

State of New Jersey In Lieu Fee Program

APPENDIX B

Compensation Planning Framework for New Jersey's In-Lieu Fee Program

2014



New Jersey Department of
Environmental Protection

Division of Coastal and Land
Use Planning

COMPENSATION PLANNING FRAMEWORK FOR NEW JERSEY'S ILF PROGRAM

Introduction

Wetlands provide a significant amount of environmental benefits. Some of the many functions that wetlands provide include: protecting drinking water by filtering out chemicals, pollutants, and sediments that would otherwise clog and contaminate our waters; soaking up runoff from heavy rains and snow melts, providing natural flood control; releasing stored flood waters to streams during droughts; providing critical habitats for a major portion of the State's fish and wildlife, including endangered, commercial and recreational species; and providing high quality open space for recreation and tourism. The purpose of this ILF instrument is to provide a mitigation alternative to permittee responsible mitigation that helps to ensure the no net loss of wetlands within the State of New Jersey. An approved instrument for an ILF program must include a compensation planning framework that will be used to select, secure, and implement aquatic resource restoration, establishment, enhancement, and/or preservation activities. The compensation planning framework must support a watershed approach to compensatory mitigation. All specific projects used to provide compensation for NJDEP permits must be consistent with the approved compensation planning framework. As per 40 CFR 230.98(c), all Compensation Planning frameworks must contain the following 10 elements: Geographic Service Area; Threats to Aquatic Resources; Historic Aquatic Resource Loss; Current Aquatic Resource Conditions; Aquatic Resource Goals and Objectives; Prioritization Strategy; Explanation of Preservation Objectives; Stakeholder Involvement; Long-term Protection and Management Strategies; and Strategy for Periodic Evaluation and Reporting. The following fulfills the NJDEP's duty to provide a Planning Framework for its ILF Wetland Mitigation Program.

Element 1: Geographic Service Areas

The State is divided into five (5) service areas for the NJ ILF program. These five regions, also known as Water Regions, cover 3-5 watershed management areas (WMAs or HUC-11) and primarily drain towards the Delaware River and Bay, Raritan River and Bay, Newark Bay or the Atlantic Ocean. These areas are defined by their drainage traits, but they also have similar hydrological, geophysical and ecosystem/biophysical characteristics within their region. These regions also somewhat coincide with the five physiographic regions: the Outer Coastal Plain; The Inner Coastal Plain; the Piedmont; the Highlands; and the Ridge and Valley, which give NJ its rich and highly diverse habitat and landscapes. These regions have distinct combinations of geologic, topographical and hydrologic features, which give rise to a wide range of environmental conditions and tremendous botanical diversity. The Department uses the “landscape regions” to develop the Landscape Project as these regions have similar plant and animal communities. The five water regions are similar to these landscape regions, but follow hydrological management areas based on their drainage properties:

Northeast: WMAs 3, 4, 5, 6

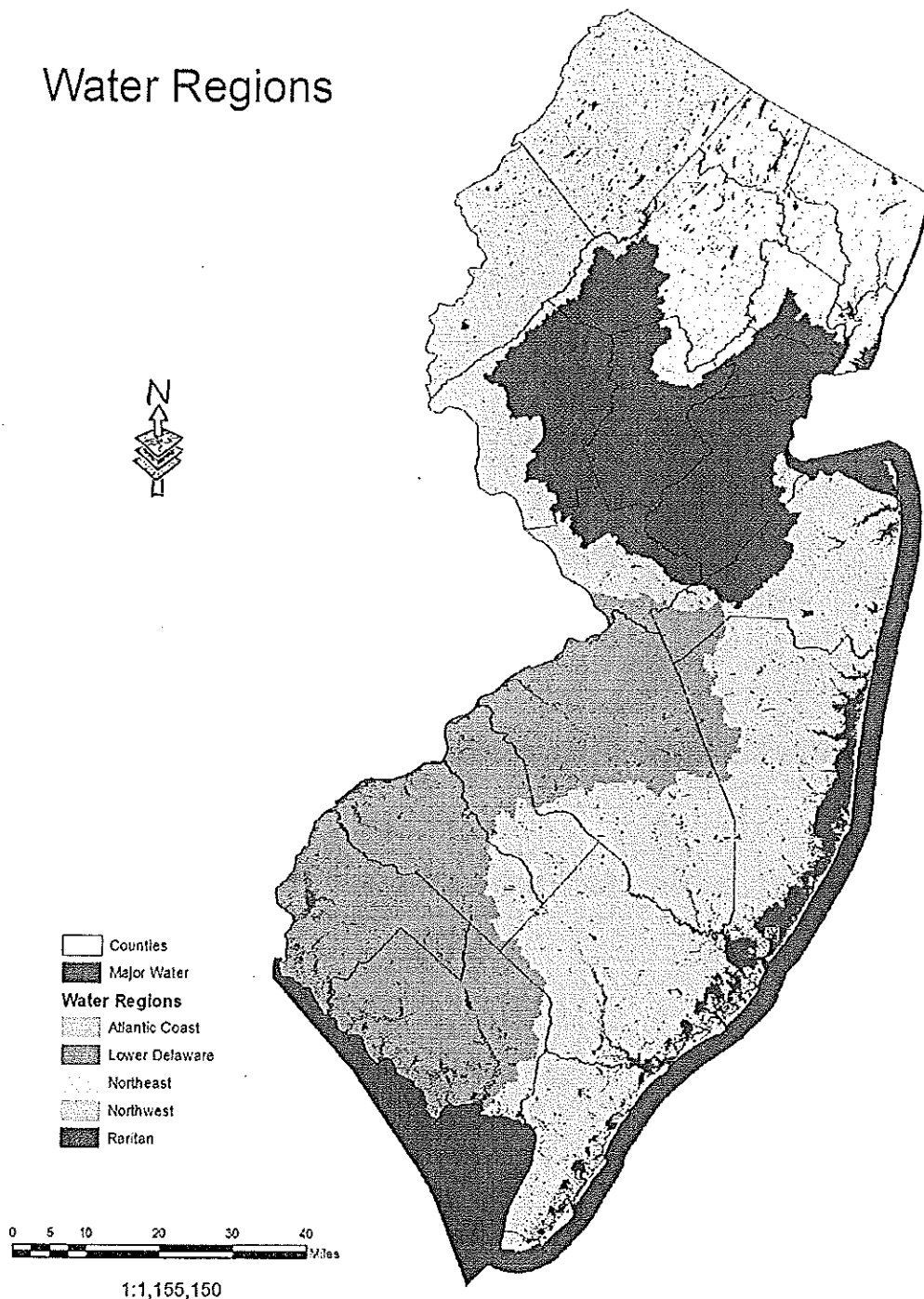
Northwest: WMAs 1, 2, 11

Raritan: WMAs 7, 8, 9, 10

Atlantic Coast: WMAs 12, 13, 14, 15, 16

Lower Delaware: WMAs 17, 18, 19, 20

Water Regions

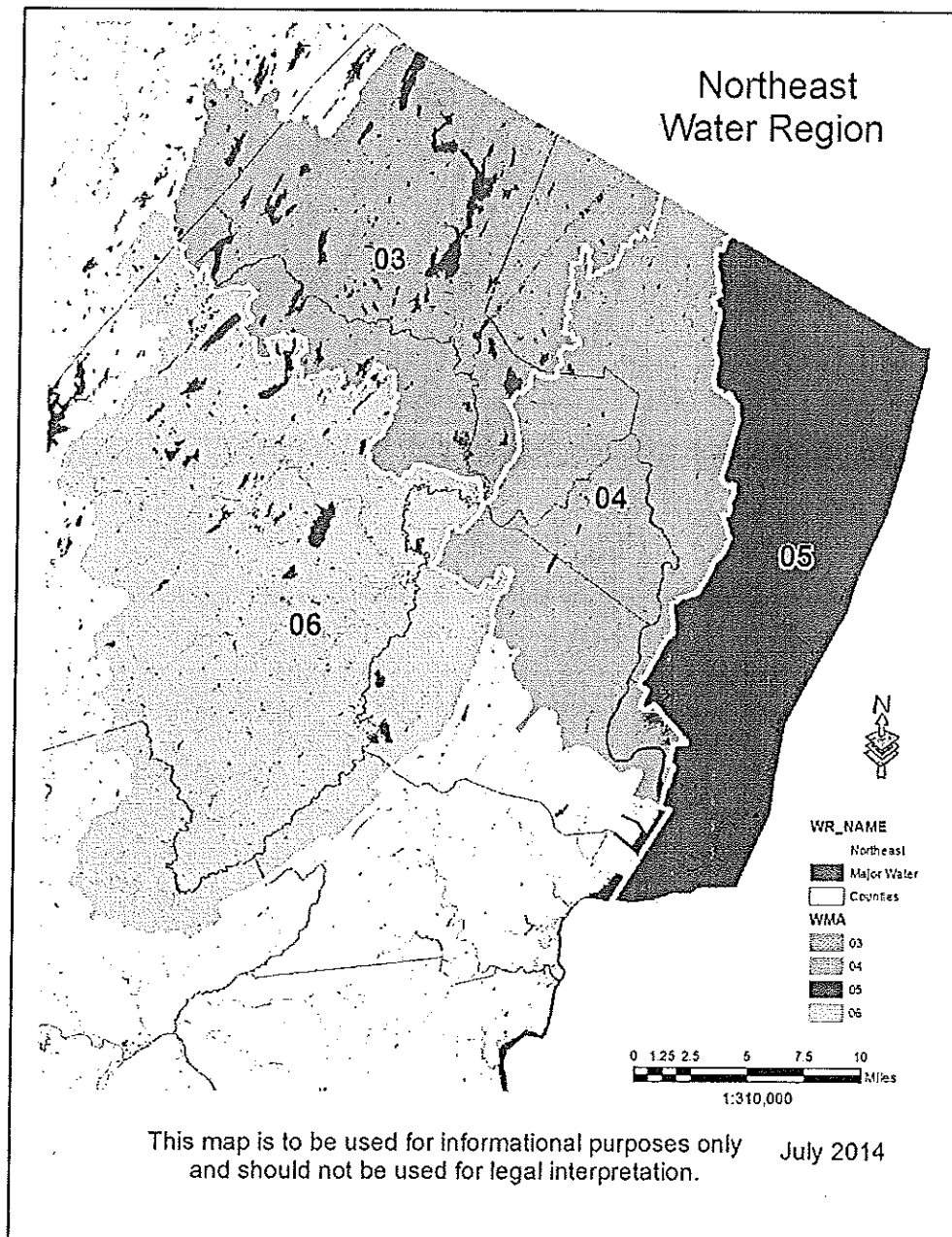


This map is to be used for informational purposes only
and should not be used for legal interpretation.

July 2014

Northeast Water Region: Watershed Management Areas 3, 4, 5, and 6

This Water Region contains the four most north east watershed management areas and encompasses all of Hudson, Passaic, and Bergen counties, a significant portion of Morris, and some of Union, Essex, Sussex, and Somerset counties. It also includes portions of the water-rich Highlands Region. The water in this area primarily flows into the Passaic and Hackensack Rivers which flow into the Newark Bay. The Hackensack Meadowlands area is also located within this region and is a large area with systems of protected complex tidal marsh. The most populated watershed management area is within this Water Region and it also contains several older industrial cities, Newark, Paterson, Clifton, and East Orange. Additionally the Great Falls is located within this very populated and historically polluted Water Region.



Below are descriptions of the various Watershed Management Areas that make up the Northeast Water Region:

Watershed Management Area 3: Pompton, Pequannock, Wanaque, Ramapo

Watershed Management Area 3 is located within the water-rich Highlands Province of New Jersey. The Pequannock, Wanaque and Ramapo Rivers all flow into the Pompton River. The Pompton River is, in turn, a major tributary to the Upper Passaic River. WMA 3 contains some of the State's major water supply reservoir systems including the Wanaque Reservoir, the largest surface water reservoir in New Jersey. There are four watersheds in WMA 3: Pompton, Ramapo, Pequannock and Wanaque River Watersheds. WMA 3 lies mostly in Passaic County but also includes parts of Bergen, Morris and Sussex Counties.

Watershed Management Area 4: Lower Passaic, Saddle River

Watershed Management Area 4 includes the Lower Passaic River (from the Pompton River confluence downstream to the Newark Bay) and its tributaries, including the Saddle River. The WMA 4 drainage area is approximately 180 square miles and lies within portions of Passaic, Essex, Hudson, Morris and Bergen Counties.

Two watersheds comprise WMA 4: the Lower Passaic River Watershed and Saddle River Watershed. The Lower Passaic River Watershed originates from the confluence of the Pompton River downstream to the Newark Bay. This 33-mile section meanders through Bergen, Hudson, Passaic and Essex Counties and includes a number of falls, culminating with the Great Falls in Paterson. This watershed has a drainage area of approximately 129 square miles. The major tributaries to this section of the Passaic River are the Saddle River, Preakness Brook, Second River and Third River. The Saddle River is one of the larger tributaries to the Lower Passaic River. The Saddle River Watershed has a drainage area of approximately 51 square miles. Land in this watershed is extensively developed and contains many older cities and industrial centers including Newark, Paterson, Clifton and East Orange.

Watershed Management Area 5: Hackensack, Hudson, Pascack

Watershed Management Area 5 has a drainage area of approximately 165 square miles, which includes parts of Hudson and Bergen Counties. WMA 5 is comprised of three watersheds: Hackensack River Watershed, Hudson River Watershed and Pascack Brook Watershed.

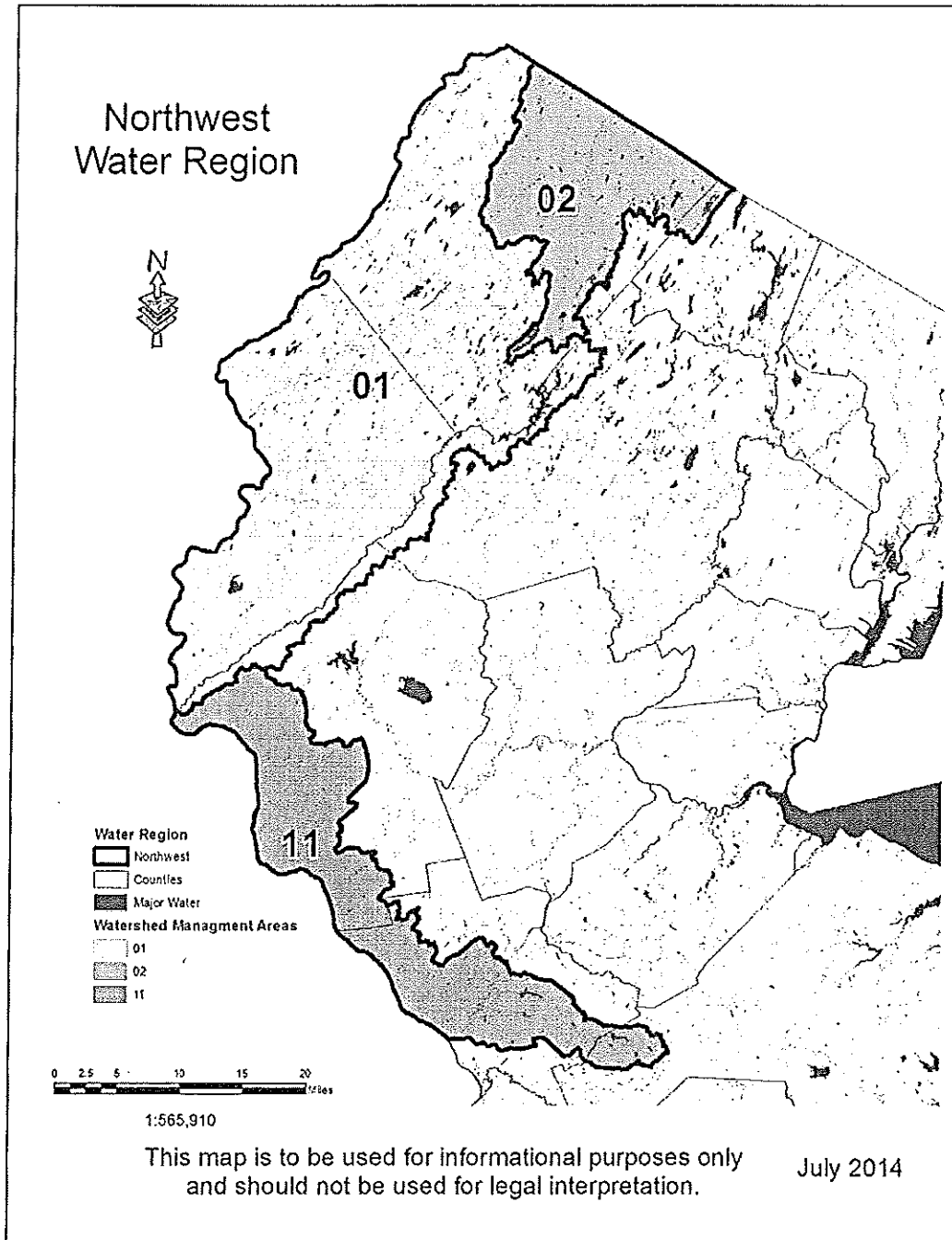
Although WMA 5 is the most populated of all the WMAs, approximately 50% of the land is still undeveloped, with more than 30% residential development. The remaining developed land is commercial/industrial use. Much of the lower Hackensack River Watershed is tidal marsh known as the Hackensack Meadowlands. The Meadowlands are home to more than 700 plant and animal species including several rare and threatened species. The Hackensack Meadowlands Development Commission (HMDC) was created by an act of the New Jersey Legislature in 1968 and was passed into law in January 1969. The act gave the HMDC three mandates; environmental protection, economic development and solid waste management. HMDC district size is 19,730 acres, 32 square miles and is located in the Hackensack River Watershed.

Watershed Management Area 6: Upper and Mid Passaic, Whippany, Rockaway

Watershed Management Area 6 represents the area drained by waters from the upper reaches of the Passaic River Basin including the Passaic River from its headwaters in Morris County to the confluence of the Pompton River. WMA 6 is characterized by extensive suburban development and reliance upon ground water sources for water supply. WMA 6 lies in portions of Morris, Somerset, Sussex and Essex Counties and includes the Upper and Middle Passaic River, Whippany River and Rockaway River Watersheds.

Northwest Water Region: Watershed Management Areas 1, 2, and 11

The Northwest Water Region includes the most north and west portions of the state as well as western portions of the State that hug the Delaware River to the State capital, Trenton. The predominate land development within the Water Region is suburban and it includes mountainous portions of the State within the Valley and Ridge and Highlands physiographic provinces. WMAs 1 and 11 flow towards the Delaware River, whereas, WMA 2 includes the headwaters that flow towards New York and eventually flow to the Hudson River. This Region includes all of Warren County, and portions of Sussex, Morris, Hunterdon, Mercer and Monmouth counties.



Below are descriptions of the various Watershed Management Areas that make up the Northwest Water Region:

Watershed Management Area 1: Upper Delaware

Watershed Management Area 1 includes portions of Sussex, Morris, Hunterdon, and all of Warren counties. It contains 54 Municipalities. This area, also known as the Upper Delaware River Watershed encompasses 746 square miles in the mountainous northwestern corner of the state, within the Valley and Ridge and Highlands physiographic provinces.

Within Area 1 there are six major drainage basins: Delaware River, Flat Brook, Paulins Kill, Pequest River, Lopatcong and Pohatcong River Drainage, and the Musconetcong River. These drainage basins flow in a southeasterly direction to the Delaware River, providing an outstanding recreational resource for trout production and maintenance, as well as habitat for an abundance of wildlife including threatened and endangered species.

Watershed Management Area 2: Wallkill

Watershed Management Area 2 is also known as the Wallkill River Watershed and includes 11 townships in Sussex County. The Wallkill River Watershed is unique in that its headwaters begin at Lake Mohawk in Sparta Township and then flow north into New York, eventually emptying into the Hudson River.

The Wallkill Watershed is approximately 208 square miles in area, and is comprised of a variety of land uses including rural and centralized residential development, agriculture, commercial, recreational and industrial usage. Also located within this watershed area is the Wallkill National Wildlife Refuge. The refuge watershed/wetlands complex provides migratory and nesting habitats for numerous birds and waterfowl and is home to several endangered species.

Within Area 2, there are 4 subwatersheds: the Wallkill River, Pochuck Creek, Papakating Creek and Rutgers Creek Tributaries.

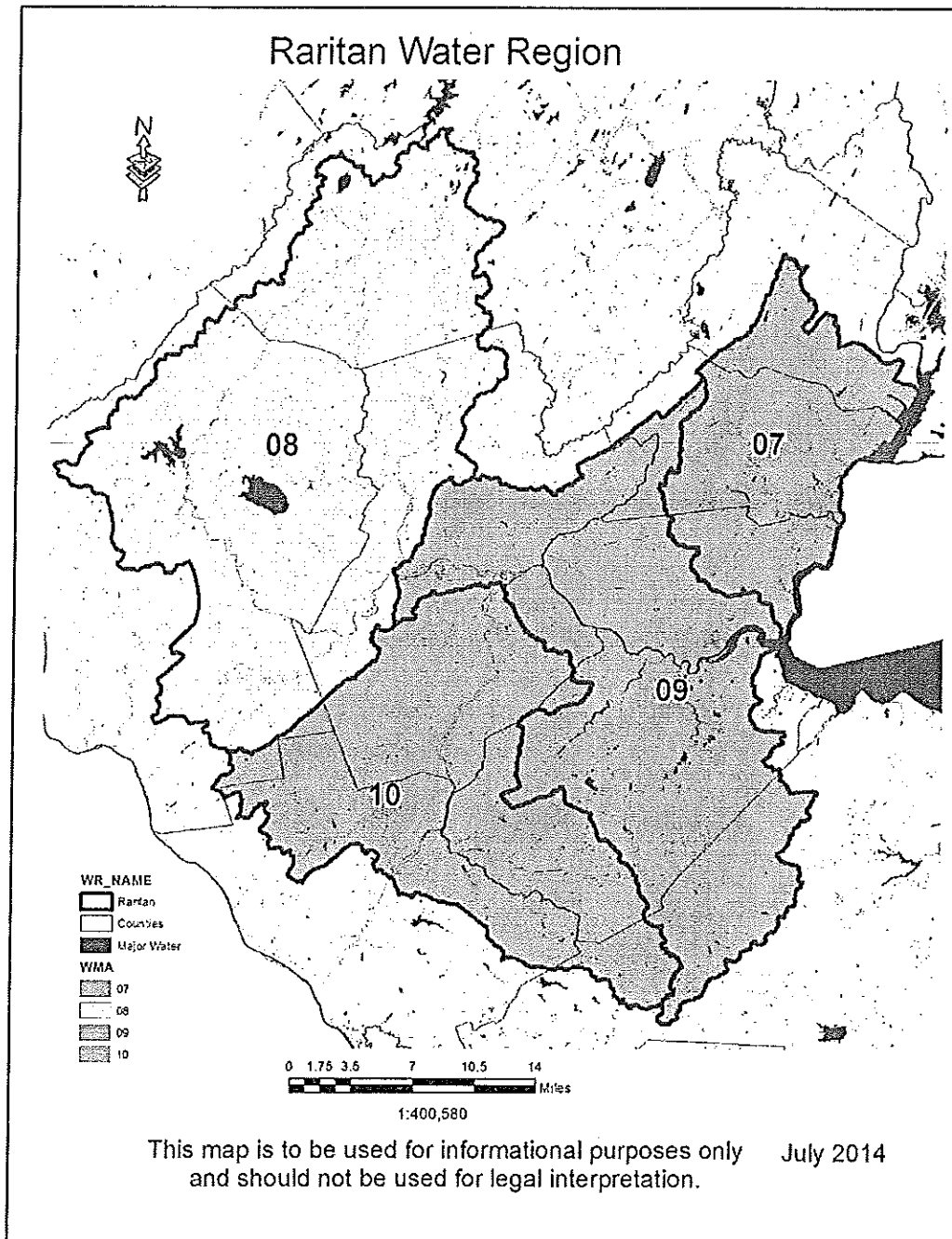
Watershed Management Area 11: Central Delaware

Watershed Management Area 11, known as the Central Delaware Tributaries, affects the drainage in 24 municipalities within the counties of Hunterdon, Mercer and Monmouth. The predominant drainage funnels to the Delaware River or the D&R Canal. Watershed Management Area 11 covers approximately 272 square miles and is dominated by the Assunpink Creek and its tributaries to the south and much smaller creeks in the northern portions. Land uses in this area range from agricultural to urban, most notably in our State Capital, the City of Trenton. The land area has also been heavily impacted by suburban development. Population for this area over the past 10 years has greatly increased, with its development stressing water resources and impacting water quality.

There are 4 subwatersheds in Area 11 that include Lockatong Creek/Wickecheoke Creek, Hakiwokake/Hariwokake/Nishisakawick Creek, Alexauken Creek/Moore Creek/Jacobs Creek and Assunpink Creek.

Raritan Water Region: Watershed Management Areas 7, 8, 9, and 10

The Raritan Water Region contains four watershed management areas that encompass intense development along major road corridors, residential areas mixed with rural woodlands, and scattered agricultural areas. It includes the densely populated areas of Middlesex, Monmouth, and Somerset Counties. Also contains portions of Essex, Union, Hunterdon and Morris Counties. The area drains primarily to three major rivers, Rahway, Raritan and Millstone Rivers.



Below are descriptions of the various Watershed Management Areas that make up the Raritan Water Region:

Watershed Management Area 7: Arthur Kill

Watershed Management Area 7 includes large portions of Essex, Union and Middlesex Counties.

The mainstem of the Rahway River is 24 miles long, flowing from Union into the Arthur Kill near Linden and is tidal from the Pennsylvania Railroad Bridge at Rahway down to the mouth. Major tributaries include the East Branch Rahway River, Woodbridge River and Robinson's Branch and major impoundments are the Middlesex Reservoir, Orange Reservoir, Lower and Upper Echo Lakes and Diamond Mill Pond. The Elizabeth River is 11 miles long, much of it channelized for flood control purposes. Land uses in the Rahway and Elizabeth Watersheds are principally residential, commercial and industrial. There are 50 NJPDES permitted discharges and 12 biological monitoring stations in these watersheds.

Watershed Management Area 8: North and South Branch Raritan

Watershed Management Area 8 includes the North and South Branches of the Raritan River and their tributaries. Large portions of Somerset, Hunterdon, and Morris Counties are included in this land area.

The North Branch of the Raritan River is 23 miles long and flows from northwestern Morris County through Somerset County to the confluence with the South Branch between the towns of Branchburg and Raritan. Major tributaries include the Peapack Brook, Rockaway Creek and Lamington River and the only major impoundment is Ravine Lake. Land use in the North Branch Raritan River Watershed is primarily rural, woodland and agricultural with scattered areas of commercial and residential but there is intense development along the major road corridors. There are over 20 NJPDES permitted discharges and 51 biological monitoring stations in this watershed.

The South Branch of the Raritan River is 51 miles long and flows from western Morris County through central Hunterdon County into western Somerset County before joining the North Branch. Major tributaries include the Neshanic River, Spruce Run Creek, Mulhockaway Creek and Cakepoulin Creek and major impoundments are the Spruce Run and Round Valley Reservoirs. Land use in the South Branch Raritan River Watershed is mostly agricultural, but suburban-industrial development is increasing at a rapid rate. There are approximately 23 NJPDES permitted discharges and 51 biological monitoring stations in this watershed.

Watershed Management Area 9: Lower Raritan, South River, Lawrence

Watershed Management Area 9 includes the mainstem of the Raritan River, the South River and Lawrence Brook. Middlesex, Somerset and Monmouth Counties make up most of the political geography of this WMA.

The mainstem of the Raritan River spans from the confluence of the North and South Branches to the Raritan Bay. For the most part, this drainage area is densely populated. There are two low dams in this

river, Fieldsville Dam and Calco Dam. Among the many small recreational lakes and ponds in this area are Watchung Lake, Surprise Lake, Spring Lake and Green Brook Pond (all manmade). Land use in the mainstem Raritan River Watershed is primarily urban/suburban, with industrial and commercial centers throughout. There are about 73 NJPDES permitted discharges and about 29 biological monitoring stations in this watershed.

The South River begins at Duhernal Lake in Spotswood and flows to the Raritan River at Sayreville. It is formed by the confluence of Manalapan and Matchaponix Brooks. Other tributaries include Deep River and Tennants Brook and major impoundments are Matchaponix Brook and South River. Land use in the upper part of this area, the Manalapan and Matchaponix Brooks subwatersheds, is predominantly agriculture and forests. New industrial and residential development is becoming incorporated into these areas and there is existing, older development in the South River subwatershed. There are about 5 NJPDES permitted discharges in the South River Watershed and 11 biological monitoring stations in the South River and Lawrence Brook Watersheds combined.

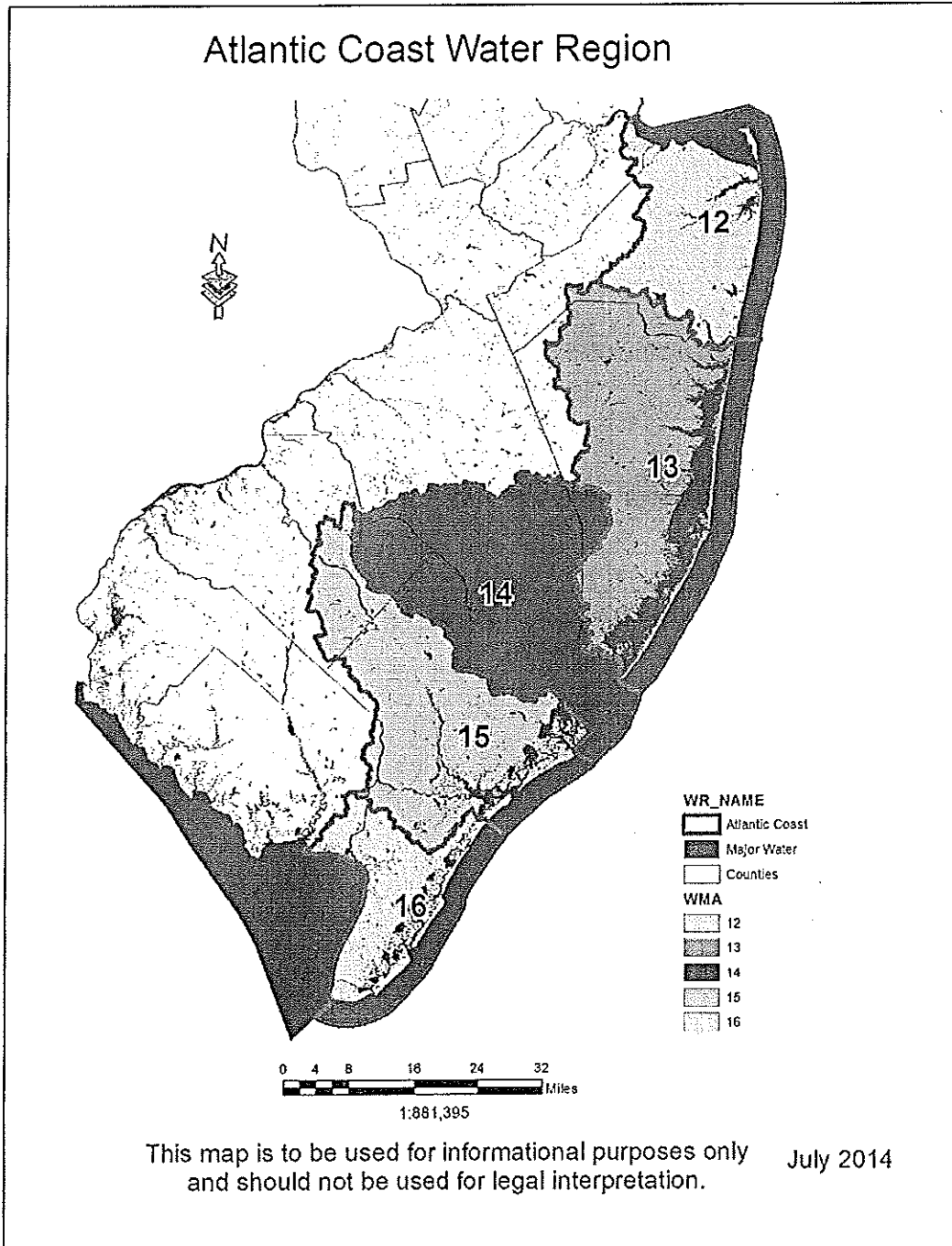
Watershed Management Area 10: Millstone

Watershed Management Area 10 includes the Millstone River and its tributaries. The Millstone River itself is a tributary to the Raritan River. This watershed lies in parts of Hunterdon, Somerset, Middlesex, Mercer and Monmouth Counties.

The Millstone River is 38 miles long and flows from Millstone Township in Monmouth County to the Raritan River near Manville and Bound Brook. Major tributaries include the Stony Brook, Cranbury Brook, Bear Brook, Ten Mile River, Six Mile River and Bedens Brook and the largest impoundment is Carnegie Lake. Land use in the Millstone Watershed is primarily suburban development with scattered agricultural areas although there is extensive, recent development present in the upper portion. There are over 40 NJPDES permitted discharges and 81 biological monitoring sites in WMA 10.

Atlantic Coast Water Region: Watershed Management Areas 12, 13, 14, 15, 16

The Atlantic Coast Water Region consists of the sub watersheds with drainage areas that flow to the Atlantic Ocean. The Water Region encompasses the Barnegat Bay, portions of the Pinelands, many large state forests and parks, as well as the highly developed Jersey shore. The Water Region has encountered new residential and commercial development at a faster rate than the rest of the State and some areas face the threat of salt water intrusion. Almost all of Monmouth, Ocean, Atlantic and Cape May counties are encompassed within this Water Region, and half of Burlington County and a small sections of eastern Middlesex, Gloucester and Camden counties.



Below are descriptions of the various Watershed Management Areas that make up the Atlantic Coast Water Region:

Watershed Management Area 12: Monmouth

Watershed Management Area 12 extends from Perth Amboy to Point Pleasant Beach. WMA 12 is comprised of an assemblage of coastal subwatersheds, all or a portion of which fall into 56 municipalities in the Raritan Bay and Atlantic Coastal drainage basins. Although the majority of impacted municipalities are in Monmouth County, several lie within the boundaries of Middlesex and Ocean Counties.

The Area 12 Watershed Management Partnership is composed of representatives of local, county, state and federal governments: representatives of six Regional Subwatershed Management Councils (Bayshore, North Coast/Shrewsbury River, Navesink Valley, Mid-Coast, South Coast and the Manasquan Valley); representatives of lake commissions and other watershed management groups; representatives of water purveyors; representatives of wastewater treatment authorities and facilities; representatives of military installations; representatives of the business community; representatives of the development community; representatives of environmental interest groups; representatives of the agricultural community; and of individual citizens, dedicated to enhancing and improving water quality throughout Watershed Management Area 12.

Watershed Management Area 13: Barnegat Bay

Watershed Management Area 13 includes watersheds that drain the central Atlantic drainage of New Jersey. The Barnegat Bay Watershed is a 660 square mile area encompassing all of the land and water in Ocean County, as well as parts of Monmouth County. The area lies mostly in Ocean County and includes the Barnegat Bay as well as the following subwatersheds: Metedeconk River, Toms River, Forked River, Cedar Creek.

The Toms River drains an area 124 square miles. It flows from western Ocean and Monmouth Counties southeast to Barnegat Bay at the town of Toms River, 11 miles north of Barnegat Inlet. This is an area of low relief, containing many small tributaries which feed into the Toms River. The larger tributaries include Davenports Branch, Union Branch and Wrangle Brook. The watershed also drains a large area of the Pinelands. Major impoundments include Success Lake and Horicon Lake. Population centers include Toms River, Lakehurst, Dover and Manchester.

This watershed lies in the Coastal Plain and is about one-half forested, with the remainder residential developments, a military installation and agriculture. There has been a substantial amount of new residential and commercial development throughout the watershed in the past five years. Of approximately 9 NJPDES permitted discharges within the watershed, half are industrial/commercial, and half are municipal/institutional. Waters have been classified as Pinelands (some of the Pinelands waters are also designated trout maintenance), FW-1, FW-2 Nontrout, and SE-1.

The Barnegat Bay National Estuary Program

The Barnegat Bay National Estuary Program (BBNEP) was created subsequent to the USEPA recognizing the Barnegat Bay/Little Egg Harbor estuarine system as an "estuary of national significance." The

restoration work done by the BBNEP compliments the Department's efforts to address identified water quality impairments within Watershed Management Area 13.

Watershed Management Area 14: Mullica

Watershed Management Area 14 includes watersheds draining portions of the Pinelands of New Jersey. Major rivers include the Mullica, the Wading River, Nochescatauxin Brook, Atsion Creek, the Bass River, Batsto River, Nescochaque Creek, Landing Creek, Hammonton Creek and the Oswego River. The area lies in Burlington, Atlantic and Ocean Counties and includes the following watersheds: Mullica River, Mechescatauxin Creek, Wading River, Atsion Creek, Batsto River and Doughty Creek.

The Mullica River and tributaries are considered the primary drainage system for the Pinelands. The total area of the drainage basin (Mullica River and tributaries) is some 561 square miles. Major tributaries within the watershed include the Wading River, Nochescatauxin Brook, Atsion Creek, the Bass River, Batsto River, Nesocochaque Creek, Landing Creek, Hammonton Creek and the Oswego River. The Mullica River empties into Great Bay, a large estuarine system. The population centers are Winslow, Galloway and Hammonton.

About 80 percent of this watershed consists of state parks and forests, with the remainder being agricultural and developed areas. Of the approximately 7 NJPDES permitted discharges here, roughly half are municipal/institutional and half are industrial/commercial. The streams are classified FW-Pinelands Waters, FW-1, FW-2 Nontrot and SE-1. Much of these waterways are incorporated in the New Jersey Wild and Scenic River System.

Watershed Management Area 15: Great Egg Harbor

Watershed Management Area 15 includes watersheds draining to Great Egg Harbor Bay in Atlantic County. The management area encompasses waters draining eastern Gloucester and Camden Counties. The area includes the following watersheds: Great Egg Harbor River, Tuckahoe River, Absecon Creek and Patong Creek.

The Great Egg Harbor River is 49 miles long and drains an area of 304 square miles. It originates in eastern Gloucester and Camden Counties, an agricultural and suburban area, before flowing through the Pinelands region. The river drains into Great Egg Harbor Bay before emptying into the Atlantic Ocean. The river is tidal downstream of the dam at Mays Landing.

The watershed's dominant land use is forests, with the remainder agricultural and development. Population centers include Berlin, Winslow, Monroe, Mays Landing and Egg Harbor City. The major tributaries are Hospitality Branch, Watering Race, Babcock Creek, Deep Run, South River and Stephens Creek. There are many lakes and ponds in this area, but the largest is Lake Lenape, near Mays Landing. Of the approximately 12 NJPDES permitted discharges here, about half are municipal and half are industrial/commercial. Waters in the Great Egg Harbor watershed are classified FW-2 Nontrot, Pinelands Waters, FW-1 and SE-1.

Watershed Management Area 16: Cape May

Watershed Management Area 16 includes watersheds draining the Cape May portion of New Jersey. The region includes Cape May County south and east of the Tuckahoe River Watershed. The region contains minimal surface water flow. Ground water and shellfish harvesting water quality are the principal water issues. No fixed physical/chemical fresh (surface) water monitoring locations are currently located within this management area. The area includes the following watersheds: Dennis Creek, Delaware Bay Coastal Drainage, Cape May Atlantic Coastal Drainage.

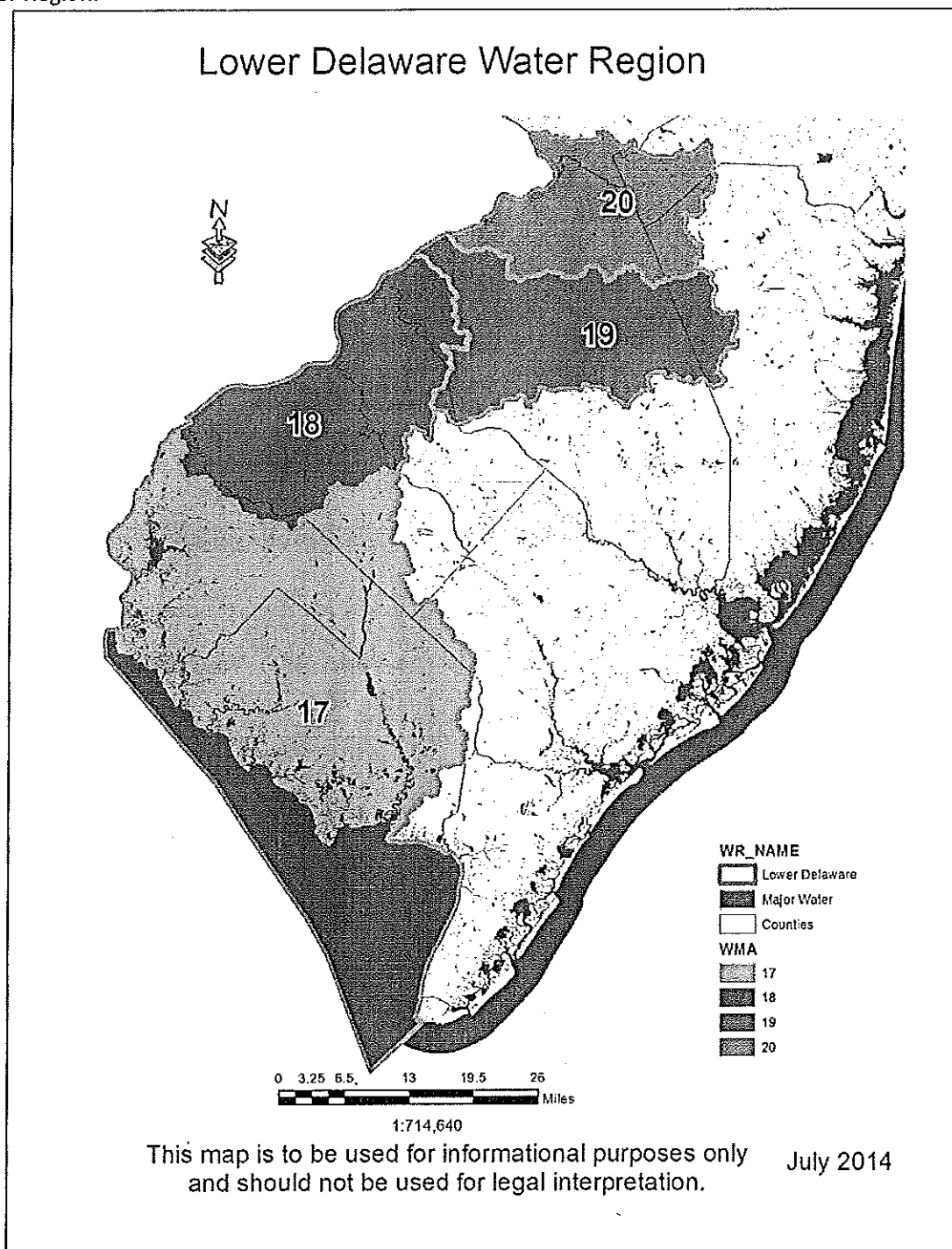
Cape May County is located at the southern-most point of New Jersey and represents a continuation of the Atlantic Coastal Plain. The county is 267 square miles in area and is bounded on the north by Atlantic and Cumberland Counties, on east by the Atlantic Ocean and on the west and south by the Delaware Bay. The region represents a low lying, gently rolling plain whose highest point is 54 feet above sea level and whose surface is largely covered by wet soils and wetlands. Large swamps (Great Cedar, Timber and Beaver Swamps) occupy the north-central part of the county. Most, if not all streams are tidal in their lower reaches and terminate by flowing into fresh water swamps that, in turn, discharge into saltwater marshes near the shore.

The county's permanent year-round population is about 77,000, with approximately 42 percent of the population residing on the barrier islands that comprise the eastern perimeter of the peninsula. The summertime population rises to 564,000 with 69 percent residing on the barrier islands.

As stated previously, one of the principal water resource issues within this management area is drinking water supply. The resource is largely dependent upon ground water that is in turn highly vulnerable to saltwater intrusion from the west, south and east, especially in the southern portion of the peninsula. The expected increase in population (an expected 68 percent by 2040) is predicted to put further stress on the already overextended water supply.

Lower Delaware Water Region: Watershed Management Areas 17,18,19, and 20

The Lower Delaware Water Region sub watersheds drain towards the Delaware River and Bay. The largest watershed in southern New Jersey is contained within this Water Region. Much of waterways throughout the Water Region have tidal influence. The area is characterized by moderate development scattered throughout agricultural areas and cropland. Part of the Pinelands area is also within this Water Region.



Below are descriptions of the various Watershed Management Areas that make up the Lower Delaware Water Region:

Watershed Management Area 17: Maurice, Salem, Cohansey

Watershed Management Area 17 includes the Cohansey River, Maurice River, Salem River and Alloway, Dividing, Manantico, Manumuskin, Miles, Mill, Stow and Whooping Creeks. This area includes portions of Atlantic, Cumberland, Gloucester and Salem Counties, over 39 municipalities and encompasses 885 square miles.

The Cohansey River is nearly 30 miles long, draining 105 square miles of eastern Salem County to the Delaware Bay. This is an area of very low relief, which results in numerous small tributaries. Sunset Lake and Mary Elmer Lake are among 20 major impoundments in this drainage basin. The main land use of this watershed is agriculture, but much of this land is forested.

The Maurice River has a drainage area of 386 square miles and meanders south for 50 miles through Cumberland County to the Delaware Bay. The major tributaries of this river are Scotland Run, Manantico Creek, Muskee Creek, Muddy Run and the Manumuskin River. There are about 20 major lakes in this area of which Union Lake is the largest. The principal use in this watershed is also agriculture.

The Salem River drains an area of 114 square miles and flows 32 miles from Upper Pittsgrove Township west to Deepwater, then south to the Delaware River. The area lies within Salem County, the major population center being Salem City. Much of the lower portions of the river are tidal. Major tributaries of the Salem River include Mannington Creek, Game Creek, Majors Run and Fenwick Creek. Land use in this watershed is about 40% cropland, with the rest of woodland, tidal/freshwater marsh, urban and pasture.

Watershed Management Area 18: Lower Delaware

Watershed Management Area 18 includes the Cooper River, Big Timber, Mantua, Newton, Oldmans, Pennsauken, Pompeston, Raccoon, Repaupo and Woodbury Creeks, as well as Baldwin Run, Swede Run and Maple Swamp. This management area covers all or parts of Burlington, Camden and Gloucester counties, including 68 municipalities encompassing 391 square miles.

The Cooper River is 16 miles long and its watershed encompasses an area of 40 square miles. The River flows through Camden County to the Delaware River at Camden City.

Big Timber Creek drains an area of 63 miles. The mainstem and most of the south branch divide Gloucester and Camden Counties before flowing into the Delaware River near Brooklawn, south of Camden.

Mantua Creek drains an area of 50.9 square miles of land. From its headwater in Glassboro, Mantua Creek flows 18.6 miles northwest to the Delaware River at Paulsboro.

Oldmans Creek drains an area of 44 square miles and flows on the Coastal Plain to the Delaware River. This Creek, 20 miles long, marks the boundary between Gloucester and Salem Counties.

The Pennsauken Creek drains 33 square miles of southwestern Burlington County and northern Camden County. This creek flows into the Delaware near Palmyra, New Jersey. The North Branch of the Pennsauken is in Burlington County, while the south branch is the boundary between Burlington and Camden Counties.

The Raccoon Creek Watershed contains approximately 40 square miles and drains central Gloucester County. The Creek itself is 19 miles long and flows from Elk Township to the Delaware River, across from Marcus Hook, Pennsylvania.

Woodbury Creek is five miles long and drains 18 square miles. It is the smallest watershed in Gloucester County.

Watershed Management Area 19: Rancocas

Watershed Management Area 19 is the largest watershed in south central New Jersey, and is comprised of the North Branch, South Branch and Mainstem of the Rancocas Creek, including Mill Creek. Portions of Burlington, Camden, and Ocean Counties, and approximately 33 municipalities are included in this management area which covers 360 square miles, and reaches deep into the Pinelands.

Of the 360 square miles, the North Branch drains 167 square miles and 144 miles is drained by the South Branch. The North Branch is 31 miles long and is fed by the Greenwood Branch, McDonalds Branch and Mount Misery Brook. The major tributaries to the South Branch include the Southwest Branch Rancocas Creek, Stop the Jade Run, Haynes Creek and Friendship Creek.

The mainstem flows about 8 miles and drains an area of approximately 49 square miles before emptying into the Delaware River at Delanco and Riverside. Tidal influence occurs for about 15 stream miles extending the entire length of the mainstream to the dam at Mount Holly on the North Branch, Vincentown on the South Branch and Kirby Mills on the Southwest Branch.

Watershed Management Area 20: Assiscunk, Crosswicks, Doctors

Watershed Management Area 20 includes the Assiscunk, Blacks, Crafts, Crosswicks, Doctors, Duck and Mill Creeks. This management area includes 26 municipalities spanning four counties: Burlington, Mercer, Monmouth and Ocean encompassing 253 square miles.

Crosswicks Creek is 25 miles long and drains an area of 146 square miles to the Delaware River at Bordentown. Major tributaries include Jumping Brook, Lahaway Creek, North Run and Doctors Creek. Tides affect this stream up to the Crosswicks Mill Dam. Allentown Lake, Oakford Lake, Prospertown Lake and Imlaystown Lake are major impoundments in the Crosswicks Creek Watershed.

Element 2: Threats to Aquatic Resources

As one of the most densely populated states, NJ's population and resource consumption put stress on the remaining open spaces, including forest, wetlands, barren and agricultural lands. Between 2002 and 2007, NJ's population increased by 1.2%, whereas urban growth and development increased 5.3% during the same time frame¹. Urbanization stresses the State's natural resources causing: changes to ecosystem functions; habitat fragmentation; increased storm water run-off, which in turn causes additional pollution, sedimentation, and volume and velocity issues to aquatic resources; and the introduction of invasive species/pests and pathogens. Additional threats to the State aquatic resources include climate change and sea level rise.

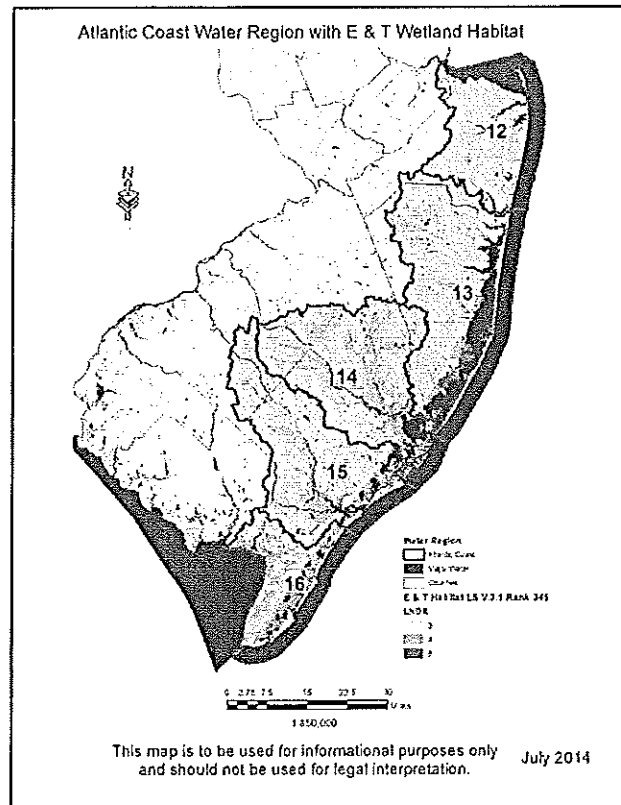
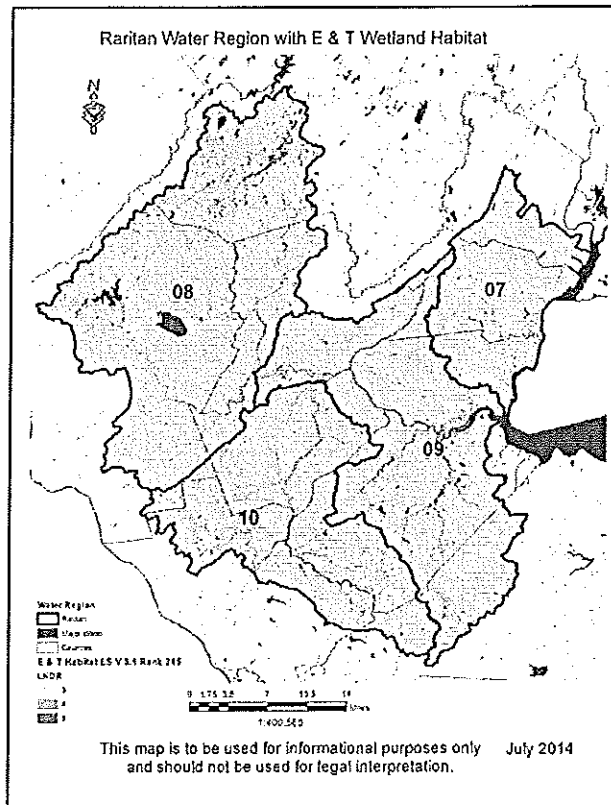
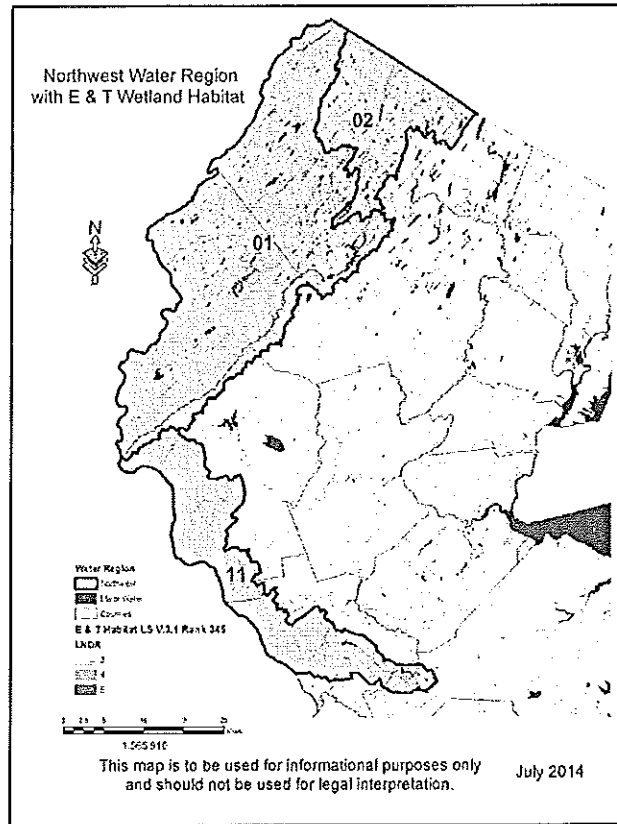
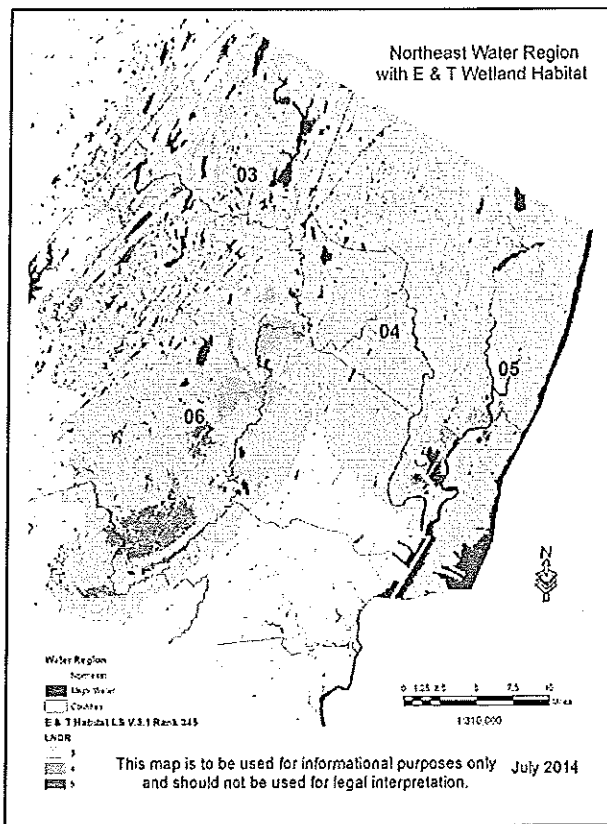
Habitat Loss and Fragmentation

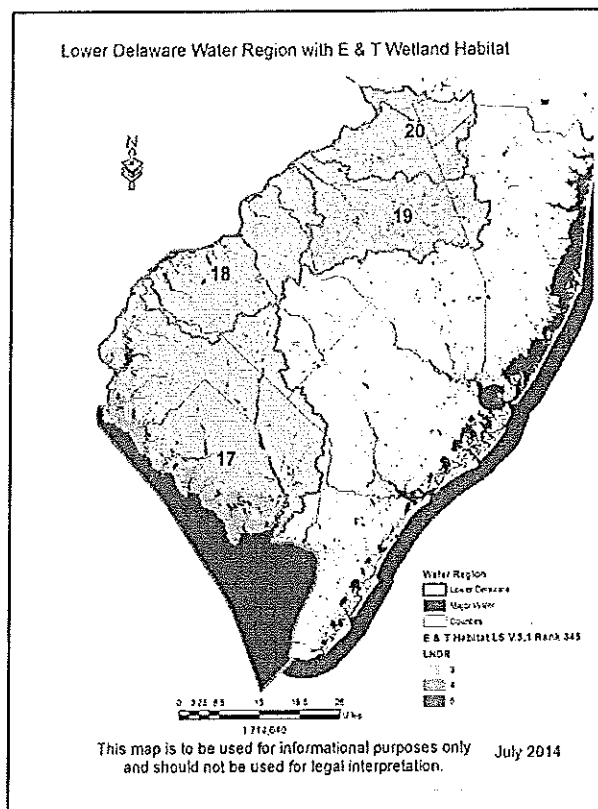
New Jersey hosts a variety of animal and plant species, of which, 356 plant species, 17% of the state's flora, and 83 animal species, 16% of the state's animal species, are listed on the State's endangered and threatened lists. New Jersey has a wide range of biodiversity due to the wide variety of habitats, including inland and coastal wetlands habitats. The Landscape Project data identifies critical areas for imperiled species based on land use (land cover classification) and imperiled species locations. Based on this data, 774,973 acres have been identified as wetlands habitat for State threatened and endangered species.

The Planning Framework and use of ILF monitory contributions will be used to identify and purchase those lands that provide for the protection of habitat or the extension of critical habitat corridors within each prospective geographic service area. In most cases, the larger the protected habitat area is, the more beneficial it is to the species and for protecting the integrity of the habitat. Additionally, the Council can identify areas of wetlands habitat that are critical to a particular species or provide for the protection of wetlands that host species that are not currently located within protected areas. For example, "although 40% of endangered plant species have at least one verified population located on state protected land, 60% do not²."

¹ Hasse, John E. and Richard G. Lanthrop. *Changing Landscapes in the Garden State: Executive Summary*. Glassboro: Rowan University and Rutgers, The State University of New Jersey, 2010. Page 5.

² NJDEP Office of Science. *Environmental Trends Report: Endangered Plants*. <http://www.state.nj.us/dep/dsr/trends>: New Jersey Department of Environmental Protection, 2013. Page 4.





Altered Hydrology

New Jersey's waterways have been altered through historical development trends, run-off, pollution, dams, and other natural events.

Decades of observation of the effects of human alterations of natural flow regimes have established that altering the hydrologic regimes in rivers can be ecologically deleterious. Many argue that stream flow quantity and times are critical factors that affect the ecological integrity of river systems. Additionally, many studies have documented ecological responses to alterations of the natural flow regime; examples include fish life-cycle disruption, encroachment of vegetation, loss of sensitive aquatic-invertebrate species, and loss of fish access to backwaters and wetlands.³

In addition, the EPA has summarized the impacts (below in the text box⁴) that altered streams and wetlands areas have on the natural environment and water quality.

Alteration of natural hydrologic regimes is a consistent and pervasive effect of urbanization within stream ecosystems, as discharge patterns—the amount and timing of water flow through streams—change with urban development. Key aspects of urbanization affecting hydrology may include:

- ↓ infiltration and ↑ surface runoff of precipitation associated with impervious (and effectively impervious) surfaces
- ↑ speed and efficiency of runoff delivery to streams, via stormwater drainage infrastructure
- ↓ evapotranspiration due to vegetation removal
- ↑ direct water discharges, via wastewater and industrial effluents
- ↑ infiltration due to irrigation and leakage from water supply and wastewater infrastructure
- ↑ water withdrawals and interbasin transfers

Commonly reported effects of urbanization on stream flow regimes include (but are not limited to):

STORMFLOW

- ↑ high flow frequency
- ↑ high flow magnitude
- ↑ flashiness or rapidity of flow changes
- ↓ high flow duration
- ↓ lag time

BASEFLOW

- ↓ low flow magnitude
- ↑ low flow magnitude
- ↑ low flow duration

These hydrologic changes can reduce habitat quality in urban streams, and adversely affect stream biota. For example, high flows can scour organisms and substrate from streambeds, while low flows can reduce habitat area and volume.

³ Kennen, J.G., Riskin, M.L., Riley, P.A., and Colarullo, S.J. "Method to Support Total Maximum Daily Load Development using Hydrologic Alteration as a Surrogate to address Aquatic Life Impairment in New Jersey Streams." 2013. <http://pubs.usgs.gov/sir/2013/5089/>. Page 9.

⁴ Environmental Protection Agency. *Flow Alteration in Urban Streams*. 31 July 2012. http://www.epa.gov/caddis/ssr_urb_hyd1.html. 12 June 2014.

When the NJ legislature passed the "Soil Erosion and Sediment Control Act" (N.J.S.A. 4: 24), it found: that sediment is a source of pollution and that soil erosion continues to be a serious problem throughout the State, and that rapid shifts in land use, from agricultural and rural to nonagricultural and urbanizing uses, construction of housing, industrial and commercial developments, and other land disturbing activities have accelerated the process of soil erosion and sediment deposition resulting in pollution of the waters of the State and damage to domestic, agricultural, industrial, recreational, fish and wildlife, and other resource uses. It is, therefore, declared to be the policy of the State to strengthen and extend the present erosion and sediment control activities and programs of this State for both rural and urban lands, and to establish and implement, through the State Soil Conservation Committee and the Soil Conservation Districts, in cooperation with the counties, the municipalities and the Department of Environmental Protection, a Statewide comprehensive and coordinated erosion and sediment control program to reduce the danger from storm water runoff, to retard nonpoint pollution from sediment and to conserve and protect the land, water, air and other environmental resources of the State.⁵

This Act combined with its regulations, and the rules governing wetlands in the State, seek to reduce the impact of development by reducing the alteration of hydrologic functions. Consistent with these goals, the Council, using the ILF funds, can identify wetland areas in need of preservation, enhancement or creation near streams and their buffers that are at risk of being impacted adversely due to stream alteration.

Nutrient Enrichment and Sedimentation

New Jersey continually performs ambient water studies and regularly updates its *Surface Water Quality* trends report. The DEP states in its report that the impact of nutrients on water quality is influenced by other environmental factors such as sunlight availability, stream velocity, and water clarity⁶. The DEP found that total Phosphorous (TP) remains one of the most frequent pollutants causing use impairment of the State's surface waters. Temperature is the predominant cause of impairment of waters classified for trout production or trout maintenance, and temperature exceedances are generally associated with loss of riparian buffers and tree canopies⁷. Arsenic is a predominant cause of impairment of the drinking water supply use⁸.

The DEP's most recent water tend studies (1984 to 2004 period and 1998-2007 period) show that total phosphorus, pH, dissolved oxygen and organic nitrogen plus ammonia have improved or stabilized throughout the State⁹. Both studies showed increasing concentrations of total dissolved solids (TDS) at many of the stations sampled. TDS is comprised of minerals and other substances dissolved in water. High TSD levels may impact drinking water, and can negatively affect aquatic ecosystems. TDS has been linked to runoff from urban and agricultural areas¹⁰. The 1998 to 2007 study also showed increasing levels of nitrate plus nitrite at a number of stations¹¹. Rising levels of TSDs in many streams are also

⁵ "N.J.S.A. 4: 24 ." "Soil Erosion and Sediment Control Act". 1975.

⁶ NJDEP Office of Science. *Surface Water Quality-Rivers and Streams: Chemical and Physical Measurements*. <http://www.state.nj.us/dep/dsr/trends>: New Jersey Department of Environmental Protection, 2012. Page 3.

⁷ ----. Page 3.

⁸ ----. Page 3.

⁹ ----. Page 4.

¹⁰ ----. Page 4

¹¹ ----. Page 4.

cause for concern. Road salting and improper salt storage are major contributors to TDS concentrations¹². NJ has recently passed an aggressive fertilizer law that serves to decrease the total amount of nitrogen in fertilizer and increase the amount of slow release nitrogen to 20 percent. Effective **January 5, 2013**, all fertilizer products sold in New Jersey for turf must contain at least 20 percent slow-release nitrogen and zero percent phosphorus unless a soil test demonstrates a need for phosphorus to be added.

By identifying and restoring, enhancing and preserving wetlands areas around the State's most polluted waters or water of significance, the ILF program can reduce the impact of pollutants and stormwater on the State's waters.

Invasive Species

The following is an excerpt from *The New Jersey Strategic Management Plan for Invasive Species*, which describes some of the threats posed by invasive species.

New Jersey has abundant biodiversity, natural resources and agricultural resources that are highly worth protecting for our citizens, both present and future. Seventy percent of our state consists of agricultural lands and natural habitats. A snapshot of our wealth includes 850,000 acres of agricultural lands, 2.1 million acres of forest cover, 52 globally rare and federally listed species and over 2,100 species of native plants (including 55 species of orchids, which is more than Hawaii). These natural resources provide ecosystem goods (e.g., agricultural commodities, timber, fish) and services (e.g., flood control, carbon sequestration), the combined value of which is estimated at \$20 billion per year. Wildlife-related tourism is estimated to provide an additional \$3 billion per year of gross economic activity. However, our natural and agricultural resources are being damaged by non-native, invasive species which are transforming our resources in undesirable ways. These animals, plants and pathogens are pervasive throughout the state, are steadily increasing in abundance and numbers of species, and already are imposing a significant cost to the public and private sectors. Further damage to our State's economy and ecology is inevitable if New Jersey does not take a proactive role toward managing invasive species.

The economic impact of invasive species on New Jersey agriculture is estimated at \$290 million per year, or 33 percent of New Jersey's total agricultural cash receipts. One prominent example of the economic impact is New Jersey's oyster industry, which has been nearly destroyed by two invasive pathogens. Other obvious negative impacts range from the loss of over 21,000 mature trees due to Asian longhorned beetle infestations in Union and Middlesex counties and increased mosquito bites due to the invasive Asian tiger mosquito, to extremely rare but severe events such as human mortality caused by West Nile Virus. In addition, invasive species have created profound impacts including modification of whole forest types and local extinction of rare species. Approximately 1,000 plant species, or about 30 percent of the State's flora are non-native. The consensus of field scientists is that invasive plant species probably cover hundreds of thousands of acres in our state. Invasive species are considered the greatest threat to

¹² ----, Page 5.

biodiversity after outright habitat destruction. In the United States, 40 percent of federally threatened and endangered species are at risk from invasive species.¹³

Enhancement projects funded through the ILF program could provide for the removal of invasive species, while preservation and creation projects could help fight against the spread of invasive species.

Climate Change and Sea Level Rise

Climate change and sea level rise pose threats to the State's aquatic resources. It is predicted that spring melts will begin up to 14 days earlier and earlier runoff produces lower late-summer stream flows, which stress human and environmental systems through less water availability and higher water temperatures¹⁴. In NJ, long-term data document a significant increase in average temperature, a significant increase in precipitation, and a significant rise in sea level that are consistent with observed and predicted global trends, and data shows a statistically significant rise in average statewide temperature over the 118 years¹⁵. The departure from normal has significantly increased over this period indicating that average annual temperatures are consistently greater than the longer term average¹⁶. Average temperatures across the Northeast have risen more than 1.5 degrees Fahrenheit (°F) since 1970, with winters warming most rapidly—4°F between 1970 and 2000¹⁷. Natural ecosystems in New Jersey will also be impacted by warmer temperatures and associated changes in the water cycle. These changes could lead to loss of critical habitat and further stresses on some already threatened and endangered species, impacts on water supply and agriculture, more intense rain events, more frequent periods of extended dryness, and continued increases in fires, pest, disease pathogens, and invasive weed species¹⁸.

Along with the changes in temperature, precipitation has also increased since 1895, making flooding and stream alteration due to increased water levels and velocity serious threats to the State aquatic resources¹⁹. Data shows a statistically significant increasing trend since 1895 in total annual precipitation and the departure from normal as there is a pronounced year-to-year variation²⁰. Although steady or significant precipitation is projected for New Jersey's future climate, there is considerable uncertainty with respect to magnitude of change from the baseline as well as seasonality of the change that is subject of active research²¹.

In addition to increased temperatures and precipitation, climate change also plays a role in the uptake in frequency of extreme weather events. Since 1988, the state has experienced a string of extreme events

¹³ New Jersey Invasive Species Council. *New Jersey Strategic Management Plan for Invasive Species*. Trenton, NJ, 2009. Page vi.

¹⁴ NJDEP Office of Science. *Climate Change in New Jersey: Trends in Temperature, Precipitation, Extreme Events and Sea Level*. <http://www.state.nj.us/dep/drs/trends>: New Jersey Department of Environmental Protection, 2013. Page 1.

¹⁵ ----, Page 1.

¹⁶ ----, Page 1.

¹⁷ Union of Concerned Scientists. *New Jersey: Confronting Climate Change in the U.S. Northeast*. Cambridge, MA: Northeast Climate Impacts Assessments (NECIA), 2007. Page 1.

¹⁸ NJDEP Office of Science. *Climate Change in New Jersey: Trends in Temperature, Precipitation, Extreme Events and Sea Level*. <http://www.state.nj.us/dep/drs/trends>: New Jersey Department of Environmental Protection, 2013. Page 4.

¹⁹ ----, Page 3.

²⁰ ----, Page 3.

²¹ ----, Page 3.

including Hurricane Sandy, which struck NJ in October 2012. It is the latest in a line of recent weather and climate extremes including:

- Major floods in 1999, 2004, 2005, 2006, 2007, 2010, 2011
- The snowiest February (2010), January (2011), October (2011) of record
- Eight of the 10 warmest summers have occurred since 1999 based on the period of 1895 to present, and
- Thirty-seven of 51 months from July 1998- September 2002 had below average precipitation²².

While increasing variability and extremes are expected in the future, the nature and magnitudes of the extremes still represent an area of great uncertainty²³. (p3)

Another threat to NJ's aquatic resources is sea level rise. Data from the National Oceanic and Atmospheric Administration (NOAA) show that the sea level at the NJ coastal sites of Atlantic City, Cape May and Sandy Hook has risen at a rate of approximately 4 mm/year since recording began in early-to-mid 1900s²⁴. While the precise rate of sea level rise is uncertain, current models indicate that climate change will cause the rate to increase. Based on the trend of sea level rise from 1961 through 2003, sea level would rise by almost 6-inches by the end of this century in the absence of any effects of climate change²⁵. Taking climate change into account, sea level is projected to rise between 7 and 21 inches by 2100²⁶. This increase would result in the threat of more sustained storm surges, increased coastal erosion, escalating inundation of coastal wetlands and saline intrusion²⁷. The State is especially vulnerable to significant impacts due to geologic subsidence, the topography of the coastline, current coastal erosion, and a high density of coastal development²⁸. Sea level rise in line with median projections would threaten a majority of NJ's coastline, and these effects will be magnified during storm events, increasing the severity of storm-related flooding in coastal and bay areas.

"Rising sea levels caused by global warming are projected to increase the frequency and severity of damaging storm surges and flooding, harming not only the State's coastal communities, infrastructure, transportation systems, and industry, but also its critical coastal wetlands."²⁹ Continued sea level rise will also threaten homes and businesses along the State's 83 miles of shoreline along the coastal bays³⁰. "These ecologically important salt marches and estuaries serve as critical feeding grounds for migrating waterfowl and other birds (making Cape May arguably the Northeast's top bird-watching area), and nursery habitat for important commercial fish such as menhaden and blue crab³¹."

Therefore continued protection of the State coastal wetlands through the State's regulations and the ILF program is important to help mitigate against the impact of climate change and sea level rise.

²² ----, Page 3.

²³ ----, Page 3.

²⁴ NJOEM- Recovery Bureau. *New Jersey State Hazard Mitigation Plan*. Trenton, NJ : New Jersey Office of Emergency Management, 2014. Page Sec4: p96.

²⁵ ----, Page Sec4:p96.

²⁶ ----, Page Sec4:p96.

²⁷ ----, Page Sec4:p96.

²⁸ NJDEP Office of Science. *Climate Change in New Jersey: Trends in Temperature, Precipitation, Extreme Events and Sea Level*. <http://www.state.nj.us/dep/drs/trends>: New Jersey Department of Environmental Protection, 2013. Page 4.

²⁹ Union of Concerned Scientists. *New Jersey: Confronting Climate Change in the U.S. Northeast*. Cambridge, MA: Northeast Climate Impacts Assessments (NECIA), 2007. Page 3.

³⁰ ----, Page 3

³¹ ----, Page 3

ELEMENT 3: Historic Aquatic Resource Loss

It is estimated that New Jersey lost 39% of its wetlands between 1870 and 1970 and an additional 20% between 1950 and 1970 prior to the enactment of NJ's Wetland Act of 1970 and the NJ Freshwater Wetlands Protection Act of 1987³². Data observed in 2002 show that approximately 1,755 acres of wetlands were lost per year between 1986 and 1995. In 2002, approximately 15% of New Jersey's land was freshwater wetlands, while 4% was tidal wetlands³³. According to *Changing Landscapes in the Garden State*, executive summary, wetlands continued to be lost to urban growth with net acreage of wetlands loss totaling 8,652 acres statewide between 2002 and 2007³⁴. This is an annual rate of loss 1,730 acres per year, which is slightly less than the annual loss between 1995 and 2002 at 1,842 acres per year³⁵.

The net loss of wetlands masks some of the positive trends that have occurred in wetlands management from 2002-2007 versus 1995-2002. Namely, there has been a significant drop in the rate of wetlands changing into urban classes- from 1,601 acres per year urbanized to 1,118 acres per year, which is a 30% drop³⁶. While this is a positive trend, wetland loss continues to be a major threat to the State's water resources and natural protection against pollution and flooding.

With the ILF program, NJ should focus on restoring wetlands lost due to secondary impacts, along tidal areas, and other forested areas where wetlands are lost even though they are not filled for development purposes.

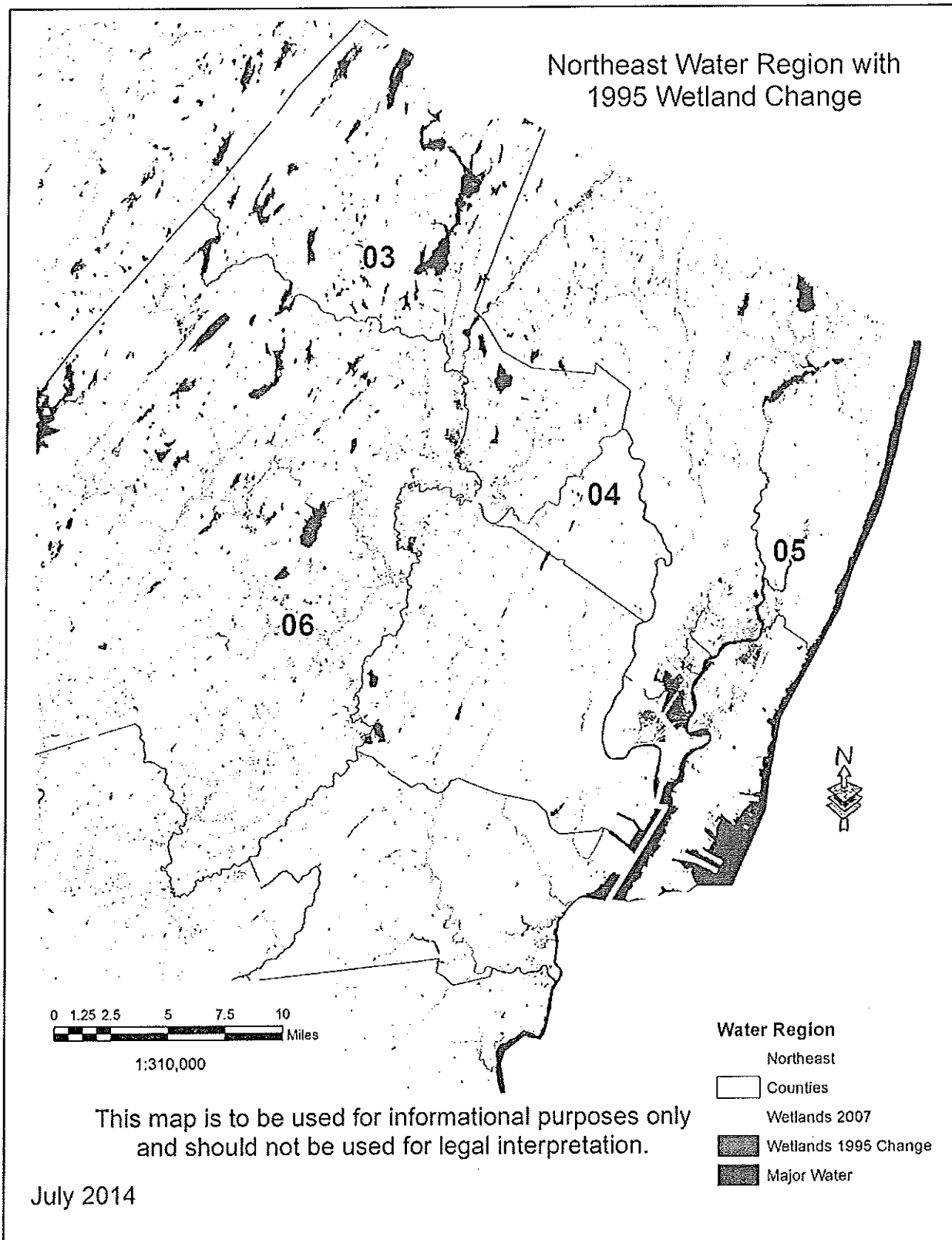
³² NJDEP Office of Science, Research, and Technology. "Background Information for "Creating Indicators of Wetlands Status (Quantity and Quality): Freshwater Wetland Mitigation in New Jersey"." 2002. Page 1.

³³ ----. Page 1.

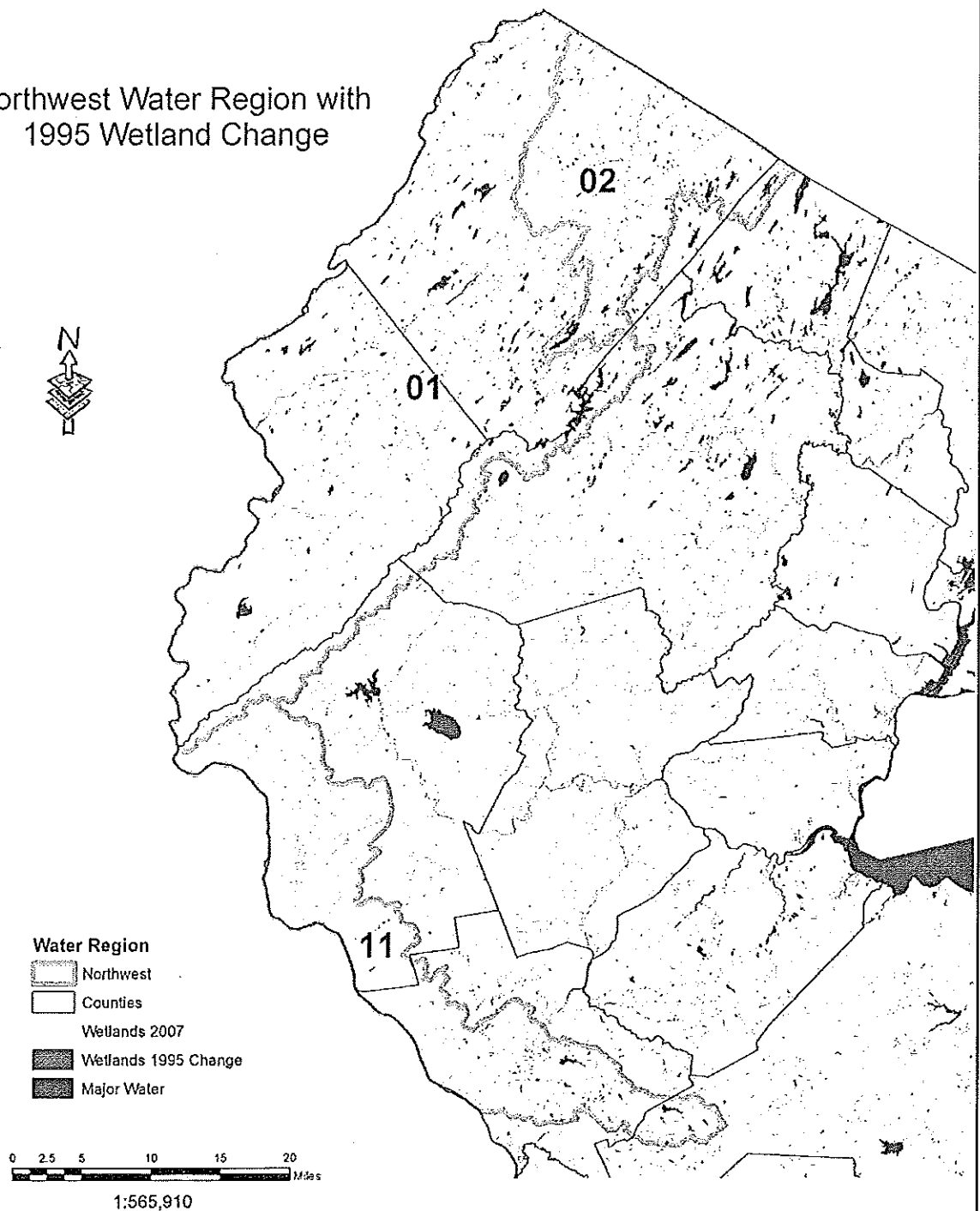
³⁴ Hasse, John E. and Richard G. Lanthrop. *Changing Landscapes in the Garden State: Executive Summary*. Glassboro: Rowan University and Rutgers, The State University of New Jersey, 2010. Page 11.

³⁵ ----. Page 12.

³⁶ ----. Page 12.



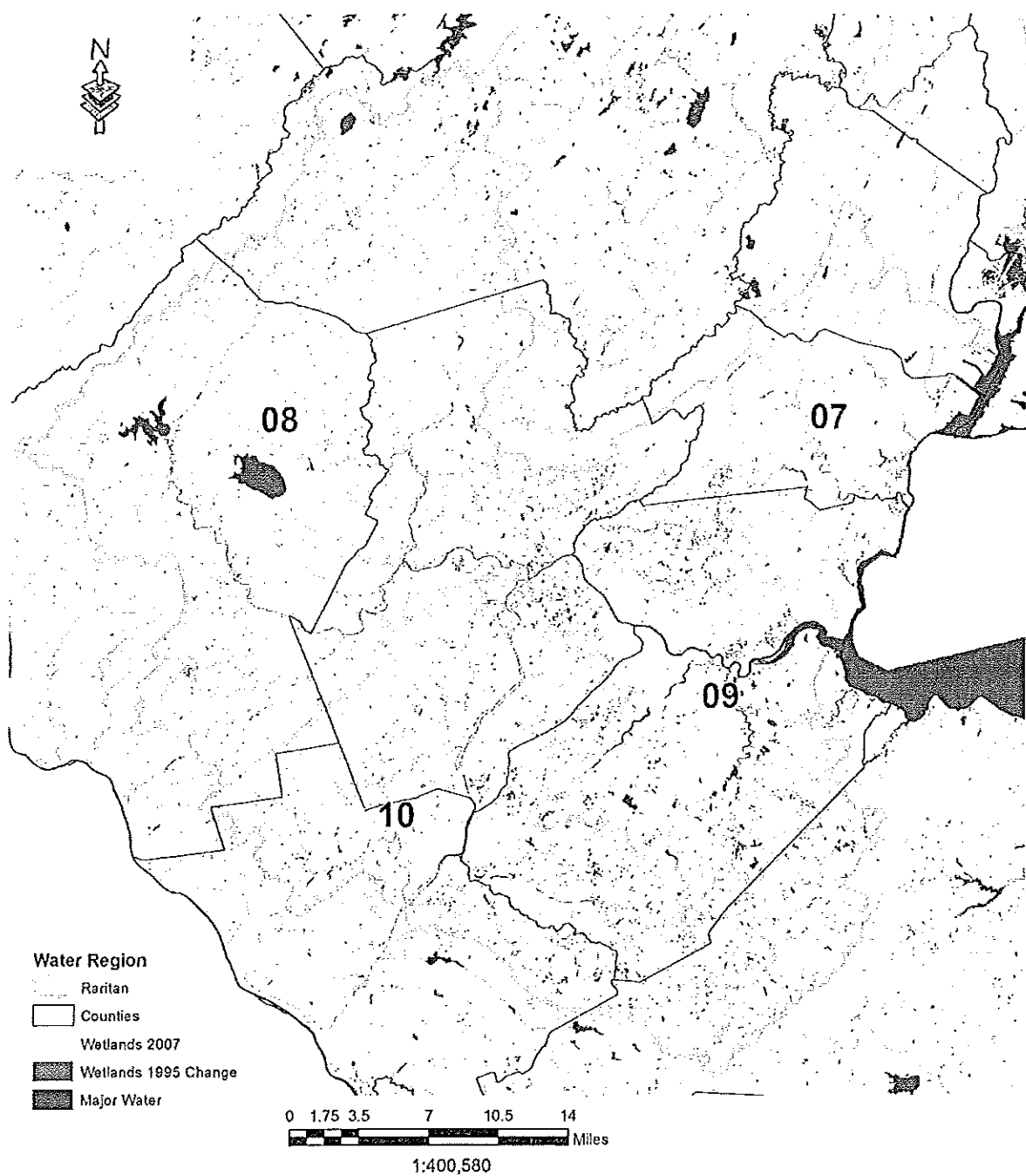
Northwest Water Region with 1995 Wetland Change



This map is to be used for informational purposes only
and should not be used for legal interpretation.

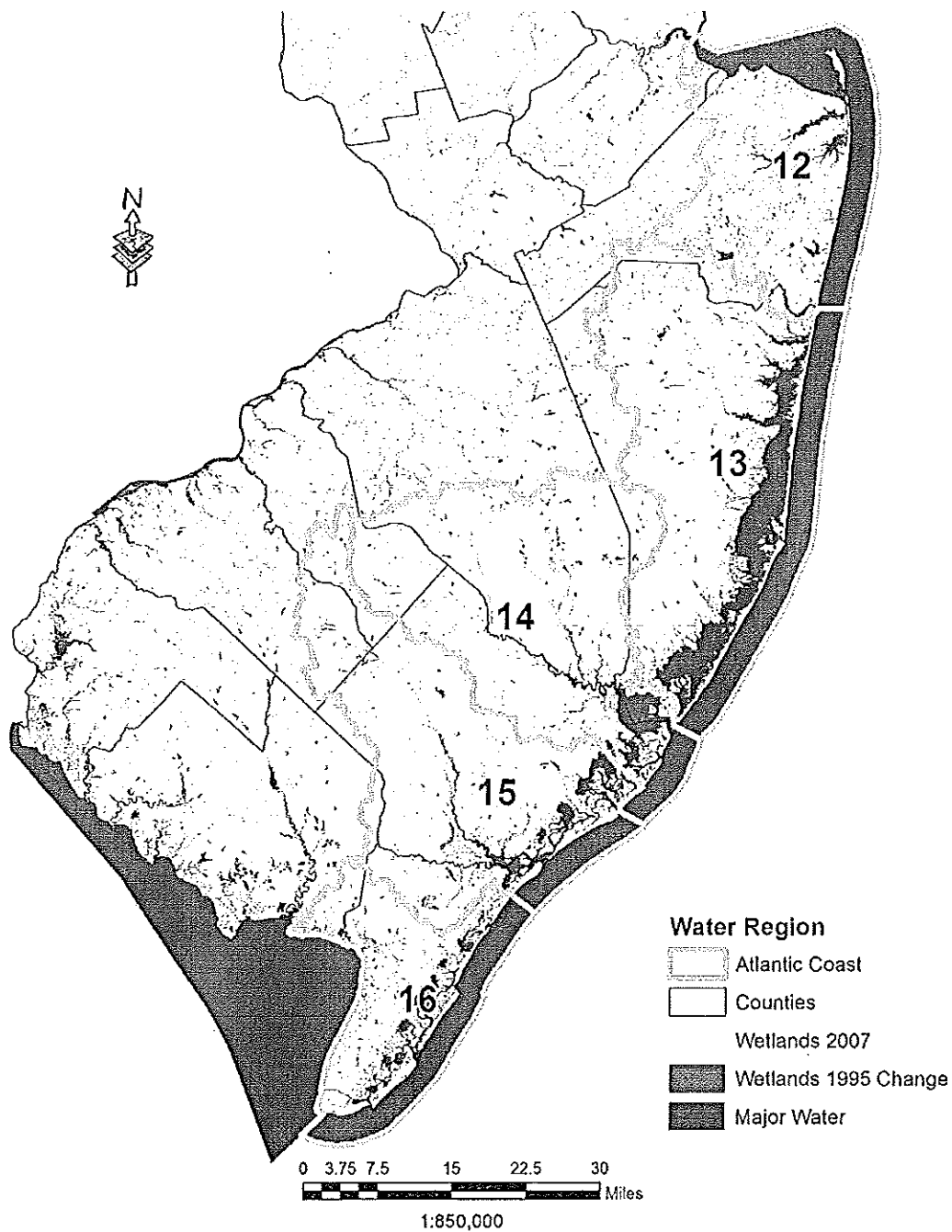
July 2014

Raritan Water Region with 1995 Wetland Change



This map is to be used for informational purposes only July 2014
and should not be used for legal interpretation.

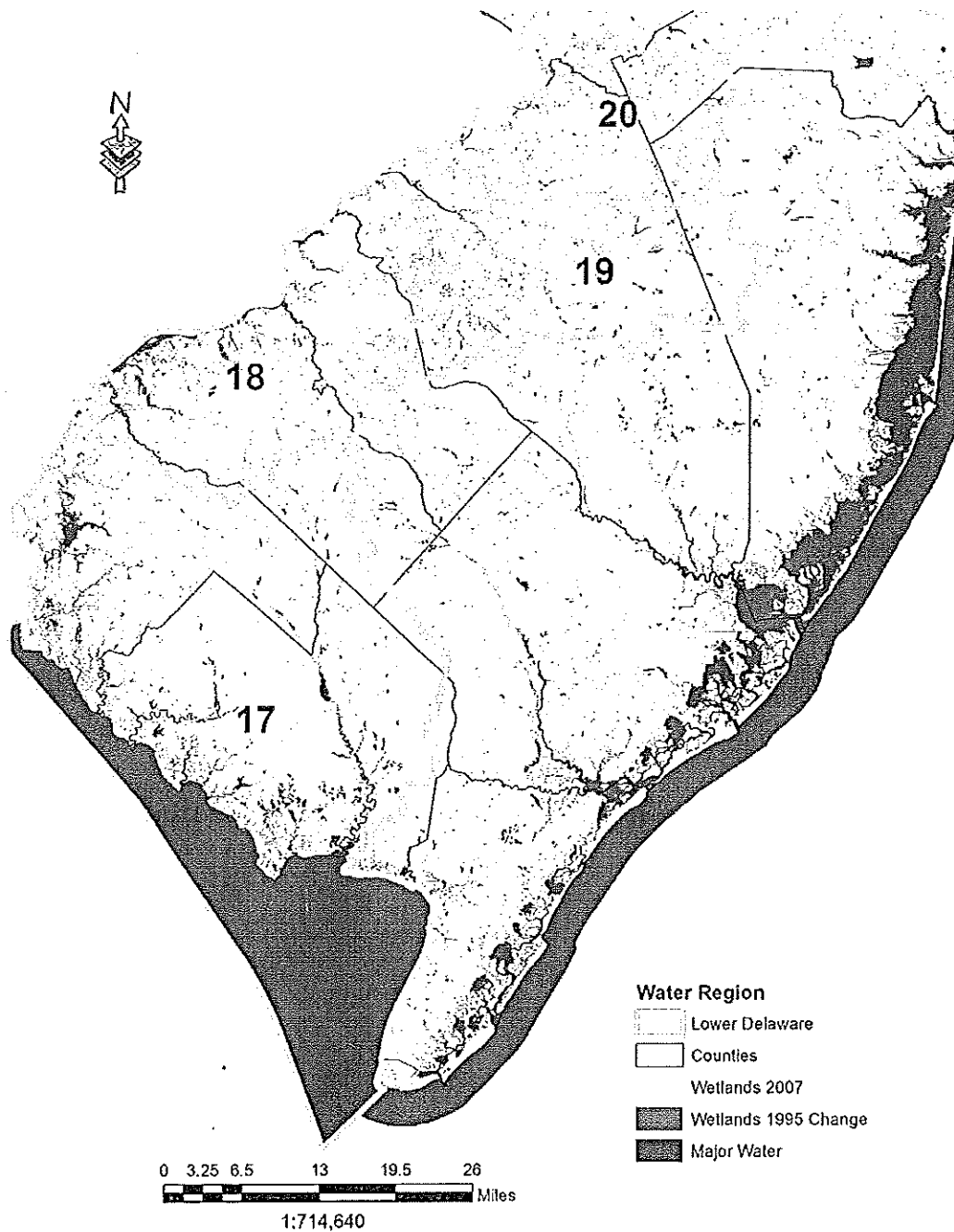
Atlantic Coast Water Region with 1995 Wetland Change



This map is to be used for informational purposes only
and should not be used for legal interpretation.

July 2014

Lower Delaware Water Region with 1995 Wetland Change



This map is to be used for informational purposes only and should not be used for legal interpretation. July 2014

Below is a chart showing the wetlands change from 1995-2007.

Acres of Wetlands Change from 1995-2007*			
WR Name	Type 1995	Type 2007	Acres Changed
Atlantic Coast	WETLANDS	AGRICULTURE	374.64
		BARREN LAND	879.91
		FOREST	822.16
		URBAN	7,887.52
		WATER	10,487.17
		Total	20,451.39
	Non-Wetland	WETLANDS	9,940.17
		Total Change	10,511.22
Lower Delaware	WETLANDS	AGRICULTURE	1,035.94
		BARREN LAND	861.31
		FOREST	1,093.31
		URBAN	6,912.74
		WATER	9,524.26
		Total	19,427.55
	Non-Wetlands	WETLANDS	8,846.22
		Total Change	10,581.33
Northeast	WETLANDS	AGRICULTURE	95.80
		BARREN LAND	246.59
		FOREST	385.56
		URBAN	3,302.21
		WATER	2,050.95
		Total	6,081.11
	Non-Wetlands	WETLANDS	2,163.63
		Total Change	3,917.48
Northwest	WETLANDS	AGRICULTURE	475.02
		BARREN LAND	152.36
		FOREST	518.87
		URBAN	2,497.17
		WATER	1,924.92
		Total	5,568.34
	Non-Wetlands	WETLANDS	2,524.73
		Total Change	3,043.61
Raritan	WETLANDS	AGRICULTURE	405.23
		BARREN LAND	754.70
		FOREST	372.13
		URBAN	8,046.43
		WATER	1,927.90
		Total	11,506.40
	Non-Wetlands	WETLANDS	3,150.93
		Total Change	8,355.46

*Additional Information Concerning DEP's Wetlands Data can be found [here](#).

ELEMENT 4: Current Aquatic Resource Conditions

New Jersey recognizes the important role of wetlands, riparian areas, and vegetated treatment systems in reducing non-point source pollution. Both the Freshwater Wetlands Act and the Wetlands Act of 1970 are water pollution control programs that address non-point source pollution and stormwater management. Both Acts require NJDEP to regulate virtually all activities proposed in the wetland, including cutting of vegetation, dredging, excavation or removal of soil, drainage or disturbance of the water level, filling or discharge of any materials, driving of pilings, and placing of obstructions.

The NJDEP also encourages techniques such as watershed and regional land use planning, stream corridor protection, and land preservation. New Jersey also participates in the Wetlands Reserve Program which helps permanently preserve and protect wetlands in order to promote water quality and improve habitat. Therefore, it is important to understand the current conditions of aquatic resources within the State in order to evaluate and determine the effectiveness of wetlands mitigation and the ILF program.

The following provides an overview of the water quality trends within New Jersey as prepared for the *2012 Integrated Water Quality Assessment for New Jersey: Overview of Water Quality Conditions*.

Water quality monitoring data collected over a five-year period provides a “snapshot” of conditions at the time of sampling but may fail to detect acute pollution events. Evaluating data over longer periods of time allows us to identify water quality trends that would otherwise not be apparent.

An analysis of water quality trends was conducted in 2010 for the Department by the U.S. Geological Survey (USGS) by evaluating key indicator parameters, including: dissolved oxygen (DO), pH, total dissolved solids (TDS), total phosphorus (TP), total organic nitrogen plus ammonia, and dissolved nitrate plus nitrite (nitrate), collected at 70 sampling stations located in various physiographic regions and land use types throughout the State between 1998 and 2007. These chemical constituents were selected for trends analysis because of their role in eutrophication as well as overall water quality. Water bodies affected by eutrophication (i.e., excessive primary production) are characterized by significant algae and weed growth and episodes of low dissolved oxygen. Nitrate is a readily available form of nitrogen taken up by organisms and plants as a nutrient. Phosphorus is also readily used by aquatic plants as a nutrient. Together, these nutrients are principally responsible for the growth rate of aquatic algae and vegetation. Low dissolved oxygen episodes occur when algae die off, and bacteria consume the dissolved oxygen in the process of decomposition. Dissolved oxygen (DO) is necessary for almost all aquatic life; consequently, concentrations of DO in water provide a good indicator of the health of aquatic ecosystems. Under low DO conditions, fish are more susceptible to other pollutants, such as metals and toxics; at very low DO levels, trace metals from sediments are released into the water column. USGS coupled the results of the 1998-2007 trend analysis with results from the 1984-2004 trend analysis to produce a long-term perspective of water quality constituents from the 1980's to the present. The full report is available on the USGS Web site at <http://pubs.usgs.gov/sir/2010/5088/>.

The 1998 to 2007 trend analysis results show that water quality conditions remained relatively stable (i.e., no trend observed) for all constituents except TDS, nitrate, and TP. TDS and nitrate results over this time period indicate declining conditions, while TP results indicate overall

improving conditions - even though TP is still one of the top ten most frequent pollutants on the 2012 303(d) List. If we look at only the aquatic life use, TDS would be in the top ten as well.

TDS is comprised of minerals and other substances dissolved in water. Changes in TDS can affect organisms by altering the flow of water through cell membranes, which can retard growth or even cause death. These changes can make water less fit for other uses. TDS exceedances have been associated with runoff from urban and agricultural areas, including runoff of salt used to control ice on roadways. Discharges from wastewater treatment facilities, including septic systems, can also contribute to increased TDS loadings. These TDS trends represent all types of land uses (urban, agricultural, mixed, and undeveloped) and physiographic regions. Although dissolved solids come from both point and nonpoint sources, road salting and improper salt storage are major contributors of this constituent.

There has been an effort to reduce the levels of the toxic form of ammonia from wastewater. In doing so, nitrate levels were correspondingly increased as ammonia levels declined (nitrate is a byproduct of ammonia oxidation). The resulting higher instream nitrate concentrations may contribute to eutrophication, along with phosphorus. (It should be noted that the few nitrate listings on the draft 2012 303(d) List are associated with the drinking water use, not aquatic life.)

Phosphorus is often considered the "limiting nutrient" in freshwater, governing the rate of growth of aquatic plants and algae. While both phosphorus and nitrogen are considered "nutrients" that contribute to eutrophication, historically the focus for controlling eutrophication has been on reducing total phosphorus (TP) concentrations rather than nitrogen. Studies demonstrate that the impact of nutrients on water quality is strongly influenced by other environmental factors such as sunlight availability, stream velocity and water clarity, meaning that the same amount of TP can have varying impacts in different waters.³⁷ Thus, while improving trends in phosphorus conditions may indicate improving water quality over time, some waters remain susceptible to the adverse effects of eutrophication despite decreasing TP concentrations.

Overall, the water quality trend results indicate that, since the 1980's, nutrient levels and DO conditions have significantly improved over time - most likely due to the upgrade and regionalization of wastewater treatment plants that occurred throughout the State in the late 1980's through the early 1990's. More current trend assessments show some stabilizing of conditions throughout the State with some improvements (e.g., TP) and some declines in water quality (e.g., TDS and nitrates).³⁷

The NJDEP continues to evaluate and monitor its water quality, providing assessments every 2 years and collecting and analyzing samples from more than 4,000 sites including lakes, streams, and shellfish waters. It is hoped that in areas where wetland mitigation occurs, water quality will improve. The ILF program will allow the Council to identify those areas that will provide the biggest impact on improving water quality throughout each of the Water Regions by enhancing, creating or preserving wetlands that help filter out pollutants that impact the State's waterways.

³⁷ NJDEP Bureau of Water Quality Standards and Assessment. "2012 Integrated Water Quality Assessment for New Jersey: Overview of Water Quality Conditions." 2012. Pages 8-10.

Below are the acres of wetlands found within each Water Region as extracted from the 2007 Land Use/Land Cover Data.

COASTAL WETLANDS*	
Water Region	Acres
Atlantic Coast	129,571.75
Lower Delaware	63,528.24
Northeast	2,709.97
Northwest	3.67
Raritan	2,958.88
TOTAL	198,772.51

*Anderson codes 6111, 6112, 6120 and 6141

EMERGENT WETLANDS*	
Water Region	Acres
Atlantic Coast	34,170.05
Lower Delaware	29,085.52
Northeast	10,508.67
Northwest	19,116.62
Raritan	12,641.51
TOTAL	105,522.37

*Anderson codes 6231, 6232, 6233, 6234, 6240, 6241, 6290

FORESTED WETLANDS*	
Water Region	Acres
Atlantic Coast	261,691.38
Lower Delaware	153,317.40
Northeast	46,099.40
Northwest	58,177.96
Raritan	72,549.69
TOTAL	591,835.83

*Anderson codes 6210, 6220, 6221, 6251, 6252

URBAN WETLANDS*	
Water Region	Acres
Atlantic Coast	4,199.94
Lower Delaware	3,277.59
Northeast	1,963.26
Northwest	1,342.37
Raritan	3,837.69
TOTAL	14,620.85

*Anderson Codes 1461, 1711, 1750, 1850

AGRICULTURAL WETLANDS*	
Water Region	Acres
Atlantic Coast	14,108.62
Lower Delaware	35,759.73
Northeast	1,011.90
Northwest	14,511.41
Raritan	10,373.89
TOTAL	75,765.55

*Anderson Codes 2140, 2150

DISTURBED WETLANDS*	
Water Region	Acres
Atlantic Coast	2,662.52
Lower Delaware	4,608.47
Northeast	844.33
Northwest	558.16
Raritan	1,804.78
TOTAL	10,478.26

*Anderson Codes 6500, 7430

ELEMENT 5: Aquatic Resource Goals and Objectives

When developing goals for the ILF program it is important to take into account how wetlands are valuable to the State of New Jersey.

- Wetlands protect drinking water by filtering out chemicals, pollutants, and sediments that would otherwise clog and contaminate our waters.
- Wetlands soak up runoff from heavy rains and snow melts, providing natural flood control.
- Wetlands release stored flood waters to streams during droughts.
- Wetlands provide critical habitats for a major portion of the State's fish and wildlife, including endangered, commercial and recreational species.
- Wetlands provide high quality open space for recreation and tourism.

The ILF program will seek mitigation sites that promote the enhancement, restoration, or protection of high quality wetlands. Specifically, the enhanced, restored, or protected wetlands will:

- Replace the desired type of wetlands (typically the same as what is being lost)
- Provide multiple functions
- Be appropriate for the landscape
- Be compatible with surround land use
- Be managed in a relatively easy and sustainable manner
- Be ecologically of the highest quality achievable and compatible with current and historic site conditions³⁸.

The following goals and objectives are applicable to all service areas:

1. Protect, restore, and preserve wetland areas that provide the highest ecological services for Category 1 waters, critical flora and fauna habitat, wetlands of exceptional value, and coastal wetlands.
2. Mitigation shall, at a minimum, fully compensate for the loss of ecological value caused by a disturbance, by replacing any freshwater wetlands and/or State open waters values or tidal wetlands and functions lost or disturbed with equal values and functions.
3. Ensure long term success by requiring:
 - a. Adequate financial and other resources must be dedicated to the project;
 - b. The project must be designed to take advantage of and work within the existing conditions in the proposed mitigation area to the extent possible;
 - c. The hydrology in and around the mitigation area must be adequate to support wetland conditions year round and indefinitely into the future. The hydrology for a proposed wetland mitigation site shall not include discharged stormwater;
 - d. The soils (and hydrology) in the mitigation area must be adequate to support wetland conditions; and
 - e. The responsibility for long term maintenance of the mitigation area must be clearly assigned to an entity that has the resources to ensure long term maintenance of the mitigation area.

³⁸ As adapted from: The Nature Conservancy. "The Nature Conservancy's Ohio Stream and Wetland In-Lieu-Fee Mitigation Program Prospectus ." 2012. Page 15

4. Achieve ecological success on a Water Region basis by directing ILF funds to protected natural resource types and functions that are appropriate to the geographic areas, and by integrating ILF projects with other conservation activities whenever possible³⁹.
5. Take into account the goals and objectives of any regional, state or TMDL plans that cover part or all of a service area when determining sites.

The ILF program goals can be applied throughout the service areas and the Council will take into account the unique wetland resources within each service area as identified previously when determining sites to restore, create, enhance, or preserve wetland areas.

³⁹ As adapted from: Maine Department of Environmental Protection. *State of Maine- In-Lieu Fee Program Instrument*. Augusta, ME: Maine Natural Resource Conservation (NRC) Program, 2011. Page 17.

Element 6: Prioritization Strategy

The EPA recommends a watershed approach to compensatory mitigation. The NJDEP has many regional and statewide plans and watershed projects that the Council can refer to when considering mitigation projects. In addition, the NJDEP works with many conservation partners (federal, county, NGOs) and these groups have extensive lists of priority lands that may serve as appropriate mitigation lands as well.

The following information is provided by the EPA describing the use of a watershed approach to compensatory mitigation:

A watershed approach to mitigation considers the importance of landscape position and resource type of mitigation projects for the sustainability of aquatic resource functions within the watershed. It considers how the types and locations of compensatory mitigation projects will provide the desired aquatic resource functions, and function over time in a changing landscape. Considerations include:

- Habitat requirements of important species
- Habitat loss or conversion trends
- Sources of watershed impairment
- Current development trends
- Requirements of other regulatory and non-regulatory programs that affect the watershed, such as storm water management or habitat conservation programs.

A watershed approach includes the protection and maintenance of terrestrial resources, such as riparian areas and uplands, when those resources contribute to the overall ecological functioning of aquatic resources in the watershed.

Mitigation requirements determined through the watershed approach should not focus on specific functions (e.g., water quality or habitat for certain species), but provide, where practicable, the suite of functions typically provided by the affected aquatic resource.

Locational factors (e.g., hydrology, surrounding land use) are important to the success of mitigation for impacted habitat functions and may lead to siting mitigation projects away from the impact site. Consideration should be given to functions and services (e.g., water quality, flood control, shoreline protection) that will likely need to be addressed at or near the permitted impacts.

A watershed approach may include on-site mitigation, off-site mitigation (including mitigation banks or in-lieu fee programs), or a combination of on-site and off-site mitigation.⁴⁰

[http://water.epa.gov/lawsregs/guidance/wetlands/upload/Watershed Approach Handout.pdf](http://water.epa.gov/lawsregs/guidance/wetlands/upload/Watershed_Approach_Handout.pdf)

⁴⁰ Environmental Protection Agency. "EPA Watershed Approach Handout."

http://water.epa.gov/lawsregs/guidance/wetlands/upload/Watershed_Approach_Handout.pdf, n.d.

The NJDEP Wetland Regulations also provide guidance for evaluating parcels for mitigation. The Council should consider the same criteria they would use for evaluating sites for preservation.

N.J.A.C. 7:7A-15.22 identifies the following criteria:

- i. Contains exceptional resource value wetlands;
- ii. Contains critical habitat for flora or fauna, as defined at N.J.A.C. 7:7A-1.4;
- iii. Contains wetlands or waters draining to FW1 or category one waters, as defined at N.J.A.C. 7:9B, or into public drinking water sources;
- iv. Contains wetlands or waters that connect one public open space or significant natural resource to another public open space or significant natural resource. For example, a parcel containing a stream that runs through two wildlife preserves that are not adjacent;
- v. Is adjacent to public lands containing wetland preserves, such as a Federal wildlife refuge, a State wildlife management area, a State park or forest, or a State, County or local wetland preservation area; or wetland preservation areas held by a charitable conservancy; or
- vi. Has unique aspects or characteristics that contribute to its ecological value, such as an unusual or regionally rare type of wetland.

When considering mitigation projects the Council should also take into consideration (as adapted from the Ducks Unlimited New York ILF Program)⁴¹:

1. Additional success parameters: Threats from invasive species or encroachment from development should be low or manageable. The project will be evaluated for its ability to result in successful and sustainable net gain of aquatic resource area and/or function.
2. Meet multiple objectives: Projects will be evaluated based on their potential to address multiple functions and services such as improvement of fish and wildlife habitat, support for threatened and endangered species, flood attenuation, water quality improvement, and ecotourism or education values. Projects that can utilize native plant community diversity and natural processes will yield greater functional gains and be given higher preference.
3. Support regional conservation initiatives and is compatible with the surrounding landscape: Projects should be located where they complement adjacent land uses, meet regional conservation priorities, address limiting factors in watersheds, increase habitat diversity, support state wildlife action plans, reduce fragmentation, establish corridors, provide additional natural areas to urban areas, and enhance the function of existing natural areas.
4. Project costs: Projects with high aquatic resource functional gain per dollar will be given preference.
5. Address water quality issues: Focus on the most degraded areas or most severe water quality issues important for maintaining or improving ecosystem functions within the water region(s) where wetlands have been lost.

By taking into account site selection criteria and project parameters listed above, the Council will be able to select sites and projects that will meet wetland mitigation goals as well as any water quality goals supported by other regional and state plans.

⁴¹ As adapted from: Ducks Unlimited, Inc.-. Great Lakes Atlantic Regional Office. "Ducks Unlimited New York– In-Lieu Fee Program Final Instrument." Ann Arbor, MI, 2012. Page 41.

Element 7: Explanation of Preservation Objectives

The goals and objectives identified in Elements 5 & 6 meet the preservation criteria listed in CFR 230 332.3(h). The ecological value is a major consideration when identifying an appropriate site and/or project for compensatory mitigation. Additionally, the Council will consider the long-term maintenance and responsibility for keeping the preserved area as beneficial to the watershed as possible. The Council will also prioritize projects and areas for preservation based on the criteria listed in NJDEP's wetland rules and as listed in Element 6. Therefore, the NJDEP ILF program promotes the following preservation objectives:

- (i) The resources to be preserved provide important physical, chemical, or biological functions for the watershed;
- (ii) The resources to be preserved contribute significantly to the ecological sustainability of the watershed. In determining the contribution of those resources to the ecological sustainability of the watershed, the district engineer must use appropriate quantitative assessment tools, where available;
- (iii) Preservation is determined by the district engineer to be appropriate and practicable;
- (iv) The resources are under threat of destruction or adverse modifications; and
- (v) The preserved site will be permanently protected through an appropriate real estate or other legal instrument (e.g., easement, title transfer to state resource agency or land trust).

Furthermore, any projects for enhancement, restoration, and/or creation of wetlands will include appropriate buffers and will be preserved through a conservation restriction. Using the watershed approached when selecting projects and sites will allow for the Council to meet the preservation criteria listed above.

Element 8: Stakeholder Involvement

In response to a letter from USEPA in December 2012, the Council at their January 29, 2013 meeting discussed the letter from USEPA as well as the steps the Council needed to take to have an acceptable ILF Program. These discussions continued during the March 21, 2013, May 29, 2013, July 24, 2013, October 1, 2013, and December 3, 2013. As a result of these discussions, the Council developed a draft ILF document. This draft document was revised and during the March 4, 2014 Council meeting staff made available for public review and comment a revised ILF document. This document was available for public comment from March 4, 2014- April 11, 2014. In addition, during the April 1, 2014 Council meeting, the Public had the opportunity for public comment on the document. The Council received comments from the public as well as from the following organizations: USEPA, United States Army Corps of Engineers, GreenVest, New Jersey Department of Transportation, Mogensen Mitigation, Inc, The Nature Conservancy, and Evergreen Environmental. As a result of the comments the draft ILF document was revised again and was made available for further public comment on December 8, 2014.

Element 9: Long-term Protection and Management Strategies

The Council shall require that all projects funded by the ILF Program have a long-term protection and management plan. As part of the required information for approval of a project for funding, the applicant for funding shall provide a conservation restriction and identify the organization which will become the long-term steward of the property. The Program Administrator will ensure that long-term protection mechanisms are in place prior to project implementation. An endowment may be established to pay for the annual monitoring and any necessary enforcement of the conservation restriction. The endowment will be held in a designated account and the amount will be decided between the funding recipient and the easement holder. Long-term stewards of each ILF project must be government or non-profit agencies.

The conservation restriction shall be recorded in the chain of title for all properties affected by the restriction. It shall be in the form and terms as specified in the appropriate template as required by N.J.A.C. 7:7A, N.J.A.C. 7:7-7, or N.J.A.C. 7:7-7E. It shall be recorded in accordance with the New Jersey Recording Act, N.J.S.A. 46:15-1.1 et seq and shall run with the property and be binding upon: the mitigator, the property owner, and successors in interest in the land or any part of the land on which the mitigation area is located.

Element 10: Strategy for Periodic Evaluation and Reporting

The Program Administrator will provide annual reports, due August 1 of each year to the NJDEP. The annual report will cover the time period of July 1- June 30 of the current year. This schedule coincides with the NJDEP's annual reporting on Assumption to USEPA. The report will include the status of current projects within the ILF Program service area, the amount of monetary contributions received by the Program Administrator, and the number of credits debited and available within the ILF Program service area.

The report will identify any issues that have been encountered as well as the status of these issues. The Program Administrator will provide a brief update and status of all projects approved under this ILF instrument.

Periodically, the Program Administrator will produce a report summarizing the previous years. The report will examine the goals for the ILF Program service area and discuss the success of each grant in achieving those goals. As funds allow, every ten years the Program Administrator, will reexamine and update the Compensation Planning Framework.

The Program Administrator will monitor all grants using monitoring reports submitted by the funding recipient. All monitoring plans must meet the requirements of the FWPA, CZM, or CPP rules. Consistent monitoring requirements for all funded projects will ensure that projects approved under the ILF Program remain consistent with NJDEP rules and regulations.

All ILF project sites must be monitored starting the first full growing season after the construction/planting of the mitigation project is completed. Depending on the type of wetlands being created, restored and/or enhanced, the mitigation project must be monitored in accordance with the terms of the approved project. All monitoring reports must meet the monitoring standards of the FWPA, CZM, or CPP rules.

If the annual monitoring report indicates that the project is not making expected progress towards meeting the performance standards, the Program Administrator shall notify the NJDEP upon such a finding and shall work with the project recipient to determine appropriate adaptive management measures necessary to meet the performance standards. Such measures may include, but are not limited, to site modifications, design changes, and invasive plant species and animal control. Performance standards and monitoring requirements may be revised based on adaptive management measures necessary to address deficiencies and ensure project success. Performance standards may also be revised to reflect changes in management strategies if the new performance standards ensure that ecological benefits are comparable or superior to those detailed in the original mitigation plan.

Works Cited

- Ducks Unlimited, Inc-. Great Lakes Atlantic Regional Office. "Ducks Unlimited New York– In-Lieu Fee Program Final Instrument." Ann Arbor, MI, 2012.
- Environmental Protection Agency. "EPA Watershed Approach Handout."
http://water.epa.gov/lawsregs/guidance/wetlands/upload/Watershed_Approach_Handout.pdf, n.d.
- Environmental Protection Agency. *Flow Alteration in Urban Streams*. 31 July 2012.
http://www.epa.gov/caddis/ssr_urb_hyd1.html. 12 June 2014.
- Hasse, John E. and Richard G. Lanthrop. *Changing Landscapes in the Garden State: Executive Summary*. Glassboro: Rowan University and Rutgers, The State University of New Jersey, 2010.
- Kennen, J.G., Riskin, M.L., Riley, P.A., and Colarullo, S.J. "Method to Support Total Maximum Daily Load Development using Hydrologic Alteration as a Surrogate to address Aquatic Life Impairment in New Jersey Streams." 2013. <http://pubs.usgs.gov/sir/2013/5089/>.
- Maine Department of Environmental Protection. *State of Maine- In-Lieu Fee Program Instrument*. Augusta, ME: Maine Natural Resource Conservation (NRC) Program, 2011.
- "N.J.S.A. 4: 24 ." "Soil Erosion and Sediment Control Act". 1975.
- New Jersey Invasive Species Council. *New Jersey Strategic Management Plan for Invasive Species*. Trenton, NJ, 2009.
- NJDEP Bureau of Water Quality Standards and Assessment. "2012 Integrated Water Quality Assessment for New Jersey: Overview of Water Quality Conditions." 2012.
- NJDEP Office of Science. *Climate Change in New Jersey: Trends in Temperature, Precipitation, Extreme Events and Sea Level*. <http://www.state.nj.us/dep/dsr/trends>: New Jersey Department of Environmental Protection, 2013.
- . *Environmental Trends Report: Endangered Plants*. <http://www.state.nj.us/dep/dsr/trends>: New Jersey Department of Environmental Protection, 2013.
- . *Surface Water Quality-Rivers and Streams: Chemical and Physical Measurements*. <http://www.state.nj.us/dep/dsr/trends>: New Jersey Department of Environmental Protection, 2012.
- NJDEP Office of Science, Research, and Technology. "Background Information for "Creating Indicators of Wetlands Status (Quantity and Quality): Freshwater Wetland Mitigation in New Jersey"." 2002.
- NJOEM- Recovery Bureau. *New Jersey State Hazard Mitigation Plan*. Trenton, NJ : New Jersey Office of Emergency Management, 2014.
- The Nature Conservancy. "The Nature Conservancy's Ohio Stream and Wetland In-Lieu-Fee Mitigation Program Prospectus ." 2012.
- Union of Concerned Scientists. *New Jersey: Confronting Climate Change in the U.S. Northeast*. Cambridge, MA: Northeast Climate Impacts Assessments (NECIA), 2007.