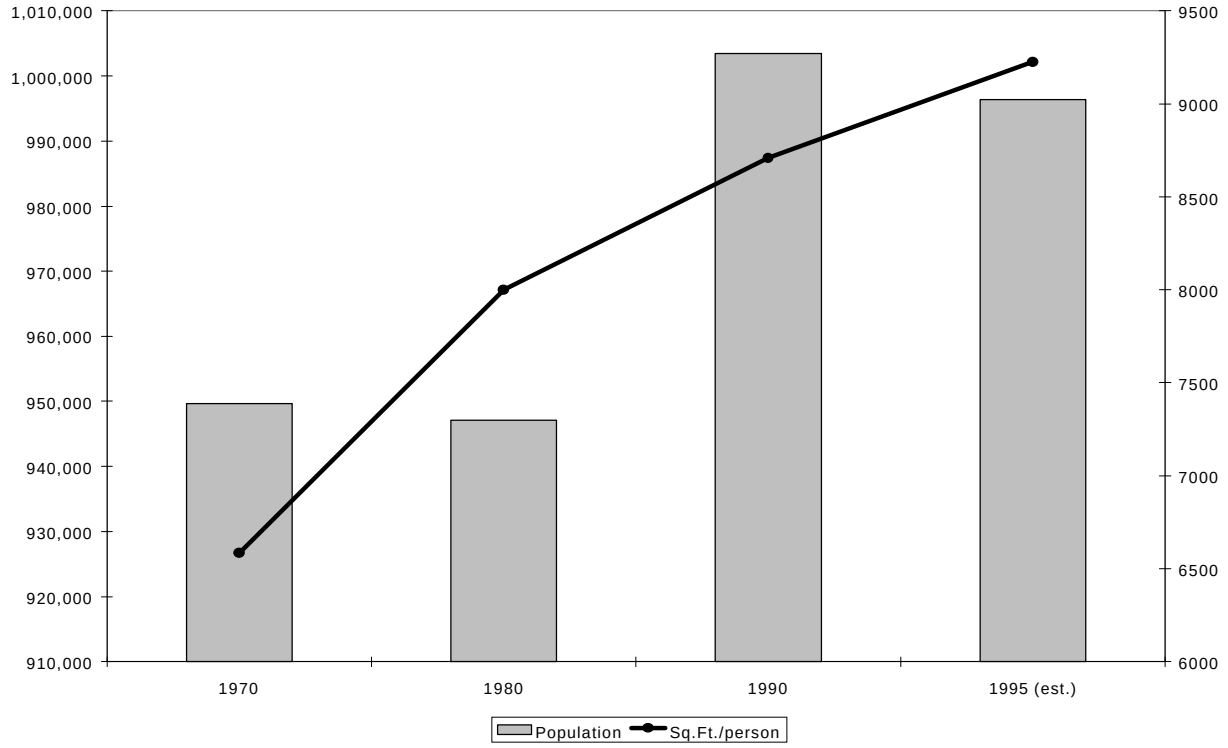
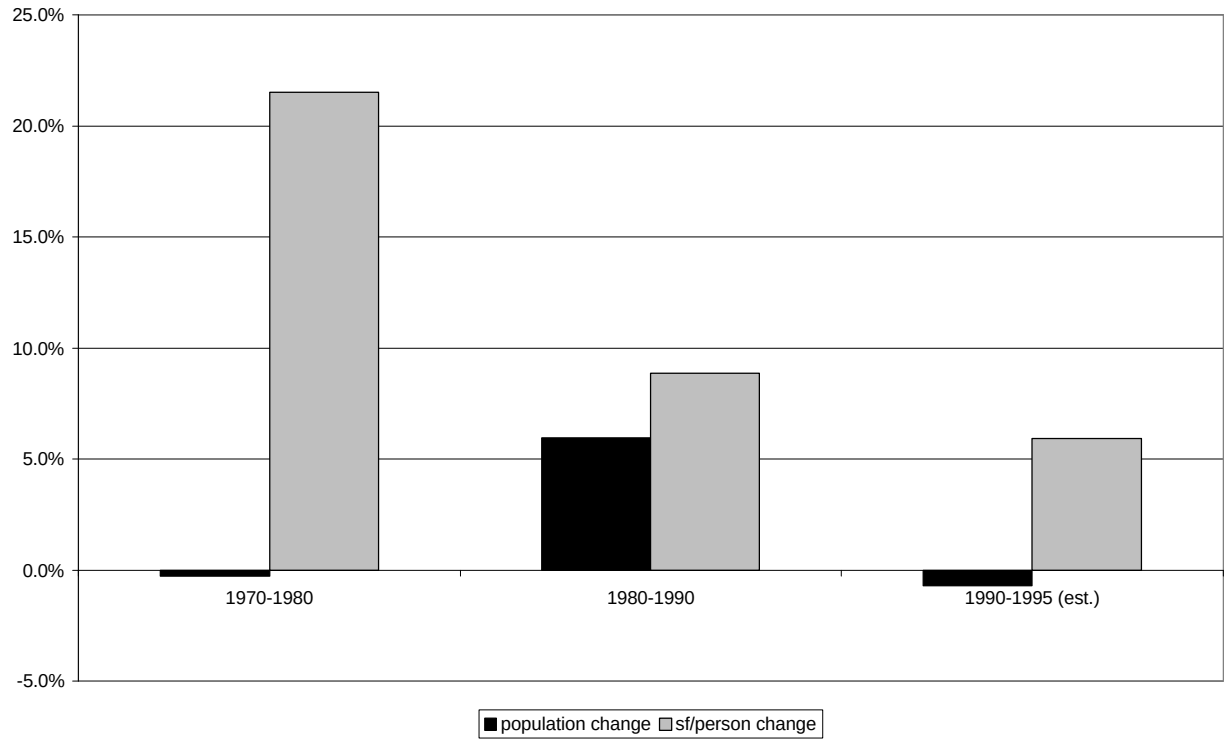


Figure 6-6
Percent Change in Developed Square Feet Per Person and Population, 1970-1995



Trend 4: The largest source of development is residential land use

Between 1970 and 1995, the state added two units of housing for every *one* new addition to the population![42] This phenomenon is not unique to Rhode Island. In 1997, the University of Delaware undertook a study on behalf of the Delaware Office of Planning Coordination for the purpose of exploring land use and demographic trends that could influence state land policy.[43] The major conclusion carries significant importance to land use planning in Rhode Island too.

> The relationship between the rate of population growth and the resulting rate of land development is not one-to-one. In fact, it has become almost exponential: land development proceeds at a much faster pace than the population growth that stimulated it.

There are two primary reasons for this phenomenon:

1. The demographics of smaller households (previously mentioned under Trend 1). This translates into greater demand for housing and;
2. The demand, on average, for single-family houses on relatively larger house lots. This translates into more land consumed per new house.

There were also economic trends such as the building boom of the mid-1980's. This combination of smaller (i.e. more) households plus larger house lots has been significant. There has also been a secondary effect of businesses building near the new population centers. As people move into previously undeveloped areas, business soon follows in order to provide convenient locations to meet the public's demand for various goods and services.

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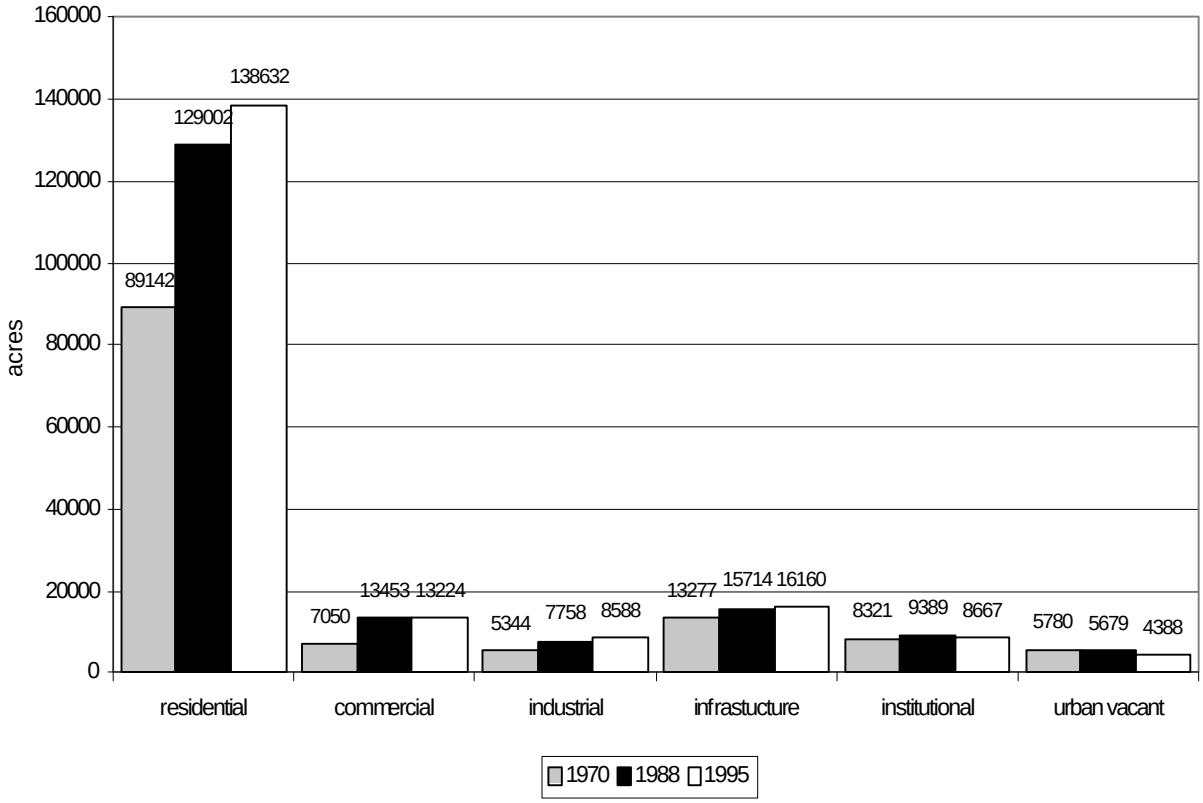
[42] Rhode Island Statewide Planning Program, Housing Section

[43] David Ames and Robert Dean, *Projected Population Growth and the New Arithmetic of Development in Delaware,* 1997. University of Delaware, Center for Historic Architecture and Design.

Figure 6-7

Developed Land Use Trends, 1970-1995[44]



Source: URI Cooperative Extension Service, *Remote Sensing Land Use and Vegetative Cover in Rhode Island* Bulletin No. 200, 1974 and RI Statewide Planning Program RIGIS data for 1988 and 1995.

[44] Figures for commercial land and for industrial land include an apportionment of the category commercial/industrial mixed.

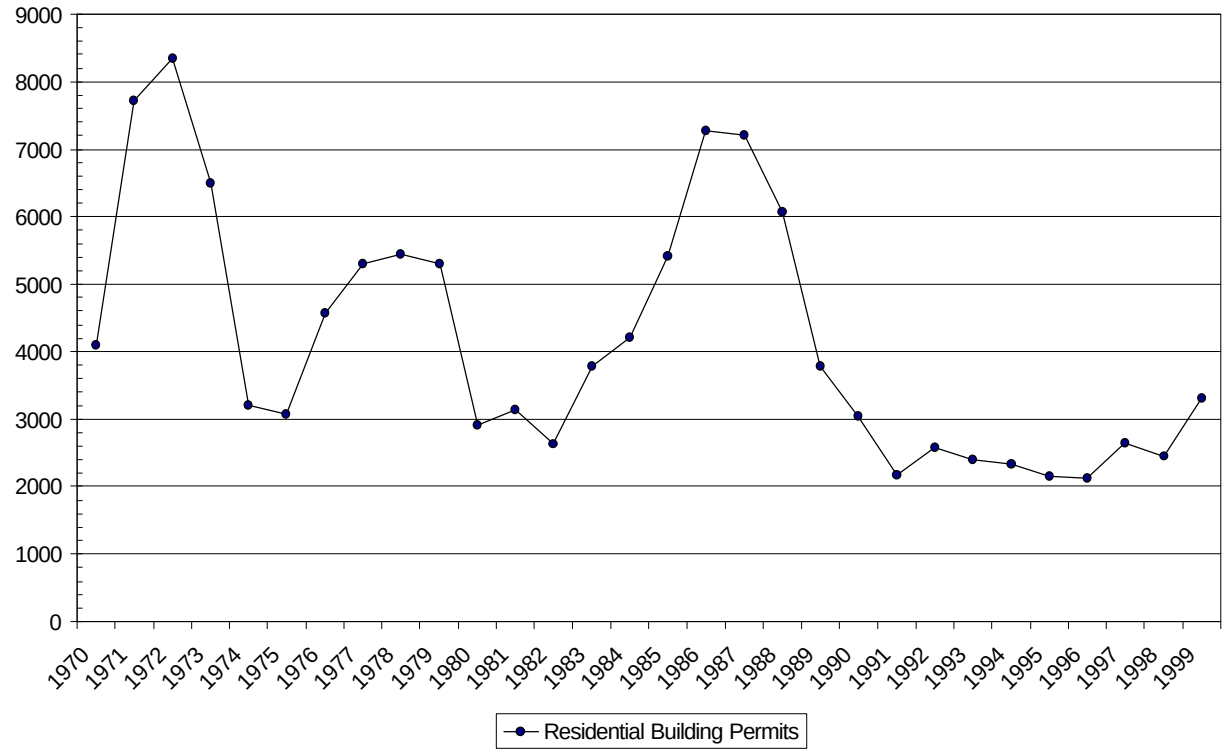
Also notable, due to the combination of rate of growth and total acres consumed, is commercial land use. Between 1970 and 1995, land committed to residential use increased by 55.5%. Although starting from a smaller base, industrial land use increased by approximately 72%. Commercial land use expanded even faster with an approximate 100% increase. See Trends 5 and 6 for additional information.

While it may be too soon to draw definitive conclusions, it appears that there is a leveling of the "boom and bust" cycle of residential construction. One possible factor in this trend may be the three major revisions to Rhode Island's land use laws, the Comprehensive Planning and Land Use Act of 1989, the Zoning Enabling Act of 1991, and the Land Development and Subdivision Review Act of 1992. While these laws may be working to control the pace of residential development it must also be noted that many other factors including the employment rate, land values, and interest rates all have a direct effect on residential construction.

Figure 6-8

Residential Building Permits, 1970-1999

Single-family and Multi-family Building Permits Issued



Source: U.S. Bureau of the Census and RI Statewide Planning Program

Trend 5: Population has migrated toward the rural parts of the state

Population shifts depicted in Figure 6-9, and Maps 3 through 5 document the suburbanization of formerly rural areas and the trend of migration from older central cities that first began in the 1940's. Providence, Central Falls, and Woonsocket each lost population starting in the 1930's. At first, Pawtucket absorbed some of this migration and achieved a slight increase in population. By the 1950's, Pawtucket joined its other urban neighbors in net population loss. The population decline in the central cities would have been even more notable if not for the offsetting increase in the population of Newport that continued until the naval base closure in the 1970's. However, since 1980 the decline in central city residents has slowed considerably, and in some instances, increased slightly. Population growth rates are shown in Figure 6-10.

We can examine the correlation between population shift and land use from a spatial perspective by classifying communities based on their geographic and historic relationship to an urban core. Providence, Pawtucket, and Central Falls act as a single urban core, with Newport and Woonsocket as outlying, secondary cores. Remaining communities are divided into inner ring, outer ring, western, or coastal. We refer to this as *spatial zone analysis*.

The inner ring communities, with the exception of Warwick[45], are categorized by a common border with an urban core city. Outer ring communities lie slightly farther from the core cities. Communities could arguably be assigned to a different classification than is presented here. Decisions must be made however, and we decided the following classification presents the information in a manner most useful to the majority of readers. See Map 2.

Older Central Cities: Central Falls, Newport, Pawtucket, Providence, and Woonsocket.

Inner Ring	Outer Ring	Western	Coastal
Cranston	Barrington	Burrillville	Charlestown
East Providence	Bristol	Coventry	Jamestown
Johnston	Cumberland	Exeter	Little Compton
Lincoln	East Greenwich	Foster	Narragansett
Middletown	North Kingstown	Glocester	New Shoreham
North Providence	North Smithfield	Hopkinton	South Kingstown
Warwick	Smithfield	Richmond	Westerly
	Portsmouth	Scituate	
	Tiverton	West Greenwich	
	Warren		
	West Warwick		

[45] There is a mile and one-half wide portion of eastern Cranston that separates Warwick from a direct border with Providence. We did not consider this to be significant.

As city residents dispersed to suburbs and new residents moved into the state, the patterns of housing have changed. Proportionally, less multifamily housing has been constructed in the suburbs, and the relatively inexpensive price of land enabled single family homes to be constructed on larger lots than in central cities. Historically, housing has been densest in the communities of Central Falls, Pawtucket, Providence, and Woonsocket.

The shifting pattern in population movement within the state has resulted in several formerly suburban communities becoming urbanized. Four of the seven municipalities listed as inner ring (Cranston, East Providence, North Providence, and Warwick), and one of the communities listed as an outer ring (West Warwick), have developed to the point where they fit the definition of urban (see Part 3: Definitions).

As illustrated in the graphs and maps that follow, the fastest population growth since 1970 has taken place in the state's western and coastal communities.

Insert map 2

Figure 6-9
Population by Spatial Zone, 1930-2000

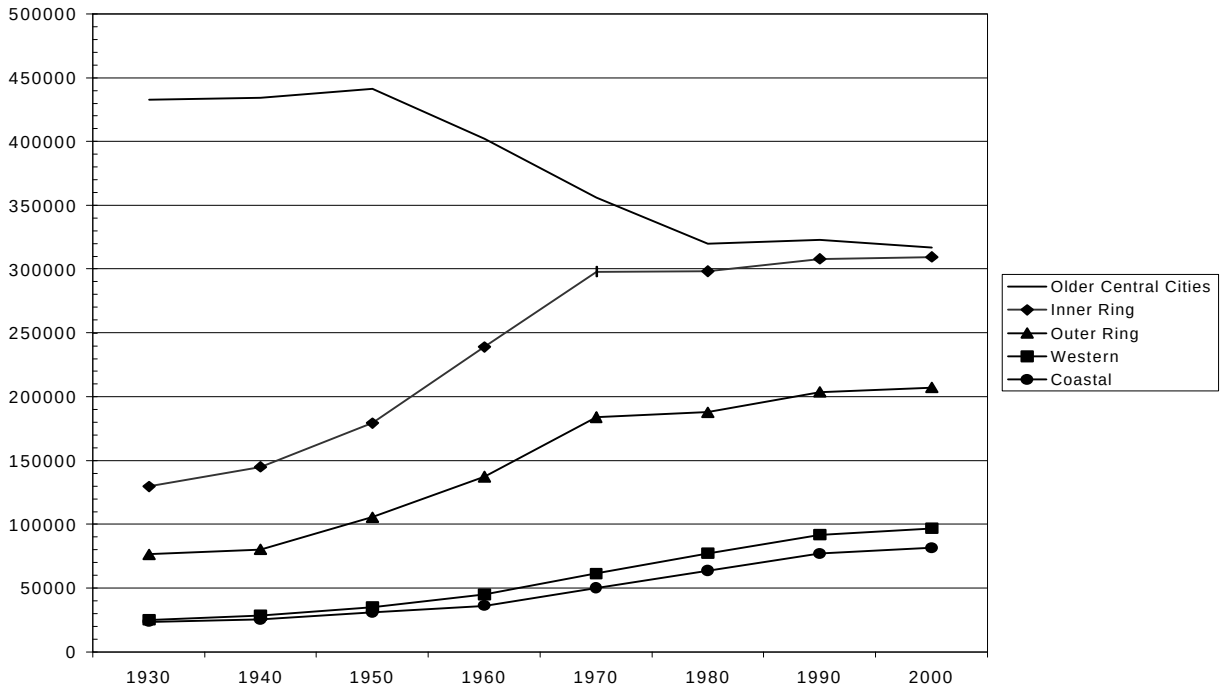
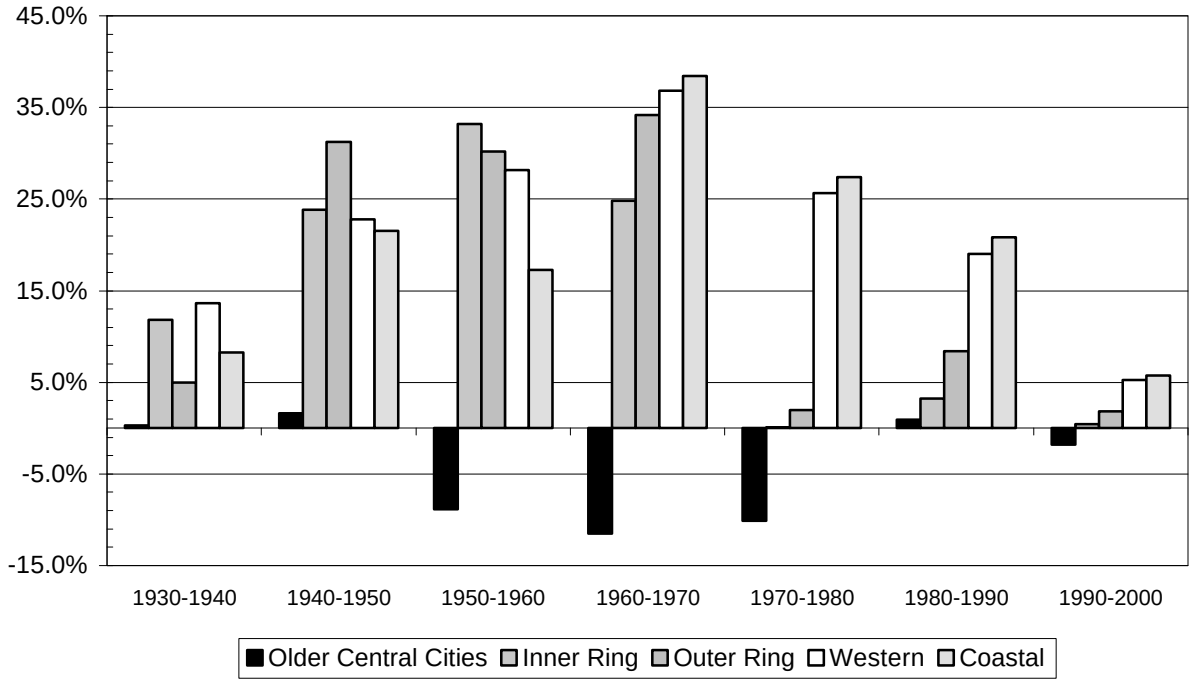


Figure 6-10
Population Growth by Spatial Zone, 1930-2000



Source: U.S. Bureau of the Census and RI Statewide Planning Program

Insert maps 3 - 5

Population Shift in Rhode Island

Trend 6: Employment centers are expanding away from central cities

There are many factors that influence the decision of where to locate a business. Land prices, proximity to markets, accessibility to infrastructure (e.g. highways, sewers, water, etc.), and availability of labor, must all be taken into account in choosing a suitable site. While population was increasing by only five percent between 1970 and 1995, industrial land use increased by about 72% and commercial land use increased at an even greater rate, almost doubling. Between 1970 and 1995, growth in employment was greatest in the inner ring communities with 44,410 new jobs. Coastal communities increased by a greater *percentage* but this is due to the relatively low number of jobs in the base year of 1970.

Although the number of jobs statewide increased by nearly 67,000 from 1970 to 1995, the state's central cities lost over 10,000 jobs. Still, central cities remained the state's primary employment location, with more than 42 % of all jobs (see Table 6-3).

Data can be viewed in more than one way. In addition to spatial analysis, we can also analyze data according to community type i.e. urban, suburban, or rural. Since this changes over time, we felt it would be helpful to subdivide our ten urban communities into Older Central Cities (the state's five historic urban centers of Central Falls, Newport, Pawtucket, Providence, and Woonsocket), and the five communities that have become urbanized since the 1940's (see Table 6-4). The results are similar to the spatial zone analysis; as suburbs expanded, so did the number of jobs located in suburbs. The New Urban communities (see footnote 47) and Suburban communities (see footnote 48) each added about 30,000 jobs. Due to the lower number of jobs in the base year of 1970, Suburban communities increased by a greater percentage. As of 1995, the state's ten urban communities contained 71% of state's jobs, down from 78% in 1970.

We must conclude that if this dispersion trend continues for a long enough period of time, there will be a homogenization of employment centers spread more or less evenly across all parts of the state. As employment centers are inextricably linked to both population and land use (see Trends 7 and 8), some currently suburban communities will become urban and some currently rural communities will become suburban.

Please note that the employment statistics reported here **do not** include government, college, hospital, or self-employed workers. While the number of jobs in those categories is quite significant (over 84,000 as of 1985), we were unable to obtain data for all years thus precluding an accurate comparison.

Table 6-3

Rhode Island Employment by Spatial Zone, 1970-1995

Spatial Zone	1970	1980	1990	1995	1970-1995 % change
Older Central Cities	168,438	162,210	164,331	158,047	-2.4
Inner Ring	75,284	91,377	110,463	119,694	46.7
Outer Ring	43,207	51,250	51,234	54,279	18.8
Western	10,068	9,132	11,616	13,076	15.4
Coastal	9,991	13,259	17,939	21,816	79.6
State Total	306,988	340,555	386,137	373,962	21.8

Table 6-4

Rhode Island Employment by Community Type, 1970-1995

Community Type	1970	1980	1990	1995	1970-1995 % change
Older Central Cities[46]	168,438	162,210	164,331	158,047	-2.4
New Urban[47]	69,694	80,691	94,581	101,143	35.7
Established Suburbs[48]	49,018	64,284	73,017	79,491	49.0
Rural[49]	19,838	20,043	23,760	28,231	19.8
State Total	306,988	340,555	386,137	373,962	21.8

Source: RI Department of Labor & Training

[46] Central Falls, Newport, Pawtucket, Providence, and Woonsocket

[47] Cranston, East Providence, North Providence, Warwick, and West Warwick

[48] Barrington, Bristol, Cumberland, East Greenwich, Jamestown, Johnston, Lincoln, Middletown, Narragansett, North Kingstown, Portsmouth, Smithfield, Warren, Westerly

[49] Burrillville, Charlestown, Coventry, Exeter, Foster, Glocester, Hopkinton, Little Compton, New Shoreham, North Smithfield, Richmond, Scituate, South Kingstown, Tiverton, West Greenwich

Figure 6-11
Rhode Island Employment by Spatial Zone, 1970-1995

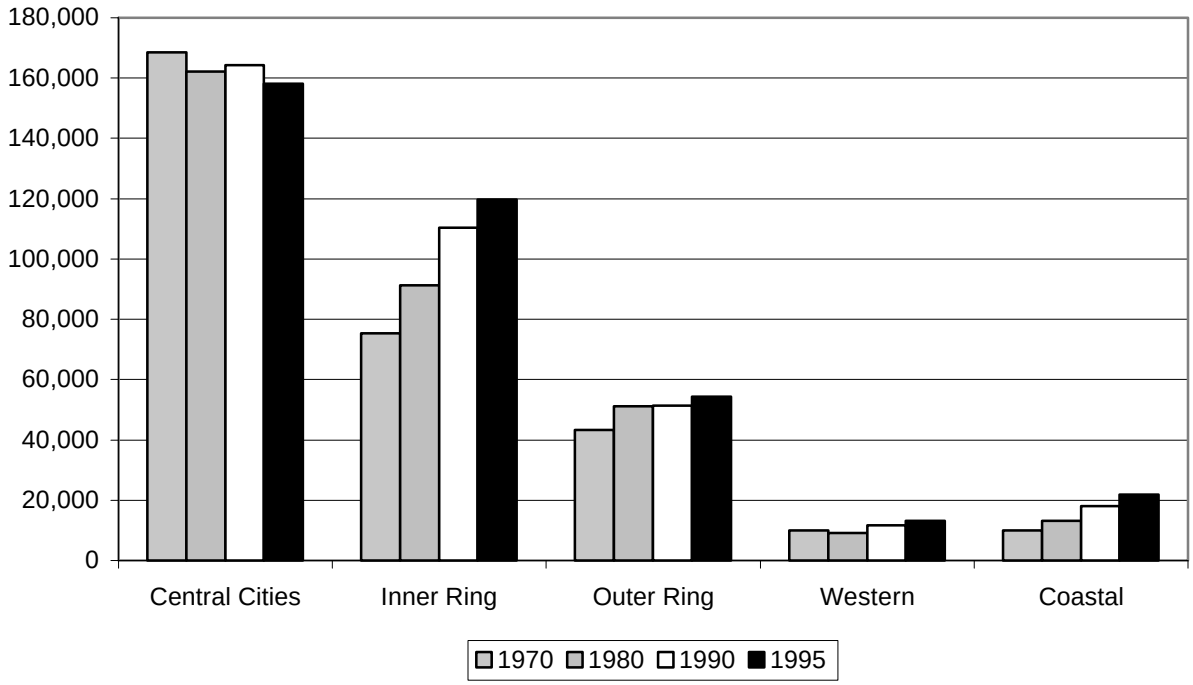
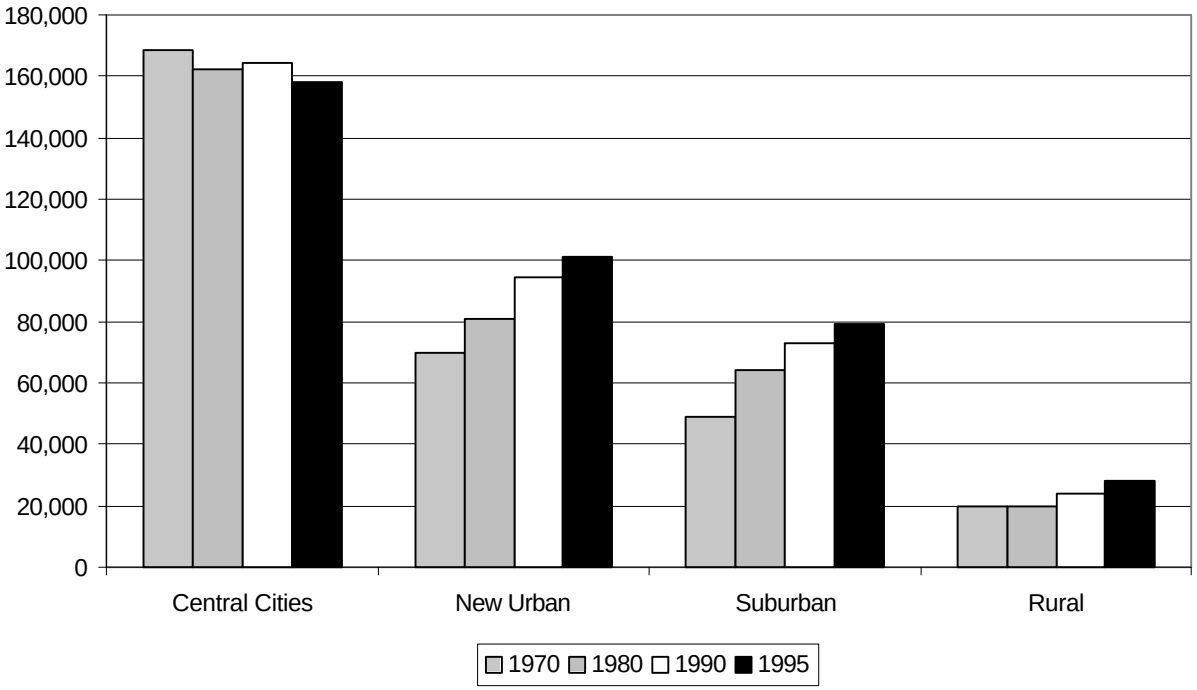


Figure 6-12
Rhode Island Employment by Community Type, 1970-1995



Source: RI Department of Labor & Training

Trend 7: Industrial land use has increased and moved farther into the suburbs

Many factors influence the suitability of land for industrial development. Good access to transportation, availability of utilities, accessibility to the labor force, and limited or no physiographic or environmental constraints are all relevant to industrial siting. The original pattern of industry location in the state was along river systems. Rivers provided power and transportation access. Furthermore, factories require workers, and it made practical sense to locate clusters of people near sources of water. As a result, Providence, Pawtucket, Woonsocket, and Central Falls were the first manufacturing centers of the state but by 1930, this pattern began to change.

A variety of evolving circumstances led to the dissemination of industry into the surrounding countryside. Power and water were available in ever more areas as public infrastructure increased. Highways provided transportation alternatives. As population increased in suburban areas, so did the availability of labor. New construction on undeveloped sites was frequently more economical and easier to permit than rehabilitating and renovating older existing facilities. Furthermore, the very nature of what is "industrial" changed with technology and shifting economic forces. As traditional industries of textiles and jewelry declined, other industries developed that used different siting criteria. By 1961, the Rhode Island Development Council's publication, *Analysis of Rhode Island Land Use* noted,

> There has been a trend for new and existing industry to relocate in the suburban areas of the State. This mobility of industry stems primarily from the inability of cities to meet their needs. That is, suburban communities now have the advantage of possessing large tracts of land suitable for development and future expansion. New highways, public utilities, and land use controls have added to the attractiveness of suburbia.

It is important to note that a considerable amount of the vacant land zoned for industrial use in Rhode Island has significant constraints due to environmental factors and/or the lack of public water or sewer facilities. It is improbable that all industrially zoned land will actually be developed for industrial uses.

To help spur large-scale commercial and industrial redevelopment, primarily in older central cities, the state enacted in 1995 a law to encourage re-use of "brownfields." Brownfields are either abandoned or underutilized industrial sites that are often strategically located near population centers and transportation hubs. They have been unattractive to developers because of cleanup costs and uncertainty about future environmental liabilities. Lending institutions traditionally shy away from brownfields because of liability issues: if a mortgagee defaults on a property, a bank could be financially responsible for cleanup.[50] The brownfields law is intended to address this.

Many brownfields are situated on prime industrial land and their redevelopment would provide new economic development opportunities and help revitalize cities and towns. Redevelopment of brownfields would help to prevent sprawl to new industrial sites in rural

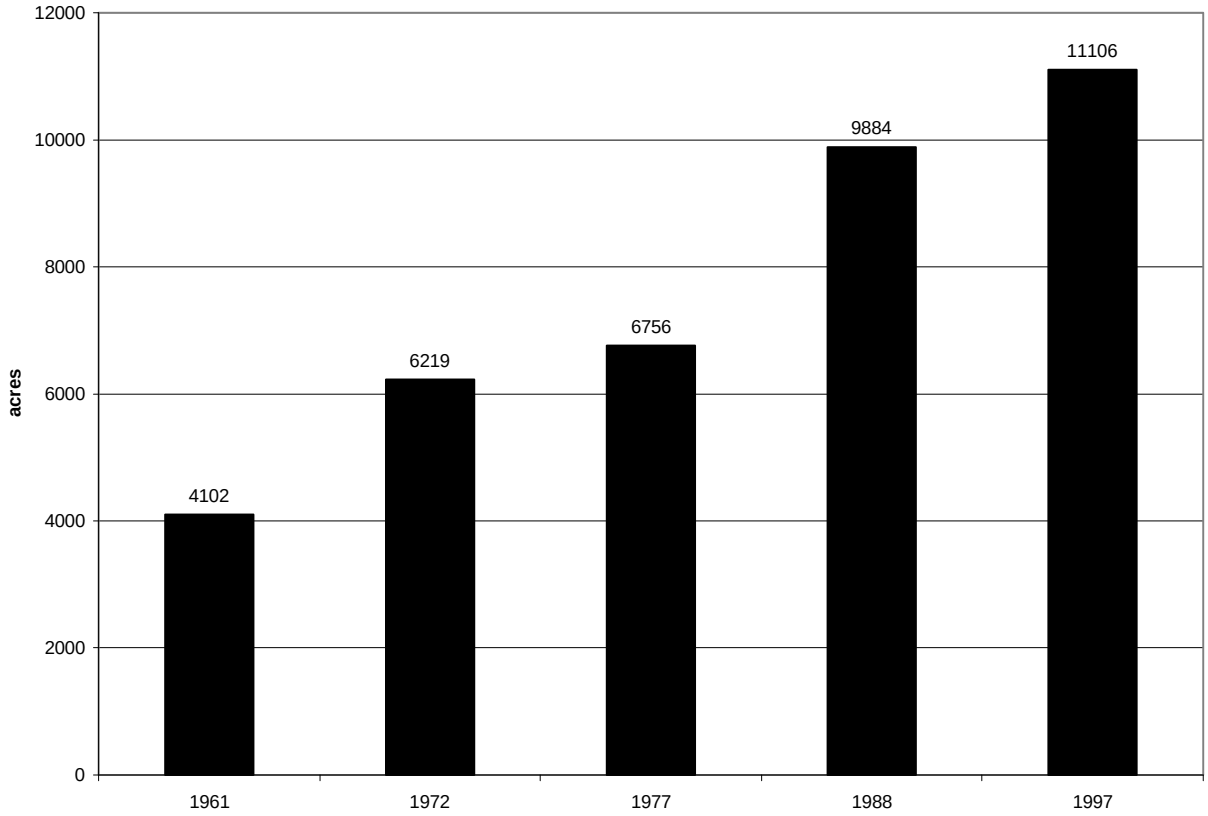
[50] Rhode Island Statewide Planning Program, *RI Overall Economic Development Program Update*, 1997, p. 29.

areas. The state recently made special tax credits available and revised its building codes in order to encourage the reuse of older manufacturing buildings.

Figure 6-13 displays the total amount of acres actually occupied for industrial use. Figures 6-14 and 6-15 display the geographic distribution of industrially occupied sites.

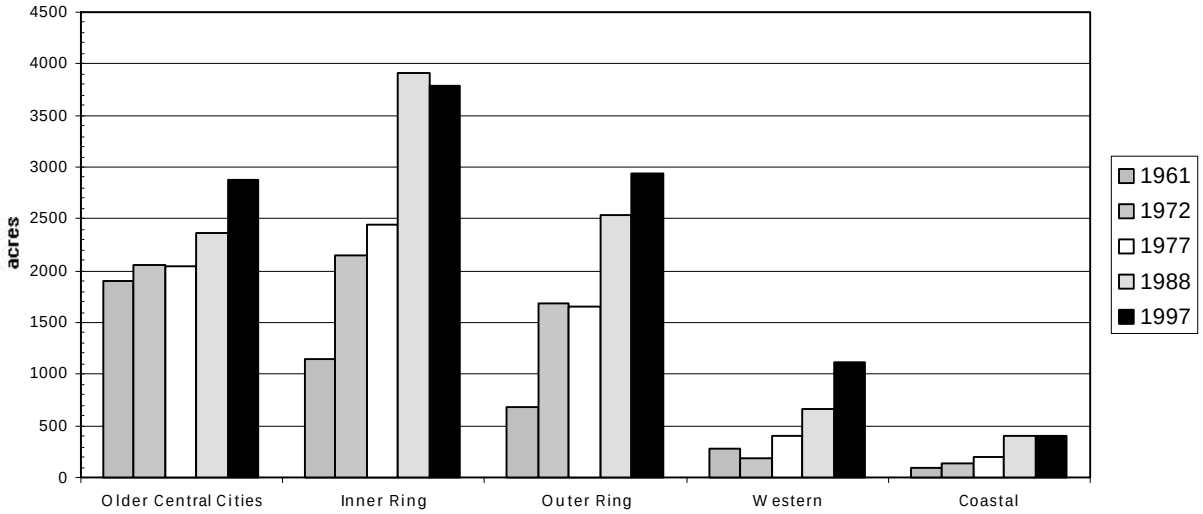
Figure 6-13

Industrial Land Use, 1961-1997



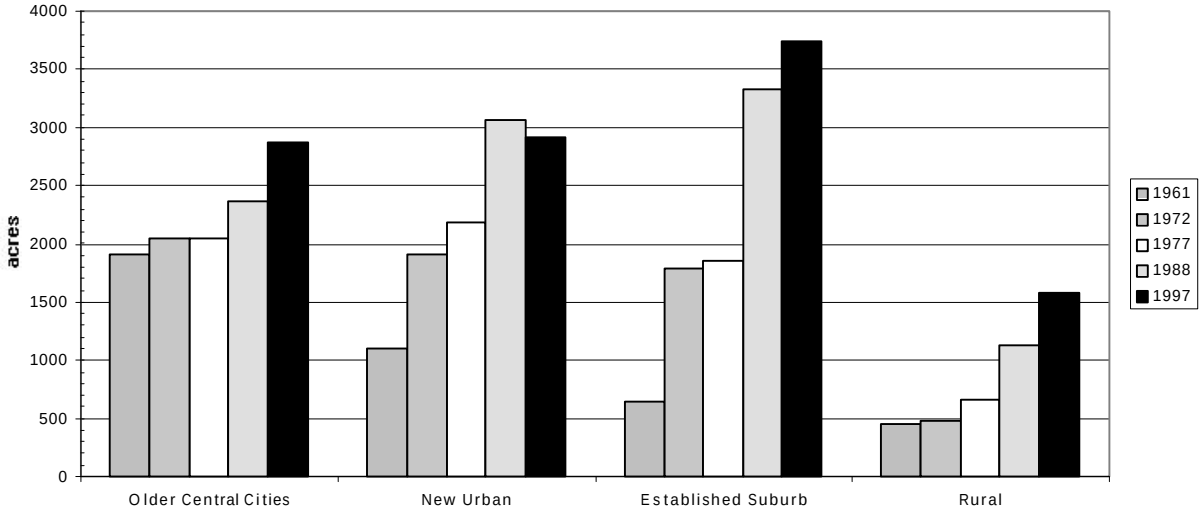
Source: RI Statewide Planning Program, *Land Use Trends in Rhode Island 1961 to 1988*, Technical Paper 146, July 1998; URI Cooperative Extension Service, *Remote Sensing Land Use and Vegetative Cover in Rhode Island* Bulletin No. 200, 1974; RI Statewide Planning Program RIGIS data for 1988 and 1995. *Industrial Land Use Plan*, Report Number 66, May 1990; *Industrial Land Use Plan*, Report Number 100, June 2000

Figure 6-14
Industrial Land Use By Spatial Zone, 1961-1997



Source: Rhode Island Statewide Planning Program, *Land Zoned for Industrial Use*, Technical Paper Number 20, January 1972.
Rhode Island Statewide Planning Program, *Land Zoned for Industrial Use: Inventory and Analysis*, Technical Paper Number 76, November 1978.
Rhode Island Statewide Planning Program, *Industrial Land Use Plan*, Report Number 66, May 1990
Rhode Island Statewide Planning Program, *Industrial Land Use Plan*, Report Number 100, June 2000

Figure 6-15
Industrial Land Use By Community Type, 1961-1997



Sources: Rhode Island Statewide Planning Program, *Land Zoned for Industrial Use*, Technical Paper Number 20, January 1972.
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Trend 8: The most visible source of development is commercial land use

Unlike residential property, commercial land concentrates along the most heavily traveled roadways. The 1970 Rhode Island Land Use Study subdivided commercial land classifications to include strip development along roadways, and shopping centers away from the urban core. Almost 60 percent of commercial development fell into one of these two land use patterns. It is this pattern of strip development that most people readily identify as sprawl. Additionally, the existing strip commercial developments tend not to be aesthetically pleasing. In this sense, commercial land development has had a disproportionate effect on people's perceptions.

As previously mentioned under Trend 4, from the period 1970 to 1995 growth in commercial land use has exceeded growth in residential land use, 55.5 percent compared to 100 percent. It seems probable that as population spread into less developed parts of the state, critical densities were reached that provided opportunities for businesses to both serve this population and draw upon them as a labor force. All regions of the state have experienced this growth.

For the purposes of this analysis, commercial land is treated as a single category. In fact, there is more than one type of commercial land. One major division within commercial land is between office use and retail use. While not significant in terms of statewide land use, at a local level the difference in services needed and traffic patterns generated can be quite significant.

The Figures 6-16 and 6-17 display the changes in commercial land use for various regions of the state.

Figure 6-16
Commercial Land Use by Spatial Zone, 1970-1995

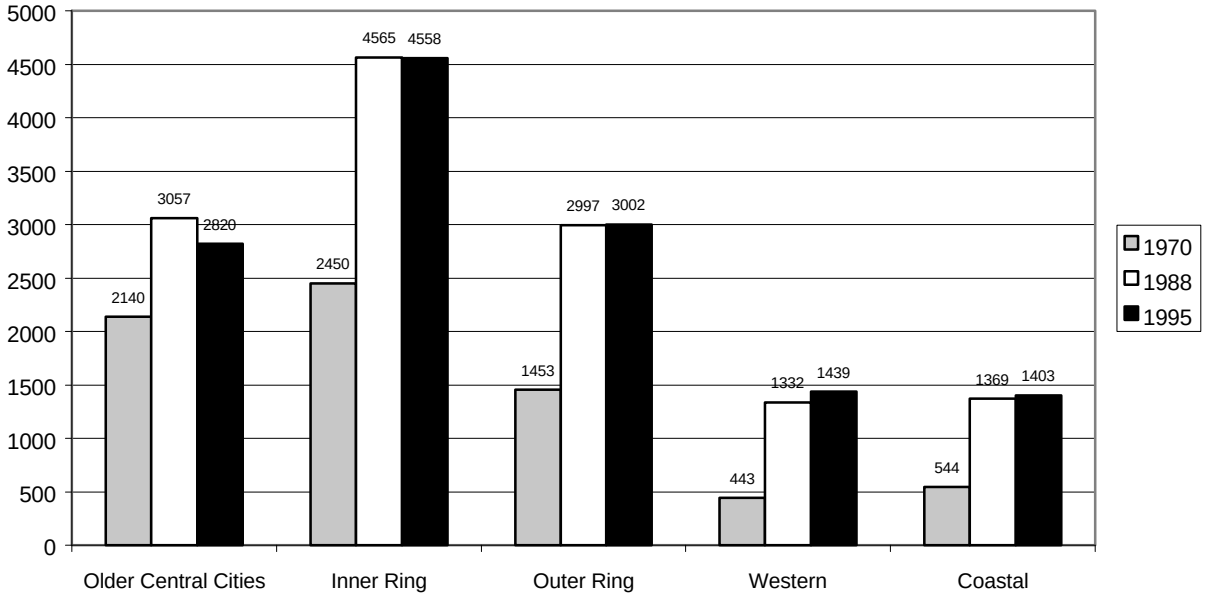
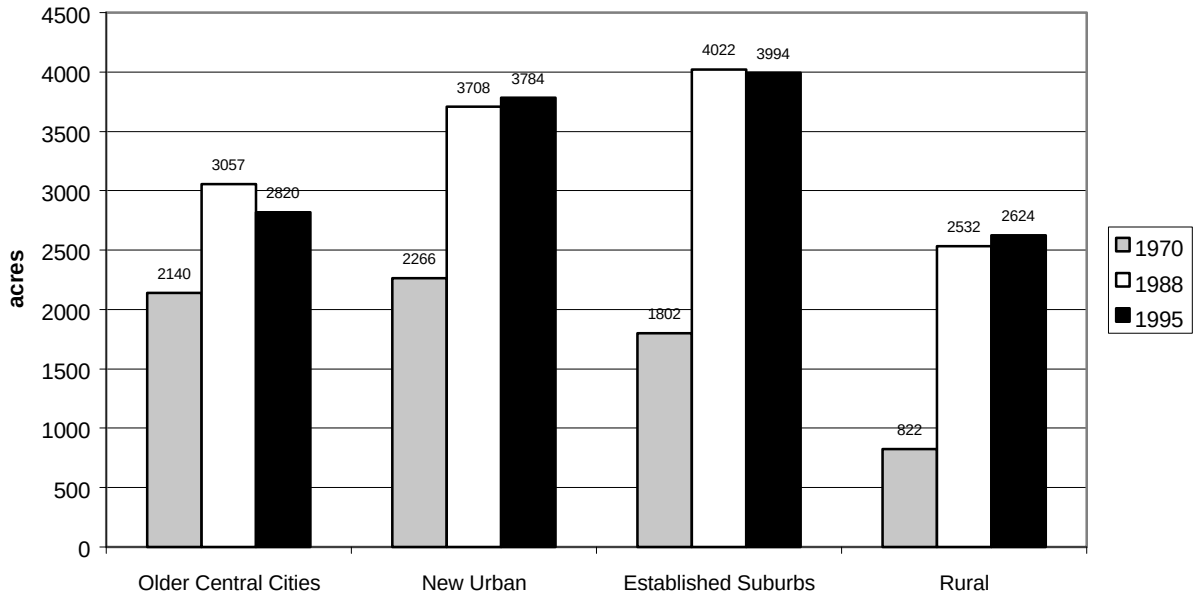


Figure 6-17
Commercial Land Use by Community Type, 1970-1995



Source: RI Cooperative Extension Service, *Remote Sensing Land Use and Vegetative Cover in Rhode Island* Bulletin No. 200, 1974 and RI Statewide Planning Program RIGIS data for 1988 and 1995.

Trend 9: The amount of land dedicated to transportation has increased

There is a profound interconnectedness between transportation and land use. How a society chooses to develop its land – residential densities, the degree of land use mixing, site designs, the location of residential areas with respect to job centers, etc. – all factor into what type of transportation systems can be used by that society. For example, a highly dense, compactly developed area can readily use mass transit systems while a low-density, highly dispersed development pattern requires automobiles for effective mobility. Conversely, the types of transportation infrastructure that a society chooses to invest in can greatly affect the viability of certain types of land uses. Choosing to build a particular transportation system in a particular area can allow for a land use that may have otherwise been impractical or uneconomical. A striking example is the interstate highway system which allowed residential development to occur well away from employment centers and yet still offer reasonable commuting times.

Inherent in the relationship between transportation and land use are economics and personal preferences. In an article reviewing causes and effects of sprawl, Reid Ewing writes, "Low-density suburban development is a 'natural' consequence of rising incomes, technological changes, low travel costs, and high travel speeds. Rising personal income has allowed households to spend more money on travel and on residential space. Industry has shifted from vertical to horizontal production processes. Increased auto ownership and the construction of high-speed highways have improved the accessibility of outlying sites, causing the urban boundary to shift outwards and flattening land rent and density gradients. Growth and decentralization of population have led to the decentralization of other activities, as market thresholds have been reached at outlying locations.[51]"

The out-migration from the cities, largely enabled by the automobile, has changed the map of Rhode Island in more than one way. The population shift toward suburban and rural municipalities resulted in significant growth in many individual communities. The cars that "drove" that growth pattern needed to travel on roads. Roads that were originally designed for light amounts of local traffic soon exceeded their capacity to safely and efficiently handle the new pattern of commuting substantial distances from one's residence to one's job. Additionally, suburbanites continued to take advantage of other trip-generating aspects of the urban environment such as educational institutions, stores, and cultural events.

As previously noted, commercial enterprises followed populations moving to suburban and rural communities. Roads became commercial strips for retail business. Successful suburban businesses became new trip-generators, adding to the pressure for new and/or improved roads.

Large commercial and industrial enterprises usually seek easy access to highways, especially interstate highways. Even without a demand for new interstates, there can still be pressure for new interstate access either through upgraded state roads and/or new interstate access ramps. Any improved highway access for business purposes will also allow for easier residential commuting. Therefore, one should be aware that even if road miles hold essentially steady, certain projects could still have a profound effect on land use patterns.

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[51] Ewing, Reid H. *Characteristics, Causes, and Effects of Sprawl: A Literature Review*, Environmental and Urban Issues, Winter 1994.

Roads had additional lanes added and entirely new roads were constructed. The most rapid increase in road construction occurred from the mid 1950's to the mid 1980's. Construction of the three Interstate highways, I-95, I-195, and I-295 was completed by 1975. The Interstates accounted for only 72 miles of the approximately 5,200 miles of public roads in 1975. The remainder was divided between State and local roads. However, we cannot be precise in allocating mileage between the two. One problem is that accurate statistics are hard to find. A second problem is that roads can be transferred from local jurisdiction to the State or vice-versa. Perhaps the best we can do is to quote from the 1992 Ground Transportation Plan which, in noting the 35% increase in road mileage from 1962 to 1985 stated, "*Much* (emphasis added) of the increase is due to newly opened residential neighborhood streets." We can say with some certainty that the state road network currently consists of approximately 6,000 miles and that, in addition to the 72 miles of Interstates this includes State roads totaling 1,200 miles and a network of local streets totaling 4,700 miles.[52]

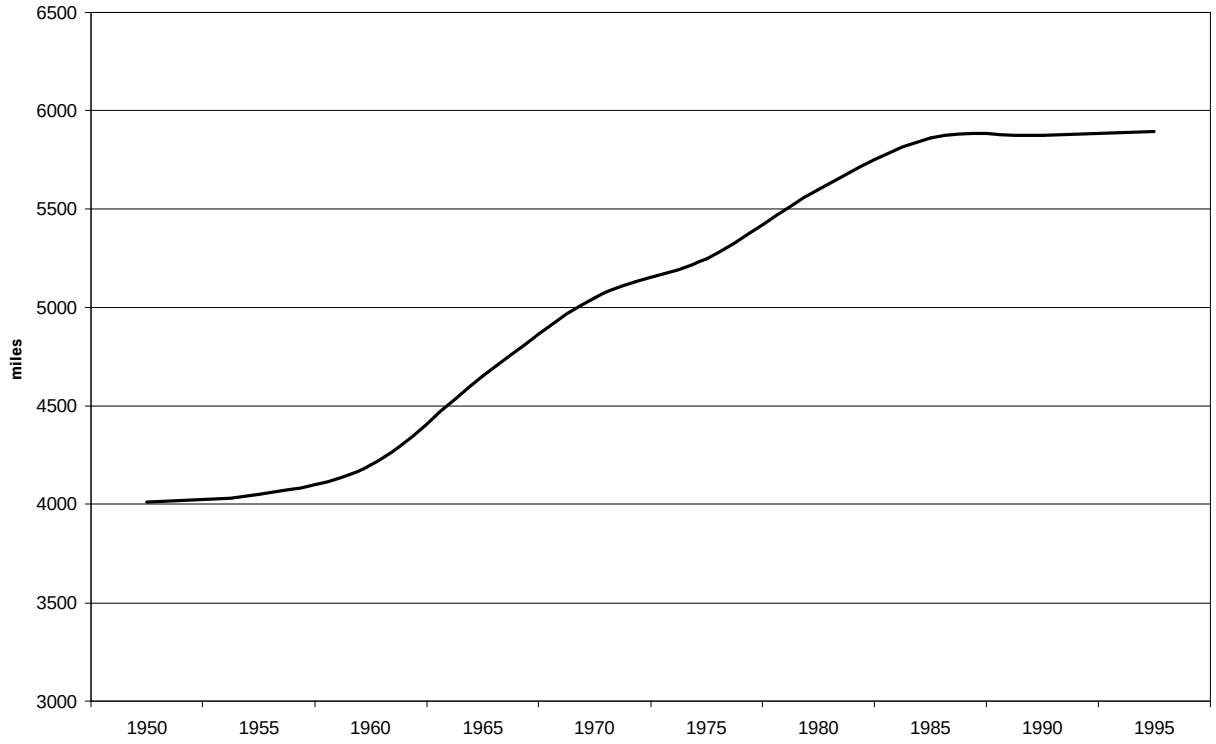
It is not the purpose of this paper to project long-term transportation trends. But given the realities of fiscal constraints, environmental constraints, and a recent change in public policy to emphasize traffic management over highway system expansion, it is safe to say that the flattened trend line from 1985 to 1995 on Figure 6-18 is not an anomaly.

Figure 6-18 displays the growth in miles of public roads over time. All public roadways, including interstates, state highways, and local roads are included in the totals. Finding reliable and consistent data regarding roads is a major problem. Historical data is spotty and often was not collected in a systematic manner. Accordingly, we have extrapolated data for several time periods in order to present a continuous trendline. Readers are cautioned not to give as much credence to the actual figures as to the overall trend.

[52] Rhode Island Department of Transportation, RIGIS data report, 1995.

Figure 6-18

Rhode Island Public Road Miles, 1950-1995



Source: Governor's Highway Commission. *Rhode Island Roads*. 1958
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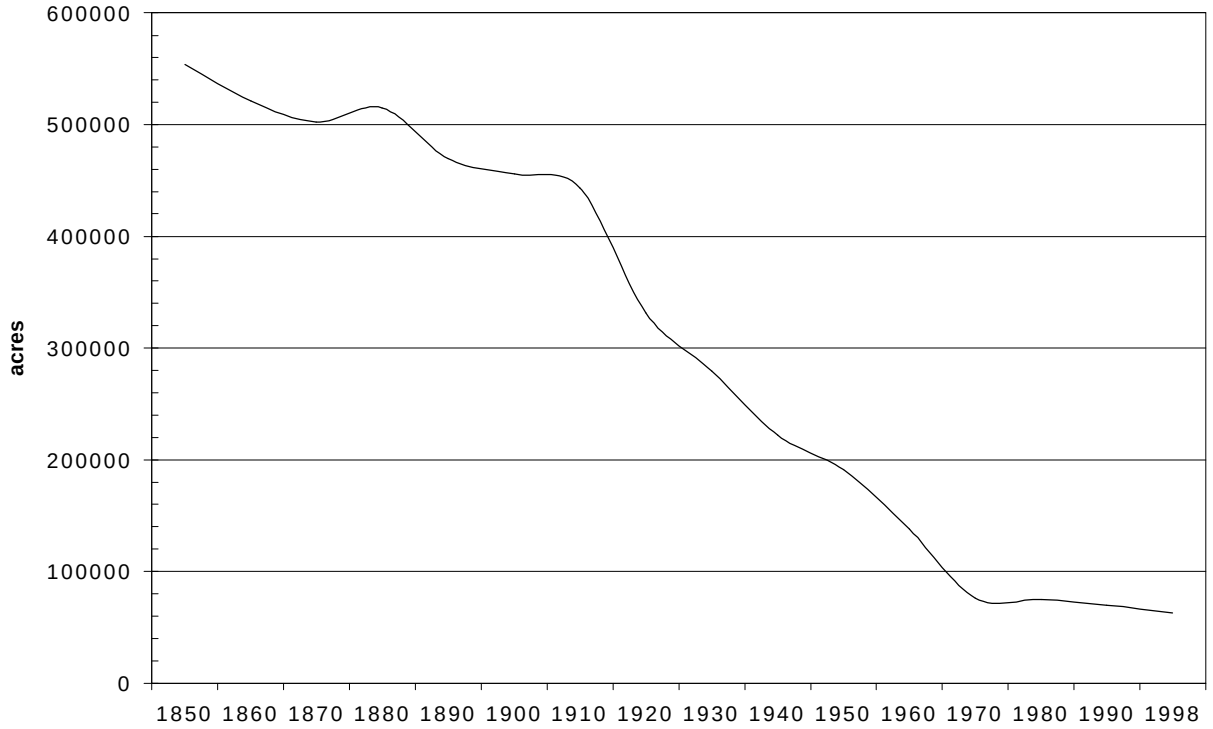
Trend 10: Agricultural use of land is in long-term decline

The overall acreage of land dedicated to agricultural use has been in steady decline since the 1800's. With Rhode Island's relatively poor agricultural soils and harsh climate, and with the advent of widespread rail and highway systems, it became more cost-efficient to import agricultural products from other regions of the country than to grow it locally. Contrary to popular conception, at least in the state of Rhode Island, the trend toward suburbanization has not accelerated the decline in active farmland. The trend from the mid-1800's to the mid-1900's was one of abandoned farmland reverting to meadows and then to forests. (In fact, from the late 1800's to the 1950's the state's total area of forestland more than doubled). Modern suburbanization did halt *this* trend. Since the 1950's most former agricultural land has quickly been developed. Theoretically, inactive farm land is still available for agriculture at some future time. Development precludes this option. Figure 6-19 illustrates the decline of active farmland.

Figure 6-19
Land in Agricultural Use, 1850-1998



Source: Lucy W. Griffiths, *One Hundred Years of Agriculture in Rhode Island (Statistics and Trends)*, University of Rhode Island, Bulletin 378, January 1965, and RIDEM Division of Agriculture

Beginning in the mid-1980's, the state began initiatives to preserve farmland. One program is the Farmland Preservation Act which established a fund to have the state purchase development rights from farmers. Another program is the Farm, Forest, and Open Space Act, which mandates that municipalities assess farmland at a lower tax rate. There are indications, as reported by the RIDEM Division of Agriculture, that the trend of diminishing active farmland has been halted and possibly even reversed in recent years. The Division is currently conducting a survey of agricultural land that will be more accurate than past studies but the final results were not available at the time of this publication.

Trend 11: Protection of undeveloped land has increased

> "Concern for the environment and access to parks and open space is not frivolous or peripheral; rather it is central to the welfare of people--body, mind, and spirit."
>
> *~ Laurance S. Rockefeller*

Although the overall acreage of undeveloped land has decreased (see Trend 2), permanently preserved open space achieved through local, state, and federal initiatives has increased. Non-profit land trusts and conservation organizations have also been very active in the protection of open space both in their own right and in partnership with government agencies. Protection comes from both the outright purchase of undeveloped land or by the acquisition of development rights (conservation easements). These lands, referred to as greenspace areas, comprise between 100,000 to 120,000 acres, or approximately 14.5% to 17% of the state.[53] The vast majority of open and undeveloped land remains however, in private ownership and is potentially subject to development.

Conservation in recent years has achieved a substantial level of sophistication. Better data and analysis has allowed protection efforts to focus on areas of critical environmental concern and the highest quality recreational value. Data from the state's Geographic Information System, RIGIS, were used as a basis for developing the *Greenspace and Greenways for Rhode Island's Future*. The availability of multiple data layers that are geographically referenced allowed for the mapping of six criteria chosen as critical values for open space protection. They are: 1) Pure water, 2) Flood hazard areas, 3) Forests, 4) Biodiversity and wildlife, 5) Agriculture, and 6) Recreation and culture.

Figure 6-20 illustrates approximate federal, state, and municipal land holdings dedicated to natural resource conservation/protection and public outdoor recreation. Commercial recreational land, such as golf courses and campgrounds, are not included as protected lands. Also, generally excluded from these figures are state-owned facilities devoted to educational or other institutional uses, even though they may contain large areas of open space. In order to provide consistency between years, we were unable to include land owned for watershed protection. The data simply was not available for all years.

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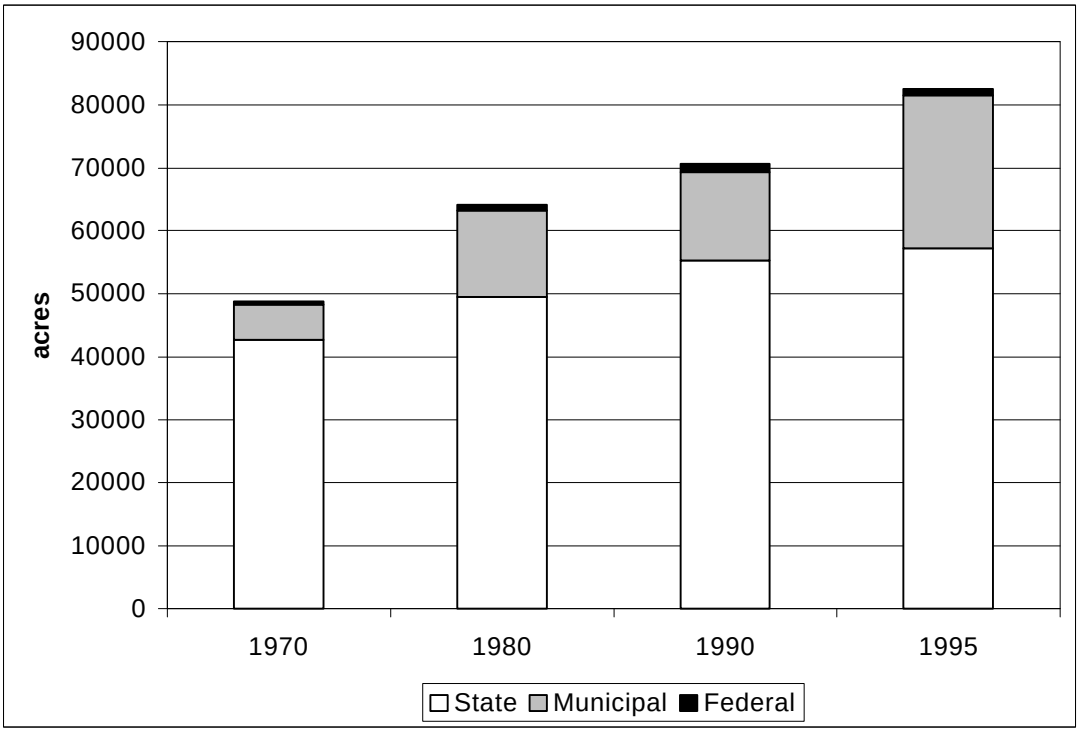
[53] Rhode Island Division of Planning, *RI Recreation, Conservation, and Open Space Inventory*, 1989, updated with unpublished RIGIS data thru 1995 and The Nature Conservancy, unpublished GIS data. It is difficult to determine a precise acreage count because ownership of protected land is scattered among so many different entities. Furthermore, reported acreages can vary depending on whether waterbodies are counted as part of a protected land parcel or are factored out.

Figure 6-20

Publicly Protected Greenspace



Trend 12: The state is increasingly urban and there is a qualitative difference between the traditional central cities and the newly urbanized suburbs

Roger Williams founded a settlement in Providence in 1636. In doing so, he also began a trend toward development and urbanization. The first federal census, taken in 1790, showed that Rhode Island was 19 percent urban and 81 percent rural. Sometime during the 1840's, the state was evenly split between urban and rural territory. The pace of urbanization did not level off until the 1930's when Rhode Island reached its highest level of urban population, 92 percent[54]. The first urban population centers grew around Newport and Providence. The rise of the industrial revolution fostered the growth of new urban communities such as Pawtucket, Central Falls, and Woonsocket along the Blackstone River.

As discussed in the Definitions section, the meaning of "urban" can be somewhat fluid. Based on our standard of a municipality having a population density of 2,500 or more persons per square mile and 50% or more of its land area classified as developed land, the state currently has ten urban communities. They are:

Central Falls	Pawtucket
Cranston	Providence
East Providence	Warwick
Newport	West Warwick
North Providence	Woonsocket

While there are areas within some of these communities that do not fit the criteria for urban (e.g. western Cranston), and there are sections of other municipalities not on this list that do fit the criteria for urban (e.g. Westerly town center), for purposes of statewide trends analysis it would be confusing to classify communities on a sub-municipal level. Also as a practical matter, land use decisions are made at the municipal, not sub-municipal, level.

Five of Rhode Island's urban municipalities may be considered "old" or traditional central cities: Providence, Pawtucket, Central Falls, Newport, and Woonsocket. Cranston, East Providence, North Providence, Warwick, and West Warwick are the new urbanized suburbs. How do they differ?

Our traditional cities were designed with high-density in mind from their inception. As such, businesses and residences are built in near proximity. Lot sizes are relatively small and multi-family housing is relatively abundant. Mass transit is widely available and sidewalks are everywhere. Public infrastructure such as water and sewers extend into almost all neighborhoods. Neighborhoods have readily defined character and boundaries.

In contrast, suburbs were designed with low-density in mind. Housing and businesses are segregated. Lot sizes are relatively large and multi-family housing relatively scarce. Due to the low-density, scattered patterns of housing, mass transit is mostly impractical. Since residences and businesses are not generally within walking distance, few sidewalks are needed. While some infrastructure such as public water is fairly common, other infrastructure such as sewers are widely scattered. Neighborhood boundaries are generally ill defined.

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[54] As defined by the U.S. Census Bureau, "urban" comprised all territory and persons in incorporated places of 2,500 or more persons.

One is not inherently “better” than the other. Each was designed for very different purposes. Central cities were designed to bring people and commerce close together. Suburbs were designed to allow people to “escape” the perceived drawbacks of urban life. People could spend their days working and shopping in central cities but could spend their leisure time and raise their children in suburban bedroom communities. In retrospect, we can see that without long-term planning and land use control, this pattern of extending development to more rural areas is intrinsically flawed because it leads to sprawl.

The first flaw we have already mentioned. As people move to low-density rural communities, they begin to change the very characteristics that attracted them in the first place. At some point those characteristics are lost. In other words, unless populations can be kept level or new land added, low-density scattered development is unsustainable.

"The sprawl pattern discourages a sense of community. It encourages land speculation. It requires high infrastructure investments. It requires high energy consumption and is a major source of air and water pollution."
~ Anton Nelessen,
Visions for a New American Dream

The second flaw is reminiscent of people who moved to Arizona in order to find relief from the hayfever that plagued them in their home regions. Finding Arizona to be too desert-like, they began to plant lawns and trees. After a few years, they discovered that their hayfever had returned. To make matters worse, they had to spend inordinate amounts of money on fertilizer and irrigation to keep their lawns and trees healthy in the Arizona desert.

Similarly, people living in suburbs found they missed the convenience of nearby shopping. Business enterprises filled this void by creating commercial strips along well traveled highways. Furthermore, municipalities in their efforts to increase the property tax base, encouraged ever more commercial and industrial development. In other words, urban land uses kept increasing, and thereby transforming, suburban communities into urban communities.

Rhode Island’s five urbanized suburbs still retain qualities that make them valuable in their own right, but unlike traditional cities that were designed to be compact, these former suburbs were designed to be diffuse with a resulting land use pattern that is not as efficient as our traditional cities.

Overall we can characterize the trend for the past 50 years as one of urban decline and suburban expansion. Where people are living and how they are using land has been changing dramatically. People are living and working farther from urban centers and consuming more undeveloped land. Urban job centers have decentralized to the suburbs, and new housing tracts have moved even deeper into agricultural and formerly forested areas.

The desire has been for a more pleasant lifestyle. The unintended side effects have included:

- Increased infrastructure costs in the form of new schools, new roads, new sewers, etc.
- Strains on municipal services as the cost of services, particularly public education, incurred from many residential areas may exceed the taxes paid by those properties.
- Increased traffic as residences, jobs, retail centers, and recreational opportunities spread farther from each other.
- Increased air and water pollution.
- Ecological damage to ecosystems such as fields and forests that have been fragmented by subdivisions.
- An increased sense of congestion as a community transforms from rural to urban.
- A decline in the urban tax base which leads to higher taxes which leads to more urban flight.

The issues connected to land use in our ever changing communities are quite literally "close to home." In response to the concern that the quality of life was eroding both in non-urban and urban communities, the state enacted significant new laws regarding local comprehensive planning, zoning, and subdivision during the period 1988 to 1992. It is too soon to determine the extent of the effectiveness of these laws on promoting more efficient development patterns and protecting the local quality of life but the monitoring of these issues will continue.

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APPENDIX

1970 CLASSIFICATION SYSTEM

The classification system described the nature of the land itself, the vegetation on the landscape, or the land use. The use of 65 land use types allowed for the assigning of relatively specific land uses and land covers. It included only features that could be consistently and accurately interpreted on 1:12,000 or 1:20,000 scale panchromatic photographs taken without snow on the ground. These types were aggregated into 22 categories under six major headings as follows.

1. Urban Lands (6 categories, 22 types)
   a) Industrial Land
      i) heavy industrial
      ii) light industrial
   b) Commercial Land
      i) distribution or merchandizing
      ii) highway retail strips
      iii) shopping centers
   c) Dense Residential
      i) garden apartments
      ii) apartment buildings, tenements, and town houses
      iii) urban residential houses (less than ¼ acre lot)
   d) Low-Density Residential
      i) residential houses (¼ to ½ acre lot)
      ii) residential houses (½ to 1 acre lot)
      iii) residential houses (1 to 2 acre lot)
      iv) residential houses (greater than 1 acre with forest cover)
      v) residential estates (3 acres or more)
      vi) clustered residential
   e) Transportation Land
      i) airports
      ii) water transportation (e.g., docks and land-based storage facilities)
      iii) railyards, rail stations, etc.
      iv) truck and bus terminals
      v) highways
   f) Urban Open
      i) urban undeveloped
      ii) public grounds (e.g., colleges, hospitals, etc.)
      iii) cemeteries

2. Recreation Facilities (4 categories, 15 types)
   a) Water-Based
      i) marinas or boatyards
      ii) freshwater beach
      iii) saltwater beach
      iv) swimming pools

b) Participation
    i) tennis court
    ii) golf course
    iii) golf driving range, archery range, or shooting range
    iv) playgrounds
    v) ski area
c) Spectator
    i) race track
    ii) athletic field
    iii) amusement park
    iv) fairground
    v) drive-in theater
d) Environmental
    i) urban park or zoo

3. Agricultural and Open Lands (5 categories, 11 types)
    a) Extensive Agriculture
        i) pasture
    b) Intensive Agriculture
        i) actively tilled
        ii) unused tillable
    c) Woody Perennials
        i) orchard
        ii) nursery
        iii) cranberry bog
    d) Open Areas
        i) abandoned field
        ii) abandoned orchard
        iii) open sand areas other than beaches
        iv) powerline rights-of-way
    e) Heathland

4. Forest Land (1 type)

5. Wetlands (4 categories, 11 types)
    a) Shallow Freshwater
        i) shrub swamp
        ii) meadow
        iii) shallow marsh
        iv) seasonally flooded basin
    b) Deep Freshwater
        i) deep marsh
        ii) bog
        iii) beaver pond
    c) Open Freshwater (i.e., lakes, rivers)
    d) Saltwater Wetland
        i) tidal salt marsh
        ii) irregularly flooded salt marsh
        iii) ditched salt meadow

6. Mining and Waste Disposal Areas (2 categories, 5 types)
    a) Mining Land
        i) sand or gravel extraction
        ii) other mining
    b) Waste Disposal
        i) dump
        ii) automobile dump
        iii) filter bed

A more detailed description for each category follows.

Urban Lands – 6 Categories, 22 Types

Land classified as urban for this survey was based on, for the most part, a large number of people living and working in closely ordered structures in a confined land space. Urban limits were at the border of the block street pattern or just beyond it. Each urban type included crossroads, parking facilities, and other features that accompany the complex. Industrial, commercial, residential, and transportation lands were the primary components the urban type.

Category 1: Industrial Land (land use symbols UI and UL)

UI Heavy industrial land containing facilities for the manufacture, storage, and assembly of raw or partially processed products such as machinery, metals, chemical, petroleum, or electrical power. Warehouses and transportation facilities for bulk products and an open, uninterrupted street pattern characterize this type.

UL Light industrial land containing facilities for the manufacture or assembly of smaller products such as electronics, appliances, and other partially processed products. Note: Many light industries were well landscaped and were indistinguishable from commercial activity on the aerial photographs.

Category 2: Commercial Land (land use symbols UC, UH, US)

UC Commercial land used predominantly for distribution or merchandising goods and services. Stores, hotels, offices, parking garages, apartment buildings, and smaller warehouses usually set close to streets. This type included commercial buildings away from the urban core.

UH Highway commercial land used for sale of goods and service away from urban centers. Examples: Gas stations, motels, restaurants, and stores located in strips along major routes.

US Shopping centers away from the urban core, surrounded by large parking lots.

Category 3 High-density Residential (land use symbols UA, UT, URH)

UA Garden apartments, which are usually located outside the urban core. They are set back from the street, have some grounds, and may have attached recreational facilities like swimming pools and tennis courts. Apartments without grounds in the city are considered type UC.

UT Tenements, town or row houses, or apartment buildings set close to the streets, and are close together. They are for the most part three or more stories in height, which helps distinguish them from URH. Some goods or services are sold here, but the area is predominantly used for high-density urban living.

URH High-density urban residential land used for homes that are spaced closely, set back from the street, and are on lots less than 1/4 acre in size. Nearly all the street frontage for these building lots is approximately 50 feet, and many of the streets are laid out in 200-foot intervals. There are about eight dwelling units per acre. This type included houses in older urban areas and mobile home parks.

Category 4 Low-density Residential (land use symbols URM, URL, URO, URF, UE, UCR)

URM Medium-density residential land used for homes that are spaced closely and arranged in orderly curved or rectangular patterns. They are set back from the street on lots that are usually 1/4 or 1/2 acre in size. Most of the street frontage is 100 feet in width.

URL Light-density residential land, with lot sizes from ½ acre to 1 acre.

URO Open, very light-density residential land, with large lot sizes from 1 to 2 acres.

URF Very light-density, forested, residential land with large lots greater than 1 acre. In this type only space for the house and a small lawn are cleared in the forest. More than 75 percent of the forest is left intact, and the lots are predominantly 2 acres in size.

UE Estates of 3 acres or more, with extensive lawns, gardens, and other grounds.

UCR Clustered residential development, with 3 to 10 dwellings in farming or forested areas.

Category 5: Transportation (land use symbols UTA, UTW, UTR, UTT, HW)

UTA Airports with landing strips, hangars, parking areas, and related facilities. Small airfields without runways, hangars, or other specialized facilities were not typed as airports.

UTW Docks, warehouses, and related land-based storage facilities for water transportation and commercial fishing. Liquid storage facilities like tank farms may be part of this type.

UTR Railyards, terminal freight and storage facilities, and passenger rail stations. This type may also include liquid storage facilities like tank farms.

UTT Terminal freight and storage facilities for trucks and buses. Transportation facilities that are part of an industrial complex are included as part of the industrial type.

HW Divided highway with 200 feet or more of right-of-way width.

Category 6: Urban Open (land use symbols UO, UP, ✝)

UO Open, undeveloped land in the midst of urban areas or adjacent to them. This type included land that was cleared for future development.

UP Public or quasi-public land with grounds and greenspace, which contains facilities to serve large numbers of people. Examples are schools, colleges, churches, hospitals, state hospitals, and prisons. When located in the urban core, public buildings without grounds could not be identified on air photos and was classified as UC.

✝ Cemeteries greater than three acres.

Outdoor Recreation Facilities – 4 Categories, 15 Types

Outdoor recreation types were either: (1) water-based, (2) active participation, (3) spectator activities, or (4) environmental in character. Each recreational type included the recreational complex, access roads, parking facilities, buildings, and other related facilities. *State parks, state forests, or town forests were typed as forest land since they had no distinguishing features on aerial photographs.* Many of these are shown on USGS base maps, but their area was computed as forest in this study. Campgrounds were not typed because they could not always be located under the forest canopy.

Category 1: Water-based Recreation (land use symbols RM, RFB, RSB, RS)

RM Marinas or boatyards.

RFB Freshwater sandy beach. Included bathhouses, parking, and related facilities.

RSB Saltwater sandy beach. Included bathhouses, parking, and related facilities.

RS Swimming pools. Included bathhouses and parking facilities greater than three acres.

Category 2: Participation Recreation (land use symbols RC, RG, RD, RPG, RSK)

RC Tennis courts. The complex must be three acres or more to have been mapped.

RG Golf courses. This included the club house and associated recreational facilities. (If tennis or swimming facilities at country clubs exceed three acres they were typed as RC or RS.)

RD Golf driving ranges, skeet shooting ranges, and archery ranges.

RPG Playgrounds. Playgrounds have a conglomeration of many types of facilities, which may include tennis courts, swimming pools, and athletic fields. If any of these were three acres or more, they were typed separately.

RSK Ski areas for alpine skiing or ski jumping. This included ski trails with wooded space between them as well as the base facilities and parking area.

Category 3: Spectator Recreation (land use symbols RT, RA, RAP, RFG, RI)

RT Race tracks for horses, dogs, or cars.

RA Athletic fields and stadiums.

RAP Commercial amusement parks.

RFG Fairgrounds for agricultural fairs.

RI Drive-in theaters.

Category 4: Environmental Recreation (land use symbol RP)

RP Urban park or common that is intensively used for green space in the city. A zoo would fall under this category.

Agricultural and Open Land – 5 Categories, 11 Types

One way to classify agricultural and open land is by the vegetation that it supports. To a degree, vegetative cover defines the land value, its aesthetic quality, its value for wildlife, and its potential for other uses.

Category 1: Extensive Agriculture (land use symbol P)

P Pasture or wild hay land that is not suitable for tilling due to the steepness of slope, poor drainage, stoniness, or lack of fertility. This land has less well-defined boundaries and often has scattered shade trees.

Category 2: Intensive Agriculture (land use symbols T, TU)

T Tilled or tillable cropland that is or has recently been intensively farmed. The boundaries on the ground are usually sharply defined and maintained. The land supporting farm buildings is included as part of this type.

TU Unused tillable land that has not been recently tilled and is not part of an agricultural unit. This kind of land occurs near growing urban areas, and it is usually mowed annually to maintain its value.

Category 3: Woody Perennials (land use symbols O, N, CB)

O Productive fruit orchard.

N Land supporting nurseries. This type includes greenhouses and adjacent land as well as lands supporting horticultural specialties, ornamentals, shrubs, and Christmas trees.

CB Productive cranberry bog.

Category 4: Open Areas (land use symbol AF, AO, S, PL)

AF Abandoned field that is reverting to wild land. Woody vegetation and grass are abundant but tree crown cover is less than 30 percent. If the tree cover was greater than 30 percent, the land was classified as forest.

AO Abandoned orchard. In addition to the decadent fruit trees, grass and woody vegetation are abundant.

S Open sand areas that may support scattered vegetation. Sandy beaches are a separate outdoor recreation type.

PL Power line rights-of-way, 100 feet or more in width, maintained through wooded areas. Where power lines crossed agricultural areas or wetland and require no maintenance, they were typed according to the vegetative type under them.

Category 5: Heathlands (land use symbol H)

H The heath plant community as well as grass, shrubs, and other low vegetation found primarily on poor, sandy soils on Block Island.

Forest Land – 1 Type

Rhode Island forests were typed from 1961 aerial photographs as part of an earlier land use inventory. The nature of a forest can be expected to change little in nine years; furthermore, since the state is heavily forested, the cost of land use mapping could be reduced considerably by recognizing only one forest type. For these reasons, agencies funding the 1970 study decided that another detailed forest breakdown was unnecessary.

F Forest lands supporting trees of any species or size with 30 percent crown closure. If the woody vegetation had 29 percent or less crown closure, it was classed as abandoned field (AF), abandoned orchard (AO), or, if it were a wetland and the woody vegetation were less than 20 feet tall, shrub swamp (SS).

Wetlands – 4 Categories, 11 Types

The wetland classification used in 1970 was a modification of the one developed by the U.S. Fish and Wildlife Service in 1953. Note: Wooded swamps were not distinguishable from other forested areas in this study.

Category 1: Open Fresh Water (land use symbol W)

W Open water in lakes, rivers, and large streams. Water depth is greater than three feet during the growing season. The boundary of coastal water was determined by either drawing a line across the river mouth to connect the edges of the coastline or using constructed features like roads or bridges that cross rivers or inlets.

Category 2: Shallow Freshwater Wetland (land use symbols SF, SS, M, SM)

SF Seasonally flooded basins or flats. This type occurs on stream flood plains characterized by common herbaceous plants and grasses. The soil is waterlogged or covered with water during spring freshets, but well-drained during the growing season. This type was difficult to recognize on aerial photographs because it does not support a distinctive vegetation complex and the floodwater is there for only a short period in the spring.

SS This type is shrub swamp. The soil is waterlogged during the growing season and is often covered with as much as six inches of water. Common woody species are alder, buttonbush, dogwood, and willow. Sedges are usually present in tussocks.

M The soil in a wetland meadow is waterlogged through most of the growing season, and the surface water is present only for a short period during the spring. Vegetation is predominantly grasses, rushes, and sedges.

SM Shallow marsh is wetter than a meadow. The soil is completely waterlogged and often covered with up to six inches of water during the growing season. There is usually some open water; and the predominant vegetation is emergent, including such plants as cattails, bulrushes, burreed, pickerelweed, arrowhead, grasses, and sedges.

Category 3: Deep Freshwater Wetland (land use symbols DM, B, BP)

DM Deep marsh is categorized by water depths ranging from six inches to three feet. Large open water areas are bordered by, or interspersed with, emergent vegetation like that found in shallow marshes.

B This type is a bog. The acid, peaty soil is waterlogged and supports a distinctive plant community that typically includes heath shrubs, cranberries, pitcher plants, and sedges. Scattered black spruce, tamarack, and red maple may be present.

BP A beaver pond resembles one or more of the above types but originates by beaver activity.

Category 4: Saltwater Wetland (land use symbols TSM, ISM, DSM)

TSM Tidal salt marsh that is flooded twice daily. Vegetation is primarily of salt marsh origin.

ISM Irregularly flooded salt meadows, flooded at monthly tides and during severe storms. Vegetation is primarily salt-meadow cordgrass, salt-grass, and black rush.

DSM Salt meadow that has been ditched for mosquito control or for agricultural purposes.

Mining and Waste Disposal Areas – 2 Categories, 5 Types

Mining in Rhode Island mainly consists of extraction of sand, gravel, or stone.

Category 1: Mining Land (land use symbols SG, OM)

SG Sand or gravel extraction.

OM Other mining. This land was used for the extraction of stone and materials other than sand or gravel.

Category 2: Waste Disposal (D, DA, FB)

D Dump. This land is used for waste and refuse materials. Active landfills would fall into this class.

DA Automobile dump. Automobile graveyards or active automobile junk yards.

FB Filter bed. Land and associated buildings used for treating liquids containing organic or chemical matter.

1988 and 1995 Classification System

The classification scheme is based on the Anderson *et al* (1976) hierarchical classification for use with remote sensor data but was modified to meet agency needs. The classification scheme can be generally defined as the Anderson Level II modified classification system.

100 Series: Urban or Built-up Land

110 - Residential

111 High-density residential area with 8 or more dwelling units per acre.
1970 Code: Garden apartments (UA), tenements (UT), and high-density residential (URH).

112 Medium-high-density residential area with 4.0 - 7.9 dwelling units per acre.
1970 Code: High-density residential (URH).

113 Medium-density residential area with 1.0 - 3.9 dwelling units per acre.
1970 Code: High-density residential (URM).

114 Medium-low-density residential area with 0.5 to 0.9 dwelling units per acre.
1970 Code: Light-density residential (URL) and clustered residential development (UCR).

115 Low-density residential area with less than 0.5 dwelling units per acre.
1970 Code: Very light-density open residential land (URO), very light-density forested residential (URF), and estates greater than 3 acres (UE).

120 - Commercial and Services

Primarily sale of products and services.
1970 Code: Commercial (UC), highway commercial (UH), and shopping centers (US).

130 - Industrial

Manufacturing, design, assembly, etc; industrial parks.
1970 Code: Heavy industrial (UI) and light industrial (UL).

140 - Transportation, Utilities, Communication

141 Roads, divided highways, greater than 200-feet rights-of-way.
1970 Code: Divided highways (HW) and terminal freight and storage (UTT).

142 Airport runways, terminals, and parking storage.
1970 Code: Airport runways and related facilities (UTA).

143 Railroads, terminals, parking, and repair areas.
1970 Code: Railroads, terminals, parking, and repair areas (UTR).

144 Water and sewerage facilities and buildings.
1970 Code: Waste disposal filter bed (FB).

145 Waste disposal areas, landfills, and junk yards.
1970 Code: Dumps (D) and automobile dumps (DA).

146 Power lines with greater than 100-feet rights-of-way.
1970 Code: Power lines with greater than 100-feet rights-of-way (PL).

147 Other water-based transportation facilities such as commercial docks.
1970 Code: Docks, warehouses, and related storage facilities (UTW).

150 - Mixed Urban

Light industrial and commercial uses mixed.
1970 Code: Light industrial (UL) and commercial (UC).

160 - Other Urban

161 Developed recreation, urban parks, zoos, golf courses, etc.
1970 Code: Urban park (RP), athletic fields and stadiums (RA), golf courses (RG), marinas (RM), swimming pools (RS), tennis courts (RC), golf, archery, or shooting ranges (RD), ski areas (RSK), race tracks (RT), amusement parks (RAP), fair grounds (RFG), and drive-in theaters (RI).

162 Urban open space, vacant land, etc.
1970 Code: Open, undeveloped land in urban areas (UO).

163 Cemeteries.
1970 Code: Cemeteries greater than three acres (✞).

170 - Institutional

Educational, health, correctional, and religious facilities.
1970 Code: Public and quasi-public land with grounds and open space (UP).

200 Series - Agricultural Land

210 Pasture, hay fields, land not suitable for tillage.
1970 Code: Pasture, hay fields, land not suitable for tillage (P).

220 Cropland, intense farming, and tillable land.
1970 Code: Tilled cropland (T) and untilled cropland (TU).

230 Orchards, groves, and nurseries.
1970 Code: Fruit orchards (O), nurseries (N), and cranberry bogs (CB).

240 Confined feeding of animals and raising area.
1970 Code: Not classified.

250 Idle agriculture and abandoned fields.
1970 Code: Abandoned fields (AF) and abandoned orchards (AO).

300 Series - Forest Land

310 Deciduous forest with greater than 80 percent species mix.
1970 Code: Forest (F).

320 Evergreen forest with greater than 80 percent species mix.
1970 Code: Forest (F).

330 Mixed deciduous with 50 - 80 percent species mix.
1970 Code: Forest (F).

340 Mixed evergreen with 50 - 80 percent species mix.
1970 Code: Forest (F).

400 Series - Brush Land

Shrub and brush areas undergoing reforestation.
1970 Code: Abandoned field (AF), abandoned orchard (AO), forest (F), and heath (H).

500 Series - Water

Reservoirs, lakes, and ponds.
1970 Code: Open water (W).

600 Series - Wetland

Forested and non-forested wetlands.
1970 Code: Shrub swamp (SS), shallow marsh (SM), deep marsh (DM), bog (B), beaver pond (BP), seasonally flooded basins (SF), wetland meadow (M), tidal salt marsh (TSM), irregularly flooded salt marsh (ISM), ditched salt meadow (DSM).

700 Series - Barren Land

710 Beaches.
1970 Code: Saltwater sandy beach (RSB) and freshwater sandy beach (RFB).

720 Sandy areas other than beaches.
1970 Code: Open sandy areas (S).

730 Rock outcrops.
1970 Code: Not classified.

740 Strip mines, quarries, and gravel pits.
1970 Code: Sand or gravel quarry (SG) and other mining (OM).

750 Transitional areas.
1970 Code: Open, undeveloped land in urban areas (UO).

760 Mixed barren.
1970 Code: Not classified.

Land Use, 1970
Summary Table

	Land Use Type	Resi-dential	Com-mercial	Indus-trial	Trans & Utilities	Institu-tional	Urb.Open & Cemeteries	Recrea-tional	Agricul-tural	Open	Forest	Water	Wetland	Mining & Waste Disp	City&Town Total	
1	**Barrington**	2,459	45	15	53	120	79	274	402	173	1,300	1,201	640	23	6,784	1
2	**Bristol**	1,609	77	129	11	103	165	187	1,436	352	2,053	382	250	74	6,828	2
3	**Burrillville**	2,061	44	88	121	114	99	165	1,411	1,094	29,852	1,194	267	110	36,620	3
4	**Central Falls**	426	98	102	23	4	49	16	0	0	38	48	26	4	834	4
5	**Charlestown**	1,620	61	23	407	95	23	251	1,265	620	18,870	3,093	859	118	27,305	5
6	**Coventry**	3,473	148	173	81	85	225	178	1,920	1,196	29,486	1,991	620	265	39,841	6
7	**Cranston**	4,881	595	335	782	493	648	289	2,704	898	5,165	364	510	177	17,841	7
8	**Cumberland**	2,836	198	124	156	139	358	81	1,730	839	10,096	940	361	207	18,065	8
9	**East Greenwich**	1,724	157	62	146	88	249	172	892	406	6,425	103	113	106	10,643	9
10	**East Providence**	3,041	373	467	646	149	485	649	259	365	1,651	569	192	135	8,981	10
11	**Exeter**	855	46	0	3	130	25	175	2,642	357	30,764	477	394	38	35,906	11
12	**Foster**	787	48	26	11	11	14	138	1,775	1,017	28,833	492	233	74	33,459	12
13	**Glocester**	1,355	53	21	7	60	32	64	1,631	779	28,419	1,421	358	93	34,293	13
14	**Hopkinton**	1,730	45	46	239	11	53	57	2,636	451	21,647	889	535	35	28,374	14
15	**Jamestown**	1,394	14	0	35	482	32	143	873	871	1,994	55	242	25	6,160	15
16	**Johnston**	2,506	208	109	260	23	162	68	769	690	9,457	489	547	268	15,556	16
17	**Lincoln**	1,749	25	285	310	57	224	413	732	1,020	6,336	309	220	82	11,762	17
18	**Little Compton**	1,253	8	0	0	4	4	116	3,926	894	7,024	1,150	220	18	14,617	18
19	**Middletown**	1,898	166	4	173	472	103	281	3,811	354	330	242	507	26	8,367	19
20	**Narragansett**	2,486	96	14	124	226	198	353	693	542	3,396	1,462	558	14	10,162	20
21	**Newport**	2,369	173	15	247	540	155	318	149	275	440	353	151	32	5,217	21
22	**New Shoreham**	269	26	7	57	32	11	381	1,240	3,571	237	871	219	19	6,940	22
23	**North Kingstown**	4,029	298	151	1,191	1,848	394	595	3,429	1,420	12,703	536	786	302	27,682	23
24	**North Providence**	1,766	162	55	28	138	123	148	112	300	710	81	43	15	3,681	24
25	**North Smithfield**	1,346	63	174	156	70	89	37	1,133	997	10,634	474	241	274	15,688	25
26	**Pawtucket**	2,927	320	661	240	122	499	299	0	62	330	165	57	22	5,704	26
27	**Portsmouth**	2,372	75	196	360	686	196	533	4,749	1,204	3,879	393	701	115	15,459	27
28	**Providence**	5,254	1,353	867	1,167	738	728	651	18	105	526	771	24	22	12,224	28
29	**Richmond**	981	27	23	54	73	8	143	2,806	262	19,613	353	785	85	25,213	29
30	**Scituate**	2,069	37	48	0	125	48	114	1,259	790	26,315	4,070	217	147	35,239	30
31	**Smithfield**	1,749	132	121	349	48	96	55	1,398	864	11,339	863	301	275	17,590	31
32	**South Kingstown**	4,125	138	98	388	412	118	388	6,068	1,144	20,237	4,110	1,701	330	39,257	32
33	**Tiverton**	2,075	83	18	245	36	79	29	2,693	1,005	11,804	959	350	177	19,553	33
34	**Warren**	942	110	60	27	34	64	49	1,210	150	1,091	904	430	0	5,071	34
35	**Warwick**	8,669	921	344	1,537	376	924	1,002	941	1,241	5,484	1,488	526	211	23,664	35
36	**West Greenwich**	750	15	7	194	34	142	26	1,278	280	28,779	536	432	400	32,873	36
37	**West Warwick**	1,887	215	153	77	29	187	140	414	263	1,646	162	55	29	5,257	37
38	**Westerly**	3,199	201	98	141	25	137	571	1,638	954	10,513	1,576	908	264	20,225	38
39	**Woonsocket**	2,221	196	225	89	89	246	75	78	293	1,224	136	56	97	5,025	39
	State Total	**89,142**	**7,050**	**5,344**	**10,135**	**8,321**	**7,471**	**9,624**	**62,120**	**28,098**	**410,640**	**35,672**	**15,635**	**4,708**	**693,960**	
	% of Total Land	**12.8%**	**1.0%**	**0.8%**	**1.5%**	**1.2%**	**1.1%**	**1.4%**	**9.0%**	**4.0%**	**59.2%**	**5.1%**	**2.3%**	**0.7%**	**100.0%**	

Source: Remote Sensing Land Use and Vegetative Cover in Rhode Island
Rhode Island Statewide Planning Program

Land Use, 1988
SUMMARY TABLE

	Land Use	Resi-dential	Com-mercial	Indus-trial	Transport & Utilities	Com/Ind Mixed	Recrea-tional	Urb.Open & Cemeteries	Institu-tional	Agricul-tural	Forest	Brush	Water	Wetland	Barren	Other	City & Town Total	
		111-115	120	130	141-147	150	161	162-163	170	210-250	310-340	400	500	600	710-750	999		
1	Barrington	2,810	115	12	38	0	289	27	160	331	473	32	232	890	83	0	5,492	1
2	Bristol	2,425	164	119	129	89	303	70	185	724	919	115	18	823	242	0	6,325	2
3	Burrillville	3,837	134	111	456	0	187	57	146	1,407	24,883	323	1,271	3,378	281	0	36,471	3
4	Central Falls	368	143	109	6	0	14	23	54	0	11	0	49	36	11	0	825	4
5	Charlestown	3,380	183	43	335	0	413	2	22	951	12,142	601	1,049	4,658	682	4	24,465	5
6	Coventry	6,024	394	222	114	15	222	100	99	1,520	22,735	264	2,041	5,422	813	0	39,986	6
7	Cranston	6,391	705	700	704	138	470	320	572	1,742	3,797	99	304	2,026	539	0	18,507	7
8	Cumberland	4,533	287	280	417	0	134	67	218	1,251	7,117	177	1,023	1,942	633	1	18,079	8
9	East Greenwich	2,900	199	119	377	0	154	36	140	622	3,913	93	70	1,604	211	0	10,439	9
10	East Providence	3,257	683	466	670	212	669	135	269	153	833	80	459	782	285	1	8,953	10
11	Exeter	2,007	79	25	246	0	228	37	109	2,753	26,057	248	626	4,780	188	0	37,383	11
12	Foster	2,052	160	26	57	0	141	12	33	1,758	24,177	389	605	3,735	130	0	33,276	12
13	Glocester	3,380	179	34	80	0	320	45	68	1,882	24,575	165	1,597	3,877	188	0	36,387	13
14	Hopkinton	2,556	94	39	332	0	116	39	51	2,486	17,416	277	915	3,721	222	0	28,263	14
15	Jamestown	1,942	60	0	58	0	205	14	243	755	1,681	294	51	830	55	0	6,187	15
16	Johnston	3,771	479	222	1,133	71	102	84	159	945	5,799	117	523	1,938	233	0	15,577	16
17	Lincoln	2,978	177	390	487	144	606	22	171	618	4,227	157	485	1,354	326	1	12,143	17
18	Little Compton	2,249	62	0	29	0	118	19	14	4,002	3,367	301	1,242	4,026	268	0	15,697	18
19	Middletown	2,438	422	174	222	0	250	56	349	2,324	251	347	253	800	200	0	8,086	19
20	Narragansett	3,271	227	13	97	0	368	7	175	300	1,921	252	152	2,093	244	0	9,120	20
21	Newport	2,400	242	72	113	22	397	52	605	150	410	223	201	175	111	0	5,173	21
22	New Shoreham	1,422	88	0	69	0	20	12	14	1,014	1,210	1,264	904	387	594	3	7,002	22
23	North Kingstown	5,364	438	102	1,519	0	567	215	1,203	2,195	9,960	624	459	4,830	792	0	28,268	23
24	North Providence	2,397	318	69	87	0	111	5	154	33	272	20	71	137	38	0	3,709	24
25	North Smithfield	2,808	237	134	732	0	104	53	106	934	7,711	165	549	2,117	281	1	15,931	25
26	Pawtucket	2,842	560	606	257	186	281	209	210	3	191	34	11	146	55	0	5,591	26
27	Portsmouth	3,338	207	209	256	0	507	50	836	3,102	2,335	1,358	339	1,874	691	0	15,103	27
28	Providence	5,199	1,370	1,072	1,142	180	888	296	1,016	2	368	45	244	94	124	0	12,039	28
29	Richmond	2,212	89	54	329	0	129	26	49	2,579	16,118	352	385	3,459	303	0	26,085	29
30	Scituate	3,497	117	17	104	0	57	12	130	1,520	21,536	121	4,044	3,838	96	0	35,088	30
31	Smithfield	3,252	392	230	865	119	99	25	149	1,009	8,123	165	830	1,993	419	1	17,670	31
32	South Kingstown	6,065	308	64	502	44	366	48	461	5,077	14,322	687	2,896	7,551	842	0	39,232	32
33	Tiverton	3,076	294	31	475	0	79	34	97	2,421	7,306	562	578	4,056	410	0	19,420	33
34	Warren	1,140	155	91	55	33	90	38	73	887	411	31	74	843	74	0	3,995	34
35	Warwick	10,066	1,492	643	1,779	105	1,103	129	602	792	2,958	230	409	1,822	844	1	22,975	35
36	West Greenwich	1,419	77	28	540	0	85	95	7	1,216	23,903	291	565	3,954	611	0	32,790	36
37	West Warwick	2,444	357	301	122	0	177	30	91	81	866	43	146	412	107	0	5,177	37
38	Westerly	5,191	409	73	658	6	450	148	103	1,020	5,774	562	748	3,792	718	4	19,655	38
39	Woonsocket	2,304	458	333	125	63	117	49	247	26	788	37	130	214	159	0	5,050	39
	State Total	**129,002**	**12,553**	**7,231**	**15,715**	**1,427**	**10,934**	**2,699**	**9,389**	**50,583**	**310,856**	**11,146**	**26,547**	**90,410**	**13,101**	**17**	**691,610**	
	% of Total Land	**18.7%**	**1.8%**	**1.0%**	**2.3%**	**0.2%**	**1.6%**	**0.4%**	**1.4%**	**7.3%**	**44.9%**	**1.6%**	**3.8%**	**13.1%**	**1.9%**		**100%**	

Source: RIGIS Land Use Statistics
Rhode Island Statewide Planning Program

Land Use, 1995
Summary Table

	Land Use	Resi-dential	Com-mercial	Indus-trial	Transport & Utilities	Com/Ind Mixed	Recrea-tional	Urb.Open & Cemeteries	Institu-tional	Agricul-tural	Forest	Brush	Water	Wetland	Barren	Other	City & Town Total	
		111-115	120	130	141-147	150	161	162-163	170	210-250	310-340	400	500	600	710-750	999	Total	
1	Barrington	2,894	114	12	38	0	291	29	158	314	423	35	230	873	78		5,490	1
2	Bristol	2,628	174	134	121	92	298	119	189	696	871	113	19	806	57		6,316	2
3	Burrillville	4,050	134	117	481	0	188	59	179	1,394	24,462	324	1,246	3,365	326		36,325	3
4	Central Falls	364	143	111	6	0	14	24	54	0	15	8	49	36	0		825	4
5	Charlestown	3,579	193	43	334	0	421	4	21	921	11,929	599	1,049	4,655	705		24,452	5
6	Coventry	6,829	401	227	114	15	220	120	100	1,537	21,796	271	2,040	5,393	882		39,946	6
7	Cranston	6,871	753	752	725	146	465	298	612	1,670	3,449	159	303	1,990	311		18,504	7
8	Cumberland	4,784	294	314	429	7	149	103	222	1,133	7,084	200	1,026	1,921	375	36	18,077	8
9	East Greenwich	3,175	224	124	376	0	154	36	141	591	3,649	120	63	1,594	188		10,438	9
10	East Providence	3,299	687	480	615	212	571	140	271	119	817	123	457	775	370		8,936	10
11	Exeter	2,431	90	27	269	0	242	37	108	2,849	25,463	246	625	4,770	213		37,370	11
12	Foster	2,248	157	27	62	3	140	13	33	1,767	23,834	357	605	3,722	189		33,157	12
13	Glocester	3,498	177	35	81	0	329	45	81	1,943	24,164	163	1,587	3,843	223		36,168	13
14	Hopkinton	2,939	104	42	334	0	116	40	51	2,426	16,975	359	916	3,714	232		28,247	14
15	Jamestown	2,065	59	0	105	0	124	19	329	736	1,535	292	51	832	37		6,183	15
16	Johnston	4,144	499	255	1,205	71	139	83	159	903	5,381	133	502	1,896	195		15,565	16
17	Lincoln	3,298	187	392	588	176	608	36	177	540	4,018	188	483	1,334	114	8	12,149	17
18	Little Compton	2,308	60	0	26	0	118	12	12	3,645	2,963	261	1,251	3,617	183		14,456	18
19	Middletown	2,662	445	176	253	0	240	93	382	2,238	246	491	254	844	121		8,445	19
20	Narragansett	3,405	242	21	104	0	369	8	185	270	1,807	238	152	2,065	252		9,117	20
21	Newport	2,401	247	73	115	22	245	54	758	146	413	179	224	175	122		5,175	21
22	New Shoreham	1,539	90	0	73	0	20	19	16	1,018	1,150	1,195	284	385	589		6,378	22
23	North Kingstown	5,906	504	1,073	1,514	0	574	262	261	2,005	9,410	801	458	4,791	681		28,239	23
24	North Providence	2,452	324	69	85	0	115	8	158	22	236	19	71	131	20		3,708	24
25	North Smithfield	3,093	216	158	742	0	104	59	118	825	7,516	144	549	2,110	286	6	15,927	25
26	Pawtucket	2,834	559	617	256	178	281	211	208	3	191	34	90	146	50		5,658	26
27	Portsmouth	3,633	202	204	261	0	510	209	584	2,972	2,425	1,455	338	1,869	426		15,087	27
28	Providence	5,165	1,395	1,089	1,127	180	873	303	1,067	6	394	37	244	92	57		12,029	28
29	Richmond	2,674	110	53	328	0	355	28	59	2,728	15,182	272	370	3,448	465		26,074	29
30	Scituate	3,893	120	18	97	0	67	10	130	1,481	21,165	121	4,043	3,820	112		35,077	30
31	Smithfield	3,608	447	249	898	131	101	25	149	934	7,709	253	827	1,985	354		17,669	31
32	South Kingstown	6,934	314	100	505	44	395	70	454	4,907	13,684	639	2,896	7,524	759		39,225	32
33	Tiverton	3,393	312	31	413	0	79	34	101	2,434	6,845	550	808	4,032	386		19,418	33
34	Warren	1,210	158	94	54	33	95	38	73	844	398	30	59	836	63		3,985	34
35	Warwick	10,193	1,663	728	1,791	105	1,157	223	592	779	2,862	250	394	1,802	428	3	22,971	35
36	West Greenwich	1,938	146	41	735	0	113	97	19	1,194	23,214	234	561	3,948	538		32,779	36
37	West Warwick	2,555	357	297	123	0	181	36	97	69	792	70	147	405	51		5,178	37
38	Westerly	5,379	445	73	640	6	449	133	105	1,014	5,630	512	501	3,789	722		19,399	38
39	Woonsocket	2,346	476	332	133	79	127	67	254	18	766	48	115	211	74		5,048	39
	State Total	**138,617**	**13,221**	**8,587**	**16,159**	**1,500**	**11,038**	**3,206**	**8,667**	**49,090**	**300,861**	**11,523**	**25,886**	**89,543**	**11,237**	**36**	**689,188**	
	% of Total Land	**20.1%**	**1.9%**	**1.2%**	**2.3%**	**0.2%**	**1.6%**	**0.5%**	**1.3%**	**7.1%**	**43.7%**	**1.7%**	**3.8%**	**13.0%**	**1.6%**		**100%**	

Source: RIGIS Land Use Statistics
Rhode Island Statewide Planning Program