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ABSTRACT

Development of the Land Use Capability Map

Introduction

This abstract provides an introduction and overview of the development process, data input information, and findings of the Land Use Capability Map. More detailed descriptions on the technical methods and results that support this abstract can be found in the Highlands Draft Regional Master Plan and relevant Technical Reports located at <http://www.highlands.state.nj.us/>.

The Land Use Capability Map, through the identification of geographic zones, provides for a comprehensive evaluation of both resource constraints and development opportunity. It addresses the potential for conflict between natural resource protection and economic growth by identifying constraints and capacity limitations of land and infrastructure, and identifying those areas within the Highlands Region that can best support appropriate and varying levels of development activity.

The goal of the Land Use Capability Map is to address the requirements of the Highlands Water Protection and Planning Act and provide guidance for the implementation of the policies contained in the Regional Master Plan. This was accomplished through definition of 3 overlay zones, as established by evaluation of regional indicators. The challenge of the Land Use Capability Map was to recognize the range and nature of land throughout the Highlands Region, and assign an overlay zone that best represents the requirements of the Highlands Act and the policies of the Plan.

Based upon the Highlands Act and the policies contained in the Plan the Highlands Council established three initial overlay zones. These zones include the Protection Zone, the Planned Community Zone, and the Conservation Zone. The overlay zones distinguish between resource constrained lands, where development will be limited (Protection Zone), and those lands that have the necessary infrastructure capacity and land use characteristics to support growth (Planned Community Zone). The Conservation Zone identifies those agricultural lands where development potential may be limited based either on the limitations of available infrastructure to support development, e.g. water availability, or on the protection of important agriculture resources.

Since 2004, the Highlands Council has held numerous outreach meetings, public events, and public releases in an effort to incorporate a multifaceted public participation process into the development of the Regional Master Plan. This public input has been ongoing, and has helped to incorporate the goals of the Highlands Act into the Regional Master Plan, and supporting Land Use Capability Map.

Overlay Zones

As described in the draft Regional Master Plan, an overlay zone serves to establish a district that addresses distinguishing circumstances or features, and is superimposed over existing municipal zoning. Overlay zones do not replace existing municipal zoning, but rather build upon base zoning by establishing additional standards and criteria, and are intended to provide a means to address a special public interest (e.g. watershed management area, open space preservation, historic preservation, urban enterprise zone, etc.) that the underlying base zoning may not otherwise take into consideration.

In the Highlands Region, overlay zones will provide all levels of government, including municipal and county officials, with an indication of areas where special consideration is required to protect significant resources. Overlay zones also indicate where and how development initiatives may occur based on the ability of areas to accommodate such growth. The Highlands Council has developed three primary overlay zones each with their own purpose, application, and minimum standards as generally discussed below.

The **Protection Zone** consists of high resource value lands that are important to maintaining water quality, quantity, and other significant ecological processes. Land acquisition is a priority in the Protection Zone. Any development activities will be subject to stringent limitations on consumptive and depletive water use, degradation of water quality, and impacts to environmentally sensitive lands, and may only occur via redevelopment of existing developed areas. The Highlands Council used 640 acres or 1 square mile as the minimum mapping threshold for identification of a Protection Zone.

The **Conservation Zone** consists of areas with significant agricultural lands and interspersed environmental features that should be preserved when possible. Development potential is limited in area and intensity due to infrastructure constraints and resource protection goals, although opportunities exist for low impact, clustered development. The Highlands Council used 640 acres or 1 square mile as the minimum threshold for mapping a Conservation Zone.

The **Planned Community Zone** consists of areas with concentrated development signifying existing communities. These areas tend to have less environmental constraints, and have existing infrastructure that may support development provided that it is compatible with the protection and character of the Highlands environment, at levels that are appropriate to maintain the character of established communities. Areas exhibiting development patterns characteristic of the Planned Community Zone, but ranging in size from 100 acres through 640 acres, or located in the Preservation Area were given Specially Planned Area designation. The Specially Planned Area shares similar characteristics with the Planned Community Zone, but occurs in a smaller, more discrete manner.

Regional Indicators

In order to develop the three overlay zones, the Highlands Council utilized the results of both the Resource Assessment and the Smart Growth Component. The Resource Assessment was used to identify those lands within the Highlands Region with significant natural and ecological resources. Indicators were used to measure the regional significance of a particular resource, such as ground water recharge, watershed condition, open waters and riparian areas, forests, critical habitat, and slopes. Areas with significant agricultural lands and important farmland soils were also evaluated. A determination was made as to their quality and regional significance to the Highlands Region.

Smart Growth Component topics were utilized to identify the nature and extent of developed lands that have limited and dispersed environmental and agricultural resources. Areas were identified based upon existing patterns of development with particular emphasis on areas that are currently served by existing water and wastewater infrastructure.

Over 50 indicators were used to characterize the Highlands Region and to assign the most appropriate overlay zone, see the table entitled *Criteria/Indicators Used to Develop the Land Use Capability Map*. Each indicator

was given an equivalent weight. Three forms of indicators were used, including: (1) feature based indicators, (2) intensity indicators, and (3) integrity based indicators.

Feature based indicators capture the location and extent of geographic objects. Preserved farms are an example of a feature based data layer. Many feature based data layers utilized extractions from existing data sets, including but not limited to those compiled by the U.S Census, the NJDEP draft 2002 Land Use Land Cover, or Natural Resources Conservation Service Soil Survey Geographic digital soils coverage.

Intensity indicators were developed using a Highlands mapping approach that calculated the magnitude to which an area in question included a particular feature. Rather than spatially delineating the location of an actual feature or features, these intensity indicators capture the area in which a critical mass of features or combination of features exists. The actual process includes several steps, including; rasterizing input feature based data at a **50ftx50ft** grid cell size, identifying the critical mass of input features and yielding a magnitude per unit area, as calculated using a 250ft circular search radius. An example of an intensity indicator is the Forest Resource Area, which reflects that portion of the Region that contains the critical mass of high ecological value forest areas that exhibit the least fragmentation.

Integrity-based indicators measure the relative degree of quality of a particular resource. The Riparian Corridor – Habitat Quality is an example of an integrity-based indicator, representing the amount of habitat suitable for one or more water/wetland dependent species of concern including rare, threatened or endangered species within the Riparian Corridor. From this data layer, riparian corridors that exhibit relatively higher, moderate, or lower amounts of suitable habitat for species can be determined.

The following section provides a brief description of the contents of each of the data layers that contributed to the development of the Draft Land Use Capability Map. Additional discussion relating to the methods and selection of individual indicators is contained within the respective technical reports.

CRITERIA/INDICATORS USED TO DEVELOP THE DRAFT LAND USE CAPABILITY MAP			
Zone	Criteria	#	Indicator(s)
Protection Zone (33 Indicators)	Forest Integrity	1	Total Forest Area
		2	Forest Resource Protection Area
		3	Forest Core > 250 ac
		4	Forest Patch > 500 ac
		5	Proportion of Total Forest > 45%
	Watershed Characteristics	6	Watershed Condition – High
		7	Forest Condition – High
		8	Habitat Quality – High
	Riparian Corridor	9	Riparian Area
		10	Riparian Area – Undeveloped
		11	Flood Prone Area
		12	Riparian Corridor Condition – High
		13	Riparian Corridor Impervious Cover – Low
		14	Riparian Vegetation Condition – High
		15	Riparian Habitat Quality – High
	Recharge	16	Prime Recharge >40%
	Open Water	17	Highlands Open Water Protection Area
		18	HOW Protection Area - Non Developed
		19	Streams and Lakes
		20	Wetlands
		21	Streams and Lakes - Highlands Classification
		22	Wetlands Protection Area – Highlands

CRITERIA/INDICATORS USED TO DEVELOP THE DRAFT LAND USE CAPABILITY MAP			
Zone	Criteria	#	Indicator(s)
Protection Zone (33 Indicators)			Classification
	Critical Habitat	23	Critical Habitat Resource Protection Area
		24	Critical Habitat Area
		25	All Habitat - Landscape Rank 2-5
		26	Highlands Conservation Status - Highlands Rank 2-3
		27	Water/Wetland Dependent Species Habitat
		28	Mussels + 1000 ft
		29	Vernal Pools + 1000 ft
	Slope	30	Significant Natural Areas
		31	>20% Slope – Undeveloped
32		>15% Slope – Undeveloped	
Conservation Zone (6 Indicators)	Agriculture	33	>10% within Riparian
		1	Agriculture Resource Area
		2	Important Farmland Soils - Undeveloped
		3	Preserved Farms
		4	Contiguous Farms >250 acres
	5	All Agricultural Uses Greater than 10 Acres	
Development Intensity	6	Rural Residential - Low Density Residential	
Planned Community Zone/ Specially Planned Areas (12 Indicators)	Development Intensity	1	Core Developed Area
		2	Moderate Developed Area
		3	Suburban Fringe - Low Density Residential
	Utilities	4	Sewer - Existing Area Served
		5	Water - Existing Area Served
	Population Density	6	Population Density > 3 dwelling units/ac
		7	Population Density >5 dwelling units/ac
	Impervious Area	8	Impervious Cover >30%
		9	Impervious Cover >50%
		10	Commercial/Industrial - Non Residential Waste Generating
	Transit	11	Transit Hubs within 1 mi
		12	Transit Hubs within 0.5 mi

Land Use Capability Map Indicators:

The following sections described the indicators that were used to inform the development of the Draft Land Use Capability Map.

I. Protection Zone:

Forest Integrity Indicators, as further described in the draft Ecosystem Management Technical Report, January 2007.

1. Total Forest Area The Total Forest Area is a feature based data layer that was extracted from the NJDEP 2002 draft Land Use Land Cover data. Forest is defined as all upland and wetland forest and scrub/shrub categories (excluding old field). NJDOT roads, buffered by 10 feet, were removed from the file. (p. 43-4, draft Ecosystem Management Technical Report, January 2007)
2. Forest Resource Area The Forest Resource Area data layer is an intensity indicator that captures high ecological value forest areas including those forested areas that exhibit the least fragmentation, which are vital for the maintenance of ecological processes. The Forest Resource Area was spatially delineated based upon presence of any one of the following data layers: Total Forest Area, Forest Core Area > 250, Forest Patch >500, and Proportion Total Forest >45%. (p. 49, draft Ecosystem Management Technical Report, January 2007)
3. Forest Core Area >250 Core area refers to the area and percent of a forest patch that is greater than 300 feet from a forest edge, based on the Total Forest Area. The Forest Core Area >250 is a feature based data layer that includes those areas consisting of 250 acres or greater of core forest. (p. 43-4, draft Ecosystem Management Technical Report, January 2007)
4. Forest Patch >500 Forest patch refers to the size of a contiguous forest stand, based on the Total Forest Area. The Forest Patch >500 is a feature based data layer that captures contiguous forest patches that are equal to or greater than 500 acres in size. (p. 43-4, draft Ecosystem Management Technical Report, January 2007)
5. Proportion Total Forest >45% The Proportion Total Forest data layer measures the proportion of forest cover within a 3 square kilometer search area in order to provide a landscape level view of the Highlands forest landscape and to simulate habitat requirements of Highlands wildlife species. This intensity based layer was based on the Total Forest Area and captures those areas that account for 45% or greater of proportion of total forest cover. (p. 43-4, draft Ecosystem Management Technical Report, January 2007)

Watershed Characteristics Indicators, as further described in the draft Ecosystem Management Technical Report, January 2007.

6. High Resource Value Watershed High Resource Value Watershed data layer includes all subwatersheds that contain predominantly forest lands and includes a significant portion of the watershed that is high quality habitat. A High Resource Value Watershed is an integrity-based indicator and was developed by considering the following watershed characteristics: Percent Core, Proportion Total Forest, Percent Total Forest, Percentage Habitat Quality, and Percent Developed. (p. 19-20, draft Ecosystem Management Technical Report, January 2007)

Watershed Characteristics - Percent Core Forest The Watershed Characteristics - Percent Core Forest watershed indicator represents the percentage of a subwatershed that contains the percentage of a subwatershed with forested areas greater than 300 feet in distance from an altered edge (i.e., disturbed land), based on NJDEP draft 2002 Land Use Land Cover data. This is an integrity-based indicator. (p. 19 and 44, draft Ecosystem Management Technical Report, January 2007)

Watershed Characteristics - Proportion of Total Forest The Watershed Characteristics - Proportion of Total Forest is the amount of forest cover within a given geographic area. A 3-kilometer search area was used to calculate this metric, based on NJDEP draft 2002 Land Use Land Cover data. This is an indicator of watershed integrity (i.e., the higher the percentage, the higher the watershed quality). This is an integrity-based indicator. (p. 19 and 44, draft Ecosystem Management Technical Report, January 2007)

Watershed Characteristics - Percent Total Forest The Watershed Characteristics - Percent Total Forest watershed indicator represents the percentage of a subwatershed that is forested, with forested defined as all mature and successional upland and wetland forested communities (excluding old fields), based on NJDEP draft 2002 Land Use Land Cover data. This is an integrity-based indicator. (p. 19 and 44, draft Ecosystem Management Technical Report, January 2007)

Watershed Characteristics - Habitat Quality The Watershed Characteristics - Habitat Quality watershed indicator represents the percentage of a subwatershed that contains habitat for species of concern including rare, threatened or endangered species, based on Landscape data. Habitat quality is used as an indicator of the biological diversity of a watershed (i.e., the more habitat that supports a species of concern, the higher the quality of habitat within a watershed). This is an integrity-based indicator. (p. 19, draft Ecosystem Management Technical Report, January 2007)

Watershed Characteristics - Percent Developed The Watershed Characteristics - Percent Developed Lands represents the percentage of a subwatershed that is developed, with developed defined as lands that have been altered for residential and/or commercial use. Developed lands include areas with impervious cover as well as those with non-impervious cover (e.g., lawns, golf courses). Percent developed land is an indicator of watershed impairment (i.e., in general, the

higher the percentage, the lower the watershed quality) and is an integrity-based indicator. (p. 18, draft Ecosystem Management Technical Report, January 2007)

7. High Integrity Forest Area
High Integrity Forest Area is a watershed that is predominantly forested, including a high proportion of forest cover consisting of high core area, large patch size, and a low distance to nearest patch. The High Integrity Forest Area data layer was developed according to a value class rank ranging from 1-12 and considering the following watershed characteristics: Percent Core, Proportion Total Forest, and Percent Total Forest. This is an integrity-based indicator. (p. 19-20, draft Ecosystem Management Technical Report, January 2007)

8. Habitat Quality - High
Habitat Quality represents the percentage of a subwatershed that contains habitat for species of concern including rare, threatened or endangered species, based on Landscape data V 3.3. Habitat quality is used as an indicator of the biological diversity of a watershed (i.e., the more habitat that supports a species of concern, the higher the quality of habitat within a watershed). Those watersheds that have been classified as “high” is assigned when 40% or greater of the subwatershed is characterized by high habitat quality. This is an integrity-based indicator. (p. 19-20, draft Ecosystem Management Technical Report, January 2007)

Riparian Corridor Indicators, as further described in the draft Ecosystem Management Technical Report, January 2007.

9. Riparian Area
The Riparian Area data layer is a feature based data layer, comprised of flood prone areas, riparian soils, and contiguous Highlands Open Waters, which includes Wetlands, and Wildlife Corridors. (p. 25-6, draft Ecosystem Management Technical Report, January 2007)

Riparian Soils
Defined as a hydric soil, a soil exhibiting a shallow depth to seasonal high water table, or alluvial soil based on Natural Resources Conservation Service (NRCS) Soil Survey Geographic (SURGO) digital soils coverage. Riparian Soils is a feature based data layer. (p. 27-8, draft Ecosystem Management Technical Report, January 2007)

Wildlife Corridor
Defined as a 300-foot corridor on each mapped stream bank or from the stream centerline if no stream bank is mapped. The Wildlife Corridor is a feature based data layer. (p. 28, draft Ecosystem Management Technical Report, January 2007)

10. Riparian Corridor – Undeveloped
The Riparian Corridor - Undeveloped is a feature based data layer that represents the riparian corridor, with developed lands removed.

11. Flood Prone Area
Defined as U.S. Geological Survey (USGS) documented and undocumented flood prone areas and Federal Emergency Management Agency (FEMA) 100-year floodplain. The Flood Prone data layer is feature based. (p. 25-6, draft Ecosystem Management Technical Report, January 2007)

12. Riparian Corridor Condition - High
 A Riparian Area integrity value class was assigned to the riparian corridor for each subwatershed based on a cumulative assessment of 5 indicators (including impervious cover, natural vegetation, water/wetland species, agricultural, and road crossings). The Riparian Corridor Condition - is an integrity-based data layer that represents areas that exhibit predominantly natural vegetation including high quality habitat for water/wetland dependent species, and a generally low incidence of impervious area, agricultural uses, and/or road crossings. (p. 31-2, draft Ecosystem Management Technical Report, January 2007)
- Riparian Corridor - Impervious Cover
 The Riparian Corridor Impervious Cover is an integrity-based data layer that represents the percentage of the riparian area that includes impervious surfaces. (p. 30, draft Ecosystem Management Technical Report, January 2007)
- Riparian Corridor - Natural Vegetation
 The Riparian Corridor Natural Vegetation is an integrity-based data layer that represents the percentage of the riparian area that features urban and agricultural lands (as a way to determine natural vegetation). (p. 30, draft Ecosystem Management Technical Report, January 2007)
- Riparian Corridor – Water/Wetland Species
 The Riparian Corridor - Habitat Quality - is an integrity-based data layer that represents the amount of habitat suitable for one or more water/wetland dependent species of concern including mussels. (p. 30-1, draft Ecosystem Management Technical Report, January 2007)
- Riparian Corridor – Agriculture
 The Riparian Corridor - Agriculture is an integrity-based data layer that reflects the percentage of the riparian area that is in agricultural use. (p. 30, draft Ecosystem Management Technical Report, January 2007)
- Riparian Corridor - Crossings
 The Riparian Corridor Crossings is an integrity-based data layer that represents the number of road crossings per linear stream mile, (per the Highlands roadway center-line) which indicate impairment of the riparian area integrity. (p. 30, draft Ecosystem Management Technical Report, January 2007)
13. Riparian Corridor - Impervious Cover - Low
 The Riparian Corridor Impervious Cover is an integrity-based data layer that represents the percentage of the riparian area that includes impervious surfaces. The “low” classification is assigned when less than 10% of the riparian area is covered with impervious surfaces. (p. 30-1, draft Ecosystem Management Technical Report, January 2007)
14. Riparian Corridor - Natural Vegetation - High
 The Riparian Corridor Natural Vegetation is an integrity-based data layer that represents the percentage of the riparian area that features urban and agricultural lands (as a way to determine natural vegetation). The “high” classification is assigned when less than 30% of the riparian area is being used as urban or agriculture lands. (p. 30-1, draft Ecosystem Management Technical Report, January 2007)
15. Riparian Corridor – Water/Wetland Species - High
 The Riparian Corridor - Habitat Quality - High is an integrity-based data layer that represents the amount of habitat suitable for one or more water/wetland dependent species of concern including mussels. The “high” classification is assigned when greater than 40% of the riparian corridor is

considered to be suitable habitat for water/wetland dependent species. (p. 30-1, draft Ecosystem Management Technical Report, January 2007)

Recharge Indicator, as further described in the Water Resources Technical Report, Volume II – Water Use and Availability, January 2007

16. Prime Recharge >40% The land area that contributes 40% of groundwater recharge by volume, under drought conditions. (beginning on p. 14, Water Resources Technical Report, Volume II – Water Use and Availability, January 2007)

Open Water Indicators, as further described in the draft Ecosystem Management Technical Report, January 2007.

17. Highlands Open Water Protection Area The Highlands Open Water Protection Area feature based data layer includes all Highlands Open Waters and associated buffers of 300 feet. (p. 15-6, draft Ecosystem Management Technical Report, January 2007)
18. Highlands Open Water Protection Area - Undeveloped The Highlands Open Water Protection Area - Undeveloped feature based data layer includes all Highlands Open Waters and associated buffers, with developed lands removed.
19. Streams and Lakes The streams and lakes feature based data layer includes hydro data, based on the NJDEP 2002 Hydrography Draft, and Waters, as defined by the NJDEP draft 2002 Land Use Land Cover, including streams and canals, natural lakes, and artificial lakes. (p. 13, draft Ecosystem Management Technical Report, January 2007)
20. Wetlands The Wetlands feature based data layer includes wetlands as defined by the NJDEP draft 2002 Land Use Land Cover. (p. 13, draft Ecosystem Management Technical Report, January 2007)
21. Water/Hydro – Highlands Classification Waters – Highlands Classification is feature based data layer and includes rivers, streams, and lakes classified as Highlands Waters, based upon the following:
- **Highlands Waters** – Waters that are contained within the Highlands Preservation Area.
 - **Special Waters** – Waters that drain to C1 or TP waters, or that are upstream of, are within the same subwatershed, and/or are hydrologically interconnected with a C1, TP, or Highlands Waters.
 - **Exceptional Waters** - Waters other than Highlands Waters or Special Waters that drain to a FW1 waterway or include habitat for water/wetland dependent threatened or endangered species. In addition, this will include any other waters (which are not considered Highlands Waters or Special Waters) that are upstream, of, are within the same subwatershed, and are hydrologically interconnected with an Exceptional Water.
 - **Intermediate Waters** - All remaining Waters that are not a Highlands, Special, and Exceptional Waters and consist of waters that are man-made and hydrologically isolated from a surface water feature within the same subwatershed. (p. 15-6, draft Ecosystem Management Technical Report, January 2007)

22. Wetlands – Highlands Classification
- Wetlands – Highlands Classification is a feature based data layer and includes wetlands classified as Highlands Waters, based upon the following:
- **Highlands Waters** –Waters that are contained within the Highlands Preservation Area.
 - **Special Waters** –Waters that drain to C1 or TP waters, or that are upstream of, are within the same subwatershed, and/or are hydrologically interconnected with a C1, TP, or Highlands Waters.
 - **Exceptional Waters** - Waters other than Highlands Waters or Special Waters that drain to a FW1 waterway or include habitat for water/wetland dependent threatened or endangered species. In addition, this will include any other waters (which are not considered Highlands Waters or Special Waters) that are upstream, of, are within the same subwatershed, and are hydrologically interconnected with an Exceptional Water.
 - **Intermediate Waters** - All remaining Waters that are not a Highlands, Special, and Exceptional Waters and consist of waters that are man-made and hydrologically isolated from a surface water feature within the same subwatershed.
- (p. 15-6, draft Ecosystem Management Technical Report, January 2007)

Critical Habitat Indicators, as further described in the draft Ecosystem Management Technical Report, January 2007.

23. Critical Habitat Resource Area
- The Critical Habitat Resource Area is an intensity indicator that was delineated by combining the Critical Wildlife Area, Significant Natural Areas, and all land within 1,000 feet of a vernal pool. A spatial analysis was performed in order to identify those areas in the Region that contain a critical mass of habitat features. The Critical Habitat Resource Area contains at least 90% of those areas designated as Landscape Rank 2, 3, 4, or 5, Highlands Rank of Critically Significant or Significant, vernal pools, and Significant Natural Areas. (p. 67, draft Ecosystem Management Technical Report, January 2007)
24. Critical Wildlife Area
- The Critical Wildlife Area is an intensity indicator that was delineated by combining Landscape Project Rank 2, 3, 4, and 5 and Highlands Conservation Rank 2 and 3 (or Critically Significant and Significant), those water/wetland dependent species that occur within the Highlands Region, and portions of streams containing mussels including a 1,000 foot buffer. A spatial analysis was performed using the aforementioned data sets, with the Critical Wildlife Area reflecting those areas exhibiting the greatest intensity of critical wildlife features. (p. 62, draft Ecosystem Management Technical Report, January 2007)
25. All Habitat (Landscape Rank 2 - 5)
- The Landscape Project ranks habitat according to the status and distribution of species of concern. All Habitat (Landscape Rank 2 - 5) is a feature based data layer and includes Landscape ranked Habitat 2 through 5, which refer to the habitats of species that are federally endangered, state endangered, state threatened, and/or of special concern. (p. 57-8, draft Ecosystem Management Technical Report, January 2007)

26. Highlands Rank The Landscape Project ranks habitat according to the status and distribution of species of concern. The Highlands Rank feature based data layer refers to the following:
- Critically Significant – if habitats in the Highlands Region were lost, that species would not exist in the state, and
 - Significant – Highlands Region habitats play a significant role for that species' existence in the state.
- (p. 57-8, draft Ecosystem Management Technical Report, January 2007)
27. Water/Wetland Dependent The Highlands Council selected 34 rare, threatened, and endangered species for which dependence upon water bodies or wetlands is critical to their survival to serve as indicator species for high quality aquatic ecosystems. The Water/Wetland Dependent is a feature based data layer. (p. 59-62, draft Ecosystem Management Technical Report, January 2007)
28. Mussels +1000 NJDEP Endangered and Nongame Species Program data identifies critical stream reaches for mussels species of concern. The spatial extent of documented habitat for mussels includes all associated stream reaches within 2,460 feet (0.75 kilometers) of a known occurrence. The Mussels + 1000 is a feature based data layer that includes those portions of streams containing mussels buffered by 1,000 feet. (p. 59, draft Ecosystem Management Technical Report, January 2007)
29. Vernal Pools +1000 A vernal pool is a confined ephemeral wetland depression that provides important breeding areas for amphibians. The Vernal Pools +1000 feature based data layer includes 2005 NJDEP confirmed vernal pool data buffered by 1,000 feet. (p. 66-7, draft Ecosystem Management Technical Report, January 2007)
30. Significant Natural Areas The Significant Natural Area feature based data layer contains sites or areas that constitute outstanding examples of a particular habitat type or geologic formation, or habitat that supports populations of rare or endangered plant species in the Highland Region. The data layer utilized NHP data and was spatially reviewed for the 95 sites. "Active Use" lands (per the Highlands Land Classification Data Layer Relationship table) and roadway right of ways were removed from the file. (p. 62 and 66, draft Ecosystem Management Technical Report, January 2007)

Steep Slope Indicators, as further described in the draft Ecosystem Management Technical Report, January 2007.

31. >20% Undeveloped The >20% Undeveloped is a feature based data layer that includes all slopes of 20% or greater, excluding developed lands. (p. 34-5, draft Ecosystem Management Technical Report, January 2007)
32. >15% Undeveloped The >15% Undeveloped is a feature based data layer that includes all slopes of 15% or greater, excluding developed lands. (p. 34-5, draft Ecosystem Management Technical Report, January 2007)
33. >10% within the Riparian Corridor The >10% within the Riparian Corridor is a feature based data layer that includes all slopes of 10% or greater that exist within, intersect, proximate to, or drain to the riparian corridor. (p. 34-5, draft Ecosystem Management Technical Report, January 2007)

II. Conservation Zone:

Agricultural Indicators, as further described in the draft Sustainable Agriculture Technical Report, January 2007.

1. **Agriculture Resource Area** The Agriculture Resource Area is an intensity indicator that reflects areas in the Region with a prevalence of active farms and is based upon Contiguous Farms >250, Important Agricultural Soils - Undeveloped, and Preserved Farms data layers. The boundary was drawn to reflect areas with the highest agricultural areas. (p. 2-9, draft Sustainable Agriculture Technical Report, January 2007)
2. **Important Agricultural Soils - Undeveloped** The type of soil is an important factor in determining the productivity of farmland. The Important Agricultural Soils (1%+) feature based data layer includes soils of local and statewide importance and prime soils, as defined by Natural Resources Conservation Service's (NRCS) Soil Survey Geographic (SURGO). Developed lands were removed from this file. (p. 2-9, draft Sustainable Agriculture Technical Report, January 2007)
3. **Preserved Farms** The Preserved Farms feature based data layer is based on New Jersey Department of Agriculture, State Agriculture Development Committee (SADC) Program spatial files and contains farms that are preserved and farms with final approval from the SADC. (p. 2-9, draft Sustainable Agriculture Technical Report, January 2007)
4. **Contiguous Farms >250** The Contiguous Farms >250 data layer is an intensity indicator that represents areas with contiguous farming landscapes. The layer is based upon the following factors: parcels with 10% or greater agricultural uses and 1%+ important soils (local and statewide importance and prime soils) and preserved farms. Features were buffered by 50 feet to reduce fragmentation and only those areas with 250 or greater contiguous areas were selected. Once the Agriculture Resource Area was established (based upon this data layer) those parcels that are outside of the Agriculture Resource Area were deleted. (p. 2-9, draft Sustainable Agriculture Technical Report, January 2007)
5. **Agricultural Uses** The Agricultural Uses, >10 is an intensity indicator that represents the extent of lands that are currently in agricultural use based upon NJDEP 2002 Land Use Land Cover data, with 10 acres as a minimum threshold. Agricultural lands are used primarily for the production of food and fiber and some of the structures associated with this production. Categories include cropland and pastureland, orchards, vineyards, nurseries and horticultural areas, confined feeding operations, and other agriculture. Parcels were identified 10% or more of the parcel was classified as agricultural per Land Use Land Cover. (p. 2-9, draft Sustainable Agriculture Technical Report, January 2007)
6. **Rural Residential Developed** Rural Residential Land is an intensity indicator and is comprised of areas classified as Suburban Fringe Lands, which are isolated and non-contiguous with more intensely developed areas. See the Developed Lands Indicators discussion for additional information regarding the delineation of Suburban Fringe Lands.

III. Planned Community Zone/Specially Planned Areas

Developed Lands Indicators, as further described in the draft Regional Land Use Conditions and Smart Design Guideline Technical Report, January 2007 and the draft Utility Capacity Technical Report, January 2007.

1. Core Developed Lands The Core Developed Land is an intensity indicator that is based on any one of the following factors:
 - Areas with an impervious surface of at least 30 percent (as indicated by NJDEP draft Land Use Land Cover data) and at least 5 contiguous acres;
 - Existing Areas Served with wastewater, buffered by 10 feet;
 - Population densities of greater than 8 people per acre occurring for at least 10 contiguous acres;
 - Non-residential “waste generating” land uses of at least 5 contiguous acres served by on-site wastewater disposal units.; and
 - “Waste generating” land uses, greater than 50 contiguous acres, but excluding rural residential lands.

A spatial analysis was performed in order to identify those areas in the Region that contain a critical mass of core developed features in areas of greater than 75 acres of greater. (p. 43-5, draft Regional Land Use Conditions and Smart Design Guideline Technical Report, January 2007)
2. Moderate Developed Lands The Moderate Developed Land is an intensity indicator that includes and extends beyond Core Developed Lands, with the addition of “Active Use” lands, excluding rural residential land (NJDEP Land Use Land Cover code 1140). Actively used lands are listed in the Highlands Land Classification Data Layer Relationship. A spatial analysis was performed in order to identify those areas in the Region that contain a critical mass of moderately developed features of 75 contiguous acres or greater. (p. 43-5, draft Regional Land Use Conditions and Smart Design Guideline Technical Report, January 2007)
3. Suburban Fringe Lands The Suburban Fringe Land is an intensity indicator that includes and extends beyond Moderate Developed Lands, by adding rural residential lands. Only those areas that adjoin or are next to a Moderate Developed Lands and exhibited 75 contiguous acres or greater of suburban fringe developed areas were retained in the data layer. (p. 43-5, draft Regional Land Use Conditions and Smart Design Guideline Technical Report, January 2007)
4. Sewer EAS +100 Community infrastructure, wastewater in particular, is based upon the identification of Highlands Domestic Sewerage Facilities, which include publicly-owned and investor-owned domestic wastewater treatment facilities, and provides wastewater treatment to municipalities. The Utility Analysis delineated existing areas served with sewers. The Sewer EAS + 100 is a feature based data layer and was buffered by 100 feet to reduce fragmentation due to roads. (p. 8-9, draft Utility Capacity Technical Report, January 2007)

5. Water EAS +100
The Utility Analysis delineated areas served with existing water service based upon “public community water supply systems” (PCWS), which may be owned and operated by governmental entities or investor-owned utilities. The Water EAS + 100 is a feature based data layer and was buffered by 100 feet to reduce fragmentation due to roads. (p. 19, draft Utility Capacity Technical Report, January 2007)
6. Population Density >8 p/a
A dasymetric mapping analysis was used to refine Census population information in the Highlands by reallocating population within the Census boundaries (block and block group) based upon environmental constraints to development (such as Highlands Open Waters or steep slopes), existing land uses (such as high or low density residential), and other features (such as preserved land and road right of ways) that would likely give some indication of areas of inhabitation. Based upon the dasymetric mapping analysis, the Population Density >8 p/a feature based data layer reflected areas with population density of greater than 8 people per acre, occurring in greater than 2 contiguous acres. (p. 35, draft Regional Land Use Conditions and Smart Design Guideline Technical Report, January 2007)
7. Population Density >14p/a
A dasymetric mapping analysis was used to refine Census population information in the Highlands by reallocating population within the Census boundaries (block and block group) based upon environmental constraints to development (such as Highlands Open Waters or steep slopes), existing land uses (such as high or low density residential), and other features (such as preserved land and road right of ways) that would likely give some indication of areas of inhabitation. Based upon the dasymetric mapping analysis, the Population Density >14 p/a feature based data layer reflected areas with population density of greater than 14 people per acre, occurring in greater than 1 acre. (p. 35, draft Regional Land Use Conditions and Smart Design Guideline Technical Report, January 2007)
8. Impervious Surfaces >30%
The Highlands Act broadly defines impervious surfaces to mean any structure, surface, or improvement that reduces or prevents absorption of stormwater into land, and includes porous paving, paver blocks, gravel, crushed stone, decks, patios, elevated structures, and other similar structures, surfaces, or improvements. Existing development and areas that have been previously disturbed were identified in part by the Highlands Council’s impervious surface analysis and NJDEP draft 2002 Land Use Land Cover. The Impervious Surfaces >30% feature based data layer reflects areas with average impervious surface cover of 30% or greater, occurring over 2 or more contiguous acres. (p. 35, draft Regional Land Use Conditions and Smart Design Guideline Technical Report, January 2007)
9. Impervious Surfaces >50 %
The Highlands Act broadly defines impervious surfaces to mean any structure, surface, or improvement that reduces or prevents absorption of stormwater into land, and includes porous paving, paver blocks, gravel, crushed stone, decks, patios, elevated structures, and other similar structures, surfaces, or improvements. Existing development and areas that have been previously disturbed were identified in part by the Highlands Council’s impervious surface analysis and NJDEP draft 2002 Land Use Land Cover. The Impervious Surfaces >50% feature based data layer reflects areas with average impervious surface cover of 50% or greater, occurring over 2 or more contiguous acres. (p. 35, draft Regional Land Use Conditions and Smart Design Guideline Technical Report, January 2007)

10. Non Residential Waste Generating
The Non-residential Waste Generating land use layer captured urbanized lands that generate waste, including commercial, service, industrial, mixed urban lands, cultural centers, airports, and military reservations that occur in areas greater than 2 contiguous acres. The Non Residential Waste Generating feature based data layer, used in conjunction with Sewer EAS +100, is intended to identify areas commercial and industrial areas that are served by on-site waste disposal systems. (Appendix P of the draft Regional Land Use Conditions and Smart Design Guideline Technical Report, January 2007)
11. Transit Hub 1 mile Buffer
Transportation “capture areas” include the general area from which transportation and transit services attracts users via pedestrian access. Any additional growth, redevelopment, and revitalization initiatives in these areas will support the use of existing public transportation. The Transit Hub 1 mile Buffer feature based data layer includes estimated “capture areas” established at distances of 1 mile from train stations, excluding undeveloped lands. (p. 38, draft Regional Land Use Conditions and Smart Design Guideline Technical Report, January 2007)
12. Transit Hub 0.5 mile Buffer
Transportation “capture areas” include the general area from which transportation and transit services attracts users via pedestrian access. And additional growth, redevelopment, and revitalization initiatives in these areas will support the use of existing public transportation. The Transit Hub 0.5 mile Buffer feature based data layer includes estimated “capture areas” established at distances of 0.5 miles from train stations, excluding undeveloped lands. (p. 38, draft Regional Land Use Conditions and Smart Design Guideline Technical Report, January 2007)

Land Use Capability Map - Integration

The Highlands Council utilized regional indicators to develop the Land Use Capability Map and to identify those lands within the Highlands Region which have the highest resource value, highest agriculture value, and the highest intensity of existing development patterns.

The Regional Master Plan zones were developed based on a process of raster data layering. Raster maps generally depict surfaces through a matrix of identically sized cells. Each cell is given a value depending upon the underlying features in that area, indicating the presence or absence of a feature. The purpose of creating raster-based value maps was to develop an understanding of areas (as indicated by raster cells) that show the strongest values for a particular topic including resource areas, as well development indicators.

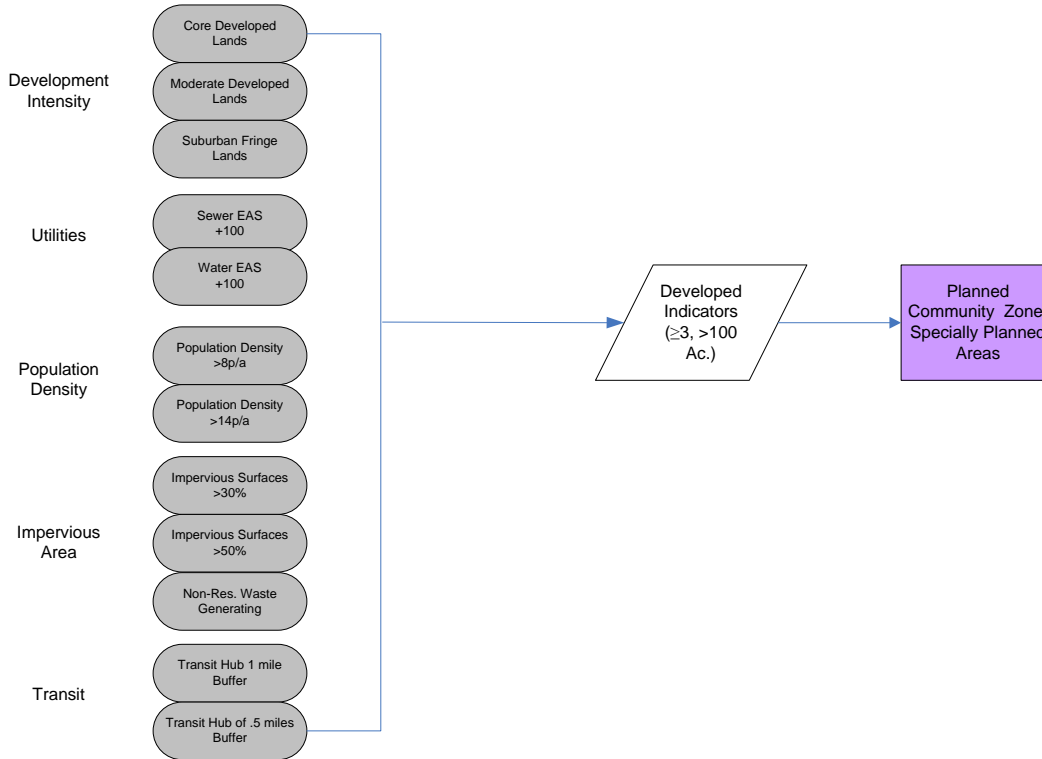
It should be noted that there are limitations to the raster data layering approach; when integrating multiple raster layers, the output raster data stores only the cumulative numeric value based on the presence or absence of multiple input layers. This inherent limitation allows for faster data processing over a large area such as the Highlands Region, but lacks the attribution to allow a user to identify which layers were present and which were absent. This limitation has been identified by the Highlands Council and action has been taken to acquire customizable software to overcome this limitation. It is the intention that this software will be utilized for final Regional Master Plan adoption.

The following section describes the general integration steps that were taken in order to delineate the three overlay zones, and presents an overall schematic of the process, entitled *Land Use Capability Map Integration Steps*. In addition, professional judgment, aided with aerial photography and Regional Master Plan strategies and policies were employed to address inconsistencies.

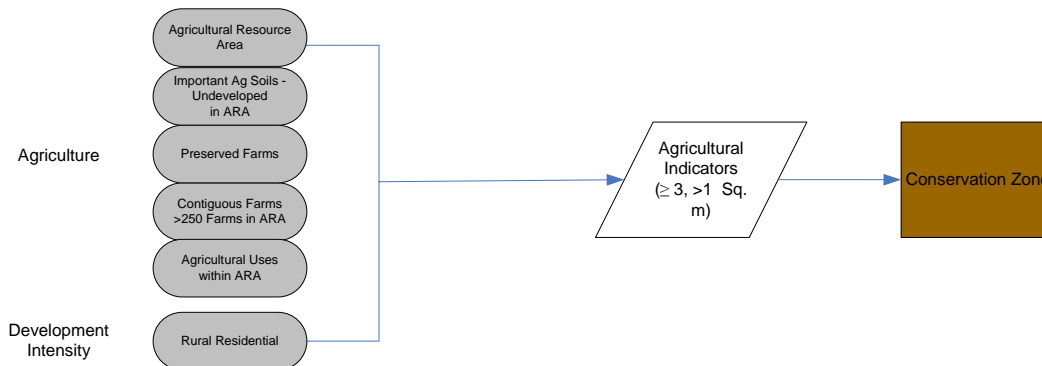
1. Protection Zones represent those areas in the Highlands Region that exhibit exceptionally high ecological resources, as indicated by the presence of at least 6 of the protection indicators. Each protection indicator is given an equivalent weight. As such, any lands in the Highlands Region which contain values from 6 or more protection indicators, occurring in greater than 1 square mile were generally assigned to the Protection Zone.



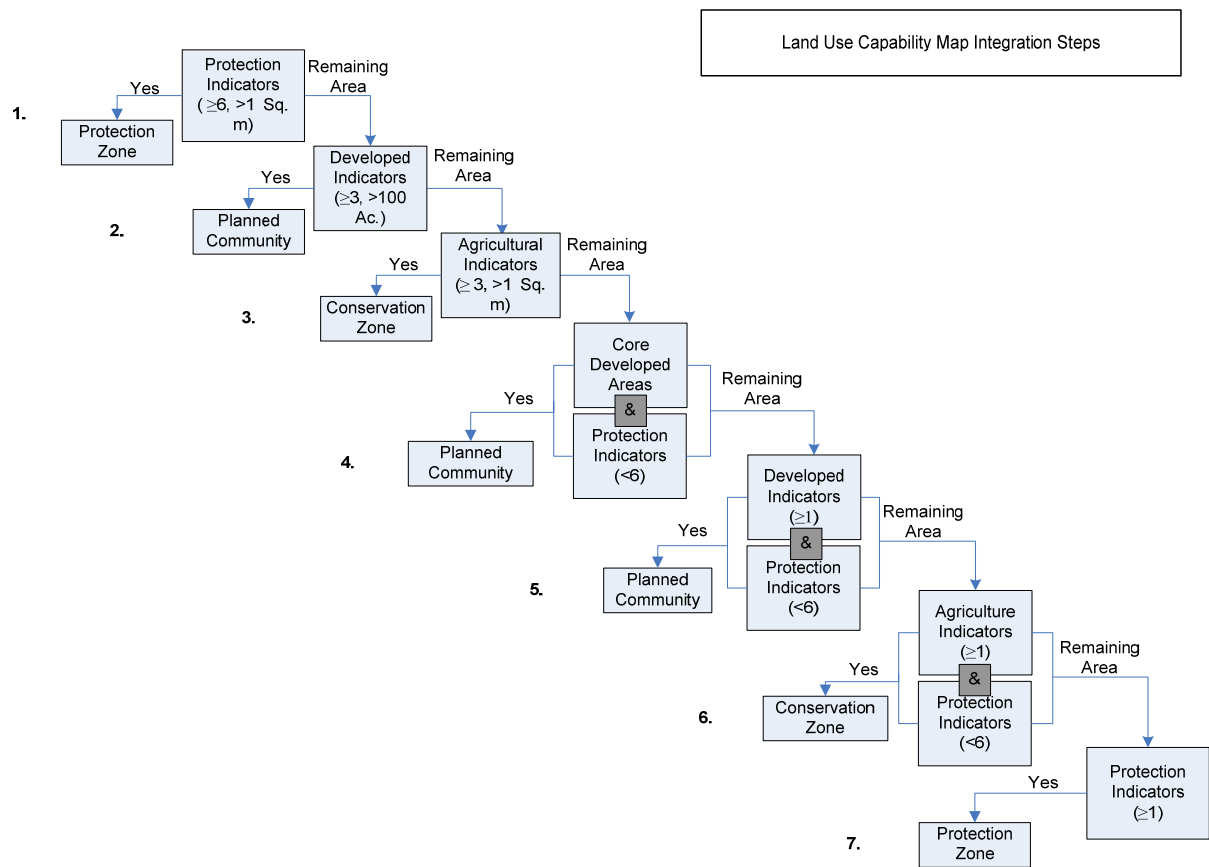
2. Planned Community Zones represent those areas in the Highlands Region that exhibit at least 3 developed land indicators that combined are greater than 100 contiguous acres. Each indicator is given an equivalent weight. Any areas with strong developed land values, which had not already been assigned a zone, were generally assigned to the Planned Community Zone.



3. Conservation Zones were identified and represent those areas in the Highlands Region that exhibit contiguous agricultural landscapes features, as indicated by the presence of at least 3 agricultural indicators. Each agricultural indicator is given an equivalent weight. Any lands with high regional agricultural values occurring in greater than 1 square mile, which had not already been assigned a zone, were generally assigned to the Conservation Zone.



4. Any remaining areas identified as a core developed area, and contained fewer than 6 protection indicators were generally assigned to the Planned Community Zone/Specially Planned Areas.
5. Any remaining areas that contained at least 1 developed lands indicator, and fewer than 6 protection indicators were generally assigned to the Planned Community Zone/Specially Planned Areas.
6. Any remaining areas with agricultural indicator values of at least 1, and fewer than 6 protection indicators were generally assigned to the Conservation Zone.
7. Any remaining areas that contained 1 or more protection indicators were generally assigned to the Protection Zone.



The minimum threshold for the Protection and Conservation Zones is 640 acres or 1 square mile. A Planned Community Zone/Specially Planned Area may have a minimum threshold of 100 acres. The map *Land Use Capability Map* illustrates the 3 overlay zones for the Highlands Region.

The results of the Land Use Capability Map process are summarized in the table entitled *Composition of Land Use Capability Map Zones within the Highlands Region*. The table entitled *Land Use Characteristics by Land Use Capability Map Zone* presents the land uses within each overlay zone. The composition of land use within each of the Land Use Capability Map Zones illustrate that the Protection Zone includes most of the forest, water and wetlands (86%, 87% and 78%, respectively), while the Planned Community Zone/Specially Planned Area includes the majority of the developed lands (51%). The Conservation Zone includes over 72% of the agricultural uses within the Highlands Region.

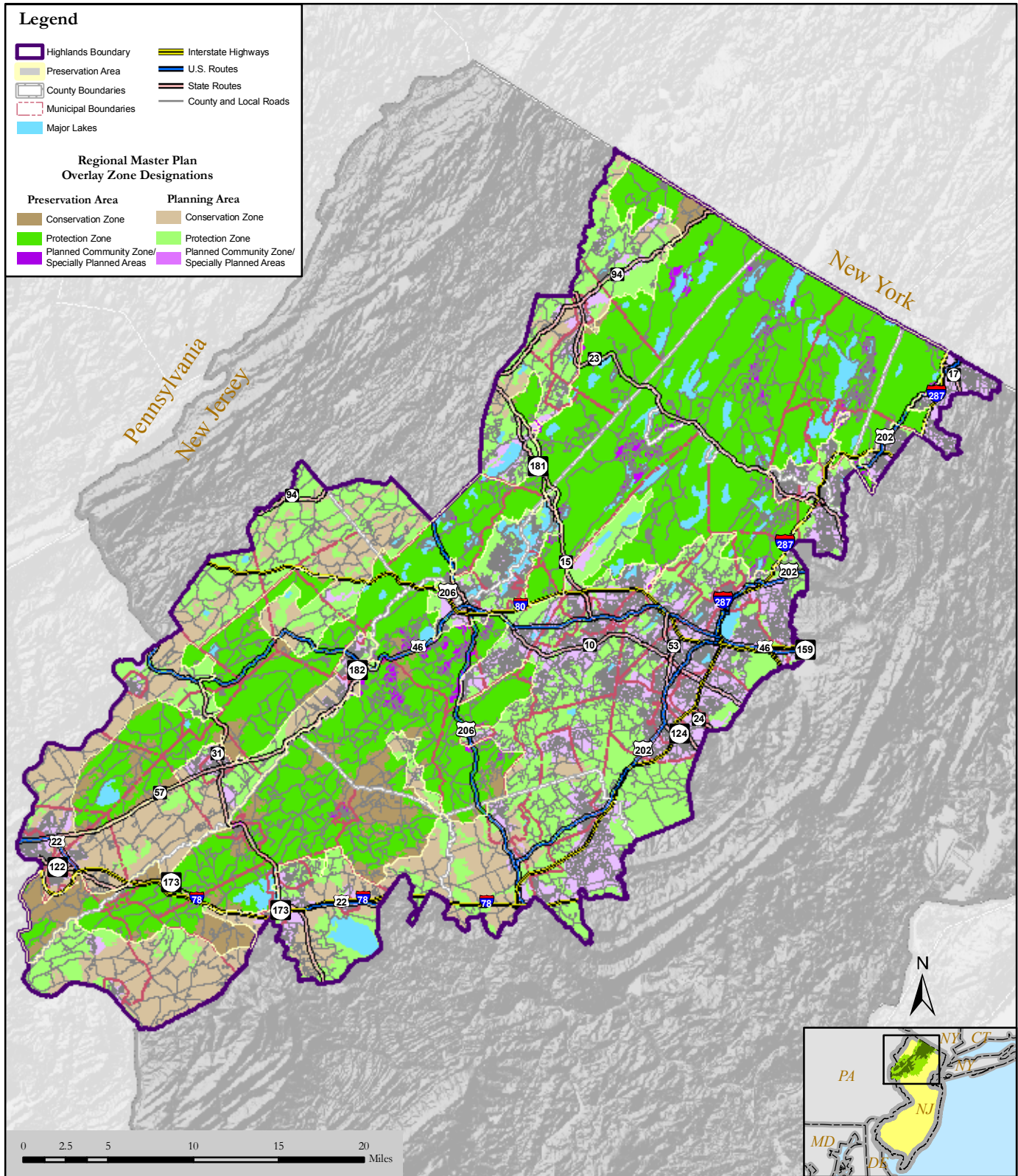
Composition of Land Use Capability Map Zones within the Highlands Region

Land Use Capability Map Zone	Planning Area		Preservation Area		Highlands Region	
	Area (acres)	Percent	Area (acres)	Percent	Area (acres)	Percent
Protection Zone	199,926	44.99%	357,580	86.17%	557,507	64.87%
Conservation Zone	111,835	25.17%	40,392	9.73%	152,227	17.71%
Planned Community Zone/ Specially Planned Areas	132,632	29.85%	16,992	4.09%	149,624	17.41%
TOTAL	444,393	100.00%	414,964	100.00%	859,358	100.00%

Land Use Characteristics by Land Use Capability Map Zone

Land Classification (2002)	Protection Zone		Conservation Zone		Planned Community Zone/ Specially Planned Areas		Highlands Region	
	Area (acres)	Percent of Land Class	Area (acres)	Percent of Land Class	Area (acres)	Percent of Land Class	Area (acres)	Percent of Total Land Area
Residential	58,574	37.77%	19,912	12.84%	76,614	49.40%	155,100	18.05%
Commercial	2,314	15.45%	1,325	8.85%	11,340	75.70%	14,980	1.74%
Industrial	872	15.94%	498	9.10%	4,101	74.96%	5,471	0.64%
Other Urban	16,390	40.21%	4,777	11.72%	19,590	48.07%	40,757	4.74%
Agriculture	28,341	25.84%	79,275	72.28%	2,065	1.88%	109,681	12.76%
Forest	347,942	86.47%	30,965	7.70%	23,493	5.84%	402,399	46.83%
Water	28,367	87.21%	1,123	3.45%	3,039	9.34%	32,529	3.79%
Wetlands	70,390	78.13%	12,889	14.31%	6,810	7.56%	90,089	10.48%
Barren Land	4,317	51.69%	1,463	17.52%	2,572	30.80%	8,352	0.97%
TOTAL	557,507	--	152,227	--	149,624	--	859,358	100.00%

Land Use Capability Map



The Highlands Council makes no representations of any kind, including, but not limited to, the warranties of merchantability or fitness for a particular use, nor are any such warranties to be implied with respect to the information contained on this map. The State of New Jersey shall not be liable for any actions taken or omissions made from reliance on any information contained herein from whatever source nor shall the State be liable for any other consequences from any such reliance.

Draft Regional Master Plan, November 2006



Sources:
New Jersey Highlands Council, 2006

