RHODE ISLAND STATEWIDE PLANNING PROGRAM
TECHNICAL APPENDIX D

Geographic Analysis for Land Available and Suitable for Development for Land Use 2025

A technical appendix for the update of:
State Guide Plan 121, Land Use 2025
State Land Use Policies and Plan

DATE : January 23, 2006

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ABSTRACT

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ABSTRACT:

The Statewide Planning Program is preparing an update of the State Guide Plan Element 121, *Land Use 2025: State Land Use Policies and Plan*, published in 1989. This technical appendix is one of a series of appendices that develop background information for the updated land use plan. This paper describes the detailed steps taken in a geographic information system (GIS) analysis of land use in Rhode Island. It describes the geographic information used and the decisions made in a creating 8 step process to draft a new statewide future land use map.

Nancy Hess, Principal Environmental Planner, prepared this appendix. George Johnson, Assistant Chief of Statewide Planning co-authored sections of this appendix. Other program staff who assisted in the production of this appendix were; Christina Delage, Geographic Information Analyst and Kim Gelfuso, Information Services Technician II. John Stachelhaus, RIGIS Coordinator, provided support and reference information concerning the Rhode Island Geographic Information System (RIGIS) for the analysis.

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Part 1: Introducing GIS

For an update of the 1989 State Land Use and Policies Plan the Statewide Planning Program staff performed an overlay constraint analysis using data from the Rhode Island Geographic Information System (RIGIS). The purpose of the analysis was to identify those lands most appropriate for development and those least suitable, according to a concentration of selected concerns and constraints. The results of the analysis are used in Part 4 of the updated land use plan to recommend how land should be allocated to various land intensity categories for development of the future land use map in Part 2 of the plan. The analysis consisted of several parts which this paper will describe in detail:

- Land Availability Assessment – identified committed and available land within the state.
- Land Suitability Analysis – combined data on resource values and constraints to identify the varying suitability of lands for development.
- Land Intensity Potential Classification – combined suitability assessment with additional water resource and infrastructure considerations to assess an optimum development intensity potential for land in the state, especially undeveloped, unprotected areas.
- Development and Conservation Area Prioritization – introduced proximity factors to prioritize undeveloped, unprotected areas for development or conservation.
- Alternative Land Use Patterns or “Scenarios” – defined four options for future urban form of the state, and constructed generalized geographic patterns illustrating these alternatives in terms of intensity and distribution of future development.
- Evaluation and Scenario Selection – assessed each scenario in terms of land availability by intensity requirements, and for policy conformance, and selected a preferred scenario as a basis for the recommended future land use map.

The 1995 RIGIS Land Use/Land Cover data served as a primary data source for this analysis. Due to the age of some of the RIGIS data (1995 to 2002), actual land cover and use may have changed. Most of data included in the analysis is also RIGIS-licensed and published and described in the *RIGIS Data Catalog* dated September 2003 and available at http://www.edc.uri.edu/rigis-spf/catalog2003a.htm. In a few cases for the later sections of the analysis, internal working GIS data from the Department of Environmental Management was used to insure the accuracy of open space data and protected lands. A complete set of color maps of this Appendix can be viewed on the Statewide Planning Program web page at www.planning.ri.gov.

This land suitability analysis is to be used for statewide land use planning purposes only. Analyses presented in this plan are intended as a general guide for directing development, not as local or site development decision-support tools. It is not a local site development tool but should be used as an indicator for where more local site data should be gathered when a specific land use is proposed for an area of undeveloped/unprotected land.

There are local regulatory frameworks and data that are not available in RIGIS that need to be considered as well for site development. These frameworks may restrict development options for a parcel to a subset of land uses and may further impose minimum or maximum use limits, environmental constraints, and other land regulations based upon specific local conditions. As always, *the local zoning ordinance and subdivision and land development regulations should be consulted when a specific land use is proposed for an area.*

Part 2: Land Suitability Analysis

In 1969, Ian L. McHarg wrote[1]:

> *It is not a choice of either the city or the countryside: both are essential, but today it is nature, beleaguered in the country, too scarce in the city, which has become precious.*

His observation still very much applies to Rhode Island. We face development and expansion pressures that require careful management in order to preserve natural systems and the functions they support, inside and outside the urban environment. Land is a resource whose prudent use is beneficial to all citizens. Although it is mostly privately owned, Rhode Island's land resource base, like its air and water resources, has the aspects of a public good. The natural character of our state has added immeasurably to property values and the quality of life.

This section explains the process of developing a methodology for a land suitability analysis (LSA) performed for the land use plan update and describes the items selected for this analysis, leading to a land suitability map used in developing the future development scenarios described in Part 4 of the Land Use Plan 2025.

Land Suitability Explained

"Suitability" refers to an ability "to be fitted for" a given purpose. The concept of suitability as applied to land recognizes that we have a limited amount of land, and that each unit of land possesses a mix of intrinsic characteristics that make it more or less useful for particular purposes.

As population grows, the pressure for the maximum use of land resources is increasing, along with a realization that natural resources are disappearing or being impacted by development. Most land has a natural resource value of some sort and to some degree – value as habitat, as a source of food or timber, as an element in regional hydrology, as a scenic resource, etc. While almost all land can be developed if enough money and effort are put into the task, the suitability concept seeks to identify those areas best suited to accommodate future growth with minimum impact on the natural resource value and public expense.

The first *State Land Use Policies and Plan* (1975) recognized that land is a natural resource difficult to renew, and that development should be guided to locations where it is capable of being sustained without ecological damage. This observation was reiterated in the second plan, *Land Use 2010* (1989). Derived from both plans is the understanding that development in the "wrong" locations, or in the "right" locations without proper controls, can cause lasting effects that harm socially important resources and ultimately are detrimental to the general public welfare.

Depending upon the many variables that may come into play, poorly situated or improperly controlled development can:

[1] Design With Nature, Ian L. McHarg, Natural History Press, Garden City, New York, 1969.

- Adversely affect land resources both in the short term (soil erosion, unsuitable water table) and long term (groundwater pollution, septic system failure, increased runoff pollution);

- Generate increased costs for public services;

- Prevent the optimum utilization of land, especially critical in terms of industrial development, affordable housing, and regional service centers;

- Dictate future land use patterns that are unmanageable both financially and environmentally;

- Contribute to flooding and flood hazards through encroachment on flood plains and wetlands; and

- Isolate large tracts of land, precluding their use in the future.

Properly planned and directed development, on the other hand, can protect valuable resources and accommodate the range of necessary uses in locations where access and public services can be feasibly and economically provided.

How Land Suitability Analysis Works

Land Suitability Analysis (LSA) helps determine whether land is appropriate for development in two ways. First, the LSA analyzes site characteristics and predicts their impact on development, focusing mostly on the natural features that serve as both opportunities and constraints. Second, and conversely, the LSA assesses potential impacts of development on those natural features. The LSA ideally is based on the most current RIGIS land use and natural resources information available – so it can be used to identify areas having important resource values that should be protected, and less environmentally sensitive areas where development will not seriously impact those values.

The goals of the LSA performed were: 1) to establish a statewide GIS-based analysis of natural resources for use in the update of our land use plan, and 2) to provide a tool for ongoing land use planning that meets the need to allocate land for competing uses statewide, maintains the land's natural functions, and avoids constraints and hazards to development.

If one takes a strictly economic approach in evaluating land for use, that person bases the land's value on its "highest and best" uses as determined by the market. Land is then evaluated according to its suitability to support economic and public activities efficiently, i.e., at the lowest economic cost. Location is a key consideration, and suitability is defined in terms of the parcel's size, accessibility and the availability of utilities. The environmental attributes of the land may not be considered, except as they affect development costs.

In the LSA, because natural systems are also taken into account, the landscape becomes the sum of historical, physical and biological processes. Moreover, the interrelationships between these components are stressed, rather than each feature being treated as a separate characteristic of the landscape.

The Software Used

In any land analysis a number of decisions and assumptions must be made to establish criteria for evaluating land. The first decision was to use the existing available digital data from the Rhode Island Geographic Information System. Although some data sets are 10 or more years old, they represent the most comprehensive and best available database of statewide environmental information. We selected geographic information system software, Arc Map 9.0, published by ESRI < http://www.esri.com> for the analysis tool.

Land Availability Assessment

The next step was to identify the currently committed (developed and protected) land, *versus* the undeveloped and unprotected land remaining in the state. The LSA would then identify within the undeveloped/unprotected lands those areas where development could prudently occur and where it should not, according to a concentration of selected concerns and constraints.

We identified the developed and protected land use from RIGIS' 1995 Land Use/Land Cover data, which served as a primary data source for this project. Figure (1), *1995 Land Use Land Cover* shows this coverage. Editing this data was an extensive part of the process for clarity and accuracy. The term *uncommitted* for undeveloped and unprotected land was used since some land areas, such as state management areas, are in a *committed* (protected) use even though they are not developed. Actual land cover and use may have varied or changed since 1995. Areas designated as *developed* from 1995 Land Use/Land Cover included:

- all residential, commercial and industrial uses of land
- commercial/industrial mixed land
- institutional land
- roads, airports, railroads, other transportation
- water and sewage treatment facilities
- waste disposal facilities
- power lines
- developed recreation
- cemeteries, and
- mines, quarries and gravel pits.

Areas designated as *undeveloped* from 1995 Land Use/Land Cover included:

- all vacant land
- pasture
- cropland
- orchards
- groves
- nurseries
- confined feeding operations
- idle agriculture
- forest
- brush land
- beaches
- sandy areas
- rock outcrops
- transitional areas and
- mixed barren areas.

Areas designated as *water and wetland* from 1995 Land Use/Land Cover included freshwater, saltwater and wetlands.

Figure (1):
1995 Land Use Land Cover

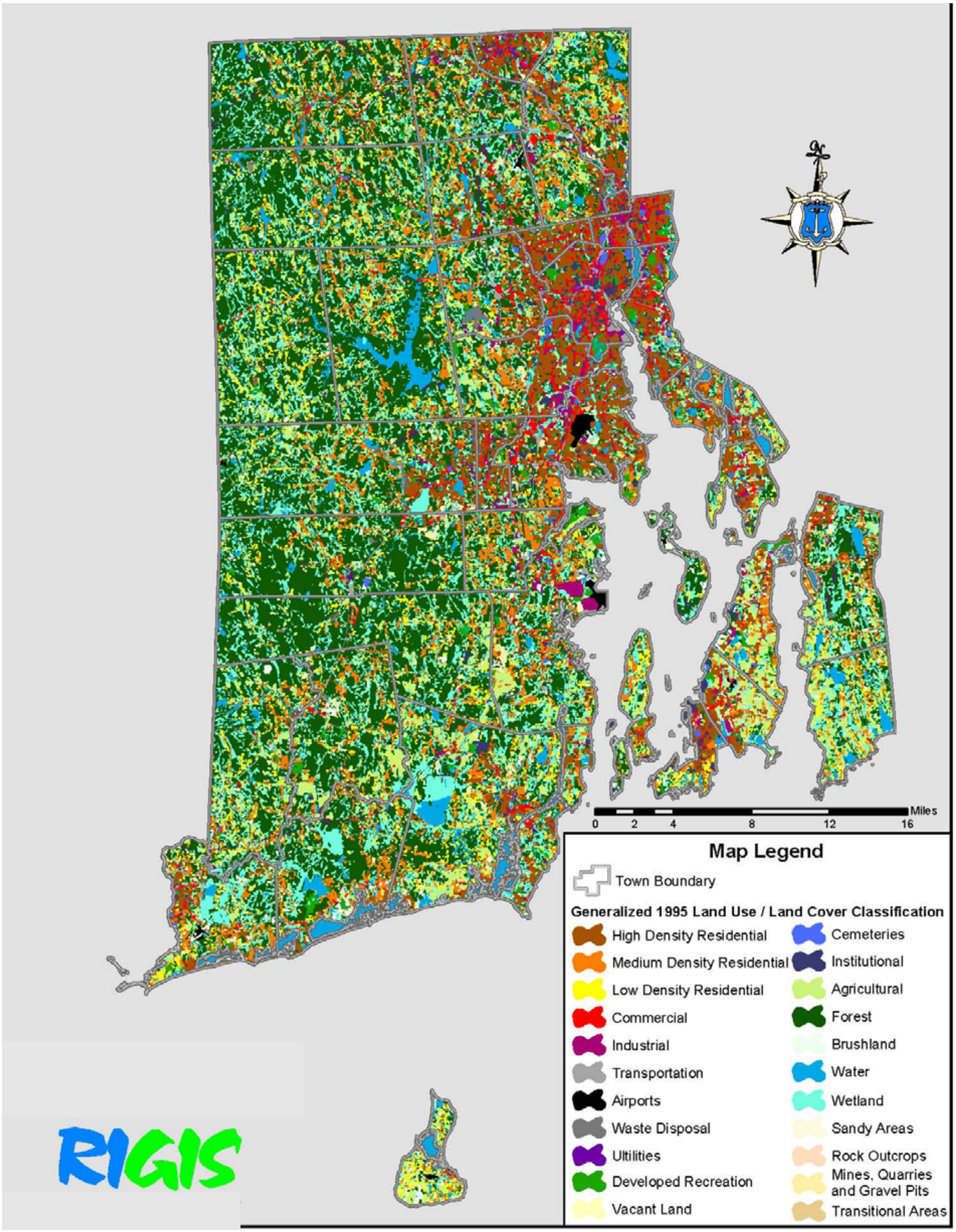
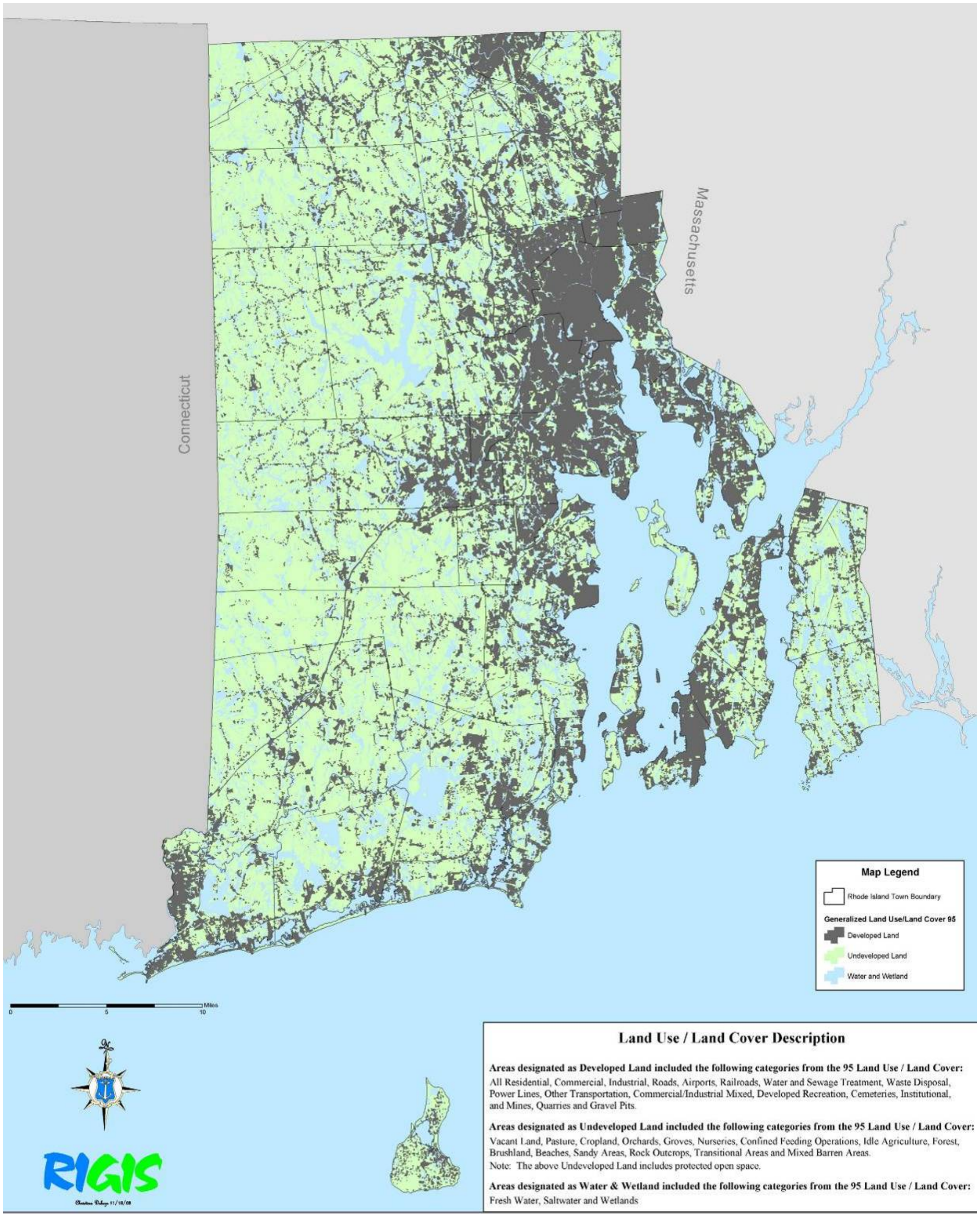


Figure (2), *Developed Land Use Land Cover 1995,* shows developed and protected land and undeveloped or uncommitted land selected from this coverage.

Figure (2):
Developed Land Use Land Cover 1995



Resource Values and Constraints

The second phase of the analysis identified and delineated land qualities and development constraints from individual resource value considerations and existing State Guide Plan policies. Important natural characteristics of land that could affect development options and opportunities were also reviewed.

We defined *land quality* as a complex attribute of land that acts in a distinct manner on the suitability of the land for a specific kind of use. Land qualities may be expressed in a positive or negative way. For this analysis, land qualities were determined on the basis of natural resource value, or physical constraints or hazards to development. Land areas shown by RIGIS data as already protected were excluded. Other qualities reflected regulatory or State Guide Plan policy concerns. These may encompass conservation, prevention of hazards to public health, or protection of public investments. The individual layers used in the analysis were chosen after research in the academic literature and staff discussions. The eight key selected factors in the analysis were:

- Surface Water
- Flood Hazard Areas
- Soils Constraints for Individual Sewage Disposal Systems (ISDS)
- Rare Species Habitats
- Agricultural Lands
- Major Forests
- Groundwater
- Drinking Water Surface Supply Watersheds

The data to create the eight layers came from existing GIS coverages in the RIGIS database. Part 2-2 of this Appendix has maps of each individual layer. A complete set of color maps of this Appendix can be viewed on the Statewide Planning Program web page at www.planning.ri.gov. Many data sets were used that had differing ages, sources, and degrees of scale. No changes or updates to the data as licensed by RIGIS were made for these eight key layers. Table (1), *Land Suitability Concentration Layers,* shows how the eight key layers were created from the various RIGIS coverages and the buffers that where used in the creation of each layer.

Accordingly, we recognized a limitation to the resulting analysis: it should only be used for *statewide* land use planning purposes, and should not be relied upon for site-specific development purposes, except to indicate where more local site data should be gathered. Actual land cover and use may have varied or changed since 1995.

Table (1):
Land Suitability Concentration Layers

Layer Name	RIGIS Data Set(s)/Date	Selection Criteria
Surface Water Features	• Land Use/Land Cover /1995 • Wetlands /1995 • Ponds & Streams 5K /1997	• Areas coded as water * • Areas coded as wetland* * Regulatory buffers added: 50 ft – wetlands, ponds, & salt ponds, 100 ft streams
Flood Hazards	• FEMA Q3 Flood Zone, 1996	• 100-year and velocity zones
Soils w/ ISDS Constraints	• RI Soils / 1996	• Soil types classified as presenting moderate to severe limitations for Individual Subsurface Disposal Systems (ISDS)
Rare Species	• Critical Habitats of Endangered/Rare Species / 1997	• entire dataset
Agricultural Lands	• Land Use/Land Cover /1995 • RI Soils / 1996	• Areas coded as active agricultural land use • Soils classified as “Prime” or “Statewide Significance” soils for agriculture
Major Forests	• Land Use/Land Cover/1995	• Areas coded forest land cover and > 300 acres in size
Groundwater	• GAA Groundwater Reservoirs/1989 • GAA Recharge Areas/1994 • Community Wellhead Protection Areas/1999	• entire dataset • entire dataset • entire dataset
Surface Drinking Water Supply Watersheds	Public Water Supply Basins/2002 Public Water Supply Reservoirs/1994	• entire dataset • entire dataset

Source: *RIGIS Data Catalog*, *http://www.edc.uri.edu/rigis-spf/catalog2003a.htm*.

It was during this phase that we assessed important natural resource factors, including critical and fragile natural areas, as well as policy considerations that constrain development. *Critical areas* exhibit physical characteristics that make them more vulnerable; these were identified along with *fragile natural areas* that support specific natural systems.

Many fragile areas, such as the coastal zone, are also critical areas. A coastal area is vulnerable to flooding, violent storms, and continuous erosion. The coastal zone typically suffers more damage from human impact than do many other systems. The plant and animal life in a coastal area is vulnerable and fragile and recovers from injury with difficulty. Construction in coastal areas usually means destruction of the fragile natural system that protects the land from the sea; the shoreline may erode as a result and a once-productive environment lose both natural and economic value.

Not all of Rhode Island's coastal features have been mapped for RIGIS. Where digital data were available from RIGIS, the analysis considered some coastal features, such as the South Shore salt ponds, as inland water areas.

Development "Suitability"

The final phase of the suitability analysis determined *development suitability* based on a synthesis of the eight key layers. A composite suitability map was prepared to organize the above information in a hierarchy that considered the compatibility of land uses along with natural features, hazards and policy constraints. Our intention was to indicate where general land development might be best accommodated. The suitability data and maps produced by this phase were used in the various proposed future land use scenarios in Part 4 of the land use plan.

This step combined all eight key layers to determine where land development would be most compatible with environmental values, and needed to be given priority in developing statewide land use policy. Each key layer was given equal weight in the analysis. The composite of these key layers determined the land's overall rating for development suitability. Figure (3), *Concentrations of Natural Resources and Limitations to Development,* shows the geographic locations of the concentrations of natural resources.

Table (2) *Land Suitability Analysis: Concentration of Resource Factors/Constraints,* presents a summary of the areas of the concentration for all lands statewide and a summary of the areas of undeveloped or unprotected lands by concentration levels. The table shows the various amount of land and percentages of the state for the concentration or co-occurrence of the eight key layers described above. The lands with the least occurrence of resource concerns are presented first (concentration = to 0) followed by the lands with increasing conservation concerns and ending with the lands with the greatest concentration of resource concerns (concentration = to 8). The greatest concentration of concerns equal to 8 means all eight key selected layers were present.

Figure (3) shows the concentrations of resource factors and constraints. This composite map identifies the co-occurrence or *concentration* of resource factors/constraints considered in the analysis for all land within the state. Environmentally sensitive areas have higher concentration levels, and can be considered less favorable for development. Areas with multiple values present limitations that generally make development costly, and require mitigation measures to ensure protection of the public health, safety and general welfare. Conversely, those areas where resource concentrations are minimal to low can be considered to be more suited, from a *statewide* perspective, for development activities. Those areas most unfavorable for development are areas where multiple limitations are present that generally make urban development costly, as extreme measures of mitigation would be required to ensure the protection of the public health, safety and general welfare.

Figure (3):
Concentrations of Natural Resources and Limitations to Development

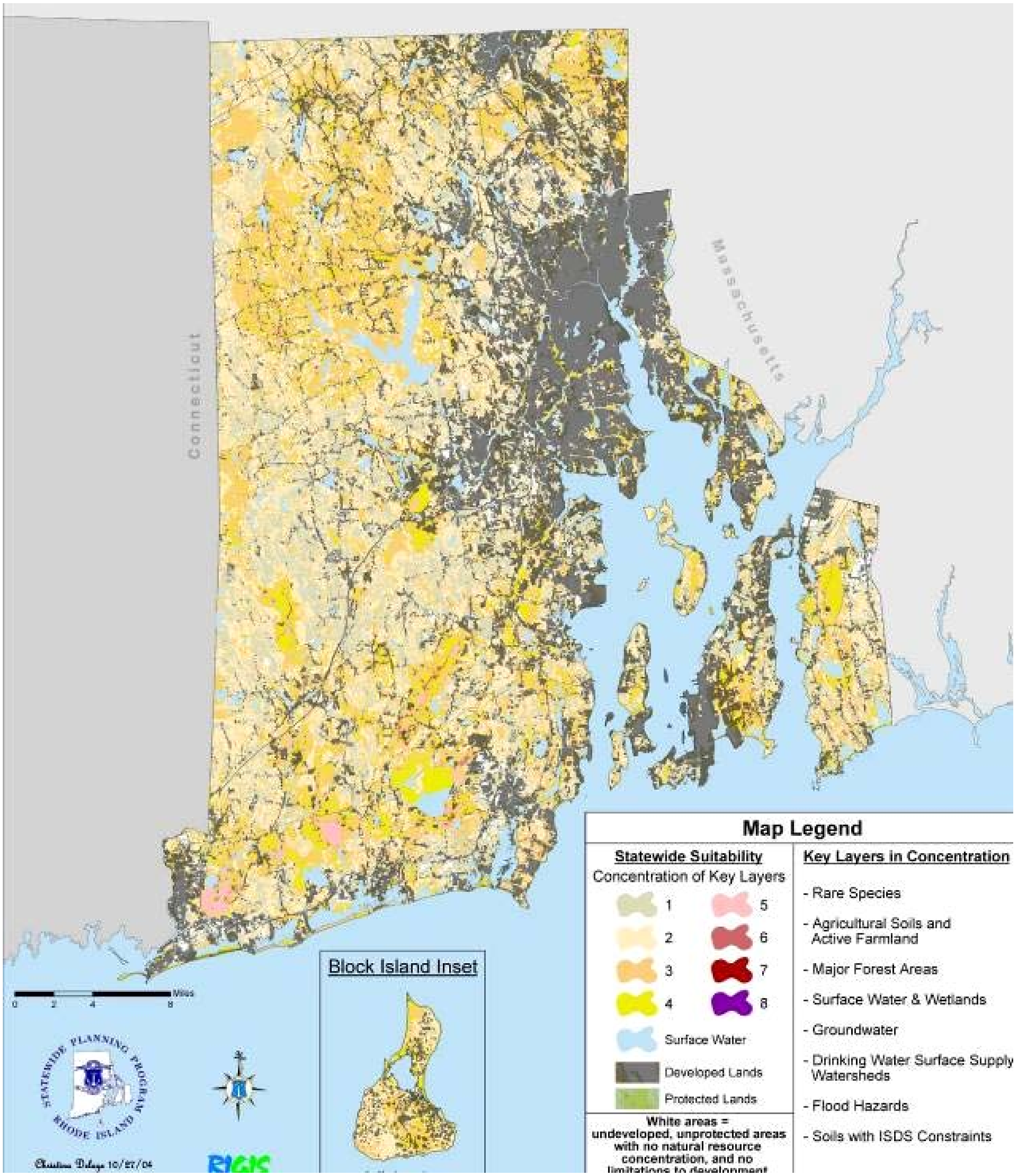


Table (2):
Land Suitability Analysis:
Concentration of Resource Factors/Constraints

Resource Layers	Acres*	% of State Area*	Acres*	% of State Area*
	Statewide (all land)		Undeveloped/Unprotected land	
Concentration = 0	90,000	13	10,500	1
Concentration = 1	167,000	24	77,400	11
Concentration = 2	221,000	32	132,600	19
Concentration = 3	154,000	23	97,400	14
Concentration = 4	54,000	8	33,400	5
Concentration = 5	13,000	2	8,700	1
Concentration = 6	1,700	>1	1,000	<1
Concentration = 7	100	>1	51	<1
Concentration = 8	3	>1	3	<1
Totals:	**700,000**	**100**	**361,000***	**52**

Source: RISPP Land Use 2005 GIS analysis based on RIGIS data.
May not sum due to rounding (Acreage rounded to nearest 000, except < 100)
*Includes surface water and wetlands

Summary Suitability Analysis

The land availability analysis developed the following data concerning the status of Rhode Island's (*1995)* land base:

Table (3):
Rhode Island Land Availability, 1995

Total Land and Water	Acres	% of State Area*
Developed land	205,200	29%
Undeveloped land	369,000	53%
Inland water	35,900	5%
Wetlands	90,000	13%
Total land and inland water	700,000**	100%
Undeveloped Land	**Acres**	**% of State Area***
Undeveloped, unprotected land	292,100	42%
Undeveloped, protected land	76,800	11%
Undeveloped land	369,000**	53%
Protected Land and Water	**Acres**	**% of State Area***
Protected, undeveloped land	76,800	11%
Wetlands	89,600	13%
Inland water	35,900	5%
Total protected land and water	202,300**	29%

* *Figures are exclusive of Narragansett Bay and coastal waters*
** *Totals may not sum due to rounding* (Acreage rounded to nearest 00)

As indicated in the above table, Rhode Island's landscape, as last captured in 1995 RIGIS Land Use/Land Cover data, is approximately one-third developed, and, considering water and wetlands, approximately one-third protected. The remaining ~40% is considered undeveloped and unprotected, and subject to change in the future. It must be noted, however, that due to the data collection method of the 1995 RIGIS Land Use/Land Cover data, the 40% figure may exaggerate the actual amount of uncommitted land available. Aerial photograph interpretation cannot interpret property lines, meaning that portions of the land actually committed to large-lot, low-density residential development in suburban and rural areas may have been coded as forest or open land in the database. Nevertheless, the data indicate that Rhode Island has a significant supply of available, undeveloped land – a quantity that would appear to more than meet the state's future development needs through 2025 based upon a continuation of current trends, as reflected in municipal future land use plans (estimated in Part 4 of the land use plan at approximately 110,000 acres, or 16% of the state's land area).

But, all the undeveloped land *potentially* available for future development is not equal in terms of its ability to accommodate development efficiently and without external effects. Moreover, it may not be desirable, for efficiency, environmental protection and a number of other perspectives, to designate such a quantity of land for development through 2025. Ultimately, the market will determine how much and which undeveloped land will be utilized to accommodate the state's future development. However, the market is always greatly influenced by public policy considerations, ranging from regulatory measures such as state environmental regulations and municipal zoning, to less direct, but no less important, factors such as public infrastructure investment decisions. The remaining sections of the geographic assess available land with regard to various intrinsic and locational factors that should influence public decisions affecting the land market so that, to the greatest degree possible, the state's future development reflects and supports public policies established in this and other State Guide Plan elements and in municipal comprehensive plans.

Our analysis combined land suitability with committed use, so that the results show the amounts and geographic distribution of land having various constraints to development, including the "commitment" of lands currently developed or protected, and areas where development would likely cause environmental damage, result in hazards, and/or conflict with state policies. To summarize:

- The state has approximately 700,000 total acres of land and water. Of that total, 29% is developed land, 65% is undeveloped land (including protected lands and wetlands), and 6% is water.

- Much of the remaining undeveloped land in the state is constrained with one or more resource concerns. Those areas having significant resource concentrations should be important candidates for conservation or additional protection because of their intrinsic value.

- Some land is unsuited for development because of soil constraints for wastewater, the presence of large wetlands, the occurrence of severe flood hazards, or a combination of these factors.

- Land with one or more constraints may be suitable for development with added investment and careful attention to the uses, intensities, and site design features to avoid impacts. Determinations based on site-specific conditions are necessary to ensure that proposed development does not impact resource values or conflict with public policy.

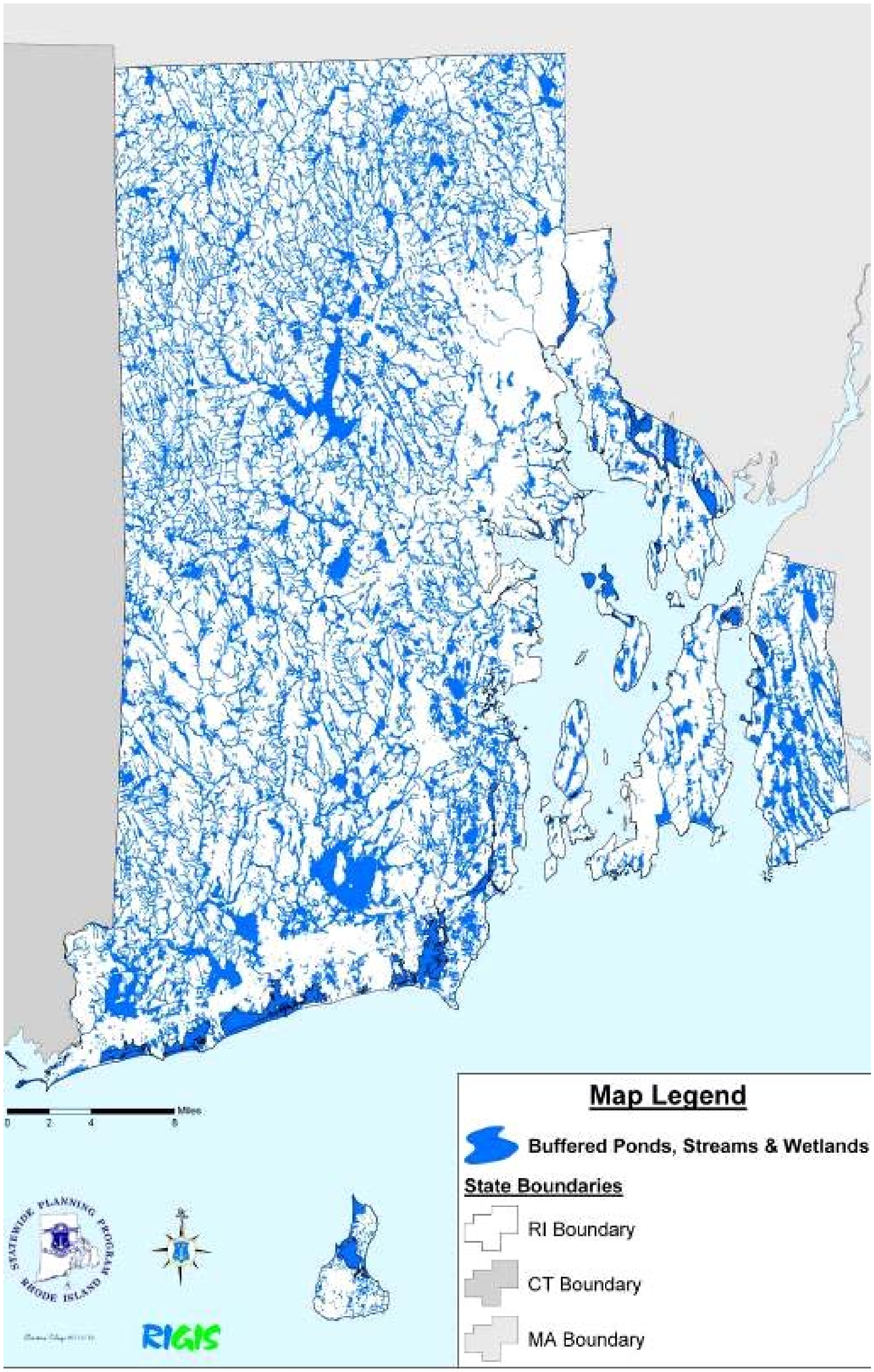
- Top priority must be good land use controls for natural resource land that has as yet been neither developed nor permanently protected. Not reflected in the analysis are consumer preferences that influence the likelihood of any land with few or no constraints being developed for a particular use and at a particular density.

Part 2-2: Land Suitability Analysis – Eight Key Layer Maps

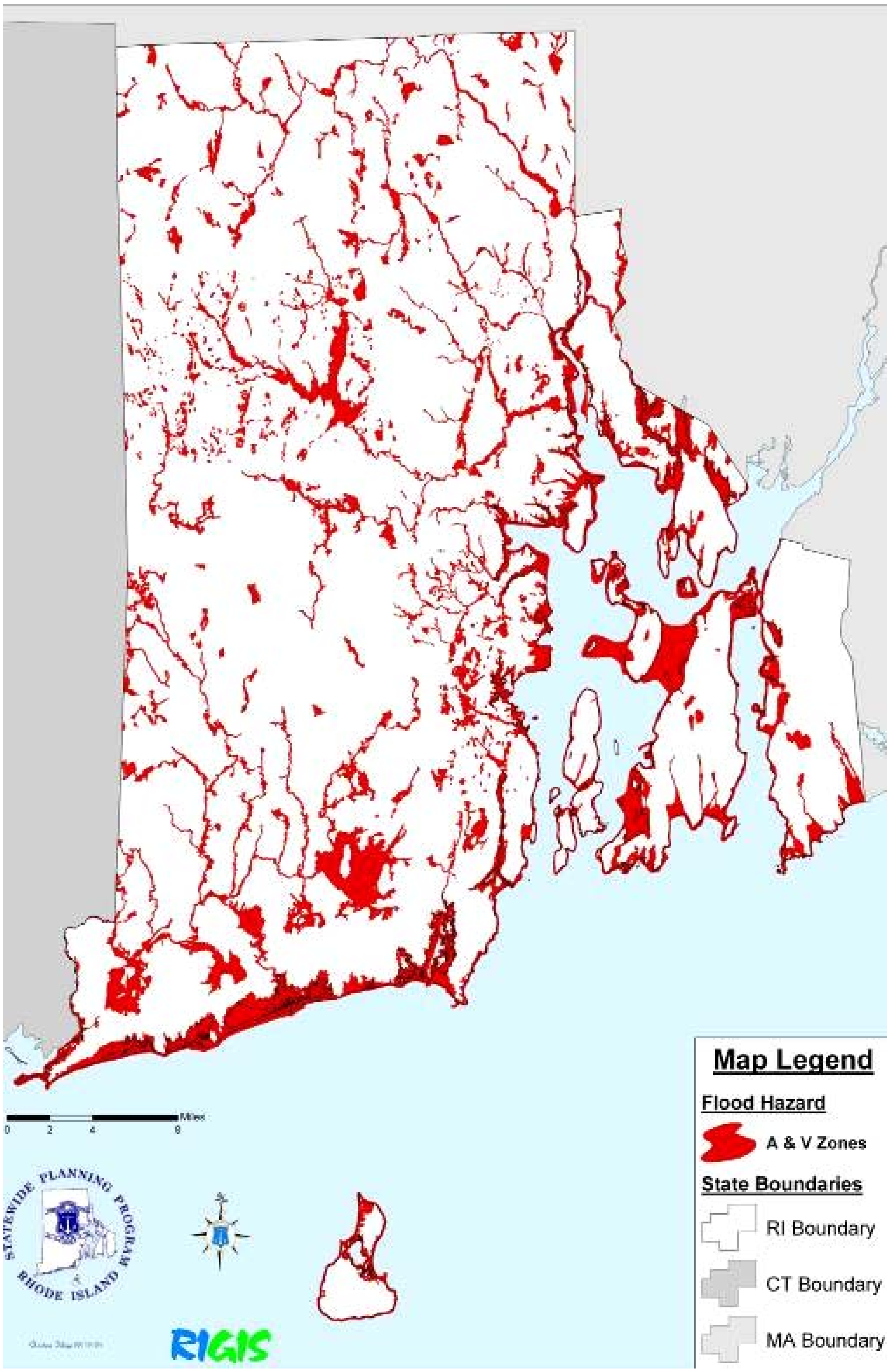
This section contains the individual eight Key Layer maps used for the land suitability analysis. A complete set of color maps can be found on the Statewide Planning Program web page at http://www.planning.ri.gov/. The eight maps that follow are:

- Surface Water
- Flood Hazard Areas
- Soils Constraints for Individual Sewage Disposal Systems (ISDS)
- Rare Species Habitats
- Agricultural Lands
- Major Forests
- Groundwater
- Drinking Water Surface Supply Watersheds

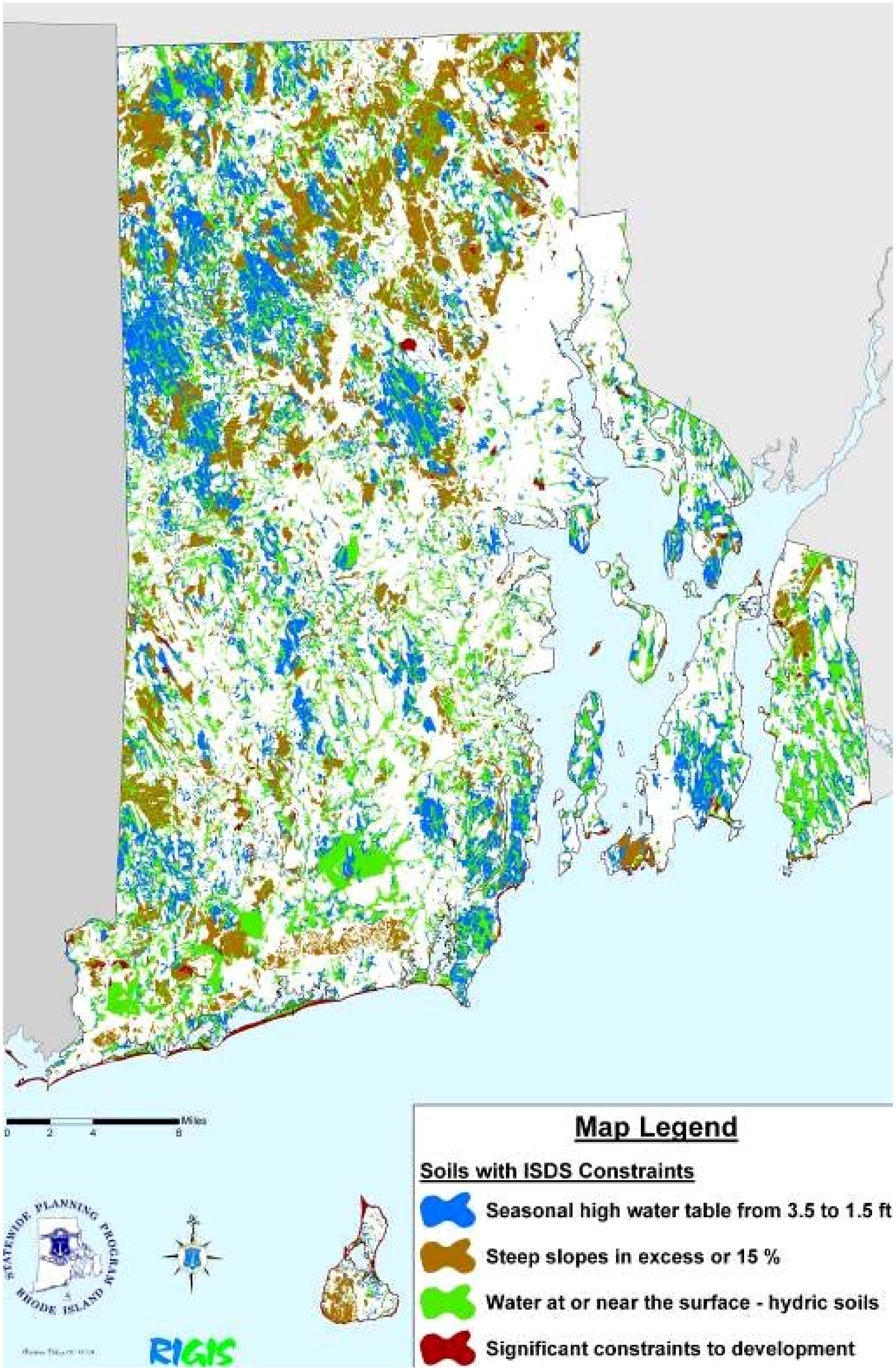
Eight Key Layer Maps:
Surface Water



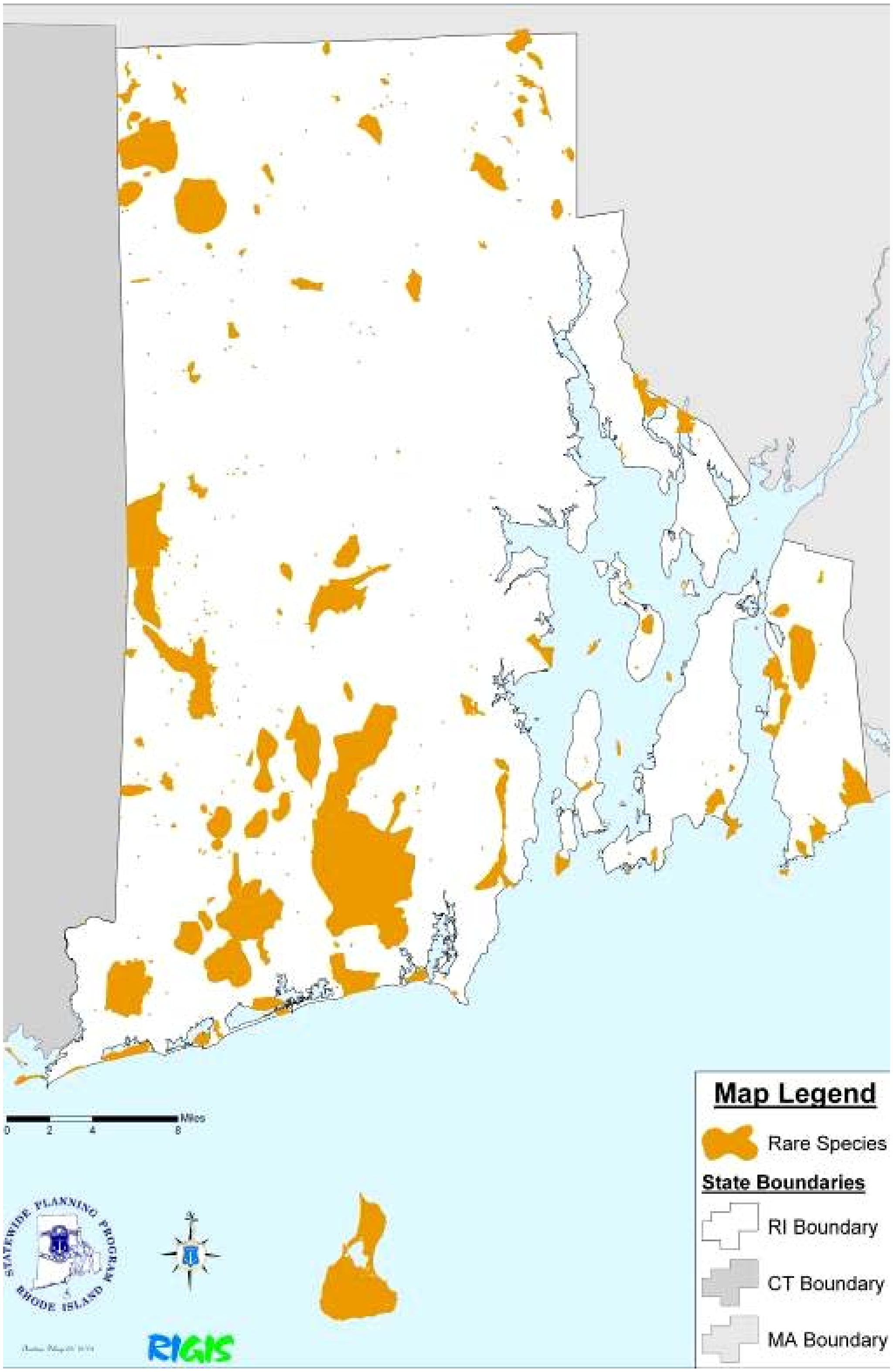
Eight Key Layer Maps:
Flood Hazard Areas



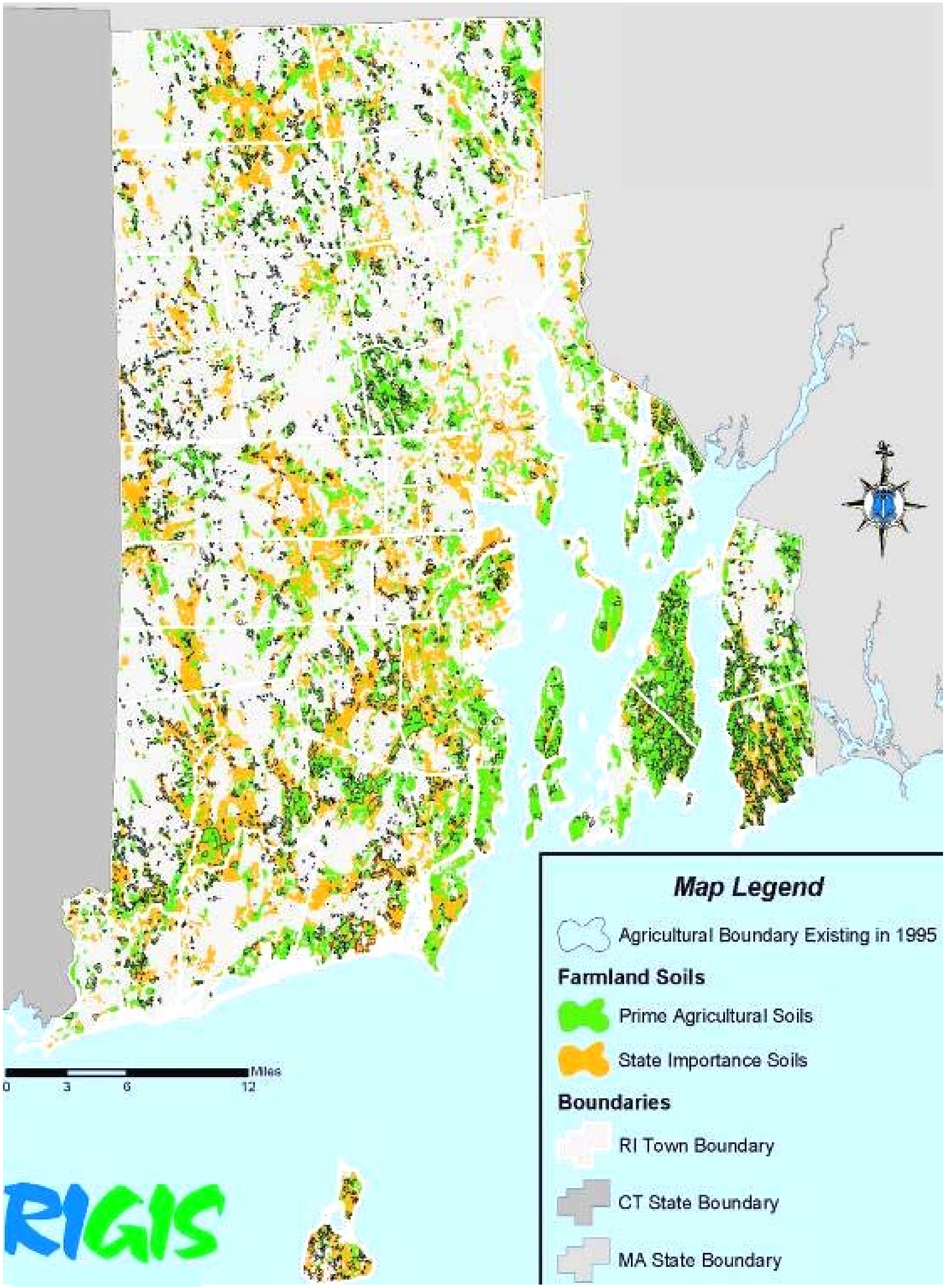
Eight Key Layer Maps:
Soils Constraints for Individual Sewage Disposal Systems (ISDS)



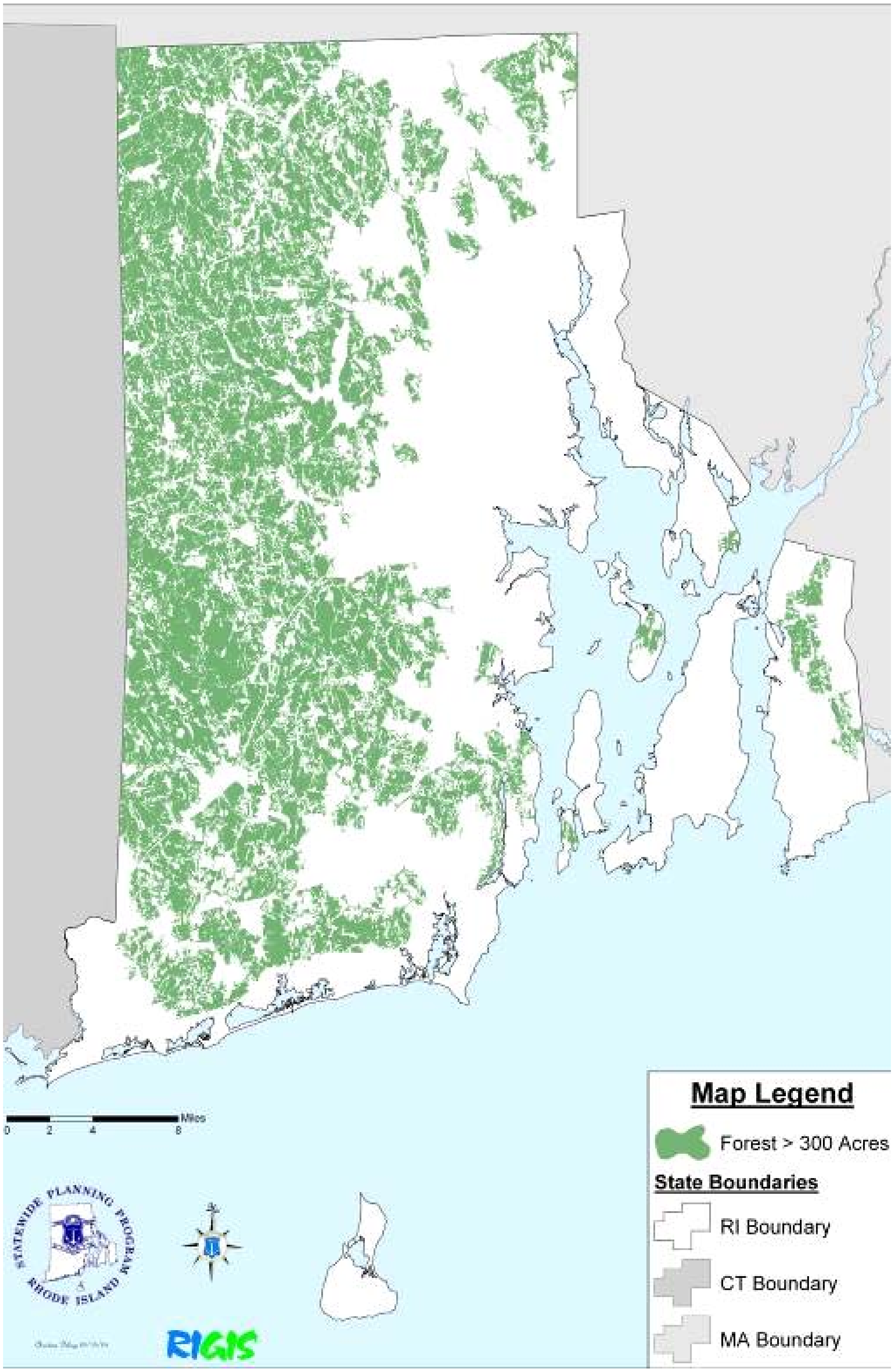
Eight Key Layer Maps:
Rare Species Habitats



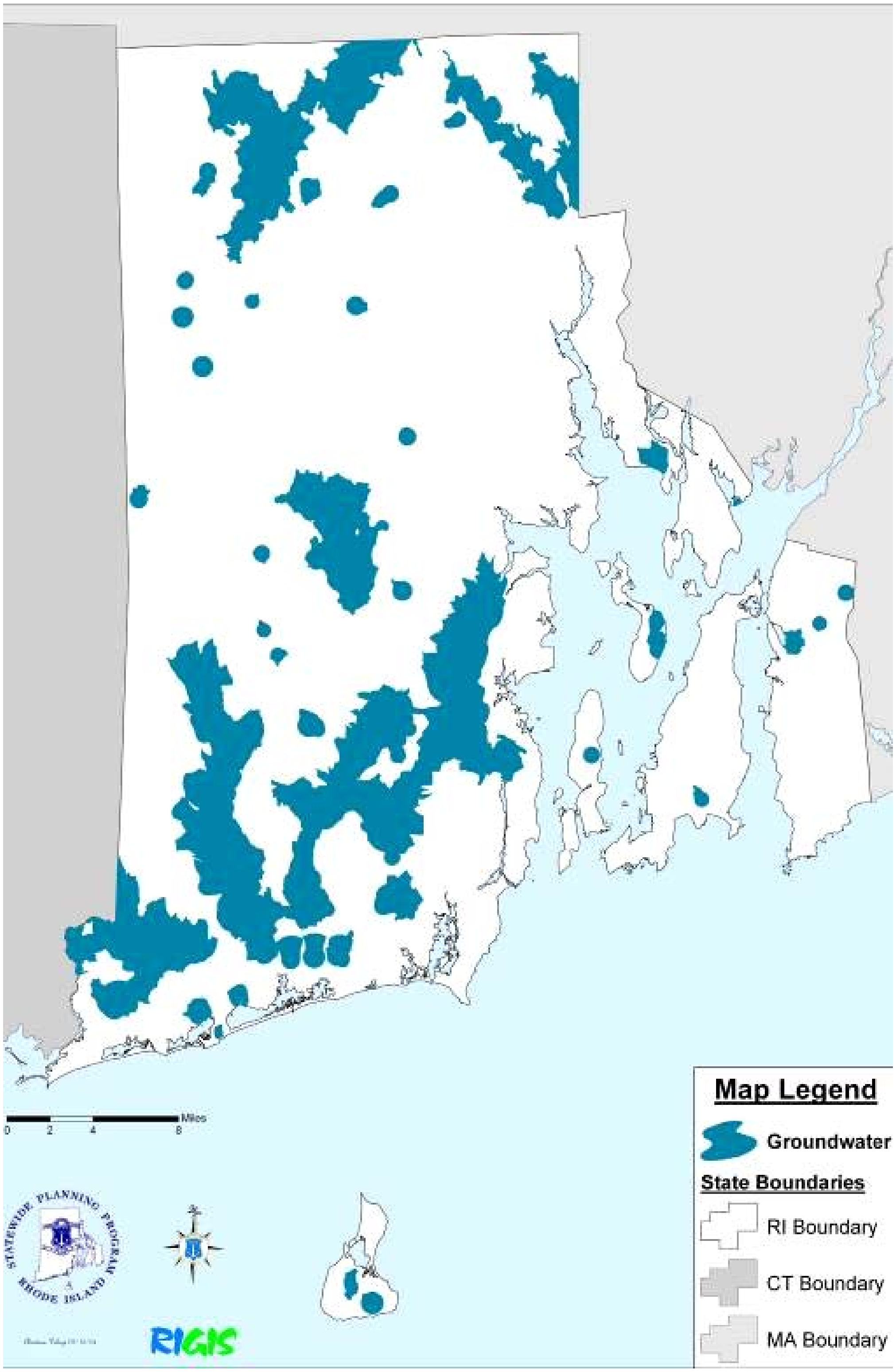
Eight Key Layer Maps:
Agricultural Lands



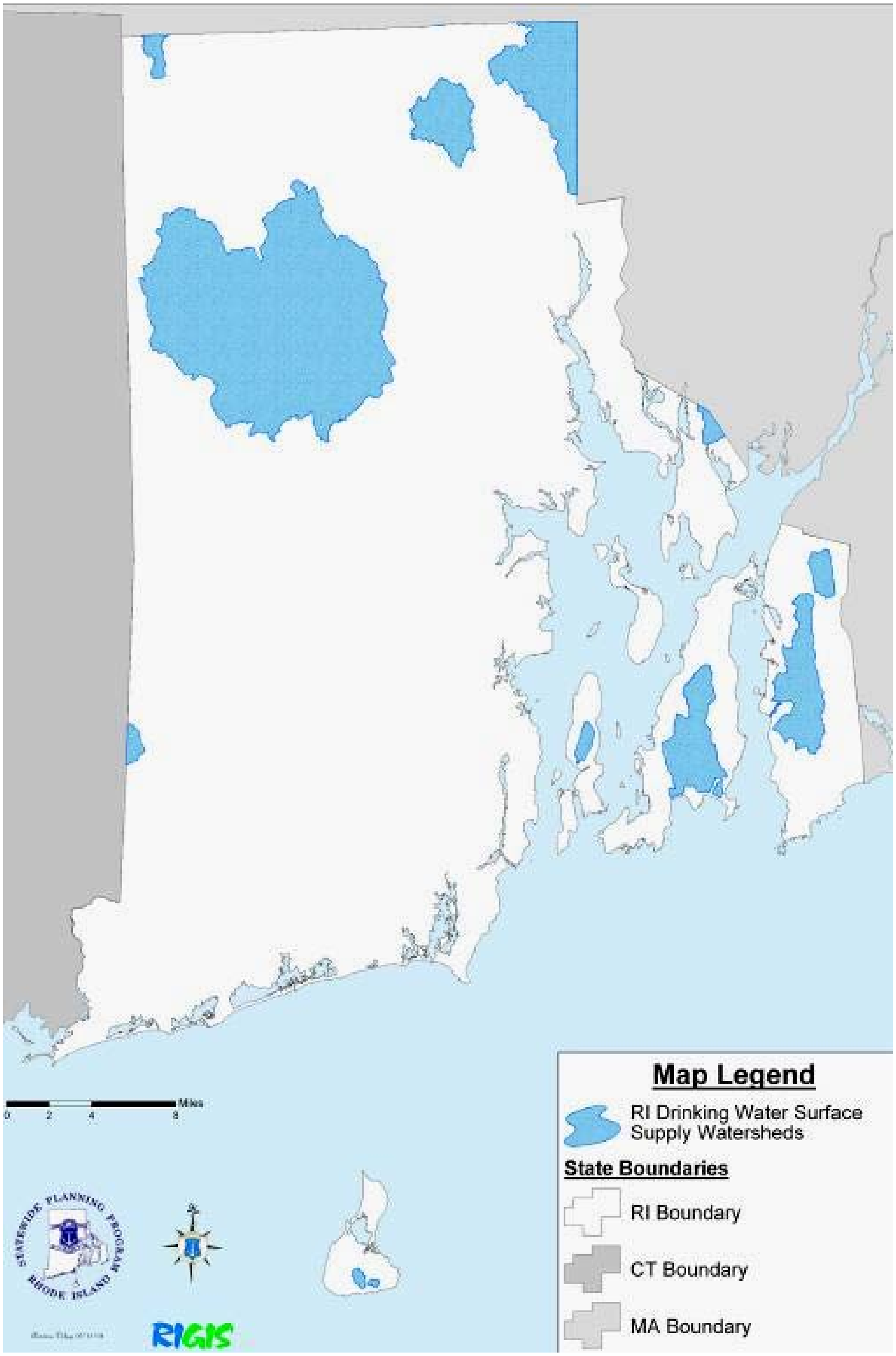
Eight Key Layer Maps:
Major Forests



Eight Key Layer Maps:
Groundwater



Eight Key Layer Maps:
Drinking Water Surface Supply Watersheds



Part 3: Land Intensity Potential Classifications

This Section describes how GIS was used to develop a land intensity classification (LIC) system and land use priority template that will be used in developing the future land use map detailed in Part 2, of the future land use plan. This section examined the existing land use patterns and infrastructure availability throughout the state in combination with the Land Suitability Analysis (LSA). The LSA took into consideration the use of land and its inherent natural attributes focusing on 8 key environmental attributes, as discussed in Part 2, important to both land development and conservation of the environment. This Section will combine the results of the LSA with the proximity of 4 key factors for development purposes and 4 key factors for conservation purposes in order to classify land for various land use intensities.

Development and management of the state is influenced by both natural and manmade factors. Several factors such as the geology, ecology, environmental and water resource qualities were discussed the previous section. We attempt here to examine the influence of these factors in combination with the proximity to infrastructure factors that influence land management and development in relation to future development. This section will define and prescribe a series of land intensity categories (LIC) and development priorities for all land within the state.

Reminder about Data Limitations

It has been pointed out earlier, that mapping with computer data does have data limitations. The primary limitation is the age of the base 1995 Land Use Land Cover layer and the age of the other RIGIS layers used. The LIC developed here are for planning purposes only and are intended to provide general policy and direction for the future use, development, and management of land resources. They are based upon available RIGIS generalized data and are not to be applied on a site specific basis.

Identifying land as appropriate for intensive uses should not be interpreted as a green light for haphazard development. Considerations of noise, glare, drainage, safety, traffic, road access, building design, landscaping, and the like, as well as development type, apply to all development. Our lands that can support the most intense development are as important as a resource as our most fragile lands. Their development should take place in a manner that will contribute to, not detract from, our quality of life. The LIC are intended as a guide to municipalities and state agencies in planning, development, and conservation of areas within their jurisdictions.

Land Intensity Potential Classifications (LIC)

The approach taken was to establish a range of development potential classes for all lands within the state. The land intensity development categories were developed by the Statewide Planning Program's (SPP) staff after study and analysis of the results of the LSA, analysis of the 1989 State Land Use and Policies Plan methodology, and input from the State Planning Council's Technical Committee. The general guidelines for establishing the range of classes were as follows:

- where few natural resources are concentrated and public infrastructure exists then high intensity development can occur

- where more natural resources are concentrated and less infrastructure is available then moderate to low density development can occur;

- where the greatest concentration of natural resources is located and no infrastructures exist then conservation should be encouraged rather than development

  - existing investments of public funds in infrastructure should be optimized, and

  - resource conflicts should be minimized.

This part seeks to answer the question: how should Rhode Island's land be allocated to future land use intensities that appear most suitable based upon GIS information about natural resources and available infrastructure resources? Factors that influence development were examined in sequential steps.

First, it was necessary to develop some policy related criteria for those lands where both positive and negative characteristics exist that do not preclude any development. Five generalized land intensity potential categories were defined by the Statewide Planning Program's (SPP) staff after study of the results of the Suitability Analysis, review of the methodology used in the prior (1989) <u>State Land Use and Policies Plan</u>, and input from the State Planning Council's Technical Committee. Generally, the approach was to categorize land in support of long-standing policies of the State Guide Plan, re-iterated in this update, which seek to encourage:

- More intensive development in areas where public infrastructures (primarily water and sewer systems) are in place, or planned. This is logical from both resource protection and public investment standpoints.

- Intensive development should not to be planned where public water and sewer does not exist.

- Valuable resource areas should be identified and reserved from development that conflicts with their resource values.

In order to classify the land, a decision rule matrix was created for the initial assignment of land to intensity categories by the SPP staff. This is not something a GIS can do because decisions had to be made by the planning staff itself on which factors alone or in combination should provide the basis for allocating land into one of five development intensity levels. Table (4), *Land Intensity Potential Classifications,* shows the 5 land use categories that we selected to use in the decision matrix. The residential ranges selected reflect gross densities.

Table (4):
Land Intensity Potential Classifications

Land Intensity Potential Category	Intensity Potential Level / Description
A	Higher Intensity Development Potential including: • Residential uses at 4+ du/acre* average density • Commercial, Industrial, Mixed Uses
B	Moderate Intensity Development Potential including: • Residential uses at 1 - 4 du/acre* average density • Commercial, Industrial, Mixed Uses
C	Low Intensity Development Potential including: • Residential uses at 0.25 - 0.9 du/acre* average density • Limited ** Commercial, Industrial, Mixed Uses • Conservation
D	Conservation-limited, resource-based Development Potential including: • Residential uses at <0.25 du/acre* average density • Limited **Commercial, Industrial, Mixed Uses
E	Conservation -- very limited development potential

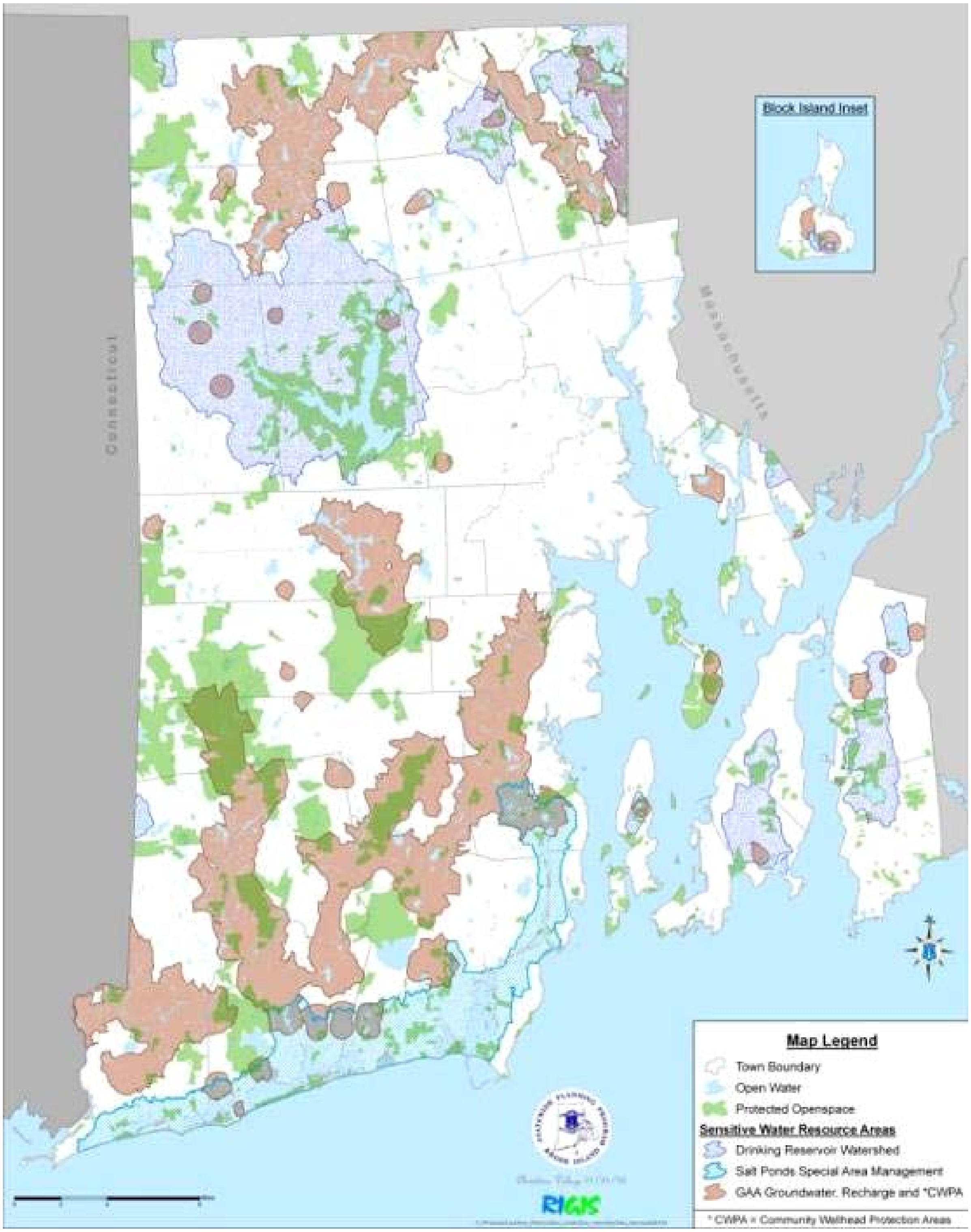
** Residential ranges selected reflect average overall densities in dwelling units (du) per acre.*
******** *Commercial, Industrial, Mix use type and intensity per recommendations of State Guide Plan 125, Scituate Reservoir Watershed Management Plan*

The LSA results of the number of co-occurring resources for all lands were then assigned to one of the 5 initial development intensities from Table (4) as the next step.

In this step, we made the decision to immediately assign lands with 4 or more co-occurring resources to the "*Conservation*" (E) intensity. Any lands currently protected as open space according to the RIGIS data were not assigned an intensity class but were categorized as "P" and were not included in the analysis. The same was done for areas of open water; they were assigned a "W" and were not included in the analysis.

Following review of the initial assignments, and upon advice of the (Technical) Advisory Committee, it was decided that drinking water sources and other fragile water resource areas needed to receive additional attention in the assignment of intensity potentials to better reflect protection of their resource values. Using RIGIS data, three specific water resource categories were identified as *"Sensitive Water Resource Areas":* areas of groundwater classified as GAA (includes aquifers suitable for public water supply and wellhead areas of public community water supply wells) by the R.I. Department of Environmental Management, watershed areas of public surface water supply reservoirs, and watersheds of the coastal ponds covered by the R.I. Coastal Resources Management Council's Special Area Management Plans for the Salt Pond Region and Narrow River Watershed. Figure (4), *Sensitive Water Resources*, shows the GIS locations of these resources.

Figure (4):
Sensitive Water Resources



We then applied a series of assumptions to the LSA results of the concentration of co-occurring resources for lands where 3 or less of the key factors (constraints) were present in order to produce an initial land intensity classification. The assignment assumptions we used were as follows:

- Areas having public water and sewer infrastructure (or sewer alone) were initially assigned to a class “A” intensity.

- Areas with public water infrastructure (alone) were assigned an initial intensity level of “A” or “B”, depending upon the number of co-occurring resources.

- The preliminary assigned intensity level was lowered one level for all available land within a Sensitive Water Resource Area, depending upon the number of co-occurring resources:

    - Areas within a Sensitive Water Resource Area with public water or sewer were assigned to “C” intensity, or lower, depending upon the number of co-occurring resources.

    - Areas within a Sensitive Water Resource Area without public water or sewer were assigned to “D” or “E” intensity level, depending upon the number of co-occurring resources.

On the next page, the Table (5), *Land Intensity Classification Decision Rule Matrix*, shows the initial classification of lands by the concentration of co-occurring resources to development intensity classifications.

Table (5):
Land Intensity Classification Decision Rule Matrix

		Public Infrastructure Availability		
# Resources	Sen. Water Resource Area	Water	Sewer	Initial Assign to
0	N	N	N	A
0	N	N	Y	A
0	N	Y	N	A
0	N	Y	Y	A
0	Y	N	N	D
0	Y	N	Y	C
0	Y	Y	N	C
0	Y	Y	Y	A
1	N	N	N	B
1	N	Y	N	B
1	N	N	Y	A
1	N	Y	Y	A
1	Y	N	N	D
1	Y	Y	N	C
1	Y	N	Y	C
1	Y	Y	Y	B
2	N	N	N	C
2	N	N	Y	A
2	N	Y	N	B
2	N	Y	Y	A
2	Y	N	N	E
2	Y	N	Y	C
2	Y	Y	N	D
2	Y	Y	Y	B
3	N	N	N	D
3	N	N	Y	A
3	N	Y	N	B
3	N	Y	Y	A
3	Y	N	N	E
3	Y	N	Y	D
3	Y	Y	N	D
3	Y	Y	Y	C
4 +	any	any	any	E
Any	exclude currently protected lands from assignment of intensity			P
Any	exclude open water areas from assignment of intensity			W

Figure (5), *Land Intensity Classification*, shows the mapped results of this step. Table (6), *Land Intensity Classification Acreages*, shows the acreage of land within each land intensity category from the GIS analysis.

Table (6):
Land Intensity Classification Acreages

	Approximate GIS Acreage*		
Land Intensity Category	**Statewide**	**Undeveloped**	**Developed**
A	117,800	22,700	94,900
B	132,600	85,600	47,000
C	94,900	79,800	15,100
D	64,900	45,800	19,400
E	129,800	112,600	17,200
P	102,000		
W	58,100		
Totals	**Statewide**	**Undeveloped**	**Developed**
	700,000	346,000	194,000

*(*Rounded to nearest 1000)*
Source: RISPP Land Use 2005 GIS analysis based on RIGIS data.

The Land Intensity Potential Classification analysis indicates that a significant quantity of the state's land (~150,000 acres) appears capable of supporting moderate to high intensity development (as defined in the intensity categories established). A sizable portion of this land has already been developed (as defined in the RIGIS data). Some of this "developed" land may (since the 1995 survey) be in uses that are abandoned or underutilized. Such lands should be considered prime candidates for investigation of reuse opportunities and with potential for intensive uses – although in some cases site-specific factors, such as brownfield issues (which were not included in the analysis done for this plan) will have to be addressed.

For undeveloped areas, the analysis indicates that (based on 1995 data), statewide, there are over 100,000 acres of undeveloped land which appear (when suitability factors, sensitive water resource areas, and infrastructure availability are considered in combination) capable of supporting a moderate to high intensity usage. Again, some of this available land may have been developed since the 1995 survey upon which RIGIS data are based.

This finding requires some qualification however. An indication that an area is inherently capable of supporting intensive development does not imply that in all cases it should so be developed, or developed within the timeframe of this plan. Policy considerations and other factors, such as attaining an efficient land use pattern, reserving sufficient land for future needs, and effectively utilizing existing infrastructure capacity, must also be considered.

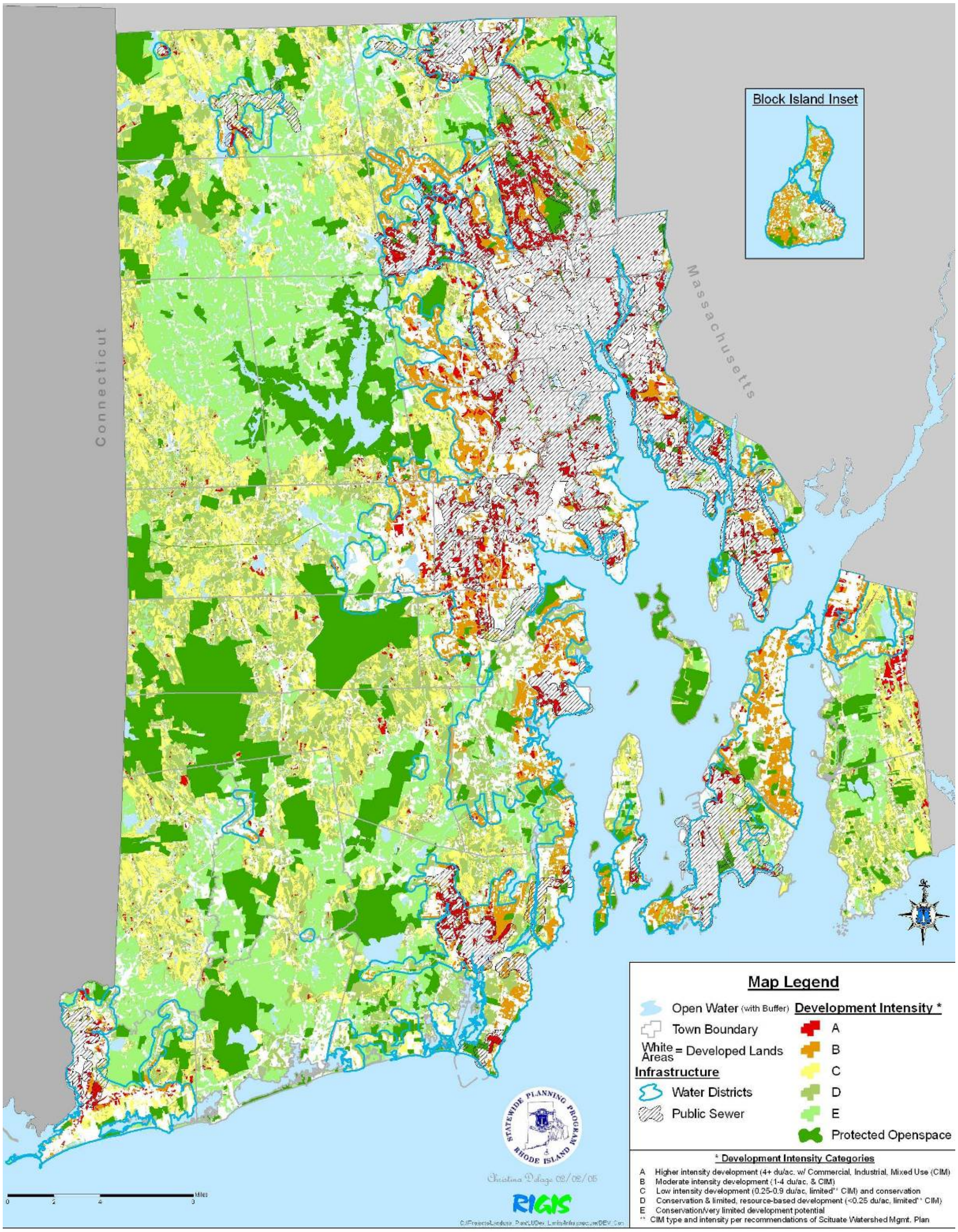
For this reason, the Land Intensity Potential Categorization must be interpreted as what it represents – results of <u>*one*</u> step in a *multiple-part* analysis. Output from this stage must be considered preliminary -- it is intended to serve only as an input to succeeding stages of the geographic analysis, and is subject to revision as other factors are introduced. In addition, as mentioned earlier, the entire geographic analysis is limited to the data available in the RIGIS, and further, by the varying ages and scope of sources it includes. Data needed to make definitive intensity determinations for specific sites are not uniformly available in RIGIS – these include the critical factor of *available and planned capacity* of the various infrastructure systems (water, sewer, highway, transit) which service different areas of the state.

It is also worthy to note that the methodology eliminated only lands that had four or more co-incident natural values/constraints from development value assignment. This means that lands assigned a moderate to high intensity potential may include areas having from one to three natural values or constraints – ranging from flood hazards to agriculturally-valuable soils to conditions unsuited for subsurface disposal. While the methodology took account of countervailing measures – principally public infrastructure (which can ameliorate concerns about some impacts/constraints), higher intensity development affecting lands that have one to three inherent resource values will raise potential policy concerns. Ultimately, individual development decisions must balance countervailing policy considerations and be informed by site specific data on the extent and character of resource values, the impact parameters of proposed developments, and effects of protection/mitigation measures proposed.

Therefore, identification of land in this analysis as appropriate for higher intensive uses must not be interpreted as a “green light” for development or haphazard growth. More specific analysis incorporating considerations of development type, as well as, noise, glare, drainage, safety, traffic, road access, building design, landscaping, and the like, must continue to apply to all site-level development decisions.

Lands that can support the most intense development are as important as a resource as our most fragile lands. Their development should take place in a manner that will contribute to, not detract from, our quality of life.

Figure (5):
Land Intensity Classifications



Development / Conservation Prioritization

Development Priorities

As indicated in the last section, the indication of land having good capability for high intensity development does not mean that it necessarily should be recommended for that level of development, or even for any development. Similarly, the determination that land has a number of coincident natural resource values or constraints does not necessarily follow, in all cases, that it should never be developed. To further aid in making such recommendations, we preformed further processing of the geographic data was performed to assign *relative* priorities for development or conservation to undeveloped, unprotected land within the state. In both cases, areas were identified as “primary”, “secondary”, or “tertiary” based on factors determined by the staff and reviewed with the Technical Committee.

We next wanted to know where the more intensely classified undeveloped lands were located in relation to selected key infrastructure factors for development purposes in order to establish a priority system for the future development of such lands. We decided that there were 4 key infrastructure factors that could help us establish development priorities. We pulled these 4 key factors from the existing RIGIS data and used GIS analysis to incorporate the LIC from the earlier part of this Section to distinguish between priorities.

The 4 key infrastructure factors we selected concerned infrastructure generally available on statewide basis: transportation features, and public water and sewer. The priority system developed ranked the more intensely classified lands for development in relation to the proximity of these lands based on the following 4 key factors:

- Location within an existing water and sewered area of the state.
- Location within a buffered extension (1000 feet) of the existing water and sewered areas of the state.
- Location within or within ½ mile of an interchange on a highway, within ½ mile of a Rhode Island Public Transportation Bus Route, or within ½ mile of a existing or planned passenger rail station (including facilities anticipated in State Guide Plan 611, Transportation 2025: Long Range Transportation Plan 2004.).
- Location within 1 mile of a state highway or roadway functionally classified as a minor arterial highway or higher (either existing or planned).

We then applied a series of assumptions to the LIC results for all lands within the “A”, ”B”, and “C” classified lands to create the priority system. It was our decision not to prioritize any “D” or “E” classified lands for development purposes. These two categories are intended for the lowest intensity future land development or conservation purposes. As before, any lands currently protected as open space according to the RIGIS data were not assigned a priority but were categorized as “P” and were not included in the analysis. The same was done for areas of open water; they were assigned a “W” and were not included in the analysis. Development priorities were assigned as follows:

Primary:

A, B, or C category lands meeting one or more of the following conditions were assigned a "primary" development designation:

- Location *within* an area having existing water or sewer infrastructure.

- Location *proximate to* existing water and sewered areas of the state. A buffered extension of 1000 feet surrounding the existing infrastructured areas was used to select land for this category.

- Location within, or within ½ mile of, an interchange on a highway; within ½ mile of a Rhode Island Public Transportation Authority (RITPA) Bus Route, or within ½ mile of a existing or planned passenger rail station (including facilities anticipated in State Guide Plan 611, Transportation 2025: Long Range Transportation Plan 2004.)

Secondary:

Remaining A, B, or C intensity category lands meeting the following criterion were assigned a "secondary" development designation:

- Location within one mile of an arterial highway (existing or planned).

Tertiary:

Remaining A, B, or C intensity category lands were assigned a "tertiary" development designation.

Table (7), *Decision Rules for Development Priority*, shows the decision matrix we used to assign the policy priorities agreed upon to the initial land intensity potential classifications to create the 3 levels of priorities of LIC for this step. Figure (6), *Development Priority Classifications*, illustrates the geographic distribution of areas assigned to the primary and secondary development categories in this stage of the analysis.

Table (7):
Decision Rules for Development Priority

		Within Current Water or Sewer Area	Within 1000' of Water or Sewer Area	Within 1/2 Mile of Highway Interchange*, RPTA Route Rail Station**	Within 1 Mile of Arterial Highway***		
Input	A, B, OR C	Yes	Yes	Yes	Yes	Output	DP-A1, DP-B1, DP-C1
Input	A, B, OR C	No	Yes	Yes	Yes	Output	DP-A2, DP-B2, DP-C2
Input	A, B, OR C	No	No	Yes	No	Output	DP-A3, DP-B3, DP-C3
Input	A, B, OR C	No	No	No	Yes	Output	DS-A, DS-B, DS-C
Input	A, B, OR C	No	No	No	No	Output	DT-A, DT-B, DT-C

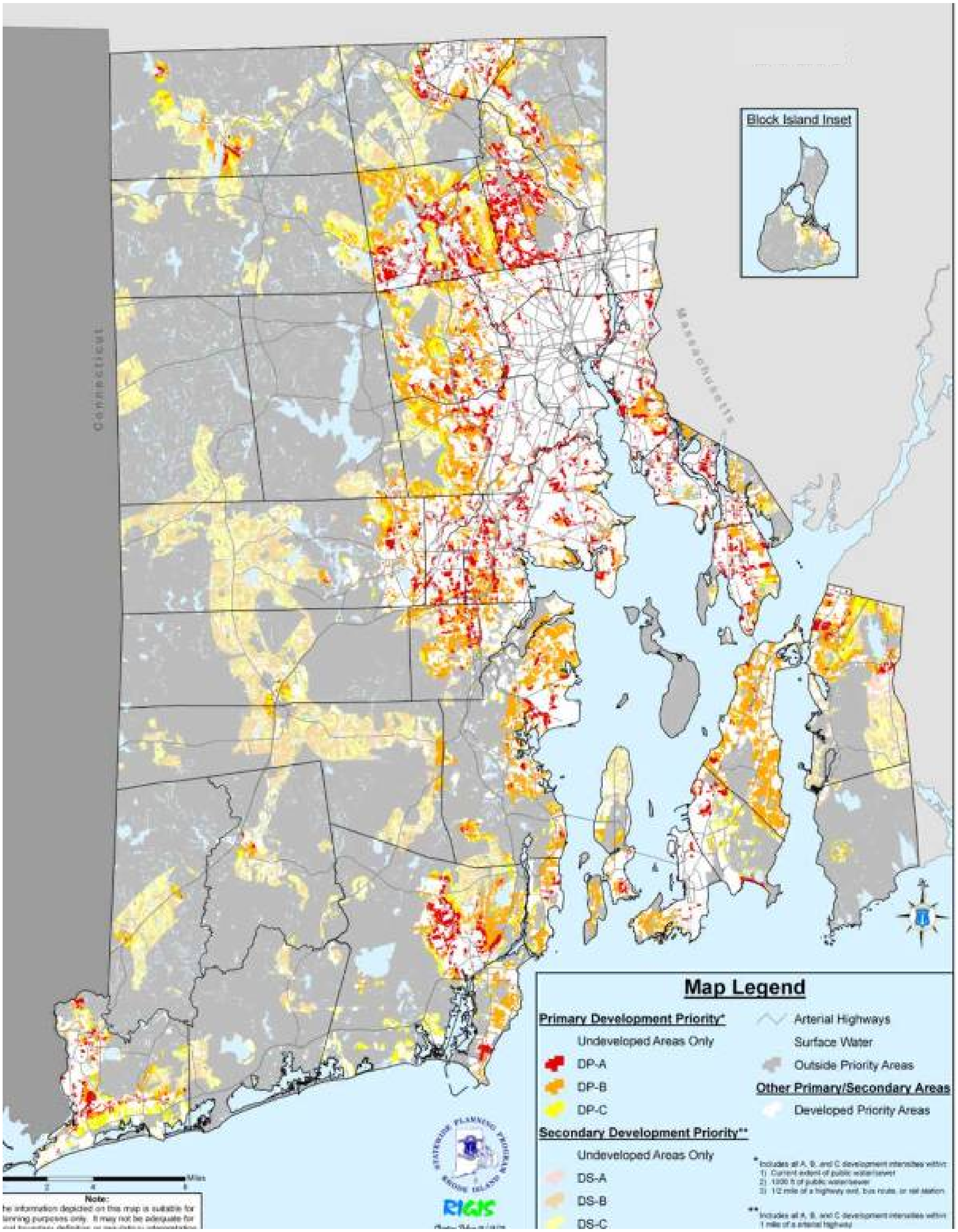
Key to Development Areas:

Level - LIC^	
DP-A1	Development Primary - LIC 1 (1= Within Current water or sewer area)
DP-B2	Development Primary - LIC 2 (2= Within 1000' of water or sewer area and transportation factors)
DP-C3	Development Primary - LIC 3 (3= only proximity to transportation factors not arterial highway)
DS-B	Development Secondary - LIC
DT-A	Development Tertiary - LIC

^LIC = A, B or C

DP - (Any LIC) # *****
*****Priority # reflects sum of related infrastructure factors

Figure (6):
Development Priority Classifications



Conservation Priorities

Land use activities can have detrimental effects upon natural resources. Some natural resources must be protected for the values and services for which they provide us. Clean water to drink, clean air to breathe, soil for agriculture and much more is often overlooked during land development activities. We wanted to know where the less intensely classified undeveloped lands were located in relation to selected key conservation factors for conservation purposes in order to establish a priority system for the future development of such lands. We decided that there were 4 key conservation factors that could help us establish development priorities. We pulled these 4 key factors from the existing RIGIS data and used GIS analysis to incorporate the LIC from the earlier part of this Section to distinguish between priorities.

The 4 conservation factors we selected concerned conservation concerns of a statewide basis that we pulled from existing public programs and policy plans. We also used State Guide Plans #155, *A Greener Path: Greenspace and Greenways for Rhode Island's Future and* #152*, Ocean State Outdoors: Rhode Island's Comprehensive Outdoor Recreation Plan* to help us set conservation priorities. The priority system developed ranked the less intensely classified lands for development in relation to the proximity of these lands based on the following 4 key factors:

- Location adjacent to or within 1,000 feet of existing protected open space.
- Any land determined to be a Department of Environmental (DEM) priority site for acquisition or easement protection.
- Location within Natural Corridors established by State Guide Plan 152 (1,200 feet wide) and locations inside and within 50 feet of existing or planned bikeways.
- Location within or west or south of Mid-State Greenway established by State Guide Plan 152.

We then applied a series of assumptions to the LIC results for all lands within the "C", "D", and "E" classified lands to create the conservation priority system. It was our decision not to prioritize any "A" or "B" classified lands for conservation purposes. These two categories are intended for the highest intensity future land development. As before, any lands currently protected as open space according to the RIGIS data were not assigned a priority but were categorized as "P" and were not included in the analysis. The same was done for areas of open water; they were assigned a "W" and were not included in the analysis. Conservation priorities were assigned as follows:

Primary:

C, D, and E category lands meeting one or more of the following conditions were assigned a "primary" conservation designation:

- Location adjacent to or within 1,000 feet of existing protected open space.
- Department of Environmental Management (DEM) priority sites for acquisition or easement protection

Secondary:

Remaining C, D, and E category lands meeting one or more of the following conditions were assigned a "secondary" conservation designation:

- Location within Natural Corridors established by State Guide Plan 152 (1,200 feet wide) and locations within and within 50 feet of existing or planned bikeways.

- Location within or west or south of Mid-State Greenway established by State Guide Plan 152.

"Tertiary"

Remaining C, D, or E intensity category lands were assigned a "tertiary" conservation designation. These lands were designated for future conservation last and might be more suitable for limited, low-intensity resource based development (based upon the conservation factors we selected).

Table (8), *Decisions Rules for Conservation Priority*, shows the decision matrix we used to assign the conservation policy priorities agreed upon to the initial land intensity potential classifications to create the 3 levels of priorities of LIC for this step. Figure (7), *Conservation Priority Classifications*, shows the geographic distribution of areas assigned to the primary and secondary conservation categories of this step.

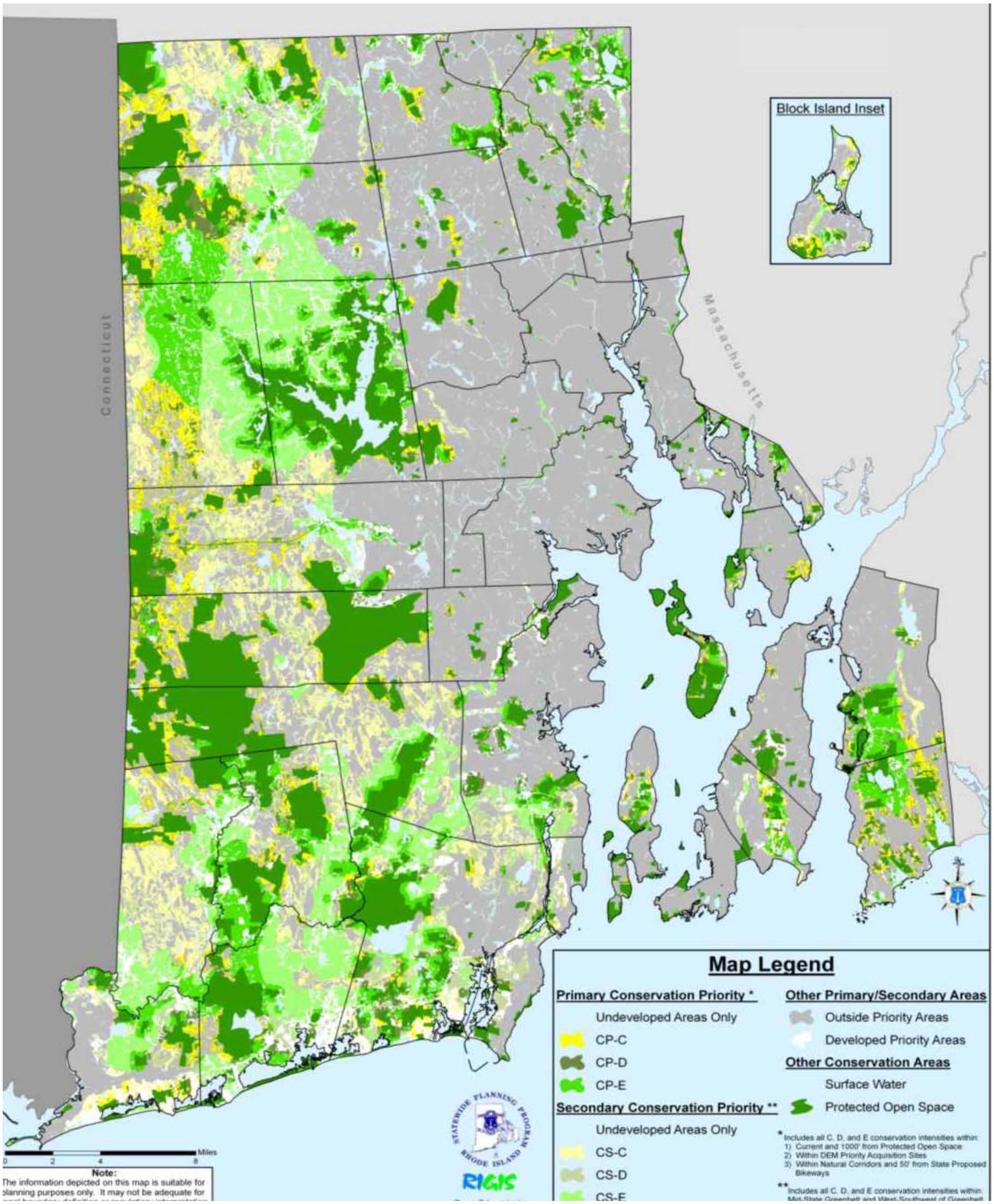
Table (8)
Decisions Rules for Conservation Priority

LIC (from Step 1A)	**Adjacent to Protected Open Space**	**DEM Priority Site**	**Bikeways atural Corrido**	**Within Mid-State Greenbelt and West-Southwest**	**Initial Assign to: Conservation Priority**
C, D, E	Y	Y/N	Y/N	Y/N	CP-C1, CP-D1, CP-E1
C, D, E	N	Y	Y/N	Y/N	CP-C2, CP-D2, CP-E2
C, D, E	N	N	Y	N	CS-C1, CS-D1, CS-E1
C, D, E	N	N	N	Y	CS-C2, CS-D2, CS-E2
C, D, E		N	N	N	CT-C, CT-D, CT-E
P	exclude currently protected lands from assignment of conservation areas				
W	exclude open water from assignment of conservation areas				
A & B	excluded for higher intensity development priority				
Key to Conservation Areas:					
Level / LIC^	**Level Description**				
PC-E1	P=Primary Choice for Conservation				
SC-C1	S=Secondary Choice for Conservation				
PT-C3	T= Tertiary Choice for Conservation				

^LIC = A, B or C

DP - (Any LIC) # *****
*****Priority # reflects sum of related conservation factors

FIGURE (7):
Conservation Priority Classifications



Template of Development and Conservation Priorities

The categorization of the Land Intensity Potential Classification data for development and conservation priorities was done as a two-stage process, and resulted in two database outputs. To allow simultaneous consideration of development and conservation priorities for all categorized areas in the state, the resultant development and conservation priority databases were combined, or “unioned”, into a single, statewide database. To create this, a further set of decision rules was used to assign a controlling intensity/priority categorization in cases where values had been assigned to the same lands in both the development prioritization and the conservation prioritization. (As described above, lands in intensity potential class “C” were processed for both the development and conservation priority assignments, and thus received both a conservation priority and a development priority value.) This was a total of approximately 47,000 acres statewide.

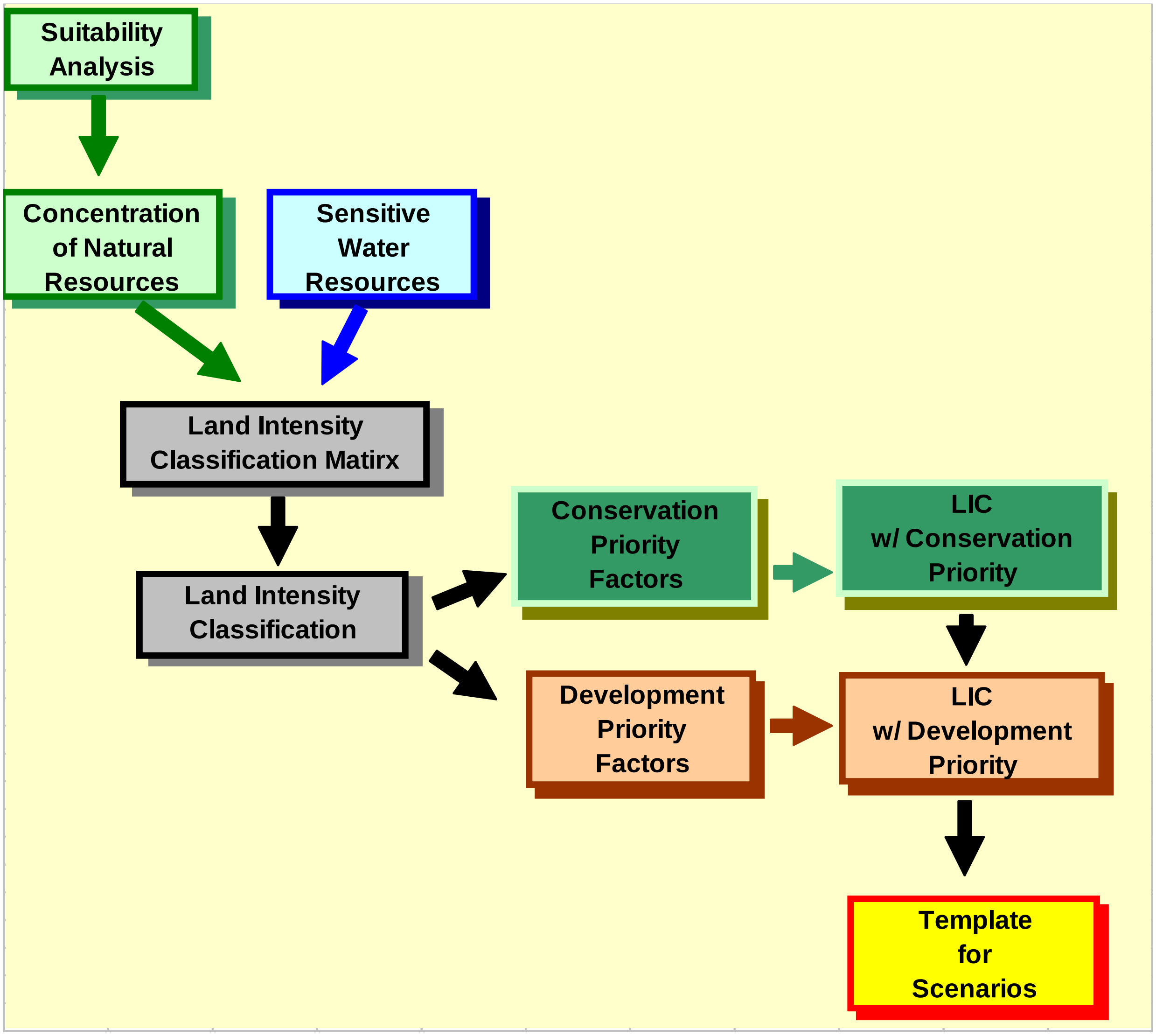
The following “rules” were utilized to determine a controlling assignment for these “C” lands:

- Areas where the development and conservation priority category were dissimilar, a “primary” value would take precedence in assignment (e.g., area having a development value = primary and a conservation value = secondary or tertiary would be assigned to development; area with a conservation value = primary and a development value = secondary or tertiary would be assigned to conservation).

- Areas where neither the development and conservation priority category values were primary, and areas where both the development and conservation priority category values were primary were assigned an “open” value, and carried forward in the database for final assignment to conservation or development status in a later stage of the analysis.

The resulting union was used as a geographic template in defining and evaluating several alternative land use scenarios, as described in the Summary Land Intensity and Priorities Analysis section and the Scenario Analysis: Assessing Alternative Patterns for Future Land Use section that follow this part.

Figure (8):
Land Intensity Priorities Methodology



Summary Land Intensity and Priorities Analysis

Figure (8), *Land Intensity and Priorities Methodology*, illustrates the methodology in a flow chart representation the stages of the geographic analysis described to this point, and follows the decision making process from the Land Suitability Analysis through the Priority Template creation. Figure (9), *Land Intensity and Priorities Template*, shows the mapping template we created.

Table (9), *Land Intensity and Priorities Summary*, provides area results of the Land Intensity Potential Classification by Development/Conservation Priority category for the primary and secondary development and conservation categories, and for the "open" category "C" areas. Figure (9), illustrates the geographic template resulting from the union of development and conservation prioritization steps. As with earlier steps in the analysis, these products must be interpreted only as interim results that are intended to serve as inputs to further processes, and are not applicable to development decision-making on an individual site basis.

Table (9):
Land Intensity and Priorities Summary

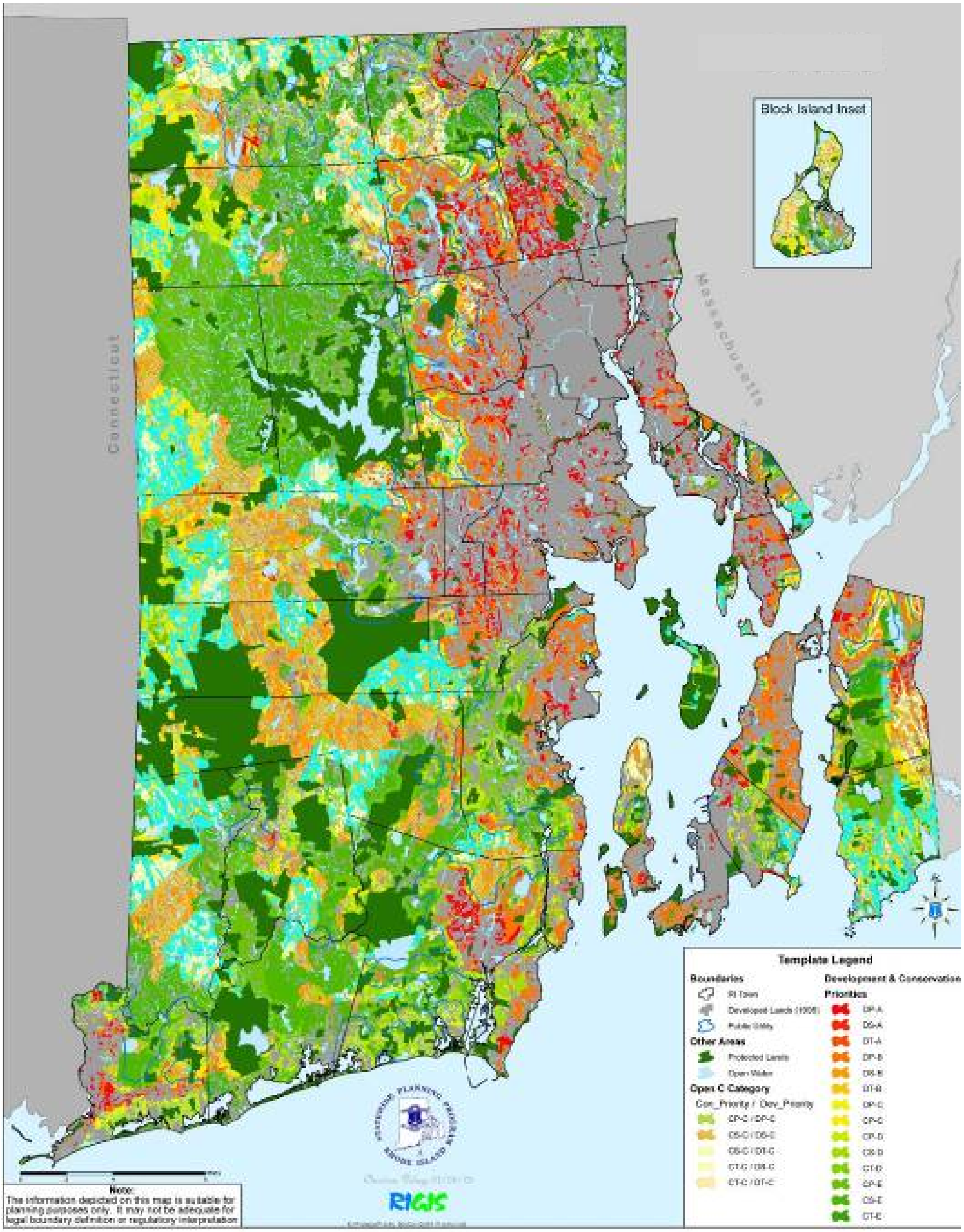
Land Intensity Classes A, B, & C -- Primary & Secondary Development Priorities			
Primary + Secondary	Statewide Acreage	Undeveloped Acreage	Developed Acreage
Intensity Class A	114,200	22,000	92,200
Intensity Class B	105,700	63,800	41,900
Intensity Class C**	23,300	12,400	10,900
Total	**243,200**	**98,200**	**145,000**

Land Intensity Class C [Open] -- Development & Conservation Priorities			
"Open" Intensity Class C	Statewide Acreage	Undeveloped Acreage	Developed Acreage
Dev. Primary / Cons. Primary	5,800	3,000	3,000
Dev.Secondary / Cons. Secondary	17,000	16,400	500
Cons. Secondary / Dev. Tertiary	15,000	15,000	500
Cons. Tertiary / Dev. Secondary	7,700	7,000	800
Cons. Tertiary / Dev. Tertiary	6,100	5,200	800
Total*	**51,600**	**46,600**	**5,600**

Land Intensity Classes C, D, & E -- Primary & Secondary Conservation Priorities			
Primary + Secondary	Statewide Acreage	Undeveloped Acreage	Developed Acreage
Intensity Class C**	72,200	62,800	9,600
Intensity Class D	49,000	35,200	13,800
Intensity Class E	110,200	96,400	13,800
Total*	**231,400**	**194,400**	**37,200**

(*Rounded to nearest 00)
** includes Class “C” areas assigned “open” value

Figure (9):
Land Intensity and Priorities Template


Block Island Inset
Connecticut
Massachusetts
Template Legend
Boundaries
RI Town
Public Utility
Other Areas
Protected Lands
Open Water
Open C Category
Con_Priority / Dev_Priority
Development & Conservation
Priorities
DP-A
DS-A
DT-A
DP-B
DS-B
DT-B
Note:
The information depicted on this map is suitable for planning purposes only. It may not be adequate for legal boundary definition or regulatory interpretation
RIGIS

PART 4: Scenario Analysis -
Assessing Alternative Patterns for Future Land Use

This Section describes the methods used to study the options for planning for the future growth of the state from 1995 to 2025. Land use practices, both good and bad, affect the composition, function and aesthetics of the built environment. There are a variety of ways that Rhode Island's future land use can be managed, each with different ecological and economic impacts. This extends to the overall pattern or structure that the state's landscape will exhibit in 2025. The structure of urbanized metropolitan regions such as Rhode Island generally fall somewhere on a scale between two extremes of characteristic urban form:

- *Compact*: Regions in which human activities are concentrated within one or more high density cores or nodes are considered compact. Often, such regions have a hierarchy of different sized centers serving different functions, and/or higher density areas along corridors following major transport lines. Surrounding areas are sparsely developed and/or reserved as open land. Metropolitan areas such as Boston, New York, and Portland, OR are generally considered to be among the more compact urban regions.

- *Sprawling*: Regions with expansive areas of low-density development and very few high density centers are considered diffuse or sprawling. Generally, transit systems in such regions are not well developed, and highways form the major transport system. Development is more uniform, with lesser amounts of open land throughout the region. Urban regions such as Los Angeles, Phoenix, and Atlanta are often identified as having a sprawling urban form.

Rhode Island (and the Providence metro area which comprises a large portion of the state) has long been considered among the more compact urban areas in the nation. As described in Part 3 of Land Use 2025, Rhode Island's development has traditionally been largely oriented towards the urban communities and town centers fronting the Bay and shore, and along the state's major rivers. State policy, embodied in the State Guide Plan, has promoted a continuation of compact development patterns. Yet, beginning in the 1970s, and increasingly in recent decades, growth and development have extended into more rural areas of the state, and have begun to change the long-prevailing pattern of compactness.

The way we decided to do this is to apply scenario planning to the results of the GIS analysis. Scenario planning a what-if technique that provides for a tool for planners to develop a mutual vision for the future by analyzing the combination of various forces that affect future growth. These combinations of fact and possible social changes are called "scenarios." After reviewing all of the work in the previous parts of this Section, we started with several questions when beginning to think about developing alternative future land use scenarios. These questions addressed the following issues:

- How should the state accommodate its inevitable growth?
- Can the state grow and retain its unique character at the same time?
- How can the state accommodate growth as it expands its urban services?
- What will happen to the natural environment and rural landscapes?

The consequences of a decision (or the lack of a decision) on what form an urban region will pursue are significant: sprawling, low density regions consume more land, produce more environmental impacts, have more congestion, and pay more to provide many services to their residents than do comparable, but more compact, regions.

The state's future land use pattern in 2025 will be derived from the interaction of thousands of individual land use decisions made by private land owners and public land managers. These decisions will be made within the context of laws and regulations affecting the uses and intensities to which land may be put, and influenced by the incentives and disincentives which public entities provide for development of various types or in various locations. Viewed collectively, these individual decisions made over the next twenty years, will determine the overall land use pattern, and urban form for Rhode Island in 2025. This, in turn, will affect many other factors, ranging from the effectiveness of transit system and the levels of highway congestion, to the cost of delivering many municipal services, and consequent tax rates.

The scenario planning we performed as part of the geographic analysis for Land Use 2025 was designed to present clear alternatives to how the state might grow over the next 20 years. It was similar to, but differed in some respects from, scenario planning exercises for other metropolitan regions described in the literature. Often, such processes are described as a bottoms-up approach, beginning with multiple public workshops engaging a broad cross-section of the populace in defining land use concerns and "brain-storming" alternative land use patterns for the region. This input is then reduced, by planners and technicians, to a series of geographically-defined alternative futures which are then re-fined, and narrowed to a single preferred format, through additional public and stakeholder input. Rhode Island is distinguished from other jurisdictions in which scenario planning has been used in that it has a long tradition of state land use planning, and consistent (State Guide Plan) policy advocating a compact development model. For Rhode Island's plan, the technical scenario analysis occurred later in the planning process, after the initial public outreach phase was completed. Public input, including results from the 2001 Public Survey and 2003 Regional Workshops, however were considered in defining and evaluating alternative scenarios developed by Statewide Planning Program staff, working with (stakeholder) input via the Technical Committee. Additional public input on the scenarios and the recommended alternative took place during public review of the final draft plan. There 4 scenarios developed were:

- Trends
- Centers & Corridors
- Infill
- Composite

In order to systematically identify and evaluate the state in order to prepare a future land use plan, a common frame of reference needed to be established for use in the scenarios. We aligned the forecasts of estimated growth needs from Part 4 of Land Use 2025 and goals and policies from Part 5 of Land Use 2025 with the land intensity classifications from our analysis in order to establish a need basis for future undeveloped land to use in all scenarios prior to constructing them. The forecasts of estimated growth needs are shown in Table (10), *Projected Acreage Requirements of Undeveloped Land for 2025*. Table (11), *Illustrative Density Pattern of New Residential Development and Assumed Number of Units Provided for 2025,* was developed to show the correlation between the land intensity classifications and density classes.

Table (10):

Projected Acreage Requirements of Undeveloped Land for 2025

		Scenario: 1: Trend			2: Centers/Corridors			3: Infill			4: Composite		
Target Efficiency Factor:		100% of est need[1]			80% of trend[2]			70% of trend[2]			65% of trend[2]		
Land Use Category:	**Dev. Cat.**	Add'l Gross Dev.acres	Add'l Net Dev.acres	Add'l Dwell. units	Add'l Gross Dev.acres	Add'l Net Dev.acres	Add'l Dwell. units	Add'l Gross Dev.acres	Add'l Net Dev.acres	Add'l Dwell. units	Add'l Gross Dev.acres	Add'l Net Dev.acres	Add'l Dwell. units
RESIDENTIAL [3]													
High (8+ du/ac)	A	201	161	1,285	625	500	4,000	1,875	1,500	12,000	1,000	800	6,400
Med-High (4-8 du/ac)	A	734	587	3,524	1,500	1,200	7,200	2,000	1,600	9,600	1,625	1,300	7,800
Medium (1-4du/ac)	B-C	4,084	3,267	6,534	4,125	3,300	6,600	7,500	6,000	12,000	8,000	6,400	12,800
Med-Low (0.5-1 du/ac)	C	20,320	16,256	11,379	16,256	13,005	9,103	4,375	3,500	2,450	9,375	7,500	5,250
Low (<0.5 du/ac)	C-D	70,110	56,088	14,022	50,000	40,000	10,000	3,750	3,000	750	22,500	18,000	4,500
Subtotal Resid.		95,448	76,359	36,744	72,506	58,005	36,903	19,500	15,600	36,800	42,500	34,000	36,750
COMM. IND. MIXED	A-C	12,100	12,100		9,680	9,680		8,470	8,470		7,865	7,865	36,750
INSTITUTIONAL	A-C	1,100	1,100		880	880		770	770		715	715	
TOTAL:		**108,648**	**89,559**	**36,744**	**83,066**	**68,565**	**36,903**	**28,740**	**24,840**	**36,800**	**51,080**	**42,580**	**36,750**
Targets (acreage & DU)		108,648	89,559	36,744	86,919	71,647	36,744	76,054	62,691	36,744	70,621	58,213	36,744
Difference		0	0	0	3,853	3,082	159	47,314	37,851	56	19,541	15,633	6
Land Relative to Trend[4]		**100**			**76**			**26**			**47**		

Notes to table:

1. Trend scenario land need estimated based upon future land needs methodology of Part 4 of Land Use 2025.
2. Other scenario land "need" based upon efficiency goals/assumptions established for each scenario
3. Gross Residential land needs include 25% increase over base (net) needs to reflect area required for roads, and supporting uses.
4. % Land = (Additional gross dev. acres of Scenario / Additional gross dev. acres of Trend)x 100

Table (11):

Illustrative Density Pattern of New Residential Development and Assumed Number of Units Provided for 2025

		1: Trend			2: Centers/Corridors			3: Infill			4: Composite		
Residential Density		**Density Range**	Add'l Dwell. units	% new Dwell. Units	Density Range	Add'l Dwell. units	% new Dwell. Units	Density Range	Add'l Dwell. units	% new Dwell. Units	Density Range	Add'l Dwell. units	% new Dwell. Units
High	A	(8+ du/ac)	1,285	3.5	(8+ du/ac)	4,000	10.8	(8+ du/ac)	12,000	32.6	(8+ du/ac)	6,400	17.4
Med-High	A	(4-8 du/ac)	3,524	9.6	(4-8 du/ac)	7,200	19.5	(4-8 du/ac)	9,600	26.1	(4-8 du/ac)	7,800	21.2
Medium	A-B	(1-4du/ac)	6,534	17.8	(1-4du/ac)	6,600	17.9	(1-4du/ac)	12,000	32.6	(1-4du/ac)	12,800	34.8
Med-Low	C	(0.5-1 du/ac)	11,379	31.0	(0.5-1 du/ac)	9,103	24.7	(0.5-1 du/ac)	2,450	6.7	(0.5-1 du/ac)	5,250	14.3
Low	C-D	(<0.5 du/ac)	14,022	38.2	(<0.5 du/ac)	10,000	27.1	(<0.5 du/ac)	750	2.0	(<0.5 du/ac)	4,500	12.2
Total New Resid. Units			**36,744**	**100.0**		**36,903**	**100.0**		**36,800**	**100.0**		**36,750**	**100.0**

Using the data available in the Land Intensity and Priorities Template, the efficacy of each scenario was assessed relative to: (1) its having the capacity, overall, to accommodate the growth needs forecasted through 2025, and (2) its being able to accommodate forecasted growth without significant impact when considering the quantities of land found suited for the various development intensity categories relative to the projected need for land within each intensity category. Scenarios were also qualitatively assessed relative to their potential for substantial conformance with the goals and policies from Part 5 of Land Use 2025 and for relationship, in general terms, to the (composite) of municipal future land use maps.

Table (10) provides estimates of land needed to accommodate future growth under the four scenarios. Estimates were devised first for the Trend Scenario. This was done based on the needs analyses described in the draft text of Part 4. (There, demand for new housing units through 2025 is estimated based upon demographic projections by the Statewide Planning Program (and other sources) reflecting a high, medium and low range of future population and household growth. A high range estimate was selected for the future land need analysis. Further documentation of projected residential land need is provided in a Technical Paper available on the Program website.) The projected growth in residential units was converted to "Add'l. Net Dev. Acres" figures via distribution of added units among density categories based upon the proportionate share of land allocated to each density category by the Composite of Municipal Future Land Use Maps, (e.g. the highest density category (8+ du./ac.) was allocated 3.5% of future residential demand because 3.5% of the undeveloped land is assigned to this density class by municipal plans). Net additional acreage totals were also adjusted upward for the residential categories (by 25%), reflecting a contingency factor to account for the difference between gross and net densities in residential land use (Commercial/Industrial/Mixed and Institutional land needs did not require adjustment). The resulting "Add'l. Gross Dev. Acres" are shown under the Trend heading in Table (10).

The estimated additional gross acreage figure for the Trend Scenario represents an <u>upper limit estimate</u> of undeveloped land required to accommodate new growth in the state through 2025 <u>assuming no major departures from recent development patterns</u>.

To estimate future land needs for the other three scenarios, proportional adjustments were made to the Trend estimates land to ensure that they achieved the target land efficiency assumptions selected for them. Thus, the estimated aggregate land needs for the Centers and Corridors Scenario was set at no more than 80% of the Trend needs. An effort was also made to select or ensure sufficient contrast between them in terms of density mix. This was done in several iterations of interactive adjustments to the residential density mix of the three remaining scenarios to ensure that each scenarios provided the estimated of housing units needed while meeting the target efficiency level.

The estimated additional gross acreage figures given for the other three scenarios represent varying estimates of undeveloped land required to accommodate new growth in the state through 2025, <u>if local policies and development practices change in the direction of greater land utilization efficiency</u>.

Table (10) also shows how the estimates of land needed for growth under each scenario align with the different residential density classifications to establish estimates of acreage need by land intensity potential class. While precise figures are given in the Table, the figures must be regarded as more approximate. We developed Table (11), *Illustrative Density Pattern of New Residential Development and Assumed Number of Units Provided for 2025,* to show the correlation between the land intensity classifications and density classes. As can be discerned from these two tables, the major variable in distinguishing among the scenarios, apart from their geographies, is their differing mixes of residential densities. The Trend assumes that future housing demand will be expressed within the proportional density breakdown represented on the Composite of Municipal Future Land Use Maps—assumed to be reflective of current local zoning. The other scenarios, as can be seen in Table (11), are based on residential density mixes which vary, <u>but which generally assume that housing demand will be met by producing significantly more new housing in the higher density categories relative to the Trend scenario</u>.

We then used GIS to create a set of 4 land use scenarios. The Scenarios compared 4 futures with varying restrictive assumptions concerning the distribution of future land use verses an alternative future without such restrictions. We then evaluated each scenario for the projected amount of land to be consumed verse the projected growth needs and we selected from these alternatives the future land use patterns that best balanced ecological and economic concerns and reflected the goals and policies from the draft text of Part 5 of the land use and policies plan.

The scenarios we have developed are not prescriptive plans but are instead visions of what could be in 2025. We cannot not predict exactly what changes will occur to affect our state but we have made certain planning based judgments about what we would like to achieve and tried to show the most likely future in terms of the distribution of future land uses.

1989 Plan – Looking Back

The 1989 Plan allocated land into 4 basic categories. Each category related to the intensity of land use rather than to the particular type of use. The four categories were:

ADP-1 = These are areas of highest intensity potential characterized by urban-type and mixed-use development with population density threshold adequate for efficient provision of public transit, and for public water and sewer service. Included is multi-family housing and regional as well as commercial and industrial development. They have projected good access to major transportation infrastructure.

ADP-2 = areas of moderate intensity potential that are likely to be served by public water with sewer service in many sections. Included was medium density single family dwellings, multi-family complexes, areas of mixed residential commercial and low-intensity industrial uses, as well as, cluster-type developments combining higher densities with permanently protected open space.

ADP-3 = areas of low intensity potential based on physical and/or cultural factors. Included was low density residential development, as well as farmland, open land, forest, marshlands, open recreation, commercial uses serving area residents and isolated industrial sites.

ACP = Areas of positive conservation potential. These were areas because of high resources values or the risks of threats to public health, safety and welfare were to remain as open spaces, natural habitats, forestlands, and other non-urban uses.

The 1989 Plan divided the land into the 4 categories based upon a performance orientation that evolved from an environmental inventory that was complied. It was the start of a state-level policy approach of the time that used policy language rather than a detailed sate land use map to guide development. The 1989 Plan recognized that with particular exceptions regulated by state or federal law, each city and town determines the types of uses to which land is put within its boundaries. That still is very much true today and will be reflected within this Plan as well.

Land Intensity Classifications 2025

We decided to start with the same basic performance orientation land use densities for the land use classifications for the scenarios. The reasoning of the 1989 Plan for dividing land into intensity classifications is still valid. Classifying land by intensity classifications responds to the need to consider the environmental features of the state, and that land uses vary in intensity and with the exception of particular uses regulated by state or federal laws, it is up to each municipality to determine the types of uses to which land is put within its boundaries. We decided further split the 4 categories into 5 classifications after reviewing the Land Suitability Analysis. We split the ADP-3 category of the 1989 plan into 2 classifications to create the 5th category. The Land Intensity Classifications (LIC) selected for the future land use scenarios are as follows:

"A" High Intensity

4 or more (+) dwelling units/acre with Commercial, Industrial, Manufacturing (CIM).uses

Similar to the 1989 ADP-1 category, these are areas of highest intensity potential characterized by urban-type and mixed-use development with population density threshold adequate for efficient provision of public transit, and for public water and sewer service. Included is multi-family housing and regional as well as commercial and industrial development. They have projected good access to major transportation infrastructure.

- Intense development of these areas without any expected adverse effect is recommended with appropriate attention to tree, setbacks, river buffers to assure functional values of the state's environment and natural resources.

"B" Moderate Intensity

1-4 dwelling units/acre with Commercial, Industrial, Manufacturing uses

Similar to the 1989 ADP-2 category, these are areas of moderate intensity potential that are likely to be served by public water with sewer service in <u>some</u> sections or on-site sewage disposal where geology permits and good access to transportation corridors. Included is medium density single family dwellings, multi-family complexes, areas of mixed residential commercial and low-intensity industrial uses.

- Moderate development of these areas is recommended without any expected adverse effect to the state's environment and natural resources.

"C" Low Intensity

0.25 – 0.9 dwelling units/acre with limited Commercial, Industrial, Manufacturing uses

Similar to the 1989 ADP-3 category, these are areas of low intensity potential based on physical and/or cultural factors. Included is low density residential development using alternative zoning techniques that conserve land, as well as conserving farmland, open land, forest, marshlands, and providing commercial uses serving area residents and isolated industrial sites.

- Low intensity development is recommended with careful siting standards and protection of natural resources to avoid any adverse effect to the state's environment and natural resources.

"D" Conservation/Limited, Resource-based Development Intensity

<0.25 dwelling units/acre with more limited Commercial, Industrial, Manufacturing uses

A refinement of the 1989 ADP-3 category, these are areas of low intensity potential based on physical resources. Included is low density residential development using alternative zoning techniques that conserve land, and conservation of open space and natural resources. Nonresidential uses are those that serve the immediate area and have little or no impact to natural resources.

- Limited resource based development is recommended, again with careful siting standards that favor the protection of natural resources and conservation of land.

"E" Conservation/Very Limited Development Intensity

<0.0 dwelling units/acre and no Commercial, Industrial, Manufacturing uses but passive recreation and open spaces uses.

Similar to the 1989 ACP category, these are areas where the concentration of natural resources is highest and or are part of sensitive water resource areas and not necessarily suitable for more intense urban uses.

- Conservation and very limited development is recommended for these areas with uses compatible with the preservation of natural resources.

Alternative Land Use Scenarios

We all want a future in which our communities and our environment are healthy. It pays to look at how the choices we make today are likely to affect our communities and our state in the future. There are many ways one might look at these issues, but one of the most telling is the pattern of development - the location and rate at which land is developed. We also know that where land is developed determines the choices people have for getting around and effects opportunities to maintain open land, farms and forests. To answer the question of what future development patterns could be like, we preformed a scenario planning project using the GIS analysis results and looked at 4 different growth scenarios predicted to the year 2025. We decided that the total amount of new land development to be consumed would be a primary factor in evaluating the impacts of future growth for each scenario. Equally, important, however, would be where the new development would be located.

The scenarios we developed built on the various GIS analysis concerning the committed verses uncommitted lands, the Land Suitability Analysis, and the Land Intensity Classifications developed in the previous parts of this Section. The scenarios were designed with certain land use efficiency objectives to be achieved and combined with GIS to provide contrasts in land use management strategies in order to examine differing future land use patterns. A scenario represents the extent, or footprint, within which the majority of development to accommodate growth needs through 2025 was postulated to occur. In order to provide contrast, the four alternatives were constructed with differing assumptions relative to the efficiency of future land use, and with differing levels of land use intensity, in particular mixes of residential density.

Figures (10) through (13) depict the geographies of the four scenarios. In these depictions, the boundary of each scenario area is best discerned by changes in map color scheme: throughout the four maps within each of the scenario areas those areas categorized for development (land intensity categories A, B, and C (portion)) are shown as red, and those areas categorized for conservation (categories C (portion), D, or E) as purple (magneta). Outside the scenario boundaries, the areas categorized for development are shown as pink, and areas categorized for conservation appear as light green. (Currently developed land is grey, and currently protected land is dark green throughout all scenarios.) Thus, each scenario can be seen as a template or "cookie cutter" for assessing how land of varying suitabilities and intensity potentials (from earlier stages of the analysis) would be impacted if future growth were focused within the scenario area.

The scenarios developed are not prescriptive plans with reference to any point on the ground, but instead represent alternative visions of general, statewide land use patterns in 2025. No model can predict an exact future land use pattern, or forecast the myriad of factors that will affect use of our state's land in the future. The scenarios are based on planning judgments and represent just four of many potential outcomes. They are about considering a range of what "*might be*" and defining what "*would be*" the most desirable outcome, based upon the long-range goals and objectives for land use contained in this plan and other State Guide Plan elements.

Trends Scenario

The Trends Scenario would continue current land uses practices and existing facilities would remain in place. We took the RIGIS 1995 Land Use Land Cover data and applied a 200 buffer to all areas of existing development for all areas for the state and applied the Land Intensity Classifications to the results. It shows the implications of current land use management strategies assuming ongoing favorable land and housing market conditions without a geographic focus.

A key parameter was that future growth needs would be accommodated based upon local land use plans (which presumably are indicative of zoning schema in place), e.g., at densities reflecting recent growth and development trends. This scenario was assumed to be the default–the likely future that would result in the absence of affirmative policy shifts to incentivize other forms—and, thus, was a baseline for contrasting the other three scenarios against.

This scenario acts as a base case when evaluating the performance of the other 3 alternative scenarios that follow. We set land consumption efficiency targets[1] for each scenario in order evaluate how each scenario would differ from this scenario. The status quo for natural resource protection and management would remain under this scenario. Current laws and local ordinances would continue to regulate land use. It would be characterized by relatively low densities, expanding road networks and unconcentrated public investments. Developing suburbs would be built at residential densities which are much lower than the densities of the state's more developed suburbs and core cities.

Accommodation of Future Needs: Table (12), *Scenario 1, Trends*, illustrates how the land intensity potential classification within the Trend Scenario compares to its estimated land requirements. As shown in this Table, the Trend Scenario would include approximately 122,000 acres of undeveloped

[1] The land consumption efficiency targets are expressed as a percentage of undeveloped land consumed verses the 100 % of undeveloped land projected for consumption within the Trends Scenario.

land. As shown in Table (12), approximately 52,000 acres (43%) of the land included would be potentially suited for higher intensity development (A & B intensity categories). However, this quantity of high intensity-development-potential land would far exceed the estimated need for intensive development, which would be a maximum of 18,000 acres (assuming that <u>all</u> new commercial, industrial, mixed, and institutional uses are located only within the A & B category land). Deficits would occur, however, within the lower density categories (C & D) where most of the new residential unit demand would be concentrated. A total of 90,000 acres are estimated to be needed for residential development in the C & D categories, with only 37,000 acres potentially available. The deficit in lower density development needs could be partially met via development of "surplus" A & B category land at lower intensity that it is capable of supporting, and/or by development of lands classified as best suited for conservation potential (i.e., the 33,000 acres in the E category). Development of land outside the scenario, while not accounted for in Table (12), could also accommodate low intensity growth needs, but this could also create further diffusion of development activity. Overall, this scenario does not efficiently utilize land in accommodating anticipated growth through 2025.

<u>Policy Considerations</u>: As show in Figure (10), Scenario 1, Trends, we found that the Trend Scenario would produce a highly diffuse or sprawling urbanized region having a relatively small residual of unfragmented open areas. This scenario would consume an estimated 122,224 acres of undeveloped land. Important resources including farmland, critical natural areas, existing protected lands, and large forest tracts would be highly susceptible to development impacts, given the wide dispersion of future development activities. The proliferation of developed uses across watersheds would constitute increased risk for contamination of wetlands and water bodies, including potable supply sources. Low densities and scattering of development would make public provision and management of supporting infrastructure and services more expensive, perhaps prohibitively so, for many areas. The emphasis on low density residential development would limit housing choice and make development of affordable units in adequate numbers problematic. Separation of uses and low densities would also make public transit prohibitive and create a high reliance on automobiles for transportation needs. Absent expansion of highway capacities, high levels of congestion could result from increased auto travel demands.

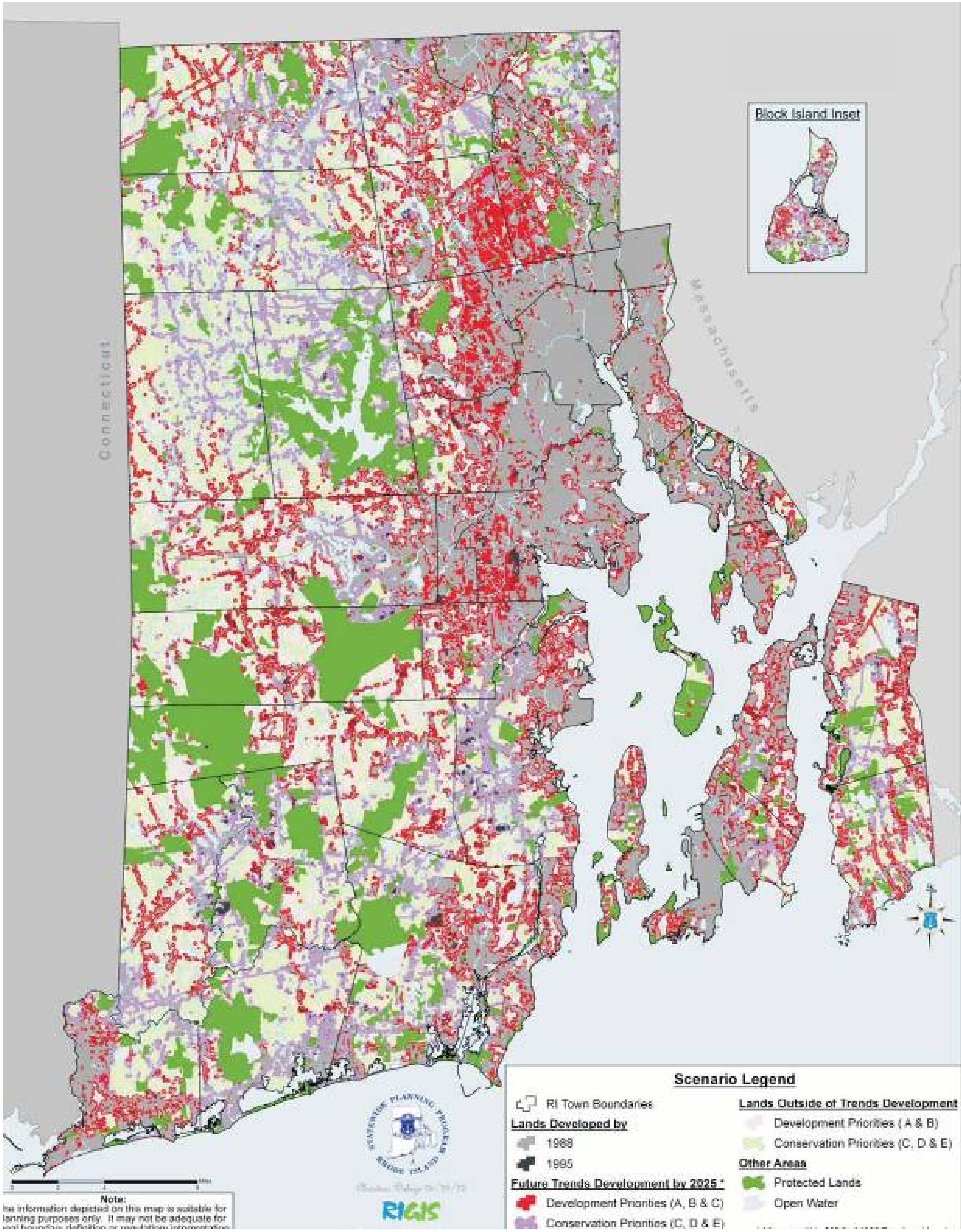
Figure (10) shows what this scenario looks like geographically. This scenario was ***<u>rejected</u>*** as the basis for the future land use plan as it is not consistent with the desired goals and policies of this Plan. This would result in a much larger urbanized region with less undeveloped open areas, farmland, natural areas, scattered infrastructure investments, and more reliance on automobiles for almost all transportation needs.

Table (12):
Scenario 1, Trends

SCENARIO 1: TRENDS

Land Use Category:	Dev. Cat.	Projected Need Target Efficiency Factor: 100 % of est. need Add'l Gross Dev. Acres	Add'l Net Dev. Acres	Add'l Dewll. Units	SCENARIO RESULTS Dev. Cat.	Total Acres
RESIDENTIAL						
High (8+ du/ac)	A	201	161	1,285		
Med-High (4-8 du/ac)	A	734	587	3,524		
Medium (1-4du/ac)	B-C	4,084	3,267	6,534		
Med-Low (0.5-1 du/ac)	C	20,320	16,256	11,379		
Low (<0.5 du/ac)	C-D	70,110	56,088	14,022	A	16,586.00
Subtotal Resid.		95,449	76,359	36,744	B	35,414.00
COMM. IND. MIXED	A-C	12,100	12,100		C	21,408
INSTITUTIONAL	A-C	1,100	1,100		D	15,462.00
					E	33,354.00
TOTAL:		**108,649**	**89,559**	**36,744**		**122,224.00**
Targets (acreage & DU)		108,649	89,559	36,744		
Difference		0	0	0		
Land Relative to Trend		**100**				

Figure (10):
Scenario 1, Trends



The next 3 planning scenarios we designed were based on the housing density projected needs, land intensity classifications, and land use policies of this Plan required to accommodate compact growth while maintaining the state's unique character and natural resources. Much of the new growth anticipated is focused in these scenarios within areas with existing urban services. They are visions of what the future could turn out to be – they represent several possible future outcomes.

Centers/Corridors Scenario

We decided to examine what a concentrated pattern of growth that avoids a sprawlling development pattern like the Trends scenario revealed. We used the prior work of the Governor's Growth Planning Council and the Statewide Planning staff on potential growth centers as one of many starting points for this scenario. The recommended 3 classes of potential centers from the Growth Planning Council Report[2], the RIGIS "Village" data layer, the GIS highway transportation corridors layer developed by the Statewide Planning Transportation staff, and the Land Intensity Classifications were combined to create this scenario. We set the following general factors for locating future growth and identifying potential centers:

- That 80% of new growth would be within centers and transportation corridor zones in order to reduce the total amount of land needed for growth.
- That new growth should occur in existing and new appropriately scaled centers.
- That growth should be in locations of areas with existing infrastructure, access to existing travel corridors, and public services.
- To protect and enhance critical environmental resources where a high co-occurrence of natural resources occurs.
- To avoid converting working lands, such as prime farmland and unfragmented forestland, into urban uses.
- To avoid fragmenting existing greenspace.
- To avoid impacting land used for water supply resources.

Using these factors we decided to within the scenario to:

- designate the 9 urban core communities-Providence, East Providence, Pawtucket, Cranston, Central Falls, Warwick, West Warwick plus Newport and Woonsocket as potential urban centers as opposed to identifying specific neighborhoods in those municipalities.
- designate some of the historical downtowns and traditional mixed-use central business cores in urban fringe / suburban communities as potential town centers
- designate some of the historical village downtowns and some of the main street traditional mixed-use cores in rural communities as potential village centers.

[2] *Growth Centers Report*, Governor's Growth Planning Council, August, 2002.

The Centers and Corridors Scenario we designed would represent a departure from current trends. Current laws and local ordinances would be revised to facilitate increased development activity within highway corridors and in existing and new centers. Development would be more concentrated, and overall densities would be higher than under the Trend scenario. However, while concentrating development in some respects, the Centers and Corridors scenario would still be characterized by a generalized distribution of development throughout areas of the state. Overall densities would considerably lower than current levels, and also much lower than traditional density patterns (e.g., existing city and town/village densities).

<u>Accommodation of Future Needs</u>: Table (13), *Scenario 2, Centers & Corridors,* illustrates how the land intensity potential classification within the Centers and Corridors Scenario compares to its estimated land requirements. As shown in this Table, the Centers and Corridors Scenario would encompass approximately 129,000 acres of undeveloped land. As shown in Table (13), approximately 51,000 acres (40%) of this land is classified for higher intensity development potential (A & B intensity categories). However, this quantity of high intensity-development- potential land would far exceed the estimated need for intensive development under this scenario (~16,800 acres – assuming all commercial, industrial, mixed, and institutional uses are located with the A & B categories). Deficits would occur, however, within the medium and lower density categories (C & D) where a total of 66,000 acres are estimated to be needed, with only 39,000 available. As with the Trend Scenario, this land deficit for lower density development needs could be met via development of "surplus" A & B category land at a lower intensity that it is capable of supporting, and/or by development of lands classified as suited for conservation potential (i.e., the 39,000 acres in the E category). Development of land outside the scenario, while not accounted for in Table (13), could also accommodate low intensity growth needs, but this could also create further diffusion of development activity, and distort the intended geographic pattern of the scenario.

<u>Policy Considerations</u>: As show in Figure (11), *Scenario 2, Centers and Corridors,* the Centers and Corridors Scenario would produce a more concentrated growth pattern compared to the Trend scenario. New development would occur in centers, including eight existing urban centers (Cranston, East Providence, Newport, Pawtucket, Providence, Warwick, West Warwick, and Woonsocket), and in broad (mile-wide) bands along arterial highways connecting these centers with all areas of the state. While concentrated in this respect, this pattern would nonetheless present a future urbanized region that would encompass virtually the entire state, and would impact upon major resource areas (particularly in currently rural portions of the state).

Of the four scenarios, the Centers and Corridors scenario area encompasses the greatest amount of undeveloped land that was rated in the analysis as best suited for conservation purposes; opening the potential for significant impacts as development activities occur in proximity to this land. (Given the deficit in land suited for lower density development needs, the conservation-suitable land within the scenario area could be directly impacted by development.) Important resources including farmland, critical natural areas, existing protected lands, and large forest tracts would be highly susceptible to development impacts, given the occurrence of future development activities in broad bands following roadways throughout the state. The concentration of developed uses in corridors could be especially problematic where corridors cross major watersheds, and would constitute increased risk for contamination of wetlands and water bodies, including potable supply sources.

The concentration of development in centers could make public provision and management of supporting infrastructure and services more economical for these areas; however, the reverse could be true within some parts of the extensive corridor network. The exception could be, where concentration of development in narrow linear bands along major roads could facilitate transit service provision by allowing direct routing, and increased potential patronage. However, corridor populations may not be sufficiently concentrated to sustain economically efficient transit service. The aggregation of growth within highway corridors would also require very careful access management so that vehicular capacities of the roadways involved are not diminished. Absent expansion of highway capacities, high levels of congestion in some corridors could result from a combination of adjacent development and increased auto travel demands. As in the Trend scenario, the Centers and Corridors scenario would continue an emphasis on lower density residential development, which would tend to limit housing choice and affordability. However, the availability of higher density areas (presumably within the centers) could promote increased housing choice, and support efforts to improve housing affordability within these areas.

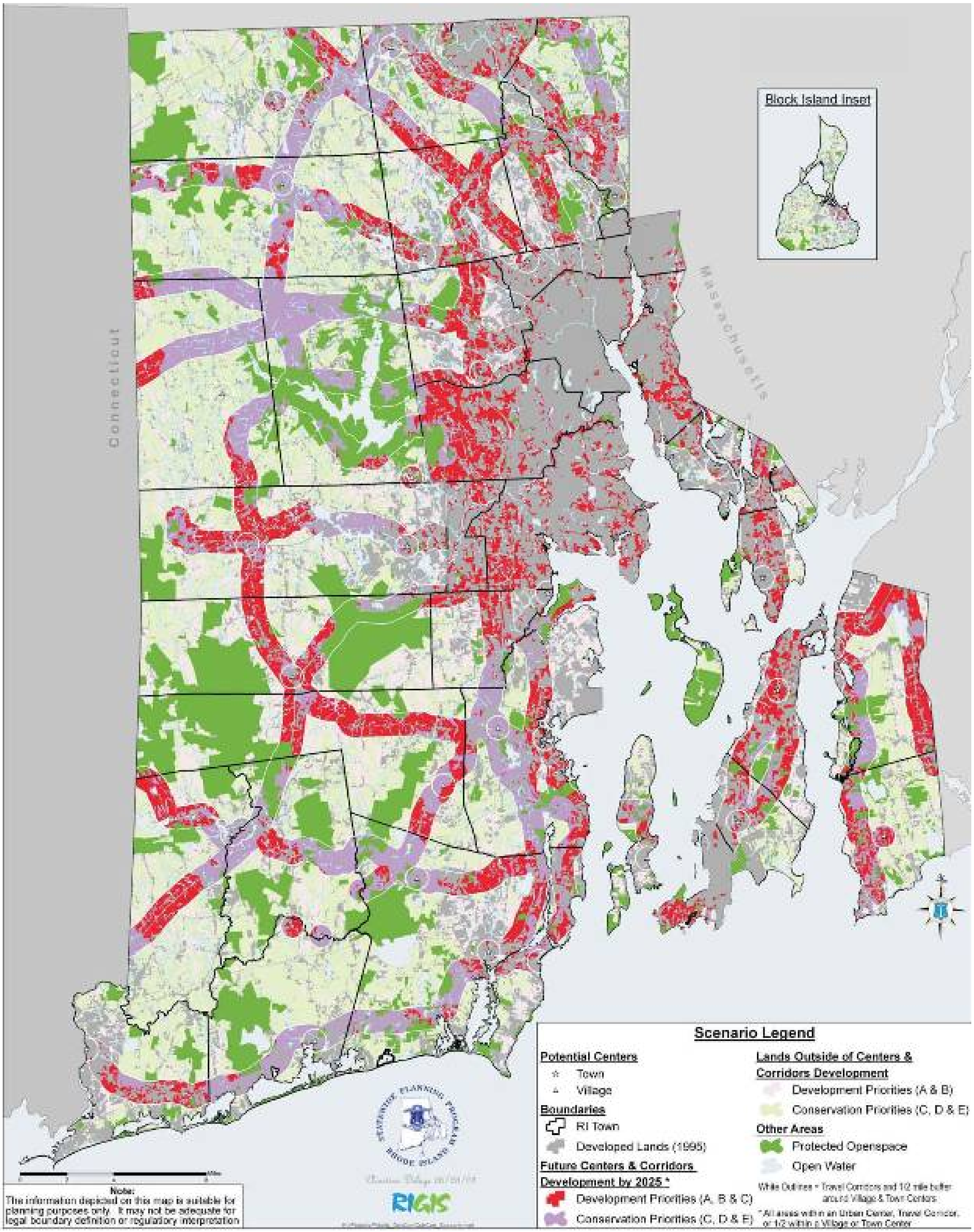
This scenario does offer geographically-distributed opportunities for growth – all communities in the state would either include one or more existing or potential centers, and/or be traversed by one or more corridors of concentrated development. Figure 11 shows what this scenario looks like geographically. This scenario was also ***rejected*** as the basis for the future land use plan as it is not consistent with the desired goals and policies of this Plan. Table (13) *Scenario 2, Centers & Corridors*, displays the estimated need of undeveloped land developed in Part 4 of this Plan verses the GIS calculated scenario land consumption results.

Table (13):
Scenario 2, Centers & Corridors

SCENARIO 2: CENTERS & CORRIDORS

		PROJECTED NEED Target Efficiency Factor: 80 % of Trend				
Land Use Category:	**Dev. Cat.**	**Add'l Gross Dev. Acres**	**Add'l Net Dev. Acres**	**Add'l Dewll. Units**		**SCENARIO RESULTS**
RESIDENTIAL					***Dev. Cat.***	**Total Acres**
High (8+ du/ac)	A	625	500	4,000		
Med-High (4-8 du/ac)	A	1,500	1,200	7,200		
Medium (1-4du/ac)	B-C	4,125	3,300	6,600		
Med-Low (0.5-1 du/ac)	C	16,256	13,005	9,103		
Low (<0.5 du/ac)	C-D	50,000	40,000	10,000	A	14,485
Subtotal Resid.		72,506	58,005	36,903	B	36,805
COMM. IND. MIXED	A-C	9,680	9,680		C	22,895
INSTITUTIONAL	A-C	880	880		D	16,130
					E	39,029
TOTAL:		**83,066**	**68,565**	**36,903**		**129,344**
Targets (acreage & DU)		86,919	71,647	36,744		
Difference		3,853	3,082	159		
Land Relative to Trend		**76**				

Figure 11:
Scenario 2, Centers and Corridors



Infill Scenario

For the third scenario, we decided to examine what the most concentrated pattern of growth within a defined area of existing urban services would look like. The scenario land use efficiency goal was that that 70% of new growth would be within an extended urban service zone in order to reduce the total amount of land needed for growth. In this scenario infill projects, reuse of brownfields sites, and conversion of underutilized structures would have priority over new construction on greenfield sites. We decided to create an extended urban service line by adding a 1,000 foot buffer to the RIGIS existing water and sewer districts data layers and adding a half mile buffer to the RIGIS existing Community Wellhead Protection Areas data layer. Figure (12), *Scenario 3, Infill*, shows what this scenario looks like geographically.

The Infill Scenario would represent a departure from current trends, and would emphasize a “back to the City” future development pattern. Instead of dispersing new development throughout all areas of the state, the Infill scenario would concentrate it within the areas presently serviced by public services and a small expansion area. Current laws and local ordinances would be revised to facilitate increased infill and new development activity within currently urbanized areas and along the urban fringe. Development would be highly concentrated, and overall densities would be much higher than under the Trend scenario. Residential densities within the Infill scenario area would be somewhat higher than traditional levels, but overall, residential densities would be comparable to current levels.

<u>Accommodation of Future Needs</u>: Table (14), *Scenario 3, Infill,* illustrates how the land intensity potential classification within the Infill Scenario compares to its estimated land requirements. As shown in this Table, the Infill Scenario would encompass approximately 107,000 acres of undeveloped land. As shown in Table (14), approximately 59,000 acres (55%) of this land is classified as potentially suited for higher intensity development (A & B intensity categories). Overall, the Infill Scenario provides a very good match between the quantities of land estimated to be needed for different intensity-level developments, and surpluses would exist in all categories. The scenario also encompasses 19,000 acres determined to be suited for conservation potential. This scenario would make the most efficient use of land – requiring only 26% of the land needed in the Trend scenario to accommodate needs.

<u>Policy Considerations</u>: As show in Figure 12 the Infill Scenario would produce a pattern of very concentrated growth – new development would occur in existing and adjacent to existing urbanized areas surrounding Narragansett Bay, in the major river valleys (Blackstone, Pawtuxet), and in the Westerly area. As a result, the Infill scenario would presumably impact less upon most major resource areas (particularly in the western portion of the state); however, a potential for increased impacts on the Bay and shoreline might be the exception. Of the four scenarios, the Infill scenario area encompasses the least amount of undeveloped land rated as best suited for conservation potential, lessening the chance of significant impacts as development activities occur in proximity to this land. The availability of sufficient land to meet all density category development needs provides an opportunity to avoid utilization of conservation-potential land within the scenario area to meet development needs.

The high degree of concentration and density in this scenario, while desirable in most respects, does raise several potential issues. Given such a highly concentrated, higher density development pattern, it will be imperative that public transit options be fully developed and supported as the primary travel mode. Without a fully-supported, highly developed transit system in place and realizing substantial market penetration, severe highway congestion could result as density grew within the scenario are, as options for expanding highway capacity could be limited in the intensely developed scenario area. Similar concerns would apply relative to the need and opportunities for supplementing the capacities of other supporting infrastructure as densities were increased within the

concentrated scenario area. However, the concentrated nature of the Infill scenario could be expected to provide economies in service provision and expansion.

Despite its seeming advantages, the Infill scenario may be considered unbalanced in several respects: Because it is so highly concentrated, the Infill scenario does not offer a geographically balanced distribution of future growth opportunities throughout the state. Growth areas would be limited in the rural western and southeastern portions of the state and several communities would not be expected to incur any new growth under this scenario. Also, the Infill scenario would provide that most new housing be constructed within the higher density categories, typically in multi-family configurations. Only 9% of new housing production would be anticipated within the lowest two density categories (e.g., 0.5 du./ac. and lower). While considerable shifts in future housing demand is anticipated, the degree of change implicit in this scenario's heavy concentration of production in the higher density categories may be unrealistic, and future demand- supply imbalances could result.

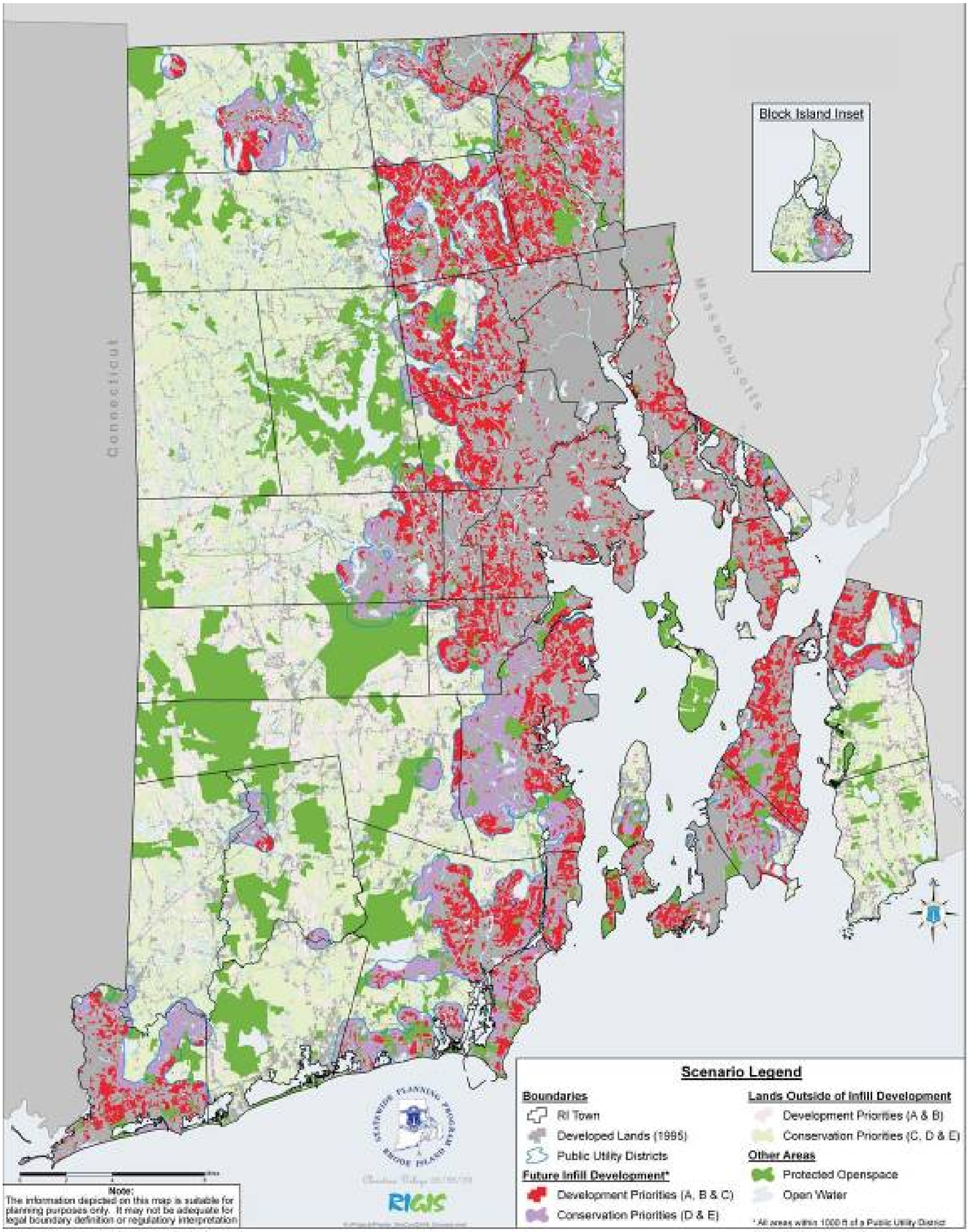
This scenario was also ***rejected*** as the basis for the future land use plan. This scenario would consume an estimated 106,985 acres of undeveloped land, the least amount of undeveloped land required when compared to the Trends and Centers & Corridors scenarios. It proposes less impact to conservation lands but however would require unrealistically high residential densities for its implementation which are unlikely to occur. It also has an unrealistic expectation of no growth in the western communities of the state. Table (14) displays the estimated need of undeveloped land developed in Part 4 of this Plan verses the GIS calculated scenario land consumption results.

Table (14):
Scenario 3, Infill

SCENARIO 3: INFILL

		Projected Need Target Efficiency Factor: 70 % of Trend				SCENARIO RESULTS	
Land Use Category:	**Dev. Cat.**	**Add'l Gross Dev. Acres**	**Add'l Net Dev. Acres**	**Add'l Dewll. Units**		***Dev. Cat.***	**Total Acres**
RESIDENTIAL							
High (8+ du/ac)	A	1,875	1,500	12,000			
Med-High (4-8 du/ac)	A	2,000	1,600	9,600			
Medium (1-4du/ac)	B-C	7,500	6,000	12,000			
Med-Low (0.5-1 du/ac)	C	4,375	3,500	2,450			
Low (<0.5 du/ac)	C-D	3,750	3,000	750		A	20,135.00
Subtotal Resid.		19,500	15,600	36,800		B	38,678.00
COMM. IND. MIXED	A-C	8,470	8,470			C	10,624
INSTITUTIONAL	A-C	770	770			D	18,462.00
						E	19,086.00
TOTAL:		**28,740**	**24,840**	**36,800**			**106,985.00**
Targets (acreage & DU)		76,054	62,691	36,744			
Difference		47,314	37,851	56			
Land Relative to Trend		**26**					

Figure 12:
Scenario 3, Infill



Composite Scenario

For the last scenario we decide to create a vision of the future that would pull positive elements from the previous scenarios and create a 4th alternative vision for the state that balances the dual planning objectives of environmental protection and land development. We set a land efficiency goal of 35 % for this scenario. We used the Infill scenario as a starting point and expanded it with some elements of the Centers & Corridors scenario. The extended urban service boundary along with some selected transportation travel corridors and some potential centers are reflected in this scenario. We felt that this combination resulted in the best land use pattern for a realistic, compact and balanced future land use for the state. Figure (13), *Scenario 4, Composite*, shows what this scenario looks like geographically.

The Composite Scenario represents a combination of features from the Centers and Corridors and the Infill scenarios. It would be a significant departure from current trends, and would emphasize compact urban growth and high densities, but would not be as limiting in these parameters as the Infill scenario. Current laws and local ordinances would be revised to facilitate increased infill and new development activity and higher densities within currently urbanized areas, along the urban fringe, and in existing and potential centers. Development would be significantly concentrated, and overall densities would be much higher than under the Trend scenario. Instead of dispersing new development throughout all areas of the state, the Composite scenario, like the Infill scenario would concentrate it within the areas presently serviced by public services and a small expansion area. However, it would also encompass growth opportunities within several corridor segments and several existing and potential centers from the Centers and Corridors scenario. Overall, 2025 residential densities would be just slightly lower than current levels.

Accommodation of Future Needs: Table (15), *Scenario 4, Composite,* illustrates how the land intensity potential classification within the Composite Scenario compares to its estimated land requirements. As shown in this Table, the Composite Scenario would encompass approximately 115,000 acres of undeveloped land. As shown in Table (15), approximately 60,000 acres (52%) of this land is classified as potentially suited for higher intensity development (A & B intensity categories). Overall, the Composite Scenario provides a good match between the quantities of land estimated to be needed for different intensity-level developments, and surpluses would exist in all categories. The scenario also encompasses 21,000 acres determined to be suited for conservation potential. This scenario would presume over a 100% increase in the efficiency of land use relative to the Trend, requiring only 47% of the land needed in the Trend scenario to accommodate future needs.

Policy Considerations: As show in Figure 13, the Composite Scenario would produce a pattern of concentrated growth, but would be more balanced geographically than the Infill Scenario. New development would be expected to focus principally within and adjacent to the existing heavily developed and areas with infrastructure surrounding Narragansett Bay, on Aquidneck Island, in the major river valleys (Blackstone, Pawtuxet), and in the Westerly area – areas which form the traditional core urban area of Rhode Island. In distinction to the Infill Scenario, however, the Composite scenario would also include opportunities for limited, compact development within centers in currently rural of low density suburban communities. A limited number of corridor segments following highways would also be included. The inclusion of these additional areas provide opportunities for some growth within all communities, however the intention of the scenario is that all growth would be more compact than under the other scenarios. As a result, the Composite scenario, like the Infill scenario would presumably impact less than the Trend or Centers and Corridors upon major resource areas (particularly in the western portion of the state). As with the Infill scenario, however, careful management would be necessary to avoid increased impacts on the Bay from increased development activity along the shoreline. Given the good correspondence of land availability within the various development intensity potential categories with forecasted growth needs by intensity category, there should be no need to impact upon lands categorized as suited for conservation potential. The availability of sufficient land to meet all density category development needs provides an opportunity to avoid utilization of conservation-potential land within the scenario area to meet development needs.

As with the Infill scenario, the highly concentrated, higher density development pattern of the Composite scenario would make it important that public transit options be fully developed and supported as a primary travel mode. Since options for expanding highway capacity could be limited in the intensely developed scenario area, without a fully-supported, highly developed transit system in place and realizing substantial market penetration, severe highway congestion could result as density increased within the scenario area. Similar concerns would apply relative to the need and opportunities for supplementing the capacities of other supporting infrastructure as densities were increased within the concentrated scenario area. However, the concentrated nature of the Composite scenario could be expected to provide economies in service provision and expansion.

Because it is more geographically balanced than the Infill scenario, the Composite scenario does offer growth opportunities to all areas of the state, including limited, compact growth centers in the rural western and southeastern portions of the state. All communities would have opportunities for new growth under this scenario. In terms of housing mix, while the Composite scenario emphasizes new housing at higher densities, with 38% of its new unit production planned within the two highest density categories (e.g., 4 or more du./ac); it would also include 25% of its production within the lower density categories (e.g., 0.5 du./ac. and lower). The more balanced housing production of the Composite scenario would help insure that a range of housing choice remains available while supporting affordable options as the market evolves in the future.

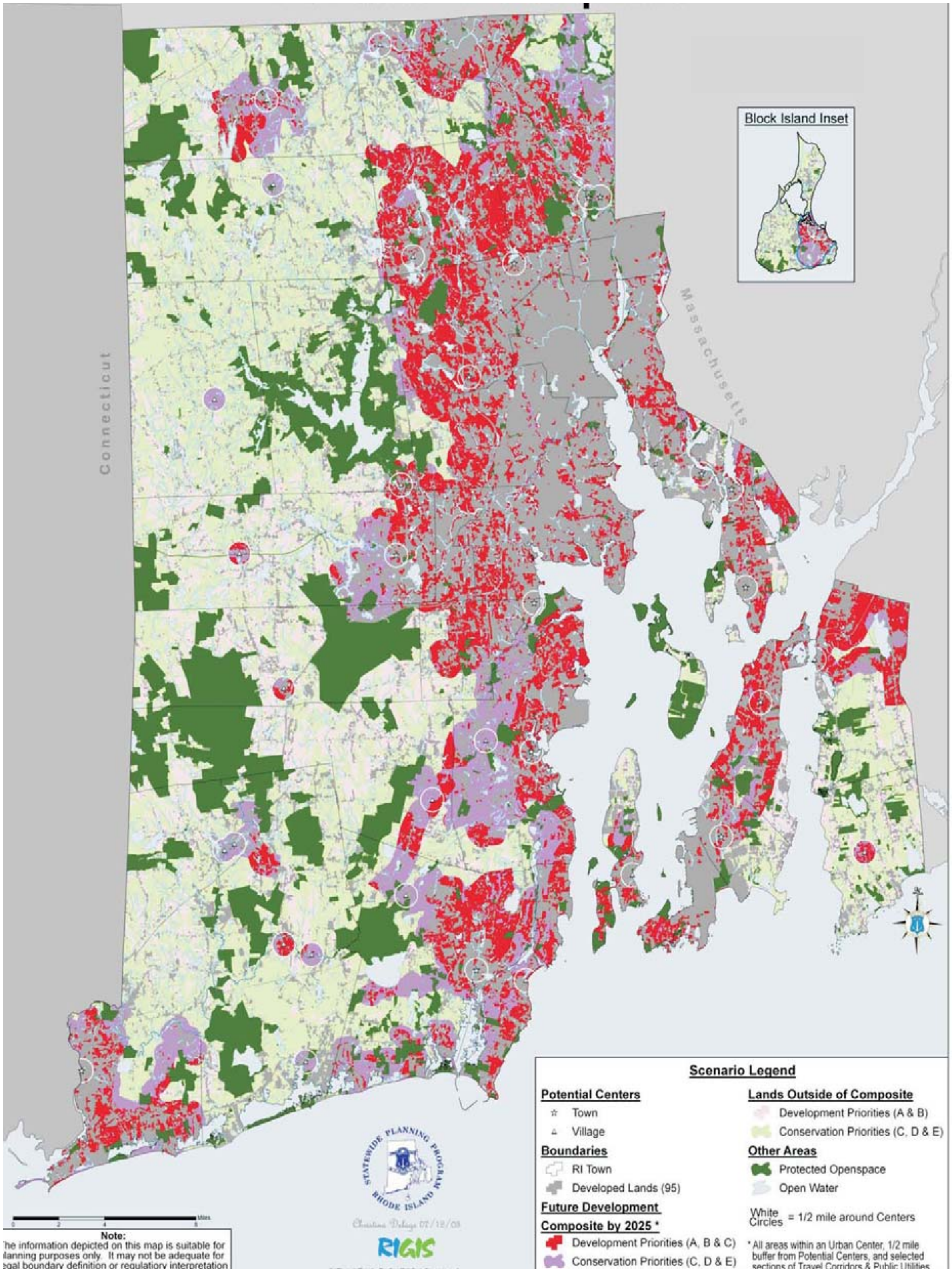
This scenario was ***selected*** as the basis for the future land use plan by the Statewide Planning staff and the Technical Committee. It proposes minimal impact to conservation lands and balances a combination of both high and medium residential densities for its implementation. It also allows for growth in the western communities of the state but suggests that growth in centers would be the most efficient land use for those locations. Table (15) displays the estimated need of undeveloped land developed in Part 4 of this Plan verses the GIS calculated scenario land consumption results.

Table (15):
Scenario 4, Composite

SCENARIO 4: COMPOSITE

Land Use Category:	Dev. Cat.	Projected Need Target Efficiency Factor: 65 % of Trend Add'l Gross Dev. Acres	Add'l Net Dev. Acres	Add'l Dewll. Units		SCENARIO RESULTS Dev. Cat.	Total Acres
RESIDENTIAL							
High (8+ du/ac)	A	1,000	800	6,400			
Med-High (4-8 du/ac)	A	1,625	1,300	7,800			
Medium (1-4du/ac)	B-C	8,000	6,400	12,800			
Med-Low (0.5-1 du/ac)	C	9,375	7,500	5,250			
Low (<0.5 du/ac)	C-D	22,500	18,000	4,500		A	19,958
Subtotal Resid.		42,500	34,000	36,750		B	40,472
COMM. IND. MIXED	A-C	7,865	7,865			C	14,301
INSTITUTIONAL	A-C	715	715			D	19,258
						E	21,450
TOTAL:		**51,080**	**42,580**	**36,750**			**115,439**
Targets (acreage & DU)		70,622	58,213	36,744			
Difference		19,542	15,633	6			
Land Relative to Trend		**47**					

Figure 13:
Scenario 4, Composite



Scenario Selection

All four of the scenarios shared one underlying assumption: all assumed as a given, that the majority of existing (1995) development (areas shown as grey in the figures) would be maintained--that is, remain in-place or be replaced in like character--through 2025. This reflected both policy and pragmatic considerations. The prime data source used to establish baseline development conditions (RIGIS 1995 Land Use/Land Cover), did not contain detailed information on the characteristics of developed lands (other than type of use) or (most importantly) their current status, and capacity for additional development through redevelopment. Nonetheless, is was assumed that existing developed areas would (at a minimum) be maintained, enhanced, and reused as future opportunities arose in order to optimize the value of prior private and public investments, and minimize the quantity of “raw” land required to meet growth needs. Had data on the current status and capacity of developed areas to accommodate additional development; this could have allowed modification of one or more of the scenarios to provide quantification of how much of the state’s growth needs through 2025 could have been accommodated via reuse (and expansion and intensification) of currently developed areas, especially within the scenario areas. In the absence of such data, a base assumption applied is that land use needs currently being satisfied within the existing footprint of developed land would continue to be so meet through 2025 (e.g. there would be no abandonment or underutilization of existing productive areas). The scenarios therefore deal primarily with the question of where *new development*, might be located; and, the character (defined by intensity pattern) of the new growth that would be expected to occur.

We evaluated the 4 scenarios by the land efficiency targets set for the scenarios, the total of the GIS acreages projected for each LIC and the projected needs for various land use densities, especially the residential densities. We set residential density[3] as our measure of the intensity of sprawl for each scenario. Table (16), *Scenario Results*, shows the initial land efficiency target set for each scenario and the final GIS land efficiency results based upon the acreage of land consumed by each scenario. Summary comments based upon the policy considerations are also noted in the Table.

[3] calculated by dividing the number of housing units by the acres of residential land

Table (16):
Scenario Results

Scenario	Land Efficiency Initial Target	Land Efficiency GIS Results	Comments
Trend	No change (100%)	No change (100%)	Significant impact on sensitive resource land & under-utilization of higher capability land
Centers/ Corridors	20% less land*	24 % less land*	Significant impact on sensitive resource land
Infill	30% less land*	74% less land*	Unrealistically high densities required; geographically unbalanced
Composite	35% less land *	53% less land*	Compact, geographically balanced growth

*Compared to estimated new land to developed under the Trend Scenario .

The Trend Scenario results show that under current trends, rural areas would convert more land to development than presently closer-in areas. Rhode Island would likely see a substantial increase in developed land all over the state if either scenario was followed. Much of the newly developed land would be in the portions of the state that are currently rural. Continuing the trends of current sprawling patterns would have farther reaching effects as well. For example, if development continues to be scattered throughout rural lands, more people will be traveling farther for every errand; public services, such as emergency response time increase with distance; and the budget for road maintenance gets stretched thinner over increasing miles. Under the Centers and Corridors Scenario, development would be likely to require about 129,000 acres of new land which is the most of all scenarios. Again this scenario would most impact on lands more suited for conservation uses. Under the stronger growth management practices envisioned for the Infill Scenario, only 106,985 acres of new land would be developed. The Composite Scenario is an intermediate vision of all the scenarios. Table (17), *Scenario Acreage Results,* shows the GIS calculated results by Land Intensity Classification for all scenarios.

Table (17):
Scenario Acreage Results

SCENARIO 1 Trends Results	
Dev. Cat.	**Total Acres**
A	16,586
B	35,414
C	21,408
D	15,462
E	33,354
	122,224

SCENARIO 2 Centers & Corridors Results	
Dev. Cat.	**Total Acres**
A	14,485
B	36,805
C	22,895
D	16,130
E	39,029
	129,344

SCENARIO 3 Infill Results	
Dev. Cat.	**Total Acres**
A	20,135
B	38,678
C	10,624
D	18,462
E	19,086
	106,985

SCENARIO 4 Composite Results	
Dev. Cat.	**Total Acres**
A	19,958
B	40,472
C	14,301
D	19,258
E	21,450
	115,439

Upon examination between the scenarios a correlation becomes evident; highly scattered, low density development does not correspond with high natural resource protection. In essence the more land set aside for economic, transportation, and housing, the less land is available for natural resources protection. The results indicate that where we are currently headed may not be where we want to end up. However, the Composite Scenario shows that we can accommodate growth without the harmful effects of sprawl if we change course now. Other general observations are that the more diffuse and expansive the future pattern, the greater the potential difficulties and costs in providing and managing necessary public services.

The results clearly indicate the potential difference between where current trends are leading, versus the future results of consistent, managed growth. Following the state's historic pattern of focusing growth in and around existing towns and cities offers people more choices in how they get around and would fully utilize the public investment in roads, transit, water and sewer while preserving important cultural, economic, and environmental lands and resources throughout the state.

The scenario evaluation results clearly indicate the potential difference between where current trends are leading, versus a future based on a more compact and managed growth pattern. The Composite Scenario was recommended by us as staff as the preferred scenario. It shows a means to accommodate necessary growth in a compact and balanced fashion, without the negative effects and dis-economies of sprawl. Pursuing policies that will restore and reinforce the state's tradition of focusing growth in and around existing towns and cities appears to offer the best alternative. his option may be the best prospect for allowing future Rhode Islanders to live, work, and travel in ways that fully utilize the public investment in roads, transit, water and sewer services, while creating the fewest impacts to critical resources and maintaining the distinctiveness of various parts of the state's urban and rural landscapes.

Part 5: Evaluation

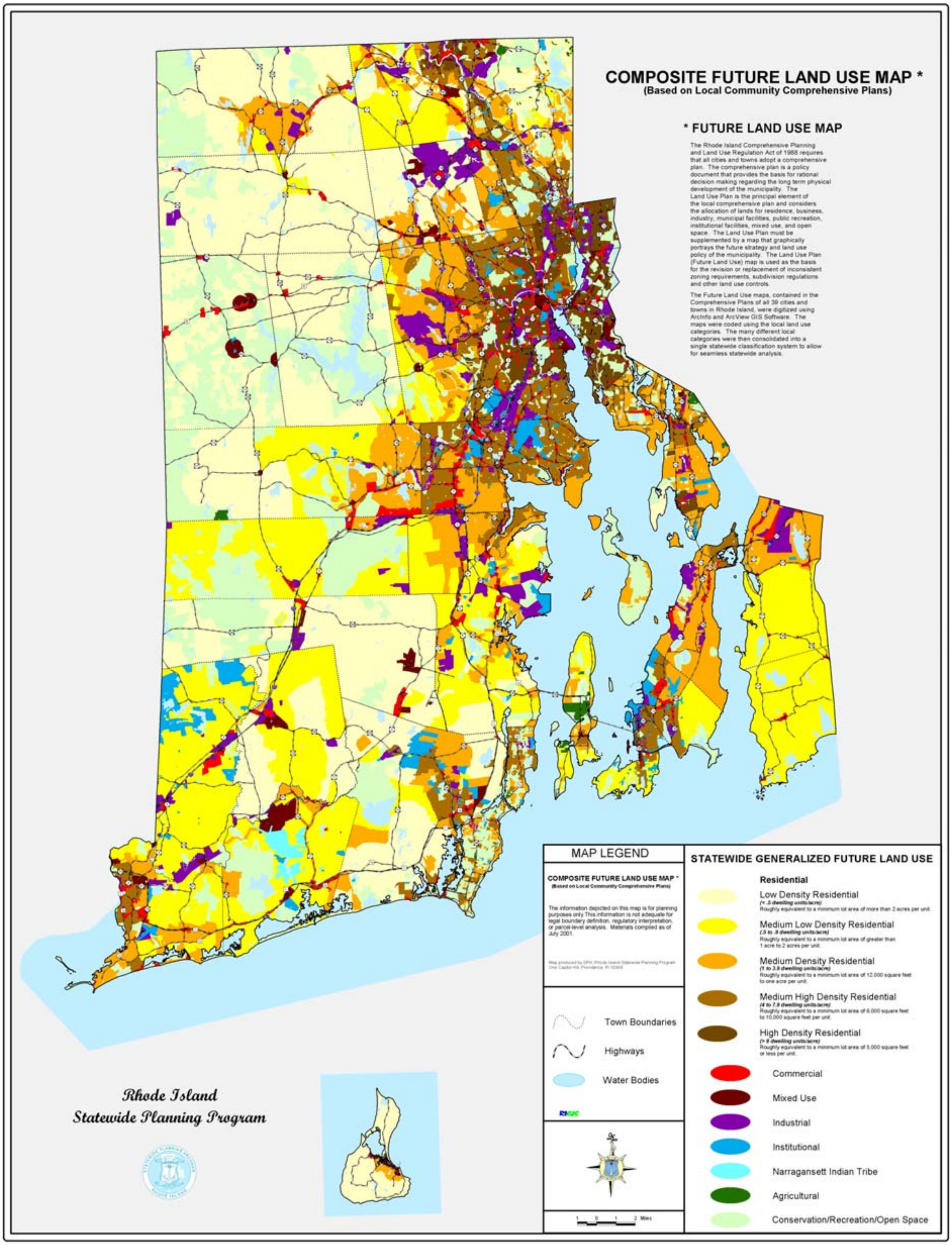
In this part we preformed a series of evaluations of the selected composite scenario to identify refinements necessary to turn the selected scenario into a future land use map. The first evaluation had two parts involving municipal policy information. We used the municipal comprehensive plans and the mandated municipal affordable housing plans to compare policy implications of the composite scenario. For our final review we used new statewide orthophotography to assess how the availability of land might have changed since the base year of our 1995 RIGIS data. Our intent was, again, to identify areas which would need to be adjusted to produce the final future land use map.

Comprehensive Plans

The first evaluation for this part was to compare the selected scenario, the Composite, with the future land use plans of the adopted municipal comprehensive plans. We assessed how close or disparate our selected scenario was to the local visions of future land use established by the municipal comprehensive plans. We wanted to identify general areas of consistency and areas of differences to be reviewed by municipalities during the next comprehensive planning update cycle.

We did this by comparing a composite map, Figure 14, *2001 Composite Future Land Use Map*, of the municipal comprehensive plan future land uses created by Statewide Planning from State Certified Comprehensive Plans to the Composite scenario. Visually we scanned the two maps in order to observe where differences might be located. On the first broad comparison side by side, the Composite scenario does not differ greatly from the municipal future land uses.

Figure (14):
2001 Composite Future Land Use Map



We then took a detailed look at each of the 12 generalized future land use categories from the Composite Future Land Use Map and scanned for differences within the proposed land intensity classifications (LIC) on the Composite scenario. Table (18), *Composite Scenario LIC vs. Municipal Future Land Use* shows the results of this comparison. This detailed comparison generally supported the first broad brush impression that the Composite Scenario did not differ greatly from the municipal future land use and revealed some areas of differing categorization.

Table (18):

Composite Scenario LIC vs. Municipal Future Land Use

Municipal Comprehensive Plan Future Land Use Category		Urban Service Area	Urban Centers	Town Centers	Village Centers	Remaining Reserve Lands
Residential	Low Denisty	★	√	★	√	★
	Medium Low Density	√	√	★	★	★
	Medium Density	√	★	√	★	★
	Medium High Density	√	√	√	√	√
	High Density	√	√	√	√	√
Non-Residential	Commerical	√	√	√	√	★
	Mixed Use	√	√	√	√	√
	Industrial	√	√	√	√	★
	Institutional	√	√	√	√	√
	Agricultural	√	√	√	√	√
	Conservation/Recreation	★	√	★	√	★
	Open Space					

√ = generally matching and no areas of great differences

★ = area of difference with municipal composite future land use composite

Specific observations relative to the comparison of the Composite Scenario's intensity potential classifications with the land use categories assigned in the Composite of Municipal Future Land Use Plans include:

- Within the Composite Scenario area, there was a good correspondence between the municipal future residential use categories and land intensity classifications of the Composite scenario. One exception was a case where a low density residential future land use was indicated by a municipal map for an area within the Composite Scenario area. All of the municipal future non-residential uses matched the land intensity classifications of the Composite scenario within the Composite Scenario areas. The municipal future land uses show more Conservation/Recreation/Open Space use than the Composite scenario. This may be because of the difference in coding -- the Composite scenario coded most urban parks as "developed/committed" in the GIS analysis.

- Within potential urban centers, municipal future land uses (except for the Conservation/Recreation/Open Space use as noted above) matched up with all of the land intensity classifications except for a few places where a municipal medium residential future land use was proposed and the Composite scenario indicated a higher land intensity potential classification.

- Within the potential town and village centers, most of the municipal future land uses aligned closely to the land intensity classifications of the Composite Scenario. All the potential centers indicated on the Composite scenario have been indicated within the municipal future land use composite as places for desired development of various intensities. The low density and medium low density residential future municipal land uses, however, differed from the Composite scenario, which often indicated higher land intensity potentials. The Conservation/Recreation/Open Space difference (noted above) occurs more frequently within the potential town centers rather than the potential village centers.

- For lands outside of the Composite scenario area, significant differences between the municipal future land uses and the land intensity classifications were noted between the two composite maps. These included:

  - Only the two highest categories within the municipal residential future land uses -- medium high and high density--coincide well with the land intensity potential classifications of the Composite Scenario. The other three municipal residential future land uses--medium density, medium low density and low density--vary in their correspondence with the intensity levels shown in the Composite scenario. In most cases the municipal residential future land uses are shown as higher than the land intensity classification of the Composite scenario. This may reflect differences in the coding of the residential classes and the fact that the Conservation/Recreation/Open Space municipal use category was not universally used by all municipalities in their plans. Some conservation lands where included within a low density residential future land use rather than Conservation/Recreation/Open Space.

  - A few of the municipal future non-residential uses mismatched with the land intensity classifications within the remaining reserve lands outside of the Composite scenario area as well. This was noted in instances where the municipal future land uses indicates commercial or industrial uses and the Composite scenario had a lower land intensity classification.

Affordable Housing Plans

For the second part of the municipal plan comparison, we compared the selected scenario, the Composite, with the municipal Affordable Housing Plans. Under legislation passed by the General Assembly in January 2004, affordable housing plans were required to be developed by 29 communities affected by the legislation and adopted as a component of the Housing Element of the Local Comprehensive Plan. The affordable housing plans are required to identify specific strategies for residential growth, supplying affording housing, and the build out of each community. We examined these plans in order to determine where municipalities have planned for potential centers and areas of affordable housing. This was necessary to identify areas where the selected scenario might need to be adjusted to produce the final future land use map for Part 2 of the Plan update.

As of this Paper, there are 17 approved affordable housing plans. Within those plans, 13 of the municipalities have identified location for centers. Our finding concerning the potential centers from the comparison of the Composite scenario to the municipal comprehensive plan future land use did not change after this review. All of the potential centers indicated on the Composite scenario have also been indicated within the local affordable housing plans as places for centers or affordable housing at one level or another.

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Based upon the foregoing evaluations, the Composite scenario was recommended by the Statewide Planning staff and presented to the Technical Committee in August 2005. It was endorsed by the Committee as the basis for additional refinement and transformation into the future (2025) state land use map.

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Availability of Undeveloped, Classified Land within Urban Services Boundary

For undeveloped areas, the analysis indicates that, statewide, there are over 100,000 acres of undeveloped land which appear (when suitability factors, sensitive water resource areas, and infrastructure availability are considered in combination) capable of supporting a moderate to high intensity usage. Some of this available land may have been developed since the 1995 survey upon which RIGIS land use land cover data are based. For our final review, we wanted to assess the extent of land use change to undeveloped classified lands within the urban services boundary of the draft future land use map.

We compared the draft future land use map to new statewide orthophotography taken in years 2003 and 2004 to assess how the availability of land might have changed since the base year of our 1995 RIGIS data. Since the draft future land use map emphasized compact urban growth within the urban services boundary delineation, we overlaid the draft future land use map land intensity classifications on the orthophotography. We used GIS software to illustrate where changes to undeveloped classified lands might have occurred within the urban services boundaries and potential centers. We did not attempt to update the entire 1995 land use land cover data for the state as that task was beyond the scope and timeframe of this analysis.

Not surprisingly we did find land use changes that occurred within our study area, the urban services boundary. The predominant change that occurred most frequently was the change from undeveloped land in 1995 to some sort of developed urban use in 2003-04. In many cases, we found that the land use changes matched our proposed land intensity classification. Our analysis was a visual evaluation of where areas of change could be noted. We then itemized the changes that occurred within each community in the urban services boundary and summarized the total impact of the development to the undeveloped classified lands.

Our findings are shown in Table 19, Summary of Undeveloped Classified Land within Urban Services Boundary. The table shows that the estimated amount of undeveloped land in 2003-04 by each community within the urban services boundary. The average percentage of remaining within the urban services boundary (including center only communities) is about 68 percent of the undeveloped land. It is our conclusion that a high percentage of the undeveloped land we identified from 1995 still remains within the urban services boundary of the future land use map. Each individual community may reflect a higher or lower percentage of undeveloped land but all communities still have much of the identified undeveloped classified lands available for future land use.

Table (19):
Summary of Undeveloped, Classified Land within Urban services Boundary

Community	What's left % of classified land	Comments
Barrington	60	
Bristol	40	
Burrillville	100	
Central Falls	30	
Charlestown	100	Centers Only
Coventry	50	
Cranston	50	
Cumberland	70	
East Greenwich	65	
East Providence	60	
Exeter	90	
Foster	100	Centers Only
Glocester	100	Centers Only
Hopkinton	100	
Jamestown	90	
Johnston	70	
Lincoln	70	
Little Compton	100	Centers Only
Middletown	60	
Narragansett	50	
Newport	80	
New Shoreham	40	
North Kingstown	80	
North Providence	50	
North Smithfield	70	
Pawtucket	70	
Portsmouth	80	
Providence	40	
Richmond	90	
Scituate	80	
Smithfield	75	
South Kingstown	25	
Tiverton	90	
Warren	50	
Warwick	35	
Westerly	40	
West Greenwich	95	
West Warwick	30	
Woonsocket	80	

Average of undeveloped classified land remaining in urban service boundary = 68%