

2.0 LAND USE/LAND COVER

2.1 Historic Land Use Patterns

Land use has a profound effect on water quality and quantity. As natural land areas are cleared and buildings, pavements and lawns take the place of forests and meadows, the hydrologic conditions of the watershed are dramatically changed. Reduction in vegetative cover and increase in impervious areas results in greater rates and volumes of stormwater runoff from the watershed, and less infiltration to groundwater. Peak flows during storms are increased, which can increase downstream flood frequency and depth, and cause erosion of the natural stream channel. Pollutant loadings to the streams, rivers and lakes are increased due to stream bank erosion and materials contained in the stormwater runoff from developed areas. These changes impact the natural environment as well as the human communities in the watershed.

Historically, development has typically begun near rivers and oceans, which offer opportunities for transportation, hunting, fishing, mining and manufacturing. In WMA 4, the major waterbodies include the Lower Passaic River and its tributaries, including the Saddle River. The region was first settled by the Lenni Lenape Indians, and later became an industrial area with tanneries, sawmills and grist mills.

As industrial centers grew, development expanded as population increased. The arrival of new transportation options such as railroad and automobile led to more development as the region became a commuter suburb of New York and other urban centers. General Land Use in 1986 in the New Jersey portions of the WMA 4 watersheds is shown in Plate 2.2.1. As shown, the eastern portion of WMA 4 is almost exclusively urban, while mostly small forest and agricultural lands are scattered in the area towards the western and northern boundaries of WMA 4. The detailed land use classifications as of 1992, as shown on Plate 2.2.2, show that the majority of the development is residential of low to high density, with some forest and urban recreational grass areas, and with concentrations of industrial and commercial development along the major highways and railroad routes. The larger concentrations of industrial/commercial areas along the Passaic River are found in the southwestern side of WMA 4 near Route 46 in Wayne, and in the southeast along the lower reach of the Passaic River in Newark, Kearny and Harrison. The 1992 data shows that land use in the 8 square miles of Rockland County, New York, that drain into WMA 4 was similar to land use in the northern part of WMA 4.

Preserved areas in WMA 4 include High Mountain Park in Wayne Township and North Haledon; Eagle Rock Reservation in West Orange; Garrett Mountain Reservation in West Paterson and the Celery Farm in Allendale. Efforts to preserve additional lands are continuing.

2.2 Modern Trends

WMA 4 is one of the most developed areas of the Passaic Watershed. Land use in 1992 and 1995 is shown on Plates 2.2.2, 2.2.3 and 2.2.4. Table 2.2.1 presents the change in land use patterns over the period from 1986 to 1995. A comparison of the 1986 and 1995 general land use shows that additional development has consisted of residential development of farmlands in the northern NJ portion of WMA 4 and expansion into forested areas in the northern and southwestern portions of WMA 4.

Table 2.2.1
Land Use Trends in WMA 4 (New Jersey Only)

Land Use	Square Miles		Change 1986-1995	
	<i>1986</i>	<i>1995</i>	<i>Square Miles</i>	<i>Percent</i>
Agriculture	0.59	0.36	-0.23	-39%
Barren Land	1.10	1.39	0.28	26%
Forest	21.52	19.95	-1.56	-7%
Urban	154.04	155.92	1.87	1%
Water	3.70	3.75	0.05	1%
Wetlands	7.55	7.12	-0.43	-6%

This table shows that forested land was reduced by approximately the same area as the increase in urban land, the greatest change in square miles in a land use category. The greatest change by percent (39% loss) was the reduction in agricultural areas, but the total agricultural area is small. As New Jersey land prices rise, farmlands in New Jersey have increasingly become a target for development. Plate 2.2.5 shows the suitability of soils for agricultural use. However, very little of the area that is considered “prime farmland” was actually used for farming, even in 1986. Overall, the reduction in natural areas (forested and wetlands) in WMA 4 over this period was 1.99 square miles, or approximately 7% of the watershed area in New Jersey.

Table 2.2.2 shows modern land use in WMA 4 by percentage of the total watershed management area. This table shows that the largest (83%) land use category in WMA 4 is urban, which in a general classification includes all residential, commercial and industrial uses. Forest, wetlands and water areas constitute approximately 16% of WMA 4.

**Table 2.2.2
Modern Land Use Patterns in WMA 4 (New Jersey Only)**

Land Use	Square Miles 1995	Percent of Total
Agriculture	0.36	0.19%
Barren Land	1.39	0.74%
Forest	19.95	10.59%
Urban	155.92	82.72%
Water	3.75	1.99%
Wetlands	7.12	3.78%

The remaining forest area in WMA 4 as of 1995, was less than 20 square miles, and consists mostly of scattered small sites. The major exception is the Preakness Mountain site, which crosses into WMA 3 at the Bergen – Passaic County line on the western side of WMA 4. There are also several sites in northern Bergen County (Ramsey, Mahwah, Allendale and Saddle River) that have been identified in the New Jersey Landscape Project as being large enough to support wildlife (see Section 1.15). Protection of these remaining forested areas is essential for preservation of habitat.

Projections to 2020

Future development in WMA 4 will be primarily by infilling and redevelopment of existing developed areas. WMA 4 has already been extensively developed, and has few remaining natural areas. However, there may be some additional changes in land use from forest to urban use. Any new urban (or suburban) area would be expected to be associated with a corresponding decrease in the small remaining forest area, since there is less than 0.4 square miles of agriculture area remaining (as of 1995), and wetland areas are largely protected. The amount of area affected will depend upon the rate of growth and density of residential, commercial and industrial uses, and the degree of protection afforded to individual remaining forest areas. It is anticipated that the greatest pressure in general over the next 20 years will be for additional housing, particularly along public transportation routes, and the commercial growth that accompanies increased population. However, as land becomes more valuable, there may be a trend in redevelopment from residential to commercial use, possibly associated with a decline in population, particularly in urban areas unless revitalization is effectively accomplished.

Any increase in residential area will depend upon the rate of population growth and the density of households. A review of population projections presented in the New Jersey State Water Supply Plan (NJSWSP) and projections developed by the State of New Jersey Department of Labor (NJDOL) indicate a potential population change in WMA 4 from a projected decline (per NJSWSP data) of about 1.04% per 5 year period to an increase (per NJDOL data) of about 1.62% per 5 years. These estimates are significantly below the actual population increase (3.01% per 5-year period) experienced in WMA 4 between 1990 and 2000 based on US Census data. These estimates were developed as follows:

The NJSWSP divides the State into planning areas that do not exactly coincide with the WMAs. However, WMA 4 is approximately the size and delineation of RWRPA No. 5 (although a little smaller in size), and the population projections for RWRPA No. 5 were estimated by NJSWSP as follows:

Projected Population Change (NJSWSP)

RWRPA	Year 2000	2005	2010	2020	2030	2040
No. 5	1,826,062	1,805,866	1,785,662	1,751,534	1,717,899	1,687,100

This projection indicates a moderate decline in population of approximately 4.1% by 2020 and 9.2% by 2040. The rate of change between 2000 and 2020 is projected at approximately 1.04% decline per 5-year period.

The New Jersey Department of Labor population projections for Bergen, Essex and Passaic Counties, which constitute 96.3% of WMA 4, are presented in the table below, with the computed long-term average percentage increase per 5-year period. NJDOL projects an increase in population over the term to 2015.

Table 2.2.3

Population Projections (New Jersey Department of Labor)						Long Term Avg. increase per 5 yrs.
County (% of WMA 4)	Est. 1998	2005	2008	2010	2015	
Bergen (40.4%)	875,200	905,600	918,800	928,800	953,500	2.55%
Essex (27.2%)	766,400	778,400	783,600	787,000	800,600	1.29%
Passaic (28.7%)	494,900	498,600	501,100	503,800	505,300	0.61%
Total (96.3%)				Weighted Average		1.62%

Based upon the relative area of Bergen, Essex and Passaic Counties in WMA 4, the weighted long-term population increase is estimated at approximately 1.62% per 5-year period. By comparison, the change in population in WMA 4 from 1990 to 2000, based upon the US Census data, was an increase of 6.11% over 10-years, which equates to about 3.01% per 5-year period (compounded rate). With consideration of the economic slowdown in recent years, the increase in protection of the few remaining natural areas in WMA 4, and potential growth and land use influences of the New Jersey State Development and Redevelopment Plan, the estimate of 1.62% per 5-year period will be used to demonstrate potential changes in land use due to this growth over the period of 2000 to 2020.

The following table presents population projections and changes in land use based on associate growth in residential areas. The increase in urban land (which includes urban and suburban areas) is based upon the increase experienced between 1986 and 1995 proportioned based upon the population increase between 1990 and 2000. On this basis,

the new urban land is estimated at approximately 0.0274 square miles per 1,000-person increase in population.

The actual increase in urban land from 1986 to 1995 was 1.87 square miles, which is 0.187 square miles per year, or 0.935 square miles per 5-year period. The estimated increase in urban land at the end of each 5-year period based upon the 1986 to 1995 trend is also presented in the table below for comparison.

**Table 2.2.4
Projected Population and Land Use Trends 2000 - 2020**

WMA 4 (NJ Only)	2000 (Census)	2005	2010	2015	2020
A – Estimates Based on NJ Dept of Labor Population Projections					
Population (Increase at 1.62% per 5 yrs)	1,185,899	1,205,100	1,224,600	1,244,500	1,264,600
Est. Increase from 2000	-	19,200	38,700	58,600	78,700
Est. Increase in Urban Land (Sq. Mi.)	-	0.53	1.06	1.61	2.16
B – Estimates Based on 1986-1995 Land Use Trends					
Est. Increase in Urban Land (Sq. Mi.)	-	0.935	1.87	2.81	3.74

As indicated above, future growth in WMA 4 based upon the NJDOL population projections would result in an increase in urban land area of approximately 2.2 square miles (Estimate A) over a 20-year period, while continued growth based upon the 1986-1995 trends would result in an increase in urban land of approximately 3.7 square miles (Estimate B) over the same time period. Population growth based on the 1990 to 2000 census data (approximately 3.01% per 5-year period) would result in almost double the increase in population indicated by the estimate based on the NJDOL projections (Estimate A, 1.62% per 5-year period) presented in the above table. Thus, there will be a significant difference in population changes in WMA 4, depending upon whether the trends of the 1990s continue, or whether growth occurs more slowly, as projected based on NJDOL population projections. The difference in increase in urban area may appear to be less significant, since an increase in approximately 2 to 4 square miles of urban land would affect only about 1% to 2% of the area of WMA 4. However, the change to urban area would be associated with a corresponding loss in the small remaining forest and agriculture areas, which could significantly affect remaining wildlife habitat.

Comparison of land use data for 1986 and for 1995 indicates that the increase in urban land in WMA 4 during that period was accompanied by an almost equal loss in forest area, and some loss in agriculture and wetland areas. If this trend continues, the above estimated increases in urban land will also reflect the associated loss in forest area and agriculture area, since the wetland area is more protected and generally less desirable for development. Since there is very little agriculture area remaining, most of the reduction would likely be in forest area. The projected reduced forest area of WMA 4, and reduced percentage of forest cover are presented in the following table based on the loss of forest area being equal to the increase in urban area. The estimated forest area for 2000 is based upon the 1995 land use data less one-half the 1986-1995 loss, to account for the 5 years from 1995 to 2000.

**Table 2.2.5
Projected Forest Area 2000 – 2020**

WMA 4 (NJ Only)	Estimate A – Based on NJDOJ Population Projections		Estimate B – Based on Continuation of 1986-1995 Trends	
	Forest Area (Sq. Mi.)	Forest Area as % of WMA 3	Forest Area (Sq. Mi.)	Forest Area as % of WMA 3
2000	19.17	10.17%	19.17	10.17%
2005	18.64	9.89%	18.24	9.68%
2010	18.11	9.61%	17.30	9.18%
2015	17.56	9.32%	16.36	8.68%
2020	17.01	9.02%	15.43	8.19%

Based upon the above two estimates, the area of forest as a percentage of the total area of WMA 4 can be expected to decrease from about 10.2% coverage to about 9.0% to 8.2% coverage over the next 20 years. Loss of forest area and increase in urban area can be expected to result in a decrease in water quality due to pollutants in surface runoff from developed areas, but more importantly for WMA 4, will result in a potential loss of 12% to 24% of the limited remaining natural habitat. Future growth in WMA 4 should be guided or influenced by the New Jersey State Development and Redevelopment Plan and the New Jersey Landscape Project (see Section 1.15). These tools should be used by planning and approval agencies to direct future development to appropriate locations and discourage inappropriate development.

State Plan and NJ Landscape Project

In March 2001, the State Planning Commission adopted the “new” New Jersey State Development and Redevelopment Plan (the State Plan), which provides more guidance and stronger policy direction than the 1992 plan. The new State Plan designates the Highlands in New Jersey as a Special Resource Area, in recognition of the critical importance of that area to the State. Although there are no Highlands areas in WMA 4, there are significant Highlands areas in upstream watersheds in WMAs 3 and 6. The

State Plan is intended to guide growth and redevelopment to prevent future suburban sprawl. It has many targets directed towards improving water quality, preserving farmland and open space, revitalizing urban areas, reducing distress in communities, reducing dependence on automobiles for transportation to school, work, shopping and recreation, conservation of natural resources and promoting beneficial economic growth, development and renewal. One of the targets of the State Plan is “Locating 85% or more of new jobs and population growth in areas designated in the State Plan for growth, while reducing land consumption per person significantly.”¹ The State Plan designates Urban Centers, Regional Centers (RC), Towns (T), Villages (V) and Hamlets (H). The Executive Summary of the State Plan states, “The preferred approach for managing growth to achieve the goals of the State Plan are through the mapping of Center Boundaries to identify areas for development and redevelopment and Environs protection in suburban and rural New Jersey and the identification of Cores and Nodes as places for more intensive redevelopment in metropolitan New Jersey.”

WMA 4 includes the Designated Urban Centers of Newark and Paterson, the Designated Towns of Totowa and Haledon, and the planned Regional Center of Passaic. Almost all of WMA 4 is identified as “Metropolitan” area on the State Plan map. The exception to the Metropolitan designation is a part of the Hackensack Meadowlands near the lower reach of the Passaic River, and several Environmentally Sensitive or Park and Recreation areas, including the Preakness Mountain site, and narrow park areas along the Saddle River in Upper Saddle River and Saddle River, and the County park along the Saddle River generally from Ridgewood to Rochelle Park and Saddle Brook. This designation also includes the Second Watchung Mountain ridge between North Caldwell and Cedar Grove, the First Watchung Mountain ridge between Verona and Montclair (including the Eagle Rock Reservation in West Orange), and Branch Brook Park in Newark and adjacent parks in Belleville.

In WMA 4, the boundaries of the Designated and planned Centers and Towns include the entire municipality. This is not the case for some of the Designated Centers and other categories in the upstream watersheds of WMAs 3 and 6, where the Designated area includes only part of the municipality.

A comparison of the areas designated in the State Plan with critical areas identified in the New Jersey’s Landscape Project For the Protection of Rare Species (see Section 1.15) reveals some areas where detailed mapping is required to determine which areas within the “Metropolitan” area of the State Plan are suitable for development. For example, the Preakness Mountain site, the ridges of the First and Second Watchung Mountains, and Branch Brook Park are not shown in the Landscape Plan, but are recognized in the State Plan. The Landscape Plan shows several small forest, wetland and grassland areas in a band across the upper part of WMA 4, generally from the southern portion of Mahwah, across Allendale and into Saddle River. These areas are not shown on the State Plan. The Landscape Plan also shows several small forest, wetland and grassland areas along

¹ NJ Office of State Planning, *Improvements in the 2001 State Plan*

the Passaic River near the southeast corner of Paterson, which are not shown on the State Plan.

Detailed planning for future development in these areas should be based on low altitude aerial photographs and field investigations rather than on satellite imagery, which is more appropriate for large scale regional planning, so that the forest, wetland and grassland areas can be mapped in detail prior to development, and appropriate protection can be provided.

The portion of WMA 4 north of the Passaic River, particularly in the Saddle River watershed, has numerous public water supply wells that serve the residents of that part of WMA 4. Construction of additional impervious areas in the Saddle River watershed would be expected to adversely affect groundwater recharge and thus reduce the supply available for a growing population in those areas. This condition and the associated planning required to address this issue are not reflected in the State Plan map, and are not the subject of interest of the Landscape Project. Therefore, even though the Saddle River watershed is essentially designated as a "Metropolitan" area in the State Plan, with little indication of environmentally sensitive areas, development in this watershed must be appropriately planned if the area is to be able to sustain the additional growth.

Current Development Plans

The tables on the following pages provide an indication of the present pressures for development in WMA 4. These tables were prepared based upon information provided by the planning boards for the respective counties, and show current or recent site plan and subdivision applications reviewed by the counties for sites in the municipalities in WMA 4.

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