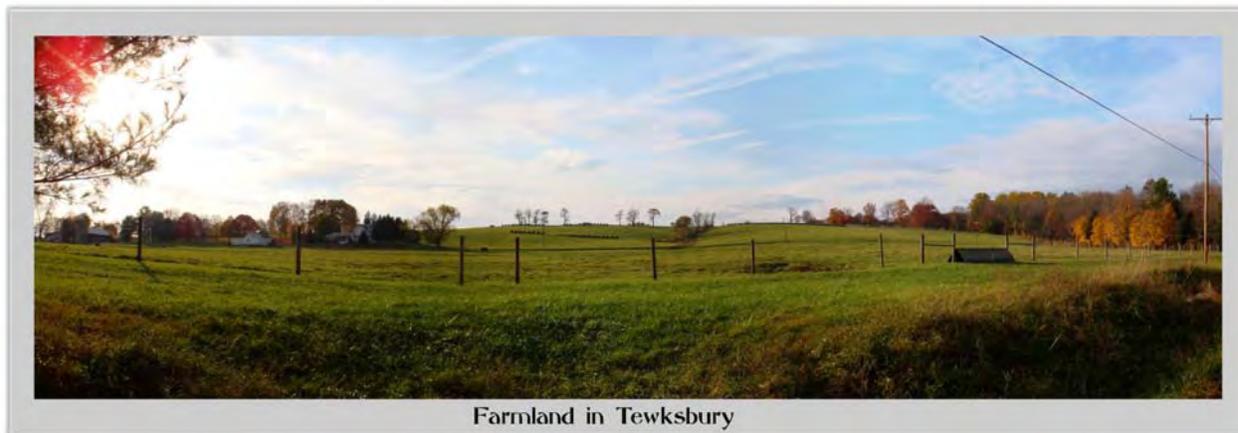

8: OPEN SPACE AND FARMLAND

A. Funding Sources & Tools

Funding for open space comes from a variety of sources, including municipal, county, state and federal sources and private land trusts. Private land trusts are non-profit organizations that “can often act faster and be more creative in their real estate transactions than established government agencies,” according to Howe (1989). Landowners are able to reap tax benefits through charitable donations to a land trust. Many successful open space purchases combine a number of funding sources and strategies.

In 1997, Tewksbury Township residents approved the establishment of a 3 cent tax for every \$100 assessed value, and in 1999, residents approved an increase to 5 cents to provide a stable source of funding for open space and farmland preservation (Hintz, 2003).



Farmland in Tewksbury

In 1999, Hunterdon County residents approved a five-year tax to fund an Open Space, Recreation, Farmland and Historic Preservation Trust Fund, which was renewed in 2004 for another 5 years. In 2008, residents approved a tax without a sunset clause, and expanded the purposes to include protecting drinking water sources and water quality, preserving open space, natural areas, farmland and historic sites, to acquire, develop, improve and maintain county and municipal lands for recreation and conservation purposes, and to preserve historic structures, facilities, sites, areas, or objects, or for the payment of debt service or indebtedness issued or incurred by the County for any of these purposes. The Board of Chosen Freeholders is authorized to determine the annual tax levy, which has been a 3 cent tax per \$100 valuation since its inception (Hunterdon County, 2009).

The Garden State Preservation Trust Act provides state funds for land acquisition and park development through the Green Acres program and funding for farmland preservation through the State Agriculture Development Committee (SADC). Various programs under the SADC include Purchase of Development Rights, Fee Simple (outright purchase), the Eight Year Program, and the Planning Incentive Grant (PIG). To participate in the Eight Year Program, landowners agree to deed-restrict their farms solely to agricultural use for a period of eight years. In return, they receive certain benefits and increase their score when applying to other programs. The PIG program seeks to preserve reasonably contiguous farms. In order to participate, a township must 1) identify a reasonably contiguous project area; 2) demonstrate a commitment to funding; 3) have an Agricultural Advisory Committee appointed by the mayor; and 4) adopt a Farmland Preservation Element of the municipal master plan.

Farmland owners may wish to pursue various programs through the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), which either rents or buys easements or cost-shares habitat restoration and conservation measures.

These include the Conservation Reserve Program (CRP), Environmental Quality Incentives Program (EQIP), Wetlands Reserve Program (WRP), and Wildlife Habitat Incentives Program (WHIP) (see **Internet Resources**).

Private land trusts working to preserve land in Tewksbury Township include the Tewksbury Land Trust, Upper Raritan Watershed Association, New Jersey Conservation Foundation, Hunterdon Land Trust Alliance and the New Jersey Natural Lands Trust. These organizations and the Association of New Jersey Environmental Commissions (ANJEC) are sources for in-depth information concerning open space preservation through various funding, planning, and zoning techniques (see **Internet Resources**).

B. Greenway Establishment & Maintenance

A *greenway* is a corridor of undeveloped land or open space, which often protects environmental features, such as a stream corridor, floodplain, forested ridgeline, or animal migration route, but which can also preserve a scenic view and provide recreational opportunities, such as parks or biking/hiking trails. Greenway corridors also have the potential for positive economic impacts, by creating jobs, enhancing property values, expanding local businesses, attracting new businesses, increasing local tax revenues, decreasing local government expenditures, and promoting a local community. The publication [Economic Impacts of Protecting Rivers, Trails and Greenway Corridors](#) outlines procedures for analyzing economic impacts of a greenway project, and it provides examples. Decision makers can benefit from recognition of potential economic impacts as well as intrinsic values of greenways in support of decisions that enhance the well-being of the community (National Park Service, 1995).

Garden State Greenways is an online planning tool designed for all those involved in conserving open space, farmland, and historic areas in New Jersey. It uses GIS to identify *hubs* (larger areas of undeveloped land with important natural resource values) and linear *connectors* between these hubs. The goal of the program is to help coordinate efforts of both private groups and government agencies (NJ Conservation Foundation, 2005).

Local governments often use a variety of planning and zoning techniques for establishing greenways, including creating a greenway map and adopting it as part of the Master Plan, creating a Greenway Overlay District, cluster zoning and Transfer of Development Rights. These strategies can be combined with farmland preservation, private land trusts, and conservation easements to meet the Township's open space, farmland and recreation goals (Howe, 1989).

Before a greenway is established, issues of maintenance, public access and monitoring of easements must be addressed to ensure long-term success of the project (Howe, 1989).

Columbia Trail is a greenway created from a former rail line. Approximately 1¼ miles of Columbia Trail (which is considered part of Hunterdon County's South Branch Reservation park) traverses the northwest corner of Tewksbury Township. The trail is available for hiking, biking and cross-country skiing, extending from its start in High Bridge, through Tewksbury, and continuing northeast into Morris County, where it will connect with the Highlands Trail (Cooper, 2009). The trail traverses both deciduous and coniferous forests, and parallels the South Branch Raritan River. These habitats provide a corridor for the movement and observation of wildlife, and breeding habitat for herptiles (Hunterdon County website, 2008).

C. Open Space

The purposes of open space preservation include:

- provide adequate active and passive recreation;

- provide recreational and open space opportunities on an equal and accessible basis for all citizens;
- maintain water quality and groundwater recharge areas;
- protect sensitive environmental features;
- protect historic areas;
- maintain biodiversity;
- minimize erosion or damage from flooding;
- maintain rural character (ANJEC, no date).

An updated inventory of the preserved open space properties is presented in **Table 8.1** and **Figure 8a**. Using the acreage figures in the GIS data files²², a total of 2,255 acres have been preserved as open space in Tewksbury Township, which is approximately 11% of the township. The following paragraphs describe some of these preserved properties.

Cold Brook Preserve on Route 517 is a 287-acre Hunterdon County Park, consisting of rolling fields and old pastures. The historical use of the property for farming is maintained by leasing the farm fields to a local farmer, in keeping with a management plan. Trails are available for hiking, horseback riding and mountain biking. Varied habitats, which include old fence rows, meadows, wooded areas, and the edge habitat between them, provide opportunities for wildlife watching (Hunterdon County website, 2008).



Whittemore Wildlife Sanctuary

The Whittemore Wildlife Sanctuary is a 180-acre property located on Rockaway Road owned by the township. The park is dedicated to environmental education. The park's trails are available for hiking, dog walking and horseback riding. These trails traverse mainly wooded areas with wetlands, ravines and hilly terrain. The Rockaway River flows along the southern border of the property (Tewksbury Township website, 2008).

A 10-acre property on Palatine Road, known as the Whitman property was preserved by a partnership of the

New Jersey Conservation Foundation (NJCF), Tewksbury Land Trust and Green Acres. It includes a section of the Cold Brook Stream, open space and woodlands with trees that are over 200 years old (NJCF Annual Report, 2005). A 40 acre tract on Fox Hill Road, known as the Lance Preserve, was another property preserved by a coalition including the Tewksbury Land Trust, NJCF, Lamington Conservancy, Hunterdon County and Tewksbury Township (Teasdale, 2009).

A number of properties preserved by the Upper Raritan Watershed Association (URWA) include Hollow Brook Preserve, a 21-acre property that consists of forested wetlands, with many springs and the headwaters of the Hollow Brook flowing through it; Fox Hill Preserve, 50 acres of fields and woodlands with a broad valley view of farm lands and forest, which is traversed by a trail; and the Dinner Pot Natural Area, a 12-acre property that consists of steep slopes, wet springs and seeps, and an unnamed tributary to trout-production waters. Due to the extreme

²² "Acres" is usually from the GIS data, and may not reflect actual acreage. In some cases, only a portion of the acreage of a property is preserved, but the full acreage is listed.

environmental constraints of the site, there are no maintained trails on this site, but it provides a scenic view from Route 517 (Upper Raritan Watershed Association website, 2008).

Properties with conservation easements are shown on **Figure 8b**. These properties, or portions of them, are restricted in some way, but are not open to the public. Boundaries of the actual easement are not shown on the map.

Table 8.1: Preserved Open Space²³

BLOCK	LOT	FACILITY	USE	OWNERSHIP	ACRES
County Parkland (279.51 acres)					
2	2	South Branch River Reservation	Recreation/Conservation	Fee Simple	2.58
2	4	South Branch River Reservation	Recreation/Conservation	Fee Simple	0.50
2	5	South Branch River Reservation	Recreation/Conservation	Fee Simple	2.77
2	100	Columbia Trail	Recreation/Conservation	Fee Simple	2.51
3	100	Columbia Trail	Recreation/Conservation	Fee Simple	5.01
3	101	Columbia Trail	Recreation/Conservation	Fee Simple	6.96
16.03	1	Columbia Trail	Recreation/Conservation	Fee Simple	4.80
21	3	South Branch River Reservation	Recreation/Conservation	Fee Simple	9.61
23	26	Adjacent to Cold Brook Preserve	Recreation/Conservation	Partial Easement	30.80
23	28	Adjacent to Cold Brook Preserve	Recreation/Conservation	Partial Easement	21.70
38	7	Cold Brook Preserve	Recreation/Conservation	Partial Easement	1.60
38	8	Cold Brook Preserve	Recreation/Conservation	Partial Easement	178.98
38	8.3	Cold Brook Preserve	Recreation/Conservation	Partial Easement	11.70
Municipal Parks and Open Space (1038.33 acres)					
6.04	1.01	Property on Dege Farm Road	open space for cluster	Fee Simple	33.83
6.04	1.24	Property on Coddington Lane	open space for cluster	Fee Simple	37.95
6.04	23.2	Property on Pace Farm Road	Recreation/Conservation	Fee Simple	21.21
7	2	Pottersville Reservoir Park	Recreation/Conservation	Fee Simple	6.60
7	4.01	Fairmount North	Recreation/Conservation	Fee Simple	15.12
7	13	Pottersville Reservoir Park	Recreation/Conservation	Fee Simple	82.02
7	13.03	Pottersville Reservoir Park	Recreation/Conservation	Fee Simple	37.65
7	23	Fairmount North	Recreation/Conservation	Fee Simple	56.99
14	21	Christie Hoffman Park	Recreation/Conservation	Fee Simple	162.15
14	21.01	Christie Hoffman Park	Recreation/Conservation	Fee Simple	4.93
14	21.02	Christie Hoffman Park	Recreation/Conservation	Fee Simple	19.44
15	9.05	Property on Tiger Dr (narrow strip on east side adjacent to road)		Fee Simple	0.30
15	18.01	Property on Farmersville Road (near Sawmill School)	Recreation/Conservation	Fee Simple	15.80
16	6	Pascal Farm Park	Passive Rec/Conservation	Fee Simple	136.64
16	6.01	Pascal Farm Park	Passive Rec/Conservation	Fee Simple	7.26
16	27	Pascal Farm Park	Passive Rec/Conservation	Fee Simple	1.11
23	8.41	Property on Homestead Road	Recreation/Conservation		13.29
23	26.02	Property on Vliettown Road	sewage disposal		14.29
27	104	Hell Mountain Preserve	Recreation/Conservation		10.41
27	108	Hell Mountain Preserve	Recreation/Conservation		2.21
27	115	Hell Mountain Preserve	Recreation/Conservation		94.26
29	18	Cold Brook, Property on Cold Spring Rd			1.10
34	8	Rockaway Creek, on Rockaway Road	Recreation/Conservation	Fee Simple	4.93
42	2	Property on Vliettown Road	sewage disposal		23.37

²³ Some properties or portions of properties are not open to the public.

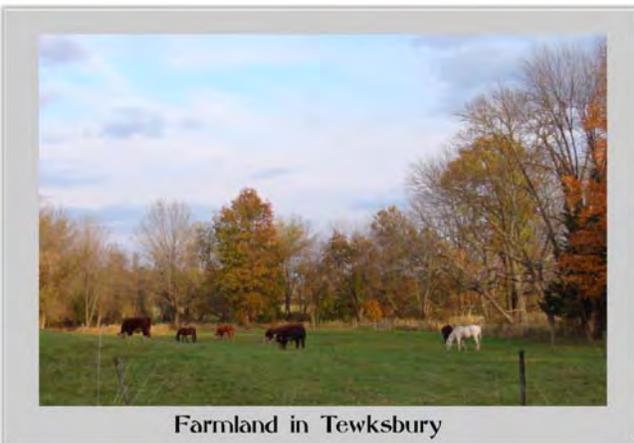
BLOCK	LOT	FACILITY	USE	OWNERSHIP	ACRES
44	12	Oldwick Fields	Recreation/Conservation	Fee Simple	11.77
44	23	Whittemore Wildlife Sanctuary	Recreation/Conservation	Fee Simple	73.93
45.01	1	Crossroads Open Space	Recreation/Conservation	Fee Simple	31.35
45.02	49	Crossroads Open Space	Recreation/Conservation	Fee Simple	7.44
46	20	Whittemore Wildlife Sanctuary	Recreation/Conservation		89.28
46	20.01	Whittemore Wildlife Sanctuary	Recreation/Conservation		15.31
49	5.02	Rockaway Creek, Property on Oldwick Rd			3.55
51	11	Rockaway Creek Access, Sawmill Rd			0.30
51	19	Rockaway Creek Access, Sawmill Rd			2.56
Non-profit and Private Conservation Lands (312.83 acres)					
6.04	4.01	Fairmount Church	Non-profit/private		0.85
6.04	5.01	Fairmount Church	Non-profit/private		1.42
6.04	6	Fairmount Church	Non-profit/private		2.22
6.04	6.01	Fairmount Church	Non-profit/private		3.02
6.04	41.03	Fox Fell Homeowners Association	Non-profit/private	Homeowners Association	15.53
15	9.15	Open Space lot for Highland Farms	Non-profit/private	Homeowners Association	7.02
15	13	Tewksbury Land Trust, Sawmill Rd (Sawmill School)			48.54
15	21.02	Open Space lot for Highland Farms	Non-profit/private	Homeowners Association	11.79
16	1	Fairmount Church	Non-profit/private		1.31
16	2.02	Fairmount Church	Non-profit/private		2.95
16	14	Hollow Brook Preserve			27.60
16	26	Hollow Brook Preserve	Recreation/Conservation	Fee Simple	21.24
27	71		Non-profit/private		52.48
28	13.01	Property on Old Turnpike Rd (Rt 517)	Recreation/Conservation	Fee Simple	11.78
28	27	Property on Fox Hill Road	Non-profit/private	Tewksbury Land Trust	35.33
29	10.04	Black River Greenway, Palatine Rd	Non-profit	Fee Simple	10.97
30	3	Cold Brook Natural Area (property on Palatine Rd)	Non-profit	Fee Simple	44.42
30	5	Cold Brook Natural Area (property on Fox Hill Rd)	Non-profit	Fee Simple	14.36
Conservation Easements (624.47 acres)					
6.04	7.2		Non-profit/private	Easement	26.83
14	14	Property on Farmersville Rd	Recreation/Conservation	Partial Easement	6.70
14	14.01	Property on Farmersville Rd	Recreation/Conservation	Partial Easement	3.20
14	15	Tewksbury Land Trust, Farmersville Rd	Farm Conservation Area	Easement	77.96
14	22	Property on Farmersville Rd	Agriculture	Easement	6.38
15	3	Open Space lot for Fern Valley	Non-profit	Easement	8.31
15	20	Property on Farmersville Rd	Agriculture	Easement	27.64
23	26		Non-profit	Easement	48.21
23	28		Non-profit	Easement	32.45
28	14	Property on Old Turnpike Rd (Rt 517)-URWA	Recreation/Conservation	Partial Easement	42.19
32	22.01				72.98
37	5.15	Bissell Run Homeowners			3.29

BLOCK	LOT	FACILITY	USE	OWNERSHIP	ACRES
		Association			
37.03	5.08	Bissell Run Homeowners Association			9.27
37.03	5.24				1.86
38	8.03		Non-profit	Easement	11.74
38	11		Non-profit	Easement	23.18
38	16.14		Non-profit	Easement	53.72
45.01	35			Easement	1.13
45.02	50	Private easement (front of lot)		Easement	3.67
46	17.01	easement-Readington Twp.		Easement	3.13
48	4	Property on Felmley Rd & Rt 523	Non-profit	Easement	159.79
48	4.01	Property on Felmley Rd & Rt 523	Recreation/Conservation	Easement	0.85
Total (excluding farmland): 2,255.15					
Notes:					
Area is usually from the GIS data, and may not reflect tax map acreage.					
There are no state or federally owned open space properties within Tewksbury.					
Acreage usually reflects area of entire parcel: conservation easement may apply to only a portion of this area in many cases.					
See Table 8.2 for preserved farmland.					
Sources: Hunterdon County GIS data; NJDEP Green Acres website; and Highlands Water Protection and Planning Council, January 2008; Tewksbury Land Use Office.					

D. Farmland

Preservation of farmland is recognized as a priority at the national, state, county and local levels. Through various public forums and opinion surveys, Hunterdon County residents have clearly stated their desire to preserve the County's rural character (Hunterdon County website, 2005). In Tewksbury, "The principal pursuit of the Township is and always has been agriculture" (Hintz, 2003).

Agriculture is an important sector of the economy, while offering a quality of life and rural atmosphere that most residents value. Farms require less governmental services than residential development, thereby stabilizing property taxes. Agriculture also maintains clean air by generating little traffic, provides fresh local produce, and offers attractive vistas. Farmland, which typically has minimal impervious surfaces, provides ground water recharge areas. Preservation of farmland allows agriculture to exist as a viable and beneficial industry now and into the future. Efforts to preserve farmland are important because the land that is best for development is typically prime farmland. Once developed, farmland is lost and is a non-renewable resource (Hunterdon County Website, 2005).



Farmland in Tewksbury

The goal of the township's Farmland Preservation Plan Element (FPPE), which is part of the 2003 Tewksbury Master Plan, is to

"Preserve farmland and encourage its continued use recognizing it as an important component of the economy of the township, county and the state, and that agricultural lands are an irreplaceable natural resource and a key element of Tewksbury's rural character (Hintz, 2003)."

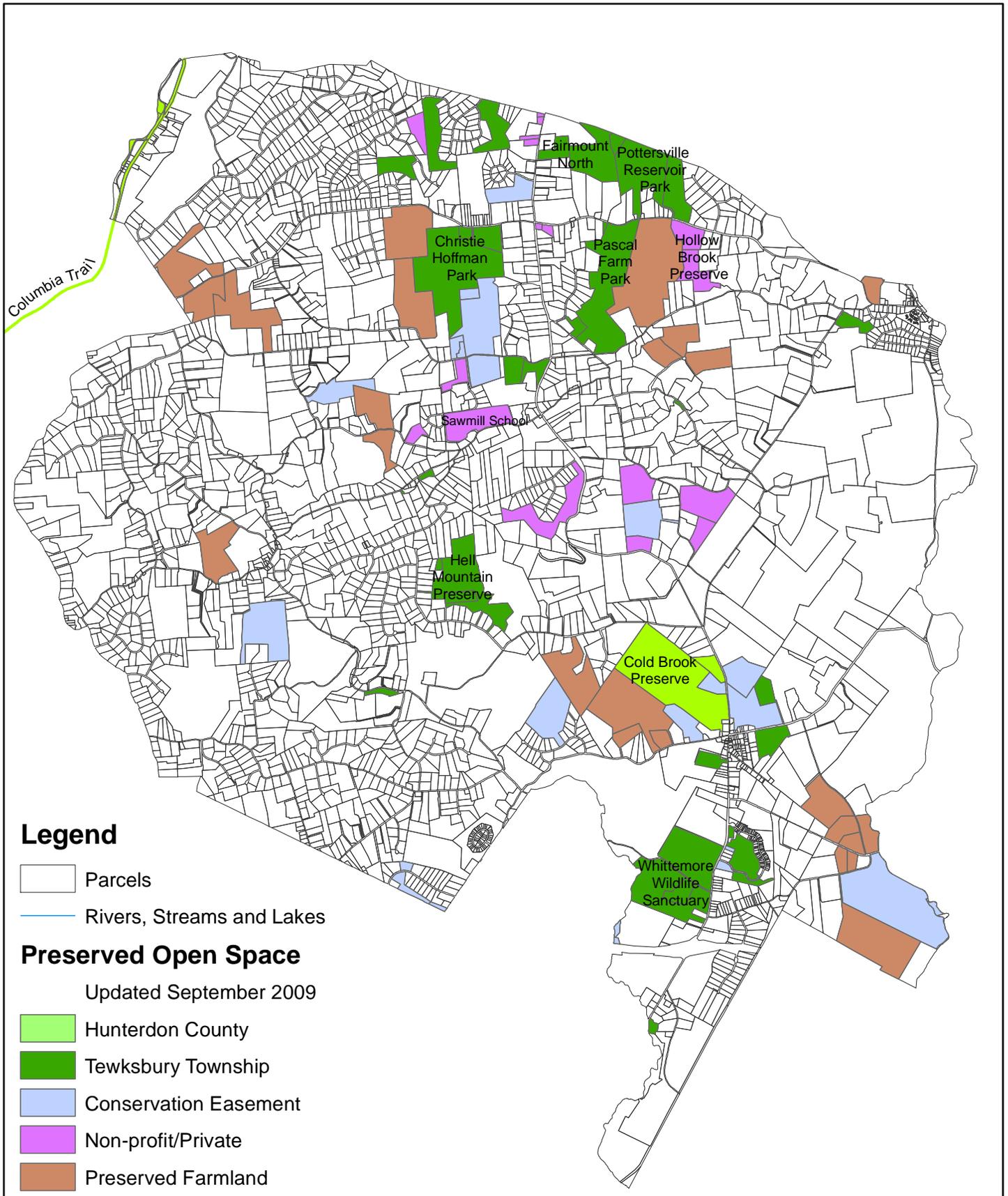
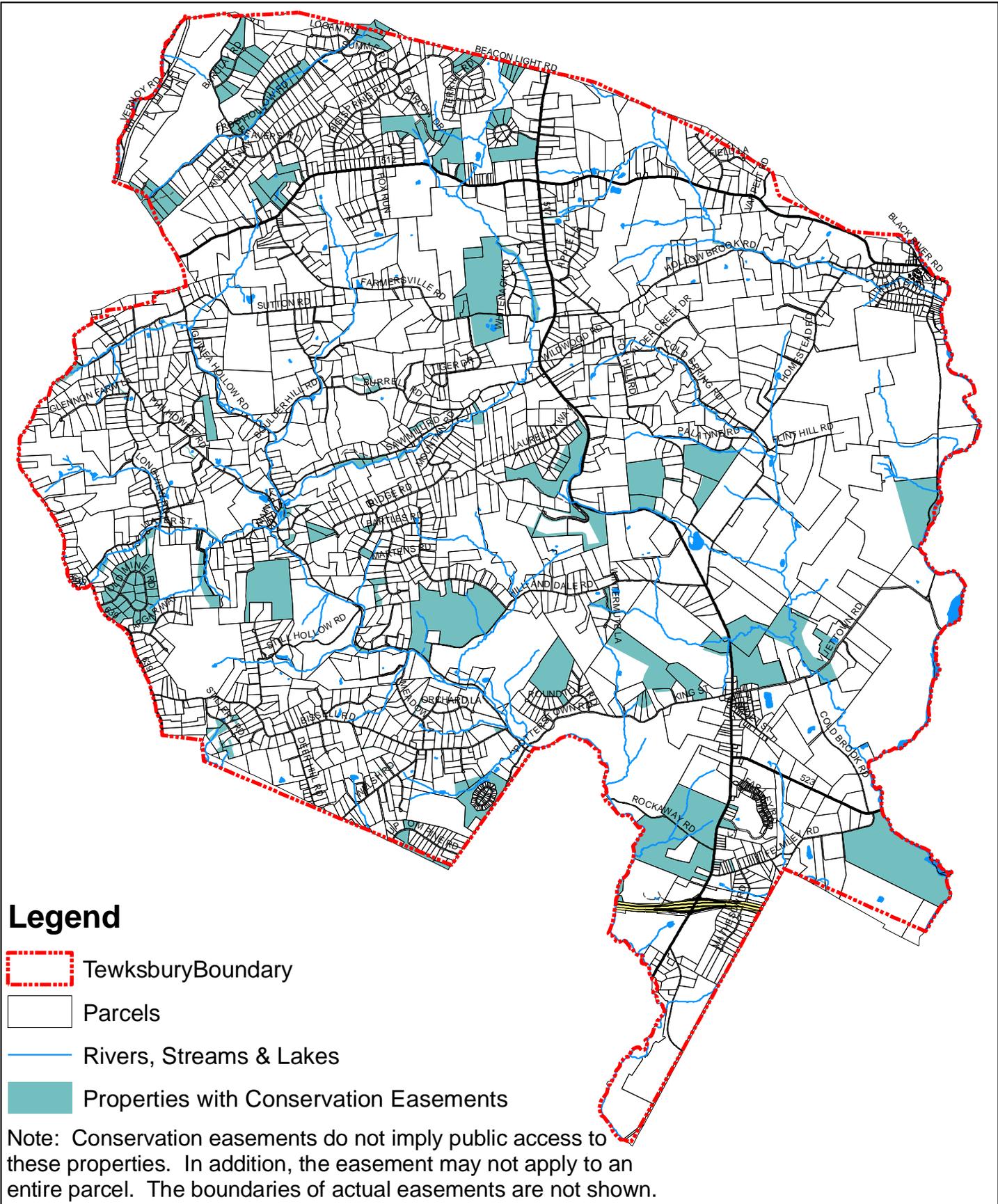


Figure 8a: Preserved Open Space



Legend

-  Tewksbury Boundary
-  Parcels
-  Rivers, Streams & Lakes
-  Properties with Conservation Easements

Note: Conservation easements do not imply public access to these properties. In addition, the easement may not apply to an entire parcel. The boundaries of actual easements are not shown.

Data Sources: See Appendix B.
Note: Map accuracy is limited to the accuracy and scale of the original data sets; see Appendix B.
Disclaimer: This map was developed using NJDEP and Hunterdon County GIS digital data, but this secondary product has not been verified by NJDEP or Hunterdon County and is not NJDEP or county authorized.



Figure 8b: Properties with Easements

As required by the Municipal Land Use Law and in order to apply for the Planning Incentive Grant (PIG), the FPPE includes an inventory of farm properties (Hintz, 20003, p.79), details of municipal support for agriculture, and a plan for preserving farmland (Hintz, 2003, pp.181-209). The FPPE also discusses the history of agriculture in Tewksbury Township, importance of farmland preservation, agricultural preservation goals and policies, prior farmland preservation efforts in the township and presents information on the types and classes of agricultural soils in the township.

Agricultural Development Areas (ADAs) in Tewksbury Township are shown on **Figure 8b**. ADAs are areas where agricultural operations currently exist and are likely to continue, based on the presence of existing farms and productive agricultural soils (farmland soils are shown in **Figure 4h**). The ADAs were delineated by Hunterdon County and approved by the State. The SADC and the County Agricultural Development Board (CADB) will only fund the preservation of farmland parcels that lie within an ADA.

Preserved farms in Tewksbury are shown in **Figure 8b**. **Table 8.2** lists these preserved farms, a total of 1,063.78 acres (approximately 5% of the township), which have been preserved pursuant to the SADC.

Table 8.2: Preserved Farmland

BLOCK	LOT	FACILITY	OWNERSHIP	YEAR	ACRES
5	12	Young	SADC	1998	60.18
10	1.01	Wade	SADC		37.41
10	5.02	Wade	SADC		66.19
14	9.01	Smith	Tewksbury Land Trust Easement		71.62
14	23.02	Schenker	SADC	2008	72.77
15	7	Vernon/Callanan	SADC		37.97
16	11	Storms	SADC	1998	157.90
19	11.05	Simpson	SADC		28.35
19	11.06	Simpson	SADC		25.96
19	11.07	Simpson	SADC		19.16
20	2	Lauber	SADC		13.35
26	10	Vernon/Callanan	SADC		19.48
31	12.01	Emmet	SADC		50.00
38	3	Turnquist	SADC	1998	66.02
38	14	Walls/Hitchcock	SADC	1998	106.48
38	14.02	Walls/Hitchcock	SADC		9.35
38	14.03	Walls/Hitchcock	SADC	2003	12.09
42	6	Chandor	SADC	1996	46.17
42	6.01	Emmet	SADC		18.46
42	6.02	Emmet	SADC		11.38
43	3.01	Emmet	SADC		17.17
45	6.02	Emmet	SADC		5.67
45	6.03	Emmet	SADC		8.82
48	5	Emmet (Additional 22 acres in Readington)	SADC	2007	101.83
Total Farmland Acres Preserved					1063.78
Sources: Hunterdon County Agriculture Development Board, 2005; Hunterdon County GIS data and NJDEP GIS data; Tewksbury Township Land Use Office; Highlands Water Protection and Planning Council, January 2008.					

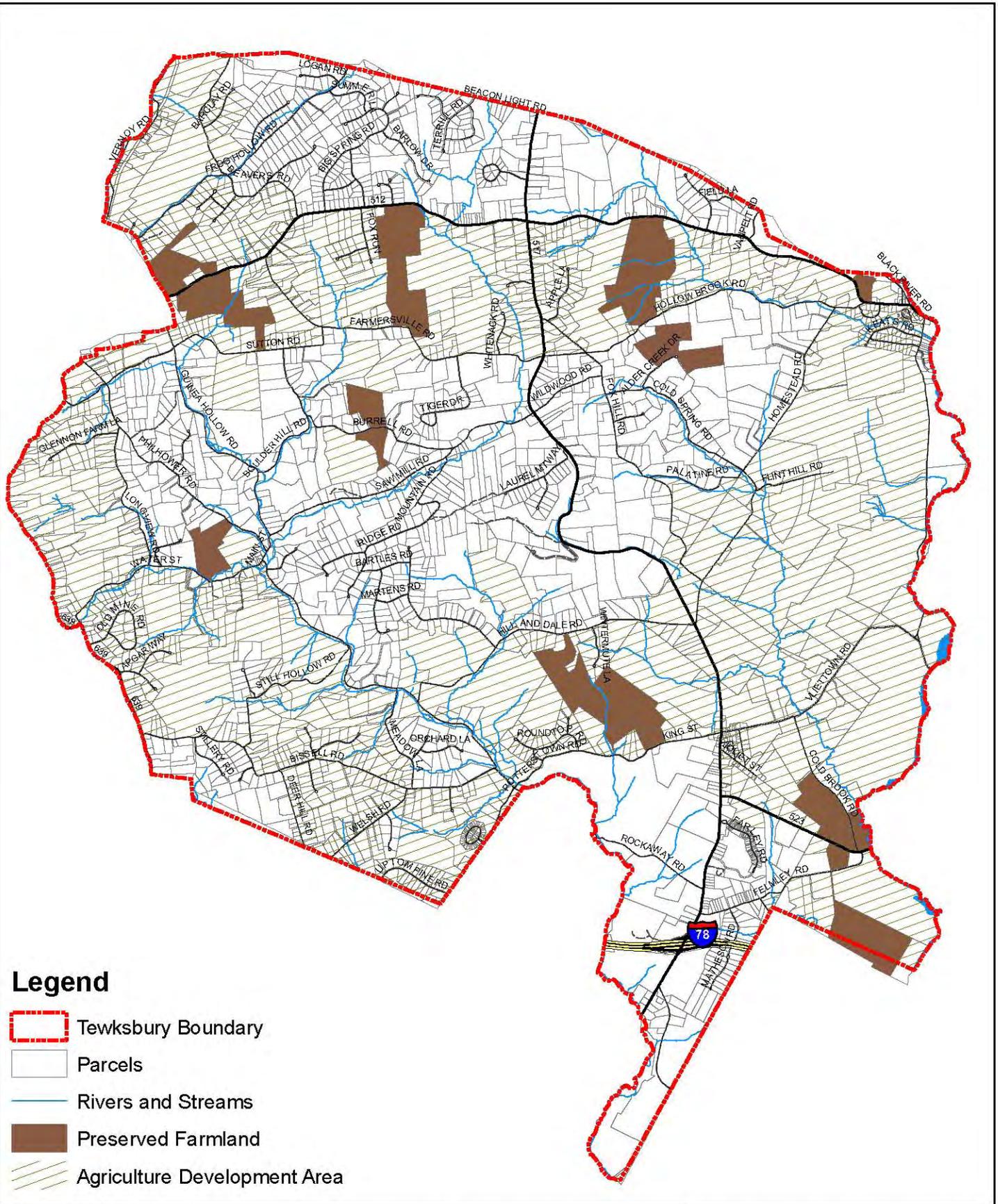


Figure 8c: Preserved Farmland & Ag. Development Area

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Hunterdon County

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Cold Brook Preserve: <http://www.co.hunterdon.nj.us/depts/parks/guides/ColdBrook.htm>

Open Space Trust Fund Program <http://www.co.hunterdon.nj.us/openspac.htm>

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Natural Resources Conservation Service (NRCS) Conservation Programs. http://www.nrcs.usda.gov/Programs/index_alph.html

NJ Conservation Foundation

[Garden State Greenways](#). <http://www.gardenstategreenways.org>

[2005 Annual Report](#). <http://njconservation.org/documents/NJCF2005AnnualReport.pdf>

NJDEP Green Acres Program: <http://www.nj.gov/dep/greenacres/>

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Tewksbury Township website. 2008. <http://www.tewksburytp.net>.

Upper Raritan Watershed Association (URWA). 2008. <http://www.urwa.org/land/tewksbury.html>

Internet Resources: Open Space & Farmland

Garden State Greenways <http://www.gardenstategreenways.org>

Hunterdon County Agriculture Development Board: <http://www.co.hunterdon.nj.us/cadb.htm>

Mailing Address: Hunterdon Co. Ag. Development Board, PO Box 2900, Flemington, NJ 08822-2900
Phone: 908.788.1490

Hunterdon County Open Space, Farmland and Historic Preservation Trust Fund:
<http://www.co.hunterdon.nj.us/openspac.htm>

Hunterdon Land Trust Alliance: <http://www.hlta.org>

Natural Resources Conservation Service (NRCS) Conservation Programs.
http://www.nrcs.usda.gov/Programs/index_alph.html

NJ Conservation Foundation: <http://www.njconservation.org/>

NJ Natural Lands Trust: <http://www.state.nj.us/dep/parksandforests/natural/trust.html>

NJDEP Division of Fish and Wildlife (grants and assistance with wildlife habitat):
<http://www.njfishandwildlife.com/artwhip06.htm>

NJDEP Division of Fish and Wildlife Landowner Incentive Program (LIP) Grants:
http://www.njfishandwildlife.com/ensp/lip_prog.htm

Rutgers New Jersey Agricultural Experiment Station (NJAES) – [Agriculture Publications Online](http://njaes.rutgers.edu/ag/) – useful information & links for farmers, gardeners, & consumers: <http://njaes.rutgers.edu/ag/>

Tewksbury Land Trust: Phone 908-879-4400 Address: PO Box 490 Oldwick, NJ 08858

9: HISTORIC RESOURCES

A. The History of Tewksbury Township

Humans arrived in New Jersey at least 9,000 - 10,000 years ago (Ashley, 2004). In nearby Kingwood Township, an archeological study found more than 3,000 Native American artifacts from the Paleo-Indian Period, many dating back to 841 BC or earlier, including ceramics, stone tools and food remains (Burrow et al, 1999 in Frenchtown.com, 2006).

At the time the first Europeans arrived in the area, there may have been as few as 2,000 or as many as 12,000 humans living in what is now New Jersey (compared to 5,541 now living in Tewksbury Township and 8.7 million in New Jersey, according to the 2000 Census). These Indians belonged to the Lenape tribe.

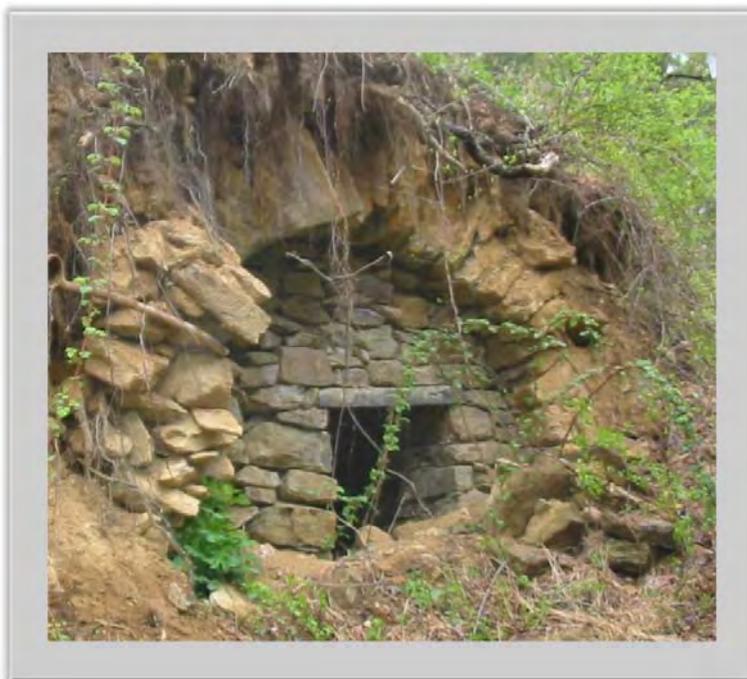
Artifacts can be found scattered throughout the area, a result of the Indians' nomadic lifestyle, with traces of the Indians more frequently found in the valleys and along streams and rivers. The vicinity of Oldwick was probably a favored location, because a concentration of 59 sites was found in the area in a study of Indian habitations in Warren and Hunterdon Counties. Three of these sites were workshops, as indicated by the number of stone chips covering the ground, while the others were ordinary camps. Argillite implements predominate, while flint and jasper implements were also found. Many smaller sites were found scattered throughout the township (Schrabisch, 1917).

As the Indians became less nomadic, they cleared the forests for village sites and agriculture, and cut wood for fuel, shelters, canoes, tools and other implements. It was also common practice to deliberately set fires for the purpose of driving game and thinning and opening up forests.

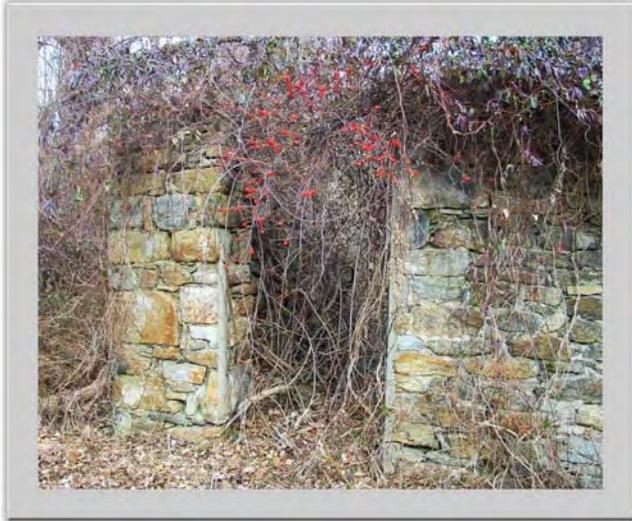
The earliest non-Indian settlers came to Hunterdon County around 1700 from the Netherlands, Germany, Scotland, England and Ireland. These settlers acquired most of the land from the Native Americans, who relocated to other areas. The Early Agrarian Period is characterized by the clearing of woodlands for agriculture. A variety of crops and vegetables were grown, and sawmills and gristmills were built along streams (McCall, 2005).

Although the Indians had affected the landscape of New Jersey, according to Robichaud and Anderson (1994) it was the European settlers and their descendents who truly disturbed the vegetation. "By the time New Jersey became a state in 1778, no extensive areas of land well suited to farming remained wooded in the central part of the state" (Robichaud and Anderson, 1994). The remaining forests were frequently and repeatedly cut for cordwood.

The villages and small towns that flourished in the 18th and 19th centuries have changed little, including Oldwick,



Mountainville and Pottersville. Many of the older farmsteads still exist. Tewksbury became a township in 1755, separated from Lebanon Township.



The Late Agrarian and Industrial Period began in the late 1800's. Railroad lines allowed farmers to transport products throughout the East. Industry in Tewksbury Township included graphite and iron (magnetite) mining (see Section 3b), but the deposits were not extensive, and apparently

none were very profitable (Bayley, 1910 and Volkert, 2002). The human population of New Jersey continued to grow, but the introduction of coal in 1850 began to allow the woodlands to recover to some extent. For example, Hunterdon County was only 14%

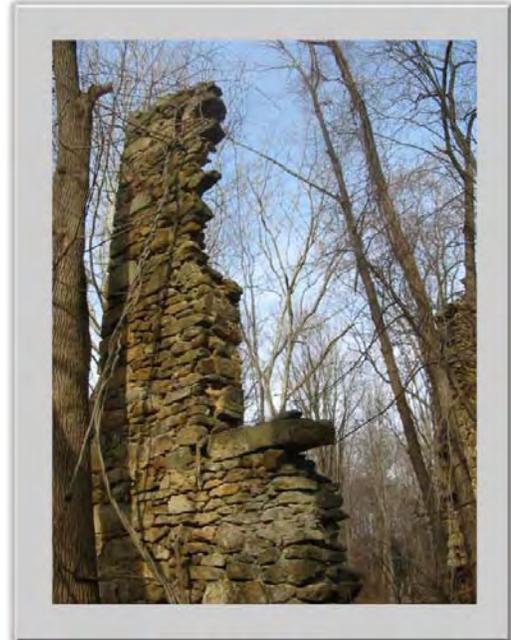


Table 9.1: Criteria for Evaluation for Inclusion in the National Register of Historic Places

The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

- A. That are associated with events that have made a significant contribution to the broad patterns of our history; or
- B. That are associated with the lives of persons significant in our past; or
- C. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- D. That have yielded or may be likely to yield, information important in prehistory or history.

Note: Properties are usually at least 50 years old to be considered eligible.

Source: National Register of Historic Places Home Page: <http://www.nationalregisterofhistoricplaces.com>

forested in 1899, but had increased to 36% forest cover in 1987 (Robichaud and Anderson, 1994). According to the NJDEP land use data, Tewksbury is now nearly 50% forested (see Section 7a).

In the Modern Period, agriculture still dominated the local economy for the first half of the 20th century, but then waned, due to competition from large-scale farms in other states and the value of land for other uses (McCall, 2005).

Despite the burgeoning human population of New Jersey, the fact that most of the population is concentrated in urban areas has allowed some areas to remain rural or natural. Tewksbury Township is one of these areas. However, recently there has been a shift of population from urban and developed areas to rural areas, extending the suburbs and eliminating farms, forests and wetlands along the way.

B. Historic Preservation

A *Historic site* means any real property, man-made structure, natural object or configuration or any portion or group of the foregoing of historical, archaeological, cultural, scenic or architectural significance. A *Historic District* is one or more historic sites and intervening or surrounding property significantly affecting or affected by the quality and character of the historic site or sites (MLUL, 2002).

Historic preservation is the planned effort to help protect structures, objects and properties of historic importance. In 1966, the National Historic Preservation Act created the National Register of Historic Places, which offered the protection of privately owned historic buildings and properties from federal government actions. It established criteria (see **Table 9.1**) for inclusion on the National Register and created a review process for public projects that threatened encroachment or razing of registered properties. It also enabled states to setup similar processes to protect registered properties from municipal, county and state encroachments. New Jersey created its State Register of Historic Places in 1970.

In addition, the New Jersey Municipal Land Use Law (MLUL) gives municipalities the express authority to zone for the protection of historic resources and to regulate private encroachments on designated historic properties. The MLUL outlines a specific planning process regarding the creation of local historic districts and the review of development activity within the districts (Hunterdon County, 2006).

Hunterdon County's Open Space Preservation Trust is a dedicated county tax of \$.03 per \$100 assessed valuation to fund open space, farmland preservation and historic preservation projects. The county's Cultural and Heritage Commission, with input from the County Planning Board and other Departments, makes recommendations for eligible projects. The County Board of Chosen Freeholders has approval authority for which projects will be funded (McCall, 2005).

Table 9.2: National Register of Historic Places in Tewksbury Township

District Name: Cokesbury Historic District	added 1997 - Hunterdon County - #97000802
Location: Along Cokesbury-Califon Rd., Rt. 639, Water St., and McCatharn Rd., Clinton (500 acres, 44 buildings, 3 structures, 2 objects)	
Historic Significance: Architecture/Engineering, Event	
Architectural Style: Italianate, Queen Anne, Greek Revival	
Area of Significance: Community Planning And Development, Architecture, Commerce, Religion	
Period of Significance: 1800-1924	
Owner: Private	
Historic Function: Commerce/Trade, Domestic, Education, Industry/Processing/Extraction, Religion	
District Name: Fairmount Historic District	added 1996 - Hunterdon County - #96001470
Location: Roughly, NJ 517 from the Morris--Hunterdon Co. line to NJ 512 and NJ 517 from Fox Hill to Wildwood Rds., Califon (4090 acres, 72 buildings, 5 structures, 1 object)	
Historic Significance: Architecture/Engineering, Event	
Architectural Style: Queen Anne, Italianate, Greek Revival	
Area of Significance: Exploration/Settlement, Industry, Architecture	
Period of Significance: 1800-1924	
Owner: Private	
Historic Function: Agriculture/Subsistence, Domestic, Funerary, Industry/Processing/Extraction, Religion	
District Name: Mountainville Historic District	added 1993 - Hunterdon County - #93001360
Location: Guinea Hollow Rd., Saw Mill Rd., Main St., Rockaway Creek Rd. and Philhower Rd., Tewksbury Township, Mountainville (1970 acres, 64 buildings, 3 structures, 2 objects)	
Historic Significance: Event, Architecture/Engineering	
Architectural Style: Queen Anne, Italianate, Greek Revival	
Area of Significance: Exploration/Settlement, Industry, Architecture	
Period of Significance: 1800-1924	
Owner: Private	
Historic Function: Agriculture/Subsistence, Domestic, Funerary, Industry/Processing/Extraction, Religion	

District Name: Oldwick Historic District	added 1988 - Hunterdon County - #88002153
Location: Roughly along CR 517, Church, King, James, Joliet and William Sts., Oldwick (1700 acres, 127 buildings, 12 structures) Historic Significance: Event, Architecture/Engineering Architectural Style: Early Republic, Late Victorian, Mid 19th Century Revival Area of Significance: Architecture, Industry, Commerce Period of Significance: 1700-1924 Owner: Private , Local Gov't Historic Function: Commerce/Trade, Domestic, Religion	
District Name: Pottersville Village Historic District	added 1990 - Hunterdon County - #90001475
Location: Properties fronting on Black River, Pottersville, McCann Mill and Hacklebarney Rds. and Fairmount Rd. E and Hill St., Pottersville (850 acres, 44 buildings, 2 structures) Historic Significance: Information Potential, Event, Architecture/Engineering Architectural Style: Italianate, Queen Anne, Other Area of Significance: Architecture, Historic - Non-Aboriginal, Exploration/Settlement, Industry, Commerce Period of Significance: 1750-1924 Owner: Private , State Historic Function: Agriculture/Subsistence, Domestic, Industry/Processing/Extraction, Religion	
District Name: Taylor's Mill Historic District	added 1992 - Hunterdon County - #92000636
Location: Jct. of Taylor's Mill and Rockaway Rds., Readington Township, Oldwick (180 acres, 2 buildings) Historic Significance: Architecture/Engineering, Person, Event Architectural Style: Other Historic Person: Col. John Taylor Area of Significance: Architecture, Military, Exploration/Settlement, Industry Period of Significance: 1750-1949; significant year 1760 Owner: Private , Local Gov't Historic Function: Domestic, Industry/Processing/Extraction Source: National Register of Historic Places, 2008	

C. Historic Inventory

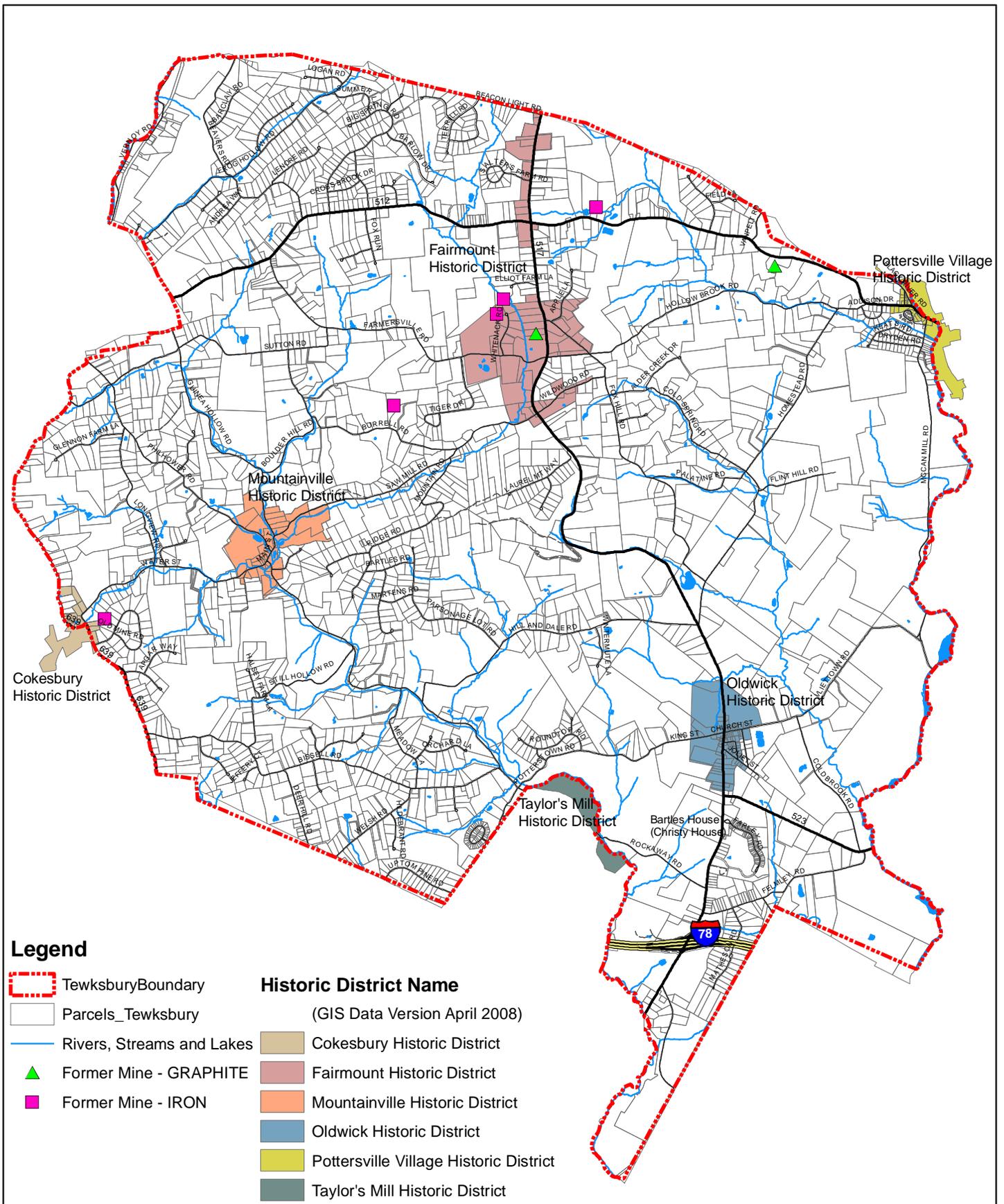
The Tewksbury Historical Society was formed in 1989 to preserve the history of the township (Tewksbury Times Online, February 2006).

Tewksbury Township encompasses part or all of six Historic Districts that are included on both the National and State Registers of Historic Places, including Cokesbury, Fairmount, Mountainville, Oldwick, Pottersville and Taylor's Mill (see **Table 9.2** and **Figure 9a**).

The oldest historic district in Tewksbury, *Oldwick* (formerly New Germantown) was originally founded by English settlers in the early 1700's. By the mid-18th century, a large number of German and Dutch immigrants had relocated to the area. In 1749 the Zion Evangelical Lutheran Church, the oldest German Lutheran parish in New Jersey, was constructed in the Gothic/Greek Revival style. The village experienced its greatest period of growth in the early to mid 19th century. The Oldwick United Methodist Church was built in 1865 in the Romanesque Revival style (Tewksbury Times Online, February 2006).

The *Pottersville Historic District* is located along both sides of the Lamington River (also known as the Black River). Portions of the village lie within Tewksbury (Hunterdon County), Washington and Chester Townships (Morris County) and Bedminster Township (Somerset County). The original mill was erected in the 1750's, and supplied grain to George Washington's Army. Many historic buildings still exist, such as the Dutch Reformed Church and the old Wortman Mill (Tewksbury Times Online, February 2006).

Beginning in the early 1800's, the *Mountainville Historic District* grew up at the intersection of what are now Rockaway Road, Main Street and Sawmill Road. Three mills were built at the confluence of four streams within the village (Tewksbury Times Online, February 2006).



Data Sources: See Appendix B.

Note: Map accuracy is limited to the accuracy and scale of the original data sets; see Appendix B.

Disclaimer: This map was developed using NJDEP and Hunterdon County GIS digital data, but this secondary product has not been verified by NJDEP or Hunterdon County and is not NJDEP or county authorized.



Figure 9a: Historic Districts & Historic Mines

Taylor's Mill Historic District is located on the southern edge of Tewksbury. A stone grist mill built in 1760 by Col. John Taylor is said to have supplied General Washington's army during the Revolution (Hunterdon County Cultural and Heritage Commission, 2006).

In 1997, the Historic Preservation Commission distributed a two volume catalogue of historic buildings, houses, and other sites throughout Tewksbury. Copies of this Historic Resources Survey are available for public use at the Tewksbury Library and at the Township offices. The survey includes a brief discussion of individual properties located within the township's National Register-listed historic districts (Tewksbury Times Online, February 2006).

Individual historic properties, buildings and bridges identified in the NJDEP Historic Preservation Office's GIS data are listed in **Table 9.3** and **Figure 9b**.

Table 9.3: Historic Districts and Sites in Tewksbury Township

District	Name	Address
Cokesbury Historic District	13 dwellings	
	Bridge (Hunterdon County bridge # T-100)	
	Bridge (Hunterdon County bridge # T-99)	
	Bridge (Hunterdon County bridge # CT-114)	
	Former general store	
	Former Cokesbury Presbyterian Church	
	Methodist Cemetery	
Fairmount Historic District	3 dwellings	
	Fairmount Presbyterian Community House	
	Fairmount Presbyterian Parsonage	
Mountainville Historic District	1 dwelling (converted bank barn)	
	13 dwellings	
	Bridge (Hunterdon Co. bridge #T 106)	
	Bridge (Hunterdon County bridge #T 84)	
	Commercial Building (originally a "carriage factory")	
	Farley's General Store	
Oldwick Historic District	33 dwellings	
	Barn and shed	
	Kline Farmhouse (Cold Spring Cottage)	Route 517
	Oldwick Community Center (old Barnet Hall Academy)	
	Oldwick Firehouse	
	Oldwick United Methodist Church	
	Oldwick Village Garage	
	UTS (phone company) Building	
Wagon House		
Pottersville Village Historic District	Unknown	
Taylor's Mill Historic District	Unknown	
Other	Bartles House (Christy House)	159 Oldwick Road
	Frog Hollow Road Bridge over minor tributary of South Branch Raritan River	
	Hollow Brook Road Bridge over tributary of Lamington River (NJDOT#100T022)	
	Palatine Road Bridge over Minor Tributary of the Lamington River	
Source: NJDEP Historic Preservation Office, 2004		

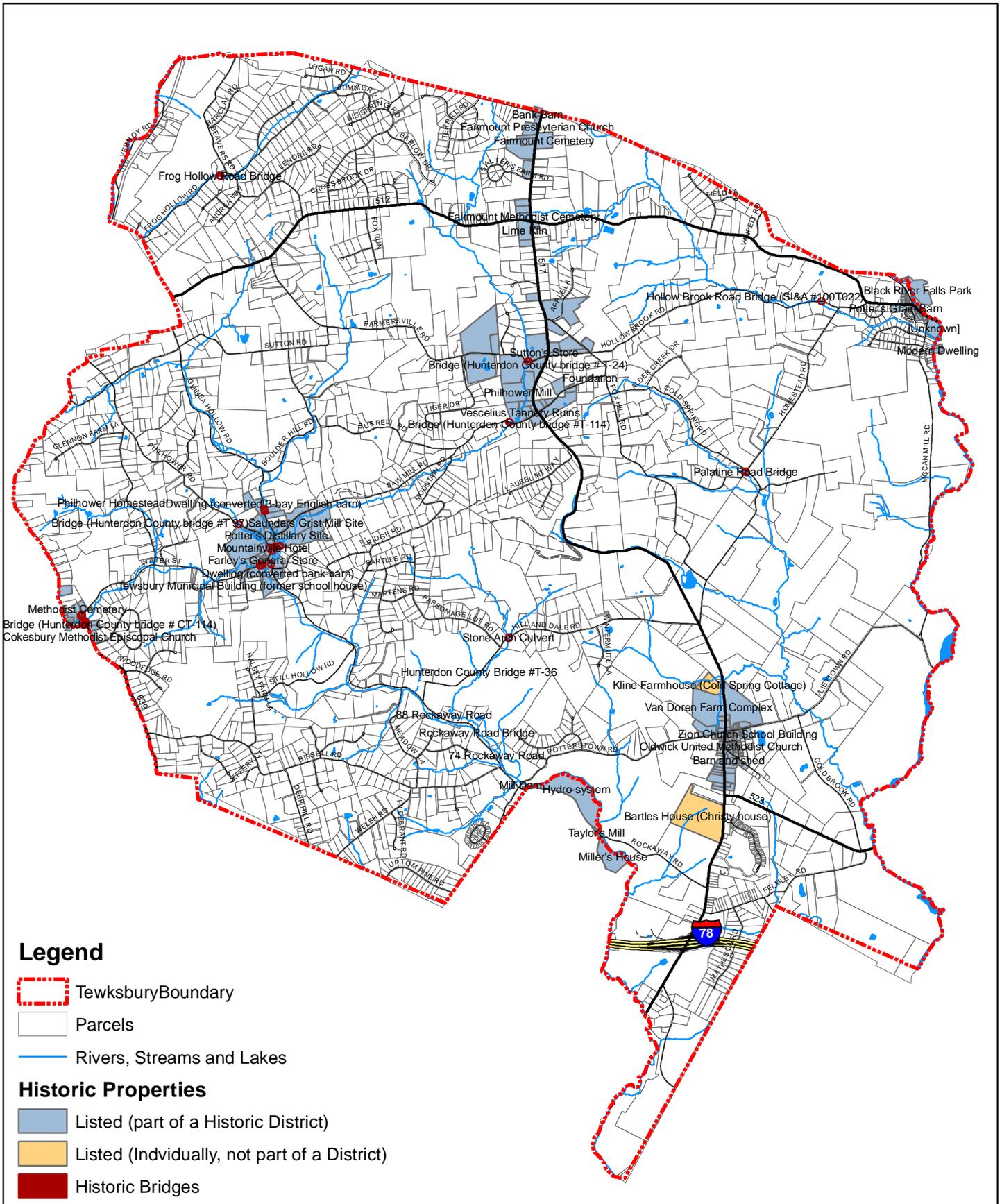


Figure 9b: Historic Properties

References: Historic Resources

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<http://www.state.nj.us/dep/njgs/enviroed/infocirc/graphite.pdf>

Internet Resources: Historic Resources

History of New Jersey (includes section on Hunterdon County) (ROOTS-L): <http://www.rootsweb.com/roots-1/USA/nj/history.html>

Hunterdon County History and Historic Preservation: <http://www.co.hunterdon.nj.us/planning/historic.htm>

National Register of Historic Places Home Page: <http://www.nationalregisterofhistoricplaces.com>

New Jersey Register of Historic Places Rules, N.J.A.C. 7:4 (Notice of Rule Proposal):
<http://www.nj.gov/dep/rules/notices/031708a.html>

New Jersey Historic Preservation Office: <http://www.state.nj.us/dep/hpo/>

Tewksbury Historical Society: <http://tewksburyhistory.net/index.html>

10: REGIONAL RELATIONSHIPS

A. The Highlands Water Protection and Planning Act

The Highlands Water Protection and Planning Act (Highlands Act) (N.J.S.A. 13:20-1 et seq.), which became effective in August 2004, is a law that aims to preserve open space and protect the state's greatest diversity of natural resources including the precious water resources that supply drinking water to more than half of New Jersey's population. The Highlands Act defines the geographical boundary of the Highlands Region and the Highlands Preservation and Planning Areas (see **Figure 10a**); requires the NJDEP to establish regulations in the Highlands Preservation Area; and creates a Highlands Water Protection and Planning Council, which is responsible for developing a regional master plan for the Highlands Region.

Of the 800,000 acre Highlands Region, the *Highlands Preservation Area* includes 398,000 acres that are designated as exceptional natural resource value. More than $\frac{1}{3}$ of this area is undeveloped. Proposals for "major development" on properties within the preservation area will require a NJDEP Highlands Preservation Area Approval, which will be guided by the environmental regulations within the act. An example of major development is one that disturbs 1 or more acres of land or increases impervious surface by $\frac{1}{4}$ acre or more. Improvements to existing single family dwellings, such as an addition, garage, patio, driveway, swimming pool, garden or septic system are exempt. The *Highlands Planning Area* encompasses all areas of the Highlands that are not designated as the Highlands Preservation Area. The Highlands Act does not establish any new regulations for development within the Planning Area, however, the *Regional Master Plan*, which was adopted by the Highlands Water Protection and Planning Council, provides for enhanced standards, transfer of development rights and smart growth in this area.

The northwestern $\frac{2}{3}$ of Tewksbury Township (13,475 acres) is within the Highlands Preservation Area, while the remainder (6,860 acres) lies within the Planning Area.

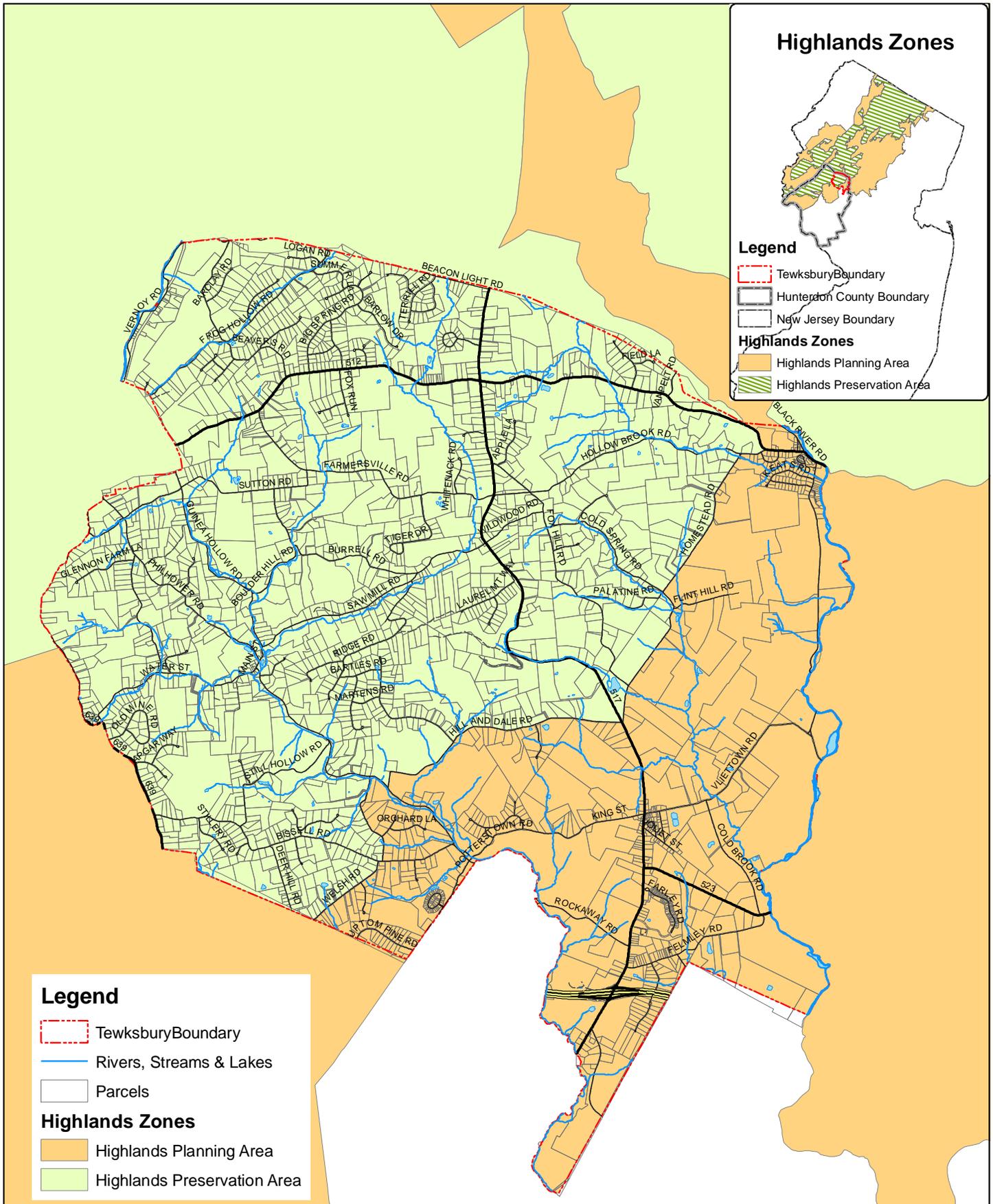
The Highlands Water Protection and Planning Council (Highlands Council) is composed of 15 members appointed by the Governor, 5 of whom must be municipal officials from the Highlands Region and 3 of whom must be county officials from the Highlands Region. The Council is responsible for carrying out the provisions of the Highlands Act.

The Highlands Council officially released the Highlands Regional Master Plan in November 2008, as well as the supporting technical information contained in the Technical Reports (NJDEP Highlands Council, 2008). This process generated an extensive amount of information at a regional scale.

Since the inception of this ERI writing project, it was intended to include Highlands information and data layers at the Township scale as part of the ERI document. In March 2009, the Highlands Council announced its Plan Conformance Grant Program specifications for *Module 4: Highlands Environmental Resource Inventory*.

The *Module 4: Highlands Environmental Resource Inventory for Tewksbury Township (draft)* was submitted in June 2009 as required for Basic Conformance. When reviewed and approved by the Highlands Council, it will be **Appendix E** of this document.

The purpose of the Highlands ERI addendum document echoes the purpose of this ERI as a whole, to "provide the base source for resource conservation." But with the additional goal of providing "a framework that supports the efforts of Tewksbury Township to bring its master plan, including the ERI, into conformance with the Highlands Regional Master Plan (RMP) (see **Appendix E**).



Highlands Zones

Legend

- Tewksbury Boundary
- Hunterdon County Boundary
- New Jersey Boundary
- Highlands Zones**
- Highlands Planning Area
- Highlands Preservation Area

Legend

- Tewksbury Boundary
- Rivers, Streams & Lakes
- Parcels
- Highlands Zones**
- Highlands Planning Area
- Highlands Preservation Area

Data Sources: See Appendix B.
Note: Map accuracy is limited to the accuracy and scale of the original data sets; see Appendix B.
Disclaimer: This map was developed using NJDEP and Hunterdon County GIS digital data, but this secondary product has not been verified by NJDEP or Hunterdon County and is not NJDEP or county authorized.



0 0.25 0.5 1 1.5
 Miles

Figure 10a: NJDEP Highlands Zones

B. Hunterdon County Planning Board

The Hunterdon County Planning Board was established by the Board of Chosen Freeholders in 1957. The office is located at the Route 12 County Complex, Building #1. The Hunterdon County Planning Board's responsibilities are as follows:

- prepare and adopt a master plan for the physical development of the County,
- review subdivision and site plan applications,
- encourage municipal cooperation in matters of mutual and regional concern,
- advise the Board of Chosen Freeholders on capital budgets and expenditures, and maintain a file on municipal master plans and development regulations. (Hunterdon County Planning Board, 2007).

Hunterdon County Planning Board reviews all land subdivisions and site plans that are located on a County road or affect County facilities. The Planning Board prepared the Hunterdon County Open Space, Farmland and Historic Preservation Trust Fund Plan, which provides the Board of Chosen Freeholders with policy guidance on the County's open space, farmland and historic preservation goals. The Planning Board is also responsible for developing other planning documents, such as the Hunterdon County Farmland Preservation Plan, Hunterdon County Park and Recreation Master Plan, and the Hunterdon County Master Plan.

The Planning Board has written a number of publications, many of which are free or downloadable from the internet, including a Woodland Conservation Handbook (2003), Community Design Handbook (1999), Strategies for Managing Growth in Hunterdon County (1998), County Databook (demographics) (2003), and Sites of Historic Interest (1979). The Planning Board developed the *Hunterdon County Environmental Toolbox*, which consists of a series of model ordinances that municipalities may use to help manage growth and ensure environmentally sound development. Eleven model ordinances have been approved, with input and consensus by diverse interests in order to ensure they were legally sound, scientifically valid and responsive to the concerns of the diverse interest groups that would ultimately be affected by them (Hunterdon County Planning Board, 2007).

C. Water Quality Management Planning

Watershed management is the process of managing all of the water resources within the area of a watershed, rather than on a site-specific basis. A watershed management approach is based on three key components: 1) a geographic focus; 2) continuous improvement based on sound science; and 3) partnerships/stakeholder involvement (NJDEP Office of Environmental Planning, 1997).

- Revisions to the Water Quality Management Planning Rules (N.J.A.C. 7:15) were adopted July 7, 2008. This rule establishes the following:
- procedures for preparation, adoption, amendment, revision, and certification of *Water Quality Management (WQM) Plans*;
- procedures for NJDEP's review of projects and activities for consistency with WQM plans;
- adoption of other NJDEP rules, priority systems and project priority lists, sludge management plans, regional stormwater management plans, effluent limitations, wastewater management plans, 201 Facilities Plans, and other documents in WQM Plans;
- coordination of WQM planning with the Highlands RMP, other programs and municipal zoning;
- mechanisms to resolve conflicts;

- procedures for submission, adoption, and updating *wastewater management plans (WMPs)*, procedures for WQM plan amendments and revisions, and the withdrawal of wastewater service areas where wastewater management plans are not current; the assignment of the duty to prepare and update wastewater management plans to county boards of chosen freeholders; and
- the process for identifying water bodies on the List of Water Quality Limited Segments and establishing total maximum daily loads (TMDLs) (see **Section 6E** for more about TMDLs) (NJDEP, 2008).

D. State Development & Redevelopment Plan

The NJ Department of Community Affairs Office of Smart Growth (OSG) implements the goals of the State Development and Redevelopment Plan to achieve comprehensive, long-term planning. The OSG coordinates planning throughout the state to protect the environment and guide future growth into compact, mixed-use development and redevelopment and integrates that planning with programmatic and regulatory land-use decisions at all levels of government and the private sector (NJ Department of Community Affairs, 2008).

The purpose of the 2001 State Plan is to "Coordinate planning activities and establish Statewide planning objectives in the following areas: land use, housing, economic development, transportation, natural resource conservation, agriculture and farmland retention, recreation, urban and suburban redevelopment, historic preservation, public facilities and services, and intergovernmental coordination" (N.J.S.A. 52:18A-200(f)). The State Plan is not a regulation but a statement of policy that has been adopted by the State Planning Commission to guide state, regional and local agencies in the exercise of their statutory authority (NJ State Planning Commission, 2001).

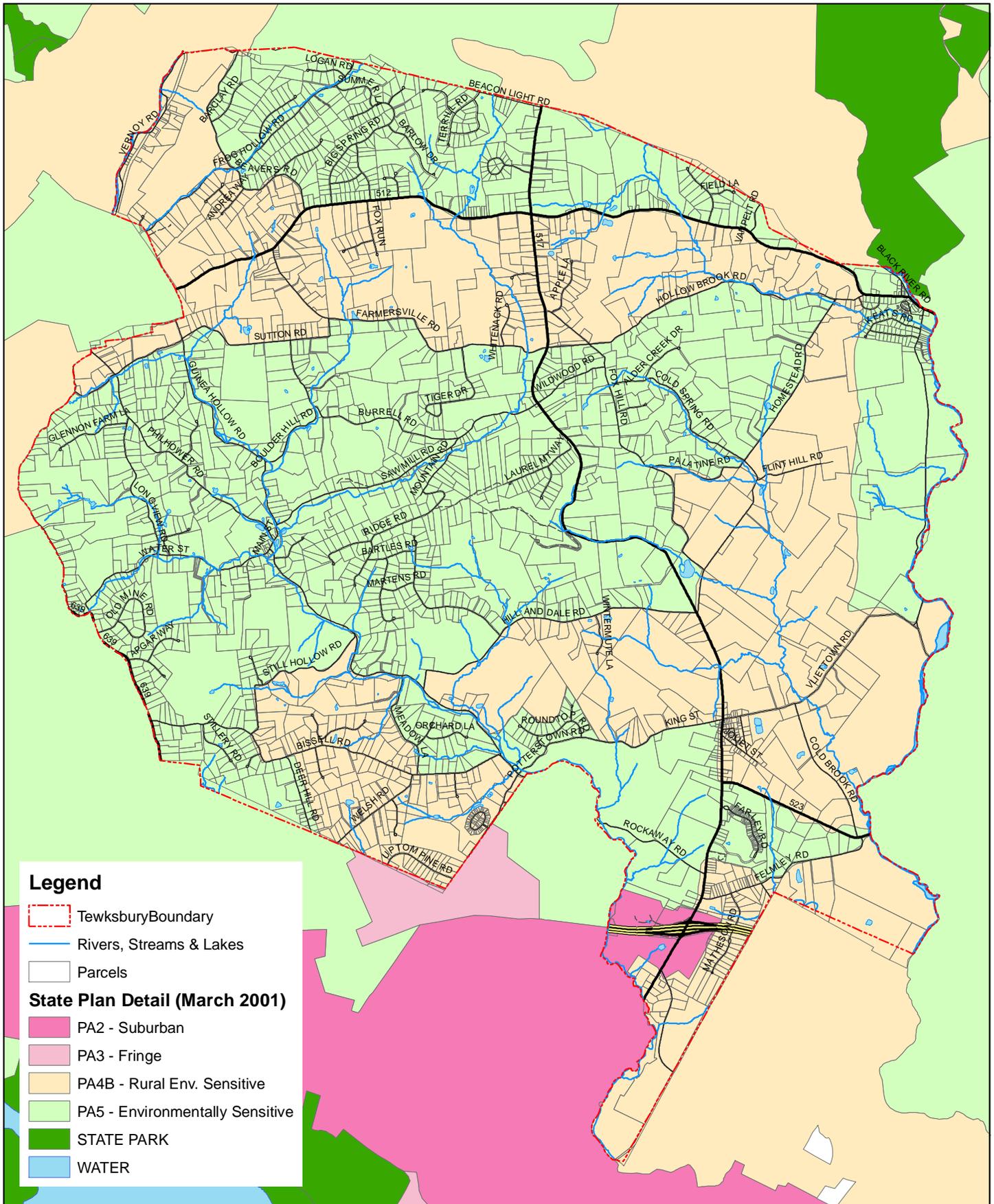
The 3 different planning zones found within Tewksbury include PA2-Suburban, PA4B-Rural Environmentally Sensitive, and PA5-Environmentally Sensitive, which are shown in **Figure 10b** and described below.

The State Plan goals for *PA2-Suburban Planning Area* are to provide for much of the state's future development; promote growth in Centers and other compact forms; protect the character of existing stable communities; protect natural resources; redesign areas of sprawl; reverse the current trend toward further sprawl; and revitalize cities and towns.

The State Plan goals for the *PA4B-Rural Environmentally Sensitive Planning Area* are to support continued agricultural development on lands with environmentally sensitive features; to maintain the Environs as large contiguous areas of farmland and other lands; revitalize cities and towns; accommodate growth in Centers; promote a viable agricultural industry; protect the character of existing stable communities; and confine programmed sewers and public water services to Centers.

The State Plan goals for the *PA5-Environmentally Sensitive Planning Area* are to protect environmental resources through the protection of large contiguous areas of land; accommodate growth in Centers; protect the character of existing stable communities; confine programmed sewers and public water services to Centers; and revitalize cities and towns (NJ State Planning Commission, 2001).

The State Plan has recognized the New Jersey Highlands (see **Section 10A**) as a *Special Resource Area* as a demonstration of the Highlands' critical importance to the state. The State Plan and Highlands process for municipalities and counties will be streamlined by providing for simultaneous agency reviews as well as joint meetings, whenever possible (Highlands Water Protection and Planning Council, 2008).



Data Sources: See Appendix B.

Note: Map accuracy is limited to the accuracy and scale of the original data sets; see Appendix B.

Disclaimer: This map was developed using NJDEP and Hunterdon County GIS digital data, but this secondary product has not been verified by NJDEP or Hunterdon County and is not NJDEP or county authorized.



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Miles

Figure 10b: State Development and Redevelopment Plan

Tewksbury Township ERI, 2009
Prepared by Kratzer Environmental Services

References: Regional Relationships

Highlands

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State Plan

NJ Department of Community Affairs, Office of Smart Growth. 2008. New Jersey State Development and Redevelopment Plan Home Page. <http://www.nj.gov/dca/osg/index.shtml>

NJ State Planning Commission. March 1, 2001. New Jersey State Development and Redevelopment Plan Executive Summary. 58 pages. <http://www.nj.gov/dca/divisions/osg/plan/>

Internet Resources: Regional Relationships

Highlands Act & Highlands Council

NJDEP Highlands Council: <http://www.highlands.state.nj.us/>

Hunterdon County Planning Board

Home Page: <http://www.co.hunterdon.nj.us/planning.htm>

Watershed Management

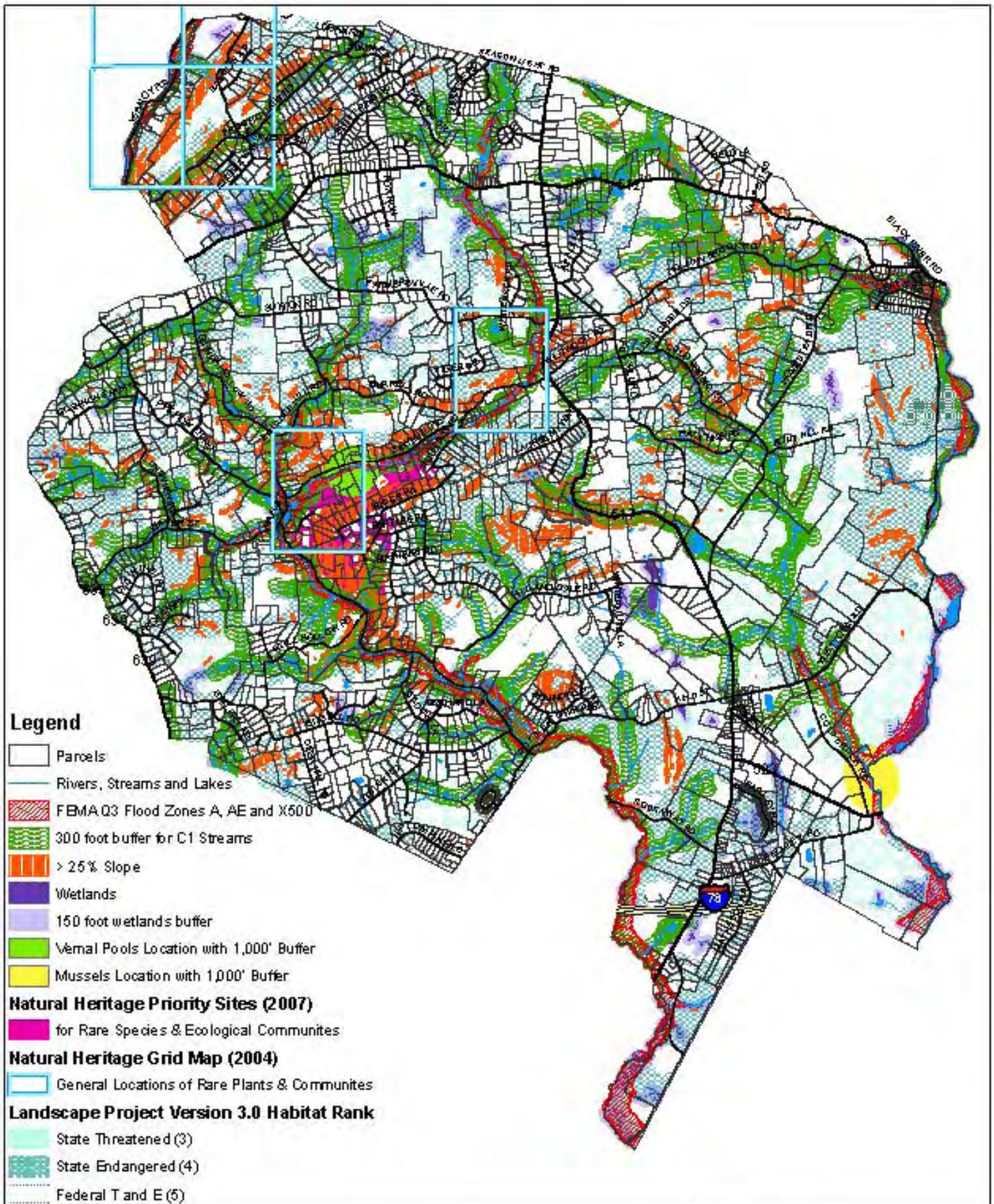
Division of Watershed Management Home Page: <http://www.state.nj.us/dep/watershedmgt/index.htm>

State Development and Redevelopment Plan

Office of Smart Growth: <http://www.nj.gov/dca/osg/index.shtml>

11: ENVIRONMENTALLY SENSITIVE AREAS

Figure 11 provides a composite view of several of the features that make an area environmentally sensitive. This map shows wetlands, 150 foot wetlands buffers, floodplains, steep slopes, 300 foot C1 stream buffers, Landscape Project animal habitats that are ranked 3 (state threatened species), 4 (state endangered species) and 5 (federally endangered species), natural heritage priority sites (for rare species and ecological communities), and natural heritage grid map (for generalized locations of rare plants and natural communities).



Data Source: See Appendix B.
 Note: Map accuracy is limited to the accuracy and scale of the original datasets; see Appendix B.
 Disclaimer: This map was developed using NJDEP and Gloucester County GIS digital data, but is a secondary product that has not been verified by NJDEP or Gloucester County and is not NJDEP or county authorized.



Figure 11: Environmentally Sensitive Areas

APPENDIX A: DATA USE AGREEMENTS

Contents

- A-1. Terms of Agreement for use of NJDEP GIS data
- A-2. Spatial Data Distribution Agreement for use of Hunterdon County GIS Data
- A-3. Cautions and Restrictions on Use of Natural Heritage Data

A-1. Terms of Agreement for use of NJDEP GIS data

(Required by NJDEP Office of Information Management, Bureau of Geographic Information and Analysis.)

1. Digital data received from the NJDEP are to be used solely for internal purposes in the conduct of daily affairs.
2. The data are provided, as is, without warranty of any kind and the user is responsible for understanding the accuracy limitations of all digital data layers provided herein, as documented in the accompanying Data Dictionary and Readme files. Any reproduction or manipulation of the above data must ensure that the coordinate reference system remains intact.
3. Digital data received from the NJDEP may not be reproduced or redistributed for use by anyone without first obtaining written permission from the NJDEP. This clause is not intended to restrict distribution of printed mapped information produced from the digital data.
4. Any maps, publications, reports, or other documents produced as a result of this project that utilize NJDEP digital data will credit the NJDEP Geographic Information System (GIS) as the source of the data with the following credit/disclaimer:

This (map/publication/report) was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

5. Users shall require any independent contractor, hired to undertake work that will utilize digital data obtained from the NJDEP, to agree not to use, reproduce, or redistribute NJDEP GIS data for any purpose other than the specified contractual work. All copies of NJDEP GIS data utilized by an independent contractor will be required to be returned to the original user at the close of such contractual work. Users hereby agree to abide by the use and reproduction conditions specified above and agree to hold any independent contractor to the same terms. By using data provided herein, the user acknowledges that terms and conditions have been read and that the user is bound by these criteria.

A-2. Spatial Data Distribution Agreement for use of Hunterdon County GIS Data

(Required by County of Hunterdon Division of Geographic Information Systems.)

- Digital data received from the County of Hunterdon is to be used solely for internal purposes in the conduct of daily affairs.
- The data is provided, as is, without warranty of any kind and the user is responsible for understanding the accuracy limitations of all digital data layers provided herein, as documented in the accompanying Data Dictionary and readme files. Any reproduction or manipulation of the above data must ensure that the coordinate reference system remain intact.
- Digital data received from the County of Hunterdon may not be reproduced or redistributed for use by anyone, without first obtaining written permission from the County of Hunterdon. This clause is not intended to restrict the distribution of printed mapped information produced from the digital data.
- Any sale distribution is prohibited without prior approval from the County of Hunterdon.
- Users agree to hold the County of Hunterdon, New Jersey and all their employees, and agents harmless from any claim, suit, or proceeding arising out of the use of the data in accordance with this agreement, including indemnification of the County of Hunterdon and the State of New Jersey for reasonable expenses incurred in defending such claims.
- The reproduction of any hard copy products, as provided by the County of Hunterdon, with the intent to sell for a profit is prohibited without the written consent from the County of Hunterdon.
- Any maps, publications, reports, or other documents produced as a result of this project which utilize Hunterdon County digital data will credit the County's Geographic Information System as the source of the data with the following credit/disclaimer:

"This (map/publication/report) was developed using Hunterdon County, New Jersey, Geographic Information System digital data, but this secondary product has not been verified by Hunterdon County and is not county-authorized."

- Users shall require any independent contractor, hired to undertake work which will utilize digital data obtained from the County of Hunterdon, to agree not to use, reproduce, or redistribute Hunterdon County GIS digital data for any purpose other than the specified contractual work. All copies of Hunterdon County GIS digital data utilized by an independent contractor will be required to be returned to the original user at the close of such contractual work.
- Users hereby agree to abide by the use and reproduction conditions specified above and agree to hold any independent contractor to the same terms. By using data provided herein, the user acknowledges the terms and conditions have been read and that the user is bound by these criteria.

A-3. Cautions and Restrictions on Use of Natural Heritage Data

(Required by NJDEP Division of Parks and Forestry, Natural Lands Management.)

CAUTIONS AND RESTRICTIONS ON NATURAL HERITAGE DATA

The quantity and quality of data collected by the Natural Heritage Program is dependent on the research and observations of many individuals and organizations. Not all of this information is the result of comprehensive or site-specific field surveys. Some natural areas in New Jersey have never been thoroughly surveyed. As a result, new locations for plant and animal species are continuously added to the database. Since data acquisition is a dynamic, ongoing process, the Natural Heritage Program cannot provide a definitive statement on the presence, absence, or condition of biological elements in any part of New Jersey. Information supplied by the Natural Heritage Program summarizes existing data known to the program at the time of the request regarding the biological elements or locations in question. They should never be regarded as final statements on the elements or areas being considered, nor should they be substituted for on-site surveys required for environmental assessments. The attached data is provided as one source of information to assist others in the preservation of natural diversity.

This office cannot provide a letter of interpretation or a statement addressing the classification of wetlands as defined by the Freshwater Wetlands Act. Requests for such determination should be sent to the DEP Land Use Regulation Program, P.O. Box 401, Trenton, NJ 08625-0401.

The Landscape Project was developed by the Division of Fish & Wildlife, Endangered and Nongame Species Program to map critical habitat for rare animal species. Some of the rare species data in the Landscape Project is in the Natural Heritage Database, while other records were obtained from other sources. Natural Heritage Database response letters will list all species (if any) found during a search of the Landscape Project. However, any reports that are included with the response letter will only reference specific records if they are in the Natural Heritage Database. This office cannot answer any inquiries about the Landscape Project. All questions should be directed to the DEP Division of Fish and Wildlife, Endangered and Nongame Species Program, P.O. Box 400, Trenton, NJ 08625-0400.

This cautions and restrictions notice must be included whenever information provided by the Natural Heritage Database is published.



NJ Department of Environmental Protection
Division of Parks and Forestry

Natural Lands Management

APPENDIX B: METADATA FOR GIS DATA LAYERS USED FOR THE TEWKSBURY TOWNSHIP ENVIRONMENTAL RESOURCE INVENTORY

Descriptions of Data Layers:

Data Disclaimers in **Appendix A** apply to the use of these data layers and the maps created from them. The user is responsible for understanding the accuracy limitations of the digital data layers, as documented in the accompanying report and metadata summaries, and the metadata files which accompany the data.

B-1: GIS Metadata – Summary of GIS Layers Used

Used for Figure	Source of Data	Data Title	Date
1a, 2a	Hunterdon County	Boundary - Municipalities of Hunterdon County	1/22/2001
	NJDEP, OIRM, BGIS	Boundary - NJDEP County Boundaries for the State of NJ	1/23/2003
1a, 2a, 2f, 10a	NJDEP, OIRM, BGIS	Boundary - NJDEP County Boundary for Hunterdon County, New Jersey	1/1/2003
	NJDEP, OIRM, BGIS	Boundary - NJDEP State Boundary of New Jersey	11/1/1998
1a, 6a	NJDEP, GS	NJDEP State Rivers for New Jersey (Third Order or Higher)	1/1/1993
1a, 6e	NJDEP, OIRM, BGIS	Boundary - NJDEP Municipality Boundaries for the State of New Jersey	11/14/2007
1b	NJDEP, OIRM, BGIS	New Jersey 2002 High Resolution Orthophotography (57 files)	7/31/2003
1c	Hunterdon County	Railroads	5/7/2007
	NJDEP, OIRM, BGIS	NJDEP Place Name Locations in the State of New Jersey	8/6/2004
	USGS, WRD	DGS99-1: USGS Topo Quads	5/27/1999
1e, 7a, 7b	NJDEP, OIRM, BGIS	NJDEP 2002 Land use/Land cover Update, N and S Branch Raritan Watershed Mgmt. Area, WMA-8 (03-2008)	3/4/2008
2a	NJDEP, DER, BAM	NJDEP Ambient Air Quality Monitors	3/1/2006
	NJDEP, GS	DGS00-1 NJDEP Drought Regions of New Jersey	5/1/2004
2c	NJDEP, DSRT	NJDEP Public Community Water Purveyor Service Areas	7/12/2004
	NJDEP, DWM, BWR	New Jersey Statewide Sewer Service Area	2/1/2008
	NJDEP, GS	DGS02-2 GIS Coverages of Public Community Water Supply Well Head Protection Areas for New Jersey	7/27/2007
	NJDEP, GS	New Jersey Public Community Water Supply Wells Database	6/28/2007
2d	Tewksbury Land Use	Tewksbury Township Mapped Wells	12/31/2000
2e	Tewksbury Land Use	Tewksbury Township Mapped Septic System Drainage Fields	12/31/2000
	Tewksbury Land Use	Tewksbury Township Mapped Septic Systems	12/31/2000
2f	NJDEP, GS	DGS02-7 Physiographic Provinces of New Jersey	6/30/2002
2g	Hunterdon County	Contours - 20 feet - Township	7/19/2005
2h, 11	Hunterdon County	Hunterdon County Steep Slopes	4/15/2003
3a	NJDEP, GS	DGS04-1 Earthquakes Epicentered In New Jersey	4/25/2005
	NJDEP, GS	DGS04-6 Bedrock Geology of New Jersey. (Scale 1:100,000) - bedrock	6/30/1999
	NJDEP, GS	DGS04-6 Bedrock Geology of New Jersey. (Scale 1:100,000) - faults	6/30/1999
	NJDEP, GS	DGS04-6 Bedrock Geology of New Jersey. (Scale 1:100,000) - folds	6/30/1999
	NJDEP, GS	DGS05-1 Selected Sand, Gravel and Rock Surficial Mining Operations in New Jersey	2/1/2005
3a, 9	NJDEP, GS	DGS03-2 Abandoned Mines of New Jersey	7/29/2005
3b	NJDEP, GS	DGS99-3 Surficial Geology of Hunterdon County, New Jersey (1:24,000)	1/1/1993
4a-h, 6b, 6c	USDA, NRCS	Soil Survey Geographic 2005 (SSURGO) Database for Hunterdon	12/7/2006
5b	NJDEP, GS	DGS98-5 Aquifers of New Jersey	1/1/1998
	NJDEP, GS	DGS98-6 Sole-Source Aquifers of New Jersey (1:100,000)	5/19/1998
5d	NJDEP, GS	DGS02-3 Ground Water Recharge for Hunterdon County, NJ	10/8/2004
5e	NJDEP, GS	Aquifer Recharge Potential for Hunterdon County, NJ	1/4/2005
5f	NJDEP, DWQ, BNPC	NJPDES Regulated Discharge to Ground Water Facility Locations	7/18/2007
	NJDEP, GS	DGS05-2 NJ's Ambient Ground Water Quality Network data	5/24/2007
	NJDEP, SRP	NJDEP Currently Known Extent of Groundwater Contamination (CKE) for New Jersey	3/1/2007
	NJDEP, SRP	NJDEP Deed Notice Extent Polygons in New Jersey, 2007	3/1/2007
	NJDEP, SRWM	NJDEP Known Contaminated Site List for New Jersey, 2005	2/1/2006
6a	NJDEP, OIRM, BGIS	NJDEP Municipality Boundaries for the State of New Jersey	11/14/2007

Used for Figure	Source of Data	Data Title	Date
		(Clipped to Coast)	
	NJDEP, OIRM, BGIS	NJDEP Watershed Management Areas in New Jersey	4/5/2000
6a, 6d	NJDEP, GS	NJDEP 14 Digit Hydrologic Unit Code delineations for New Jersey (DEPHUC14)	1/20/2006
6b, 11	FEMA	FEMA Flood Hazard Zones - Q3 Flood Data, HUNTERDON COUNTY, NEW JERSEY	5/23/1996
6c	NJDEP, OIRM, BGIS	NJDEP Linear Non-Tidal Wetlands of Hunterdon County, New Jersey, 1986	11/1/1998
6c, 11	NJDEP, OIRM, BGIS	NJDEP 2002 Land use/Land cover, N and S Branch Raritan Watershed Mgmt. Area, wetlands only	3/4/2008
6d, 11	NJDEP, DLM, BFBM	NJDEP Surface Water Quality Standards of New Jersey (June 2009 version)	6/1/2009
6e	NJDEP, DLM, BFBM	Ambient Stream Quality Monitoring Sites (1998 - 2008)	5/24/2007
	NJDEP, DLM, BFBM	NJDEP Ambient Biomonitoring Network (AMNET) 2004	12/1/2005
	NJDEP, DLM, BFBM	NJDEP Existing Water Quality Stations in New Jersey	10/19/2007
	NJDEP, DLM, BFBM	NJDEP Fish Index of Biotic Integrity Monitoring Network (2000-2006)	9/24/2007
	NJDEP, DLM, BFBM	NJDEP Supplemental Ambient Surfacewater Monitoring Network (SASMN)	10/19/2007
	NJDEP, DLM, BFBM	STORET Water Quality Monitoring Stations	8/1/2005
	NJDEP, ER, DWQ,PSPR1	NJPDES Surface Water Discharges in New Jersey, (1:12,000)	11/20/2007
	USGS, WRD	USGS continuous-streamflow gaging locations in New Jersey	4/17/2002
	USGS, WRD	USGS stream crest gaging locations in New Jersey	4/17/2002
	USGS, WRD	USGS stream lowflow gaging locations in New Jersey	4/17/2002
USGS, WRD	USGS surface-water quality gaging stations in New Jersey	4/17/2002	
7c	Rutgers CRSSA	Vernal Pools	
7d, 11	NJDEP, ENSP	NJDEP Landscape Project 3.0: Species Based Patches within the Highlands Extended Boundary	5/16/2008
7d	NJDEP, ENSP	NJDEP Landscape Project 3.0: Streams within the ENSP Highlands Extended Boundary with Mussels Rating	5/16/2008
7e, 11	NJDEP, OIRM, BGIS	Natural Heritage Grid Map	2/1/2004
7e, 11	NJDEP, OIRM, BGIS	NJDEP Natural Heritage Priority Sites	3/1/2007
8a	Hunterdon County	County Park Trail	
	Hunterdon County	Open Space - Hunterdon County	4/21/2003
	Tewksbury Land Use	Tewksbury Township/Banisch Associates	9/29/2009
	Highlands Council	Supporting LUCM Series Shape Files - Open Space	1/10/2008
8b	Tewksbury Land Use	Tewksbury Township 2008 Easement Inventory	1/28/2008
	Tewksbury Land Use	Tewksbury Township Inventory of Easements	
8c	Hunterdon County	County Preserved Farmland	4/21/2003
	Hunterdon County	Hunterdon CADB Agricultural Development Areas	4/21/2003
	Tewksbury Land Use	Tewksbury Township Preserved Farmland	9/29/2009
9	NJDEP, NHR, HPO	NJDEP Historic Districts of New Jersey, Edition 20080422	4/22/2008
	NJDEP, NHR, HPO	NJDEP Historic Properties of New Jersey	4/22/2008
10a	NJDEP, OPPS	NJ Highlands Preservation and Planning Area	12/1/2005
10b	NJDCA, OSG	Planning Areas of the NJ State Development and Redevelopment Plan, adopted March 1, 2001	6/20/2007
most	Hunterdon County	Boundary - Tewksbury Boundary Clipped from Municipalities of Hunterdon County	1/22/2001
	Hunterdon County	Lakes - Hunterdon County	10/13/2000
	Hunterdon County	Parcels - Tewksbury Township	2/20/2004
	Hunterdon County	Rivers - Hunterdon County	10/16/2000
	Hunterdon County	Road Centerlines - Hunterdon County	9/12/2007

Used for Figure	Source of Data	Data Title	Date
	Hunterdon County	Streams - Hunterdon County	10/4/2000
	NJDEP, OIRM, BGIS	NJDEP Open Water Areas of Hunterdon County, New Jersey 1986 (1:24000)	11/1/1998
	NJDEP, OIRM, BGIS	NJDEP Streams of Hunterdon County, New Jersey (1:24,000)	11/1/1998

B-2: GIS Metadata – Details of Data Layers Used

Federal Emergency Management Agency

FEMA Flood Hazard Zones - Q3 Flood Data, HUNTERDON COUNTY, NEW JERSEY

Publication Date: 5/23/1996 Scale: 1:24,000 Geospatial Data Presentation Format: vector digital data
 Used for Figure: 6b, 11 Online Linkage: FEMA_Flood_ES_redmap5353314.zip
 Short Description: The Q3 Flood Data are derived from the Flood Insurance Rate Maps (FIRMs) published by the Federal Emergency Management Agency (FEMA).

Highlands Water Protection and Planning Council

Agriculture - Preserved Farms within Agricultural Resource Area (Draft)

Publication Date: 3/22/2007 Scale: Geospatial Data Presentation Format: raster digital data
 Used for Figure: 8c Online Linkage: <http://www.highlands.state.nj.us/>
 Short Description: NJ Highlands Region Preserved Farms within Agricultural Resource Area (Draft) as referenced by the Draft Land Use Capability Map Abstract (NJ Highlands, March 2007).

Critical Habitat - Mussels Location with 1,000 Foot Buffer (Draft)

Publication Date: 3/22/2007 Scale: Geospatial Data Presentation Format: raster digital data
 Used for Figure: 11 Online Linkage: <http://www.highlands.state.nj.us/>
 Short Description: Mussels Location with 1,000 Foot Buffer (Draft) within the Highlands Region as referenced by the Draft Land Use Capability Map Abstract (NJ Highlands, March 2007).

Critical Habitat - Vernal Pools Location with 1,000 Foot Buffer (Draft)

Publication Date: 3/22/2007 Scale: Geospatial Data Presentation Format: raster digital data
 Used for Figure: 11 Online Linkage: <http://www.highlands.state.nj.us/>
 Short Description: Vernal Pools Location with 1,000 Foot Buffer (Draft) within the Highlands Region as referenced by the Draft Land Use Capability Map Abstract (NJ Highlands, March 2007).

Critical Habitat - Water/Wetland Dependent Species Habitat (Draft)

Publication Date: 3/22/2007 Scale: Geospatial Data Presentation Format: raster digital data
 Used for Figure: 11 Online Linkage: <http://www.highlands.state.nj.us/>
 Short Description: Water/Wetland Dependent Species Habitat (Draft) within the Highlands Region as referenced by the Draft Land Use Capability Map Abstract (NJ Highlands, March 2007).

Supporting LUCM Series Shape Files - Open Space (Final Draft)

Publication Date: 1/10/2008 Scale: Geospatial Data Presentation Format: vector digital data
 Used for Figure: 8a Online Linkage: <http://www.highlands.state.nj.us/>
 Short Description: This file represents open space within the NJ Highlands Region. This file is a compilation of many different data sources that include federal, county, local, and non-profit groups.

Hunterdon County GIS

Boundary - Municipalities of Hunterdon County

Publication Date: 1/22/2001 Scale: Geospatial Data Presentation Format: vector digital data
 Used for Figure: 1a, 2a Online Linkage: <http://gis.co.hunterdon.nj.us>
 Short Description: Boundaries of municipalities in Hunterdon.

Boundary - Tewksbury Boundary Clipped from Municipalities of Hunterdon County

Publication Date: 1/22/2001 Scale: 1:12,000 Geospatial Data Presentation Format: vector digital data
 Used for Figure: most Online Linkage: http://gis.co.hunterdon.nj.us/website/HC_GIS_MAP_Download.htm
 Short Description: Boundary of Tewksbury Township was clipped from the layer of the boundaries of municipalities in Hunterdon.

Contours - 20 feet - Township

Publication Date: 7/19/2005 Scale: Geospatial Data Presentation Format: vector digital data
 Used for Figure: 2g Online Linkage: http://gis.co.hunterdon.nj.us/Hunterdon/HC_GIS_MAP_Download.htm
 Short Description: This data set represents topographic elevation contour lines at 20 foot contours intervals for Tewksbury

Publication Date: 6/20/2007 Scale: Geospatial Data Presentation Format: vector digital data
Used for Figure: 10b Online Linkage: <http://www.state.nj.us/dca/divisions/osg/resources/maps/gis.html>
Short Description: This dataset contains the boundaries of the Planning Areas of the NJ State Development and Redevelopment Plan (NJSDRP).

NJDEP Department of Environmental Regulation (DER), Bureau of Air Monitoring (BAM)

NJDEP Ambient Air Quality Monitors

Publication Date: 3/1/2006 Scale: Geospatial Data Presentation Format: vector digital data
Used for Figure: 2a Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/statewide/airqm.zip>
Short Description: The ambient pollutant data is collected and analyzed to verify that the pollutants are in compliance with the National Ambient Air Quality Standards.

NJDEP Division of Landuse Management (DLM), Bureau of Freshwater & Biological Monitoring (BFBM)

Ambient Stream Quality Monitoring Sites (1998 - 2008)

Publication Date: 5/24/2007 Scale: Geospatial Data Presentation Format: vector digital data
Used for Figure: 6e Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/statewide/swpts.zip>
Short Description: This dataset is a GIS layer of points representing ambient stream sites monitored cooperatively by the NJDEP and the USGS for water quality parameters.

NJDEP Ambient Biomonitoring Network (AMNET) 2004

Publication Date: 12/1/2005 Scale: 1:24,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 6e Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/statewide/biopts200>
Short Description: This data represents point sites sampled by NJDEP as part of its Ambient Biomonitoring Network (AMNET), which samples for benthic macroinvertebrates and habitat, in addition to chemical and physical parameters.

NJDEP Existing Water Quality Stations in New Jersey

Publication Date: 10/19/2007 Scale: 1:24,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 6e Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/statewide/ewqpoi.zip>
Short Description: This data represents sampling points for the EWQ (Existing Water Quality) project at NJDEP. The EWQ Network was designed to provide supplemental data for water quality for the entire state.

NJDEP Fish Index of Biotic Integrity Monitoring Network (2000-2006)

Publication Date: 9/24/2007 Scale: 1:24,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 6e Online Linkage: <http://www.nj.gov/dep/gis/digidownload/zips/statewide/fibi.zip>
Short Description: This data represents the NJDEP Fish Index of Biotic Integrity (FIBI) Monitoring Network sample point locations for the years 2000 to 2006.

NJDEP Supplemental Ambient Surfacewater Monitoring Network (SASMN)

Publication Date: 10/19/2007 Scale: 1:2,400 Geospatial Data Presentation Format: vector digital data
Used for Figure: 6e Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/statewide/sasmn.zip>
Short Description: This data represents sampling points for the Supplemental Ambient Surfacewater Monitoring Network (formerly EWQ) project at NJDEP. The SASMN Network was designed to provide supplemental data for water quality for the entire state.

NJDEP Surface Water Quality Standards of New Jersey (June 2009 version)

Publication Date: 6/1/2009 Scale: 1:24,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 6d Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/statewide/swqs.zip>
Short Description: This data, based on hydrography stream network, is a digital representation of New Jersey's Surface Water Quality Standards in accordance with N.J.A.C. 7:9 B. The SWQS establish the designated uses to be achieved and specify the water quality (criteria) necessary to protect the State's waters. In addition, a layer was created to show a 300 foot buffer around all C1 stream segments using ArcMap.

STORET Water Quality Monitoring Stations

Publication Date: 8/1/2005 Scale: Geospatial Data Presentation Format: vector digital data
Used for Figure: 6e Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/statewide/storet.zip>
Short Description: This GIS layer represents locations of water quality monitoring stations from NJDEP's NJ STORET Database. NJ STORET maintains NJDEP's water quality monitoring data from January 1, 1999 to the present.

NJDEP Division of Science, Research and Technology

NJDEP Public Community Water Purveyor Service Areas

Publication Date: 7/12/2004 Scale: 1:24,000 Geospatial Data Presentation Format: vector digital data

Appendix B: GIS Metadata (data sources & descriptions) Tewksbury Township Environmental Resource Inventory
November 2009 Kratzer Environmental Services

Used for Figure: 2c Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/statewide/watpurv19>
Short Description: This is a graphical representation of the 1998 Public Community Water Purveyor Service Areas. Water purveyors are regulated by the NJDEP Bureau of Safe Drinking Water, under the Safe Drinking Water Act. Public Community Water Purveyors are systems that pipe water for human consumption to at least 15 service connections used year-round, or one that regularly serves at least 25 year-round residents.

NJDEP Division of Watershed Management (DWM), Bureau of Watershed Regulation (BWR)

New Jersey Statewide Sewer Service Area

Publication Date: 2/1/2008 Scale: Geospatial Data Presentation Format: vector digital data
Used for Figure: 2c Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/statewide/statessa.zi>
Short Description: This is a graphical representation of the States Sewer Service Area (SSA) mapping. The SSA mapping shows the planned method of wastewater disposal for specific areas.

NJDEP Division of Fish and Wildlife, Endangered and Nongame Species Program

NJDEP Landscape Project 3.0: Species Based Patches within the Highlands Extended Boundary

Publication Date: 5/16/2008 Scale: Geospatial Data Presentation Format: vector digital data
Used for Figure: 7d, 11 Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/landscape/highlands>
Short Description: This data set is a product of the Landscape Project, a pro-active, ecosystem-level approach to the long-term protection of imperiled and priority species and their important habitats in New Jersey. This version, Version 3.0, shows species based patches within the ENSP Highlands Extended Boundary. ENSP employed the NJDEP 2002 aerial photo-based LU/LC data layer to delineate potential rare species habitat within the Highlands Region.

NJDEP Landscape Project 3.0: Streams within the ENSP Highlands Extended Boundary with Mussels

Rating

Publication Date: 5/16/2008 Scale: Geospatial Data Presentation Format: vector digital data
Used for Figure: 7d Online Linkage: http://www.state.nj.us/dep/gis/digidownload/zips/landscape/highlands_streams.zip
Short Description: This data set is a product of the Landscape Project. An update to the DEP stream layer was completed with the DEP 2002 LU/LC classification and was incorporated into this current version of the Landscape Project (Version 3.0) within the ENSP Highlands Extended Boundary. Streams are valued only by mussel species. All mussel point occurrences within the Highlands Region were buffered by 50 meters.

NJDEP Environmental Regulation (ER), Division of Water Quality (DWQ), Bureau of Point Source Permitting - Region 1 (PSP-R1)

NJPDES Surface Water Discharges in New Jersey, (1:12,000)

Publication Date: 11/20/2007 Scale: 1:12,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 6e Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/statewide/njpdesswd>
Short Description: New Jersey Pollutant Discharge Elimination System (NJPDES) surface water discharge pipe GIS point coverage compiled from GPSed locations, NJPDES databases, and permit applications.

NJDEP Geological Survey

Aquifer Recharge Potential for Hunterdon County, NJ

Publication Date: 1/4/2005 Scale: 1:24,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 5e Online Linkage: <http://www.njgeology.org/geodata/>
Short Description: A qualitative representation of the potential for aquifer recharge for Hunterdon County, NJ built upon the combination of ground-water recharge value rankings and well-yield-based aquifer rankings.

DGS00-1 NJDEP Drought Regions of New Jersey

Publication Date: 5/1/2004 Scale: 1:24,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 2a Online Linkage: <http://www.state.nj.us/dep/njgs/geodata/dgs00-1.zip>
Short Description: This shape file delineates New Jersey drought regions, counties, and municipalities. Drought regions provide a regulatory basis for coordinating local responses to regional water-supply shortages.

DGS02-2 GIS Coverages of Public Community Water Supply Well Head Protection Areas for New

Publication Date: 7/27/2007 Scale: 1:24,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 2c Online Linkage: <http://www.state.nj.us/dep/njgs/geodata/dgs02-2.htm>
Short Description: A Well Head Protection Area (WHPA) in New Jersey is a map area calculated around a Public Community Water Supply (PCWS) well in New Jersey that delineates the horizontal extent of ground water captured by a well pumping at a specific rate over a two-, five-, and twelve-year period of time for confined wells.

DGS02-3 Ground Water Recharge for Hunterdon County, NJ

Publication Date: 10/8/2004 Scale: 1:24,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 5d, 5e Online Linkage: <http://www.njgeology.org/geodata/dgs02-3/dgs02-3.htm>
Short Description: An estimation of ground-water recharge for Hunterdon County. Ground-water recharge is estimated using the NJGS methodology from NJ Geological Survey Report GSR-32. Land-use/land-cover, soil and municipality-based climatic data were combined and used to produce an estimate of ground-water recharge in inches/year.

DGS02-7 Physiographic Provinces of New Jersey

Publication Date: 6/30/2002 Scale: 1:100,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 2f Online Linkage: <http://www.state.nj.us/dep/njgs/geodata/dgs02-7.htm>
Short Description: This data set delineates the boundaries of NJ's 4 Physiographic Provinces. The boundary between each province is determined by a major change in topography and geology.

DGS03-2 Abandoned Mines of New Jersey

Publication Date: 7/29/2005 Scale: 1:24,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 3a, 9 Online Linkage: <http://www.state.nj.us/dep/njgs/geodata/dgsdown/dgs03-2.zip>
Short Description: This data consists of point shapefile of locations and attributes for abandoned mines.

DGS04-1 Earthquakes Epicentered In New Jersey

Publication Date: 4/25/2005 Scale: Geospatial Data Presentation Format: vector digital data
Used for Figure: 3a Online Linkage: <http://www.state.nj.us/dep/njgs/geodata/dgsdown/dgs04-1.zip>
Short Description: The New Jersey Geological Survey Digital Geodata Series DGS04-1 download contains a (GIS) point dataset in an ESRI shapefile which has data of earthquakes that had epicenters in New Jersey.

DGS04-6 Bedrock Geology of New Jersey. (Scale 1:100,000) - bedrock

Publication Date: 6/30/1999 Scale: 1:100,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 3a Online Linkage: <http://www.state.nj.us/dep/njgs/geodata/>
Short Description: The Bedrock Geology of New Jersey consists of statewide data layers (geology, faults, folds, dikes). The GIS data were scanned and digitized from United States Geological Survey Miscellaneous Investigations and Open-File Series 1:100,000 scale geologic maps compiled from 1984 to 1993.

DGS04-6 Bedrock Geology of New Jersey. (Scale 1:100,000) - faults

Publication Date: 6/30/1999 Scale: 1:100,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 3a Online Linkage: <http://www.state.nj.us/dep/njgs/geodata/>
Short Description: NJGS scanned and digitized data from USGS 1:100,000 scale geologic maps compiled from 1984 to 1993.

DGS04-6 Bedrock Geology of New Jersey. (Scale 1:100,000) - folds

Publication Date: 6/30/1999 Scale: 1:100,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 3a Online Linkage: <http://www.state.nj.us/dep/njgs/geodata/>
Short Description: NJGS scanned and digitized data from USGS 1:100,000 scale geologic maps compiled from 1984 to 1993.

DGS05-1 Selected Sand, Gravel and Rock Surficial Mining Operations in New Jersey

Publication Date: 2/1/2005 Scale: unknown Geospatial Data Presentation Format: vector digital data
Used for Figure: 3a Online Linkage: <http://www.state.nj.us/dep/njgs/geodata/dgs05-1.htm>
Short Description: To provide an inventory of selected sand, gravel and rock mining operations in New Jersey.

DGS05-2 NJ's Ambient Ground Water Quality Network data

Publication Date: 5/24/2007 Scale: Geospatial Data Presentation Format: vector digital data
Used for Figure: 5f Online Linkage: <http://www.njgeology.org/geodata/dgs05-2.htm>
Short Description: This data layer shows the point locations of wells sampled for the Ambient Ground-Water Quality Monitoring Network (AGWQMN), which is an NJDEP/USGS cooperative project.

DGS06-3: Landslides in New Jersey

Publication Date: 3/1/2007 Scale: Geospatial Data Presentation Format: vector digital data
Used for Figure: no Online Linkage: <http://www.njgeology.org/geodata/dgs06-3.htm>
Short Description: This GIS point shapefile of Landslides in New Jersey contains point locations and other attributes for 133 historic and recent landslide locations in NJ mapped by the NJGS. The landslides have occurred in the northern and central part of the state and include slumps, debris flows, rockfalls and rockslides.

DGS98-5 Aquifers of New Jersey

Publication Date: 1/1/1998 Scale: 1:250,000 Geospatial Data Presentation Format:
Used for Figure: 5b Online Linkage: <http://www.state.nj.us/dep/njgs/geodata/dgsdown/dgs98-5.zip>
Short Description: This data layer consists of the NJ Geological supply depiction of the aquifers of NJ.

DGS98-6 Sole-Source Aquifers of New Jersey (1:100,000)

Publication Date: 5/19/1998 Scale: 1:100,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 5b Online Linkage: <http://www.state.nj.us/dep/njgs/geodata/dgs98-6.zip>
Short Description: This coverage allows users to identify EPA-defined sole-source aquifers in New Jersey. This is in support

of some federally-mandated programs.

DGS99-3 Surficial Geology of Hunterdon County, New Jersey (1:24,000)

Publication Date: 1/1/1993 Scale: 1:24,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 3b Online Linkage: <http://www.state.nj.us/dep/njgs/geodata/dgs99-3.zip>
Short Description: DGS99-3 is an ARC/INFO Geographic Information Systems (GIS) coverage of surficial geologic materials of Hunterdon County, New Jersey. Surficial materials are the unconsolidated sediments that overlie bedrock formations, and that are the parent material for agronomic soils.

New Jersey Public Community Water Supply Wells Database

Publication Date: 6/28/2007 Scale: 1:24,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 2c Online Linkage: <http://www.state.nj.us/dep/njgs/geodata/dgs97-1.zip>
Short Description: The Public Community Water Supply (PCWS) Wells is a GIS point coverage with associated Microsoft Access relational database. It contains information for the wells in New Jersey that supply potable water to public communities.

NJDEP 14 Digit Hydrologic Unit Code delineations for New Jersey (DEPHUC14)

Publication Date: 1/20/2006 Scale: 1:24,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 6a, 6d Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/statewide/depuc14>.
Short Description: Drainage basins were delineated from 1:24,000-scale. This data is not field checked and has no guarantees as to its accuracy. The minimum polygon size has not been defined, but the 14-digit hydrologic units have a defined minimum size of 3,000 acres. Some basins are smaller, which gives a reasonable geographic arrangement to the 14 digit sub-watersheds.

NJDEP State Rivers for New Jersey (Third Order or Higher)

Publication Date: 1/1/1993 Scale: 1:24,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 1a, 6a Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/statewide/stateriv.zip>
Short Description: This data is a graphical representation of New Jersey's State Rivers that are third order or higher.

NJDEP Natural and Historic Resources (NHR), Historic Preservation Office

NJDEP Historic Districts of New Jersey, Edition 20080422

Publication Date: 4/22/2008 Scale: 1:12,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 9 Online Linkage: http://www.state.nj.us/dep/gis/digidownload/zips/statewide/historic_di
Short Description: This data is produced and maintained by the New Jersey Historic Preservation Office (HPO) to provide accurate cultural resource information to government, regulated customers, and the public.

NJDEP Historic Properties of New Jersey

Publication Date: 4/22/2008 Scale: 1:12,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 9 Online Linkage: http://www.state.nj.us/dep/gis/digidownload/zips/statewide/historic_properties.zip
Short Description: This data is produced and maintained by the New Jersey Historic Preservation Office (HPO) to provide accurate cultural resource information to government, regulated customers, and the public.

NJDEP Office of Information Resources Management (OIRM), Bureau of Geographic Information Systems (BGIS)

Boundary - NJDEP County Boundaries for the State of New Jersey

Publication Date: 1/23/2003 Scale: 1:24,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 1a, 2a, 2f Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/statewide/stco.zip>
Short Description: New Jersey county boundaries were digitized into NJDEP's GIS to provide basic jurisdictional information.

Boundary - NJDEP County Boundary for Hunterdon County, New Jersey

Publication Date: 1/1/2003 Scale: 1:24,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 1a, 2a, 2f, 10a Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/cnb/huncnb.zip>
Short Description: This data contains the Hunterdon County boundary.

Boundary - NJDEP Municipality Boundaries for the State of New Jersey

Publication Date: 11/14/2007 Scale: 1:24,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 1a, 6e Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/statewide/stmun.zip>
Short Description: Municipal boundaries in New Jersey were gathered from USGS topoquads and other sources in 1987.

Boundary - NJDEP State Boundary of New Jersey

Publication Date: 11/1/1998 Scale: 1:24,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 1a, 2a, 2f, 10a Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/statewide/state.zip>
Short Description: This data represents the New Jersey State Boundary.

Natural Heritage Grid Map

Appendix B: GIS Metadata (data sources & descriptions) Tewksbury Township Environmental Resource Inventory
November 2009
Kratzer Environmental Services

Publication Date: 2/1/2004 Scale: 1:24,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 7e Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/statewide/nhpgrd.zi>
Short Description: The Natural Heritage Grid Map was produced by the Office of Natural Lands Management (ONLM) to provide a general portrayal of the geographic locations of rare plant species and ecological communities for the entire state without providing sensitive detailed information.

New Jersey 2002 High Resolution Orthophotography (57 files)

Publication Date: 7/31/2003 Scale: 1:2,400 Geospatial Data Presentation Format: remote sensing image
Used for Figure: 1b Online Linkage: http://njgin.nj.gov/OIT_IW/
Short Description: Digital color infrared (CIR) orthophotography of New Jersey in State Plane NAD83 Coordinates, U.S. Survey Feet. The digital orthophotography was produced at a scale of 1:2400 (1"=200') with a 1 foot pixel resolution. Digital orthophotography combines the image characteristics of a photograph with the geometric qualities of a map. There are 57 files which cover Tewksbury Township.

NJDEP 2002 Land use/Land cover Update, N and S Branch Raritan Watershed Mgmt. Area, WMA-8 (03-2008)

Publication Date: 3/4/2008 Scale: 1:2,400 Geospatial Data Presentation Format: vector digital data
Used for Figure: 1e and others Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/lulc02/w08lu02.zip>
Short Description: The 2002 Land Use/Land Cover (LU/LC) data sets were mapped by Watershed Management Area (WMA). There are additional reference documents listed in this file under Supplemental Information which should also be examined by users of these data sets. The data was created by comparing the 1995/97 land use/land cover (LU/LC) layer from NJ DEP's geographical information systems (GIS) database to 2002 color infrared (CIR) imagery and delineating areas of change. The March 2008 version changed the land use type assigned to some land uses.

NJDEP 2002 Land use/Land cover, N and S Branch Raritan Watershed Mgmt. Area, wetlands only

Publication Date: 3/4/2008 Scale: 1:2,400 Geospatial Data Presentation Format: vector digital data
Used for Figure: 6c, 11 Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/lulc02/w08lu02.zip>
Short Description: Areas with Land Use Type=wetlands were selected from the 2002 Land Use/Land Cover (LU/LC) data sets. An additional layer was created by creating a 150 buffer surrounding all the wetlands (although NJDEP does not assign 150' buffers to all wetlands).

NJDEP Linear Non-Tidal Wetlands of Hunterdon County, New Jersey, 1986

Publication Date: 11/1/1998 Scale: 1:12,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 6c Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/line/hunline.zip>
Short Description: This data was derived from the freshwater wetlands (FWW) data generated under the New Jersey Freshwater Wetlands Mapping Program. The FWW are network coverages with both linear and polygon wetlands delineated and coded. Linear wetlands features were reselected out of FWW to form this dataset. Any arc that was a linear wetland feature was given a valid wetlands (CLASS) code in the original data set. This dataset is intended to serve as a resource for analysis rather than regulatory delineations. The NJDEP may change the linework based on more in depth analysis and field inspection for regulatory purposes. In addition, a layer showing a 150 foot buffer (which will not apply to all wetlands) around all linear wetlands was created with ArcMap.

NJDEP Municipality Boundaries for the State of New Jersey (Clipped to Coast)

Publication Date: 11/14/2007 Scale: 1:24,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 6a Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/statewide/muncoast.z>
Short Description: New Jersey municipal boundaries were digitized into NJDEP's GIS to provide basic jurisdictional information, showing the coastline.

NJDEP Natural Heritage Priority Sites

Publication Date: 3/1/2007 Scale: 1:24,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 7e Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/statewide/prisites.zip>
Short Description: The Natural Heritage Priority Sites Coverage was created to identify the best habitats for rare plant and animal species and natural communities through analysis of information in the NJ Natural Heritage Database.

NJDEP Open Water Areas of Hunterdon County, New Jersey 1986 (1:24000)

Publication Date: 11/1/1998 Scale: 1:24000 Geospatial Data Presentation Format: vector digital data
Used for Figure: most Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/lakes/hunlakes.zip>
Short Description:

NJDEP Place Name Locations in the State of New Jersey

Publication Date: 8/6/2004 Scale: 1:24,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 1c Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/statewide/placenam0>
Short Description: The place name locations in this data were obtained via download from the United States Geological Survey, taken from the USGS 7.5' topoquad series revised in 2004.

NJDEP Streams of Hunterdon County, New Jersey (1:24,000)

Publication Date: 11/1/1998 Scale: Geospatial Data Presentation Format: vector digital data
Used for Figure: most Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/strm/hunstrm.zip>

Appendix B: GIS Metadata (data sources & descriptions) Tewksbury Township Environmental Resource Inventory
November 2009 Kratzer Environmental Services

Short Description:

NJDEP Watershed Management Areas in New Jersey

Publication Date: 4/5/2000 Scale: 1:24,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 6a Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/statewide/depwmas.z>
Short Description: This layer is a simplified version of the ARC/INFO dephuc14 data, and shows the outlines of the watershed management regions and areas to be used for the statewide watershed initiative.

NJDEP Office of Policy, Planning and Science

NJ Highlands Preservation and Planning Area

Publication Date: 12/1/2005 Scale: Geospatial Data Presentation Format: vector digital data
Used for Figure: 10a Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/statewide/highlands>.
Short Description: This data set was developed to be a graphical representation of the legal, verbal description of the boundary within the Highlands Water Protection and Planning Act.

NJDEP Site Remediation Program, Division of Remediation Support, Information Support Element (ISE), Bureau of Information Services and Program Support (BISPS)

NJDEP Currently Known Extent of Groundwater Contamination (CKE) for New Jersey

Publication Date: 3/1/2007 Scale: Geospatial Data Presentation Format: vector digital data
Used for Figure: 5f Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/statewide/ckepoly.zi>
Short Description: This data layer contains information about areas in the state which are specified as the Currently Known Extent (CKE) of ground water pollution.

NJDEP Deed Notice Extent Polygons in New Jersey, 2007

Publication Date: 3/1/2007 Scale: 1:24,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 5f Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/statewide/dna.zip>
Short Description: This data layer identifies those Known Contaminates Sites (KCS) or sites on Site Remediations Programs' (SRP) Comprehensive Site List (CSL) that have been assigned a Deed notice. The deed notice (polygon) was developed to provide information regarding the spatial extent of soil contamination, as well as other information.

NJDEP Site Remediation Program and Waste Management (SRWM)

NJDEP Known Contaminated Site List for New Jersey, 2005

Publication Date: 2/1/2006 Scale: 1:1,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 5f Online Linkage: <http://www.state.nj.us/dep/gis/digidownload/zips/statewide/kcsl.zip>
Short Description: The Known Contaminated Sites List for New Jersey 2005 are those sites and properties within the state where contamination of soil or ground water has been identified or where there has been, or there is suspected to have been, a discharge of contamination. This list of Known Contaminated Sites may include sites where remediation is either currently under way, required but not yet initiated or has been completed.

Rutgers University Center for Remote Sensing & Spatial Analysis

Vernal Pools

Publication Date: Scale: Geospatial Data Presentation Format:
Used for Figure: 7b Online Linkage:
Short Description: Vernal Pools locations obtained from Rutgers website and plotted as point locations on map.

Tewksbury Township Land Use Office

Tewksbury Township 2008 Easement Inventory

Publication Date: 1/28/2008 Scale: Geospatial Data Presentation Format: database
Used for Figure: 8b Online Linkage: NA
Short Description: Database of parcels with conservation easements. This database was joined to parcels.shp by the PIN (unique identifier of block and lot). Does not delineate boundaries of easements. Easements may exist on parcels not listed here.

Tewksbury Township Mapped Septic System Drainage Fields

Publication Date: 12/31/2000 Scale: Geospatial Data Presentation Format: vector digital data
Used for Figure: 2e Online Linkage: NA

Short Description: Partial database created in 2000 from Hunterdon County and Township records of septic drainage field locations in Tewksbury. The township requires "as built" plans, but these locations have not been field verified. It includes roughly 20-25% of the septics in the township.

Tewksbury Township Mapped Septic Systems

Publication Date: 12/31/2000 Scale: Geospatial Data Presentation Format: vector digital data

Used for Figure: 2e Online Linkage: NA

Short Description: Partial database created in 2000 from Hunterdon County and Township records of septic system locations in Tewksbury. The township requires "as built" plans, but these locations have not been field verified. It includes roughly 20-25% of the septics in the township.

Tewksbury Township Mapped Wells

Publication Date: 12/31/2000 Scale: Geospatial Data Presentation Format: vector digital data

Used for Figure: 2d Online Linkage: NA

Short Description: Partial database created in 2000 from Hunterdon County and Township records of well locations in Tewksbury. The township requires "as built" plans, but these locations have not been field verified. It includes roughly 20-25% of the wells in the township.

Tewksbury Township Open Space

Publication Date: 6/01/2009 Scale: Geospatial Data Presentation Format: vector digital data

Used for Figure: 8c Online Linkage: NA

Short Description: Tewksbury Land Use office maintains a list of preserved open space and farmland within Tewksbury Township.

United States Department of Agriculture, Natural Resources Conservation Service

Soil Survey Geographic 2005 (SSURGO) Database for Hunterdon

Publication Date: 12/7/2006 Scale: 1:20,000 Geospatial Data Presentation Format: vector digital data

Used for Figure: 4a-h, 6b, 6c Online Linkage: <http://SoilDataMart.nrcs.usda.gov/>

Short Description: SSURGO depicts information about the kinds and distribution of soils on the landscape. The soil map and data used in the SSURGO product were prepared by soil scientists as part of the National Cooperative Soil Survey. Hunterdon County soils data sets were downloaded from the Natural Resource Conservation Service (NRCS) Soil Data Mart. The soil map units are linked to attributes and interpretations in the National Soil Information System relational database. Photographic or digital enlargement of these maps to scales greater than at which they were originally mapped can cause misinterpretation of the data. The depicted soil boundaries, interpretations, and analysis derived from them do not eliminate the need for onsite sampling, testing, and detailed study of specific sites for intensive uses. Thus, these data and their interpretations are intended for planning purposes only.

United States Geological Survey, Water Resource Division

DGS99-1: USGS Topo Quads

Publication Date: 5/27/1999 Scale: 1:24,000 Geospatial Data Presentation Format: bitmap images

Used for Figure: 1c Online Linkage: <http://www.state.nj.us/dep/njgs/geodata/index.htm>

Short Description: N.J. Geological Survey DGS99-1 is a set of monochromatic, bit-mapped, TIFF (tagged image file format) images covering New Jersey. The images are derived from the U.S. Geological Survey 7-1/2' topographic quadrangle map Digital Raster Graphics (DRG) imagery.

USGS continuous-streamflow gaging locations in New Jersey

Publication Date: 4/17/2002 Scale: Geospatial Data Presentation Format: vector digital data

Used for Figure: 6e Online Linkage: <http://www.njgeology.org/geodata/dgs02-5/streamgage.zip>

Short Description: This dataset is a GIS point coverage of continuous-streamflow gaging stations within the United States Geological Survey (USGS), Water Resource Division (WRD) streamflow-data-collection networks in the New Jersey District. Some of these sites are currently reporting streamflow data on the Internet. Other points in this coverage represent discontinued gages.

USGS stream crest gaging locations in New Jersey

Publication Date: 4/17/2002 Scale: Geospatial Data Presentation Format: vector digital data

Used for Figure: 6e Online Linkage: <http://www.njgeology.org/geodata/dgs02-5/creststage.zip>

Short Description: This dataset is a GIS point coverage of stream crest gaging stations within the USGS, WRD streamflow-data-collection networks in the New Jersey District. Some of these sites are measured occasionally. Other points in this coverage represent discontinued gages.

USGS stream lowflow gaging locations in New Jersey

Publication Date: 4/17/2002 Scale: 1:24,000 Geospatial Data Presentation Format: vector digital data

Used for Figure: 6e Online Linkage: <http://www.njgeology.org/geodata/dgs02-5/lowflow.zip>

Short Description: This dataset is a GIS point coverage of stream lowflow gaging stations within the United States Geological Survey (USGS), Water Resource Division (WRD) streamflow-data-collection networks in the New Jersey District. Some of these sites are currently reporting streamflow data on the Internet.

USGS surface-water quality gaging stations in New Jersey

Publication Date: 4/17/2002 Scale: 1:24,000 Geospatial Data Presentation Format: vector digital data
Used for Figure: 6e Online Linkage: <http://www.njgeology.org/geodata/dgs02-5/wqgages.zip>
Short Description: This dataset is a GIS point coverage of water-quality gaging stations within the United States Geological Survey (USGS), Water Resource Division (WRD) streamflow-data-collection networks in the New Jersey District. Some of these sites are current.

APPENDIX C: ENDANGERED SPECIES

Contents:

C-1. List of Rare Species of Hunterdon County

C-2. Rare Species Reporting Form

C-3. Rare Species Fact Sheets

The following fact sheets are authored by the NJDEP Endangered and Nongame Species Program. These rare species have been reported within Tewksbury Township. Fact sheets were not available for all species.

Bald Eagle	Source: http://www.state.nj.us/dep/fgw/ensp/pdf/end-thrtened/baldeagle.pdf
Barred Owl	Source: http://www.state.nj.us/dep/fgw/ensp/pdf/end-thrtened/barredowl.pdf
Bobcat	Source: http://www.state.nj.us/dep/fgw/ensp/pdf/end-thrtened/bobcat.pdf
Bobolink	Source: http://www.state.nj.us/dep/fgw/ensp/pdf/end-thrtened/bobolink.pdf
Bog Turtle	Source: http://www.state.nj.us/dep/fgw/ensp/pdf/end-thrtened/bogtrtl.pdf
Cooper's hawk	Source: http://www.state.nj.us/dep/fgw/ensp/pdf/end-thrtened/coopers.pdf
Copperhead	Source: http://www.state.nj.us/dep/fgw/ensp/pdf/species/copperhead.pdf
Eastern Box Turtle	Source: http://www.state.nj.us/dep/fgw/ensp/pdf/end-thrtened/bogtrtl.pdf
Grasshopper Sparrow	Source: http://www.state.nj.us/dep/fgw/ensp/pdf/end-thrtened/grasshoppersparrow.pdf
Jefferson Salamander	Source: http://www.state.nj.us/dep/fgw/ensp/pdf/species/jeffereson_salamander.pdf
Mussels	Source: http://www.state.nj.us/dep/fgw/ensp/pdf/end-thrtened/mussels.pdf
Northern Spring Salamander	Source: http://www.state.nj.us/dep/fgw/ensp/pdf/species/no_spring_salamander.pdf
Redheaded Woodpecker	Source: http://www.state.nj.us/dep/fgw/ensp/pdf/end-thrtened/redhdwdpckr.pdf
Red Shoulder Hawk	Source: http://www.state.nj.us/dep/fgw/ensp/pdf/end-thrtened/redshldhwk.pdf
Savannah Sparrow	Source: http://www.state.nj.us/dep/fgw/ensp/pdf/end-thrtened/savsparrow.pdf
Wood Turtle	Source: http://www.state.nj.us/dep/fgw/ensp/pdf/end-thrtened/woodtrtl.pdf

C-1. List of Rare Species of Hunterdon County

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HUNTERDON COUNTY RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	GRANK	SRANK
*** Vertebrates					
ACCIPITER COOPERII	COOPER'S HAWK		T/T	G5	S3B,S4N
AMMODRAMUS HENSLOWII	HENSLOW'S SPARROW		E	G4	S1B
AMMODRAMUS SAVANNARUM	GRASSHOPPER SPARROW		T/S	G5	S2B
ASIO OTUS	LONG-EARED OWL		T/T	G5	S2B,S2N
BARTRAMIA LONGICAUDA	UPLAND SANDPIPER		E	G5	S1B
BUTEO LINEATUS	RED-SHOULDERED HAWK		E/T	G5	S1B,S2N
CIRCUS CYANEUS	NORTHERN HARRIER		E/U	G5	S1B,S3N
CISTOTHORUS PLATENSIS	SEDGE WREN		E	G5	S1B
CLEMMYS INSCULPTA	WOOD TURTLE		T	G4	S3
CLEMMYS MUHLENBERGII	BOG TURTLE	LT	E	G3	S2
CROTALUS HORRIDUS HORRIDUS	TIMBER RATTLESNAKE		E	G4T4	S2
DOLICHONYX ORYZIVORUS	BOBOLINK		T/T	G5	S2B
EURYCEA LONGICAUDA LONGICAUDA	LONGTAIL SALAMANDER		T	G5T5	S2
HALIAEETUS LEUCOCEPHALUS	BALD EAGLE	LT	E	G4	S1B,S2N
LYNX RUFUS	BOBCAT		E	G5	S3
MELANERPES ERYTHROCEPHALUS	RED-HEADED WOODPECKER		T/T	G5	S2B,S2N
PASSERCULUS SANDWICHENSIS	SAVANNAH SPARROW		T/T	G5	S2B,S4N
PETROCHELIDON PYRRHONOTA	CLIFF SWALLOW		S/S	G5	S2B
POECETES GRAMINEUS	VESPER SPARROW		E	G5	S1B,S2N
STRIX VARIA	BARRED OWL		T/T	G5	S3B
*** Ecosystems					
CAVE AQUATIC COMMUNITY	CAVE AQUATIC COMMUNITY			G4?	S2
CAVE TERRESTRIAL COMMUNITY	CAVE TERRESTRIAL COMMUNITY			G4?	S3
SHALE CLIFF/ROCK OUTCROP COMMUNITY	SHALE CLIFF/ROCK OUTCROP COMMUNITY			G3	S2?
*** Invertebrates					
ALASMIDONTA UNDULATA	TRIANGLE FLOATER			G4	S3
CICINDELA MARGINIPENNIS	COBBLESTONE TIGER BEETLE			G2G3	S1

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	GRANK	SRANK
ENALLAGMA BASIDENS	DOUBLE-STRIPED BLUET			G5	S3
LAMPSILIS CARIOSA	YELLOW LAMPMUSSEL			G3G4	S1
LEPTODEA OCHRACEA	TIDEWATER MUCKET			G4	S1
POLYGONIA PROGNE	GRAY COMMA			G5	SH
PTICHODIS BISTRIGATA	SOUTHERN PTICHODIS			G3	S1S3
*** Other types					
BAT HIBERNACULUM	BAT HIBERNACULUM			G?	S2
*** Vascular plants					
ADLUMIA FUNGOSA	CLIMBING FUMITORY			G4	S2
AGASTACHE NEPETOIDES	YELLOW GIANT-HYSSOP			G5	S2
AGASTACHE SCROPHULARIIFOLIA	PURPLE GIANT-HYSSOP			G4	S2
AGRIMONIA MICROCARPA	SMALL-FRUIT GROOVEBURR			G5	S2
ARISTOLOCHIA SERPENTARIA	VIRGINIA SNAKEROOT			G4	S3
ASIMINA TRILOBA	PAWPAW		E	G5	S1
ASPLENIUM PINNATIFIDUM	LOBED SPLEENWORT		E	G4	S1
ASTER PRAEALTUS	WILLOW-LEAF ASTER		E	G5T5?	S1
BOTRYCHIUM ONEIDENSE	BLUNT-LOBE GRAPE FERN			G4Q	S2
CACALIA ATRIPLICIFOLIA	PALE INDIAN PLANTAIN		E	G4G5	S1
CARDAMINE ANGUSTATA	SLENDER TOOTHWORT			G5	S3
CAREX AMPHIBOLA VAR AMPHIBOLA	NARROW-LEAF SEDGE		E	G5T4Q	S1
CAREX BUSHII	BUSH'S SEDGE		E	G4	S1
CAREX DEWEYANA	DEWEY'S SEDGE		E	G5T5	S1
CAREX FRANKII	FRANK'S SEDGE			G5	S3
CAREX HITCHCOCKIANA	HITCHCOCK'S SEDGE			G5	S2
CAREX JAMESII	JAMES' SEDGE		E	G5	S1
CAREX LEPTONERVIA	FINE-NERVE SEDGE		E	G4	S1
CAREX MEADII	MEAD'S SEDGE			G4G5	SX.1
CAREX OLIGOCARPA	FEW-FRUIT SEDGE		E	G4	S1
CAREX PALLESCENS	PALE SEDGE			G5	S2
CAREX WILLDENOWII VAR WILLDENOWII	WILLDENOW'S SEDGE			G5T5	S2
CASTILLEJA COCCINEA	SCARLET INDIAN-PAINTBRUSH			G5	S2
CERCIS CANADENSIS	REDBUD		E	G5T5	S1
CHEILANTHES LANOSA	HAIRY LIPFERN			G5	S2
CHENOPODIUM SIMPLEX	MAPLE-LEAF GOOSEFOOT			G5	S2
CRATAEGUS CALPODENDRON	PEAR HAWTHORN		E	G5	S1
CRATAEGUS DODGEI	DODGE'S HAWTHORN			G4	S2

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	GRANK	SRANK
CRATAEGUS HOLMESIANA	HOLMES' HAWTHORN			G5	S1
CRATAEGUS SUCCULENTA	FLESHY HAWTHORN		E	G5	S1
CUSCUTA CEPHALANTHI	BUTTONBUSH DODDER		E	G5	S1
CYNOGLOSSUM VIRGINIANUM VAR VIRGINIANUM	WILD COMFREY			G5T5	S2
CYSTOPTERIS PROTRUSA	LOWLAND FRAGILE FERN			G5	S2
DESMODIUM HUMIFUSUM	TRAILING TICK-TREFOIL		E	G1G2Q	SH
DICENTRA CANADENSIS	SQUIRREL-CORN		E	G5	S1
DOELLINGERIA INFIRMA	CORNEL-LEAF ASTER			G5	S2
DRABA REPTANS	CAROLINA WHITLOW-GRASS		E	G5	SH
ELLISIA NYCTELEA	AUNT LUCY		E	G5	S1
ERAGROSTIS FRANKII	FRANK'S LOVE GRASS			G5	S2
HYBANTHUS CONCOLOR	GREEN VIOLET		E	G5	S1
HYDROPHYLLUM CANADENSE	BROAD-LEAF WATERLEAF		E	G5	S1
HYPERICUM PYRAMIDATUM	GREAT ST. JOHN'S-WORT			G4	S3
ISOTRIA MEDEOLOIDES	SMALL WHORLED POGONIA		E	G2	S1
JEFFERSONIA DIPHYLLA	TWINLEAF		E	G5	S1
KUHNIA EUPATORIOIDES	FALSE BONESET		E	G5T5	S1
LATHYRUS VENOSUS	VEINY VETCHLING		E	G5	SH
LECHEA INTERMEDIA VAR INTERMEDIA	LARGE-POD PINWEED			G5T4T5	S2
LEMNA VALDIVIANA	PALE DUCKWEED		E	G5	S1
LINUM SULCATUM	GROOVED YELLOW FLAX		E	G5T5	S1
MONARDA CLINOPODIA	BASIL BEEBALM		E	G5	SH
ONOSMODIUM VIRGINIANUM	VIRGINIA FALSE-GROMWELL		E	G4	S1
PANICUM OLIGOSANTHES VAR OLIGOSANTHES	FEW-FLOWER PANIC GRASS			G5T5?	S1S2
PENSTEMON LAEVIGATUS	SMOOTH BEARDTONGUE		E	G5	S1
PHLOX PILOSA	DOWNY PHLOX		E	G5T5	SH
PINUS PUNGENS	TABLE MOUNTAIN PINE		E	G4	S1.1
PRUNUS ALLEGHANIENSIS	ALLEGHENY PLUM		E	G4T4	S1
PRUNUS PUMILA VAR DEPRESSA	LOW SAND CHERRY			G5T5	S2
PTELEA TRIFOLIATA	WAFER-ASH		E	G5T5	S1
PYCNANTHEMUM CLINOPODIOIDES	BASIL MOUNTAIN-MINT		E	G2	S1
PYCNANTHEMUM TORREI	TORREY'S MOUNTAIN-MINT		E	G2	S1
RANUNCULUS MICRANTHUS	ROCK BUTTERCUP			G5	S2
RANUNCULUS TRICHOPHYLLUS VAR	THREAD-LEAF WATER BUTTERCUP			G5T5	S2

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	GRANK	SRANK
TRICHOPHYLLUS					
RHYNCHOSPORA GLOBULARIS	COARSE GRASS-LIKE BEAKED-RUSH		E	G5?	S1
RIBES MISSOURIENSE	MISSOURI GOOSEBERRY		E	G5	S1
RUDBECKIA FULGIDA	ORANGE CONEFLOWER		E	G5T4?	S1
SALIX LUCIDA SSP LUCIDA	SHINING WILLOW			G5T5	S1
SCUTELLARIA NERVOSA	VEINED SKULLCAP			G5	S2
SEDUM TELEPHIOIDES	ALLEGHENY STONECROP			G4	SX.1
SELAGINELLA RUPESTRIS	ROCK SPIKE-MOSS			G5	S2
SOLIDAGO RIGIDA	PRAIRIE GOLDENROD		E	G5T5	S1
STACHYS TENUIFOLIA	SMOOTH HEDGE-NETTLE			G5	S3
STELLARIA PUBERA	STAR CHICKWEED		E	G5	SH
TRIOSTEUM ANGUSTIFOLIUM	NARROW-LEAF HORSE-GENTIAN		E	G5	S1
VALERIANELLA RADIATA	BEAKED CORNSALAD		E	G5	S1
VERBENA SIMPLEX	NARROW-LEAF VERVAIN		E	G5	S1
VICIA CAROLINIANA	CAROLINA WOOD VETCH		E	G5	S1
VIOLA CANADENSIS	CANADIAN VIOLET		E	G5T?	S1
108 Records Processed					

Code	Definition
Federal Status	Federal Status (U.S. Fish and Wildlife Service definitions)
LT	Taxa formally listed as threatened.
Species Status	State Status
E	Endangered: Applies to a species whose prospects for survival within the state are in immediate of extinction within NJ.
T	Threatened: Applies to species that may become Endangered if conditions surrounding it begin to or continue to deteriorate.
SRank	State Rank Definitions
S1	Critically imperiled in New Jersey.
S2	Imperiled in New Jersey.
S3	Rare in state. Species ranked S3 are not yet imperiled in state but may soon be if additional populations are destroyed.
B	Refers to the breeding population of the element in the state.
N	Refers to the non-breeding population of the element in the state.

Note:	To express uncertainty, the most likely rank is assigned and a question mark added (e.g., G2?). A range is indicated by combining two ranks (e.g., G1G2, S1S3).
Source: http://www.nj.gov/dep/parksandforests/natural/heritage/spplant_ap1.html for complete code definitions.	

RARE WILDLIFE SIGHTING REPORT FORM

REPORT FORM MUST BE ACCOMPANIED BY AN AERIAL PHOTOGRAPH, SATELLITE IMAGE, OR TOPOGRAPHIC MAP WITH THE LOCATION PRECISELY MARKED. PLEASE PRINT LEGIBLY.

*The inclusion of a map is mandatory, please see other side for further information on obtaining a map.

General Information

Today's Date _____

Common Name _____

Scientific Name (If known) _____

Where did the sighting take place?

Municipality/ Township _____

County _____

Topographic quad (if known) _____

Coordinates in state plane feet (if known) _____

Directions to location with landmarks, which will enable the future relocation of the site where the species was sighted:

Land Owner (name, address and phone number, if known) _____

Describe habitat at the point of sighting and habitat in the general area of the sighting location.

Would you accompany a biologist to the site if needed? Yes No

Can you describe any immediate or future plans to develop or disturb the site? Yes No

If so, please describe. _____

Locational Accuracy

1. Is your depiction of the sighting location on the topographic map or aerial photo within 6m (20ft) of the animals actual location on the ground? Yes No (if no, answer question 2 below)

2. Your mapping is accurate to within ___ meters ___ feet ___ miles of the actual location.

What was observed?

How was the species identification made? (ex. Sighting, Call, Road Kill, etc.) _____

Date and time of this sighting (ex. August 20, 2004, 10:30am) _____

How frequently has this species been sighted at this location and over how long a period of time? _____

Number of individuals sighted: Adult ___ Immature ___ Larva ___ Unknown/Other ___

Describe sighting and activity observed (ex. Nesting, Perched, Flying, Sunning, etc.) _____

Describe physical features that identify the sighted animal as the species you are reporting. _____

Were photos taken? Yes No Was video recorded? Yes No Was audio recorded? Yes No
(PHOTOS/VIDEO/AUDIO ARE STRONGLY ENCOURAGED IN ORDER TO VERIFY THE ACCURACY OF A SIGHTING. Items should be identified with the date taken, location, and observer signature. Items will not be returned.)

List manuals used or experts consulted to verify identification. _____

Provide a brief background on wildlife knowledge and/or experience, or additional information that would add to the validity of the sighting. _____

Can this be verified by someone else or can anyone vouch for your identification skills? Yes No _____

Describe any additional information that may be useful in regards to the condition of the animal or location. _____

Your Contact information

Name _____

Street _____

City _____ State _____ ZIP _____

Daytime Phone () - E-mail _____

Preferred method of contact _____

Signature _____



Return to:
Endangered and Nongame Species Program
NJ Division of Fish and Wildlife
PO Box 400
Trenton, NJ 08625-0400
(609) 292-9400



Instructions

1. Complete this form for first-hand field observations only.
2. **DO NOT COMPLETE THIS FORM** if the source of your information is a report, letter, conversation, or other document. Send us the documentation instead.
3. Attach a copy of a map. (**see below*)
4. Only report one species at each location per form and map.

***Mapping**

A map is necessary to help our biologists determine if suitable habitat is present at the location. Once the suitability of the area is determined the map provided aids in the delineation of land to be protected. Ideally the most accurate form of map is an aerial photo, which can be obtained from <http://www.state.nj.us/dep/gis/imapnj/imapnj.htm>, if you are comfortable with your ability to identify the location of the sighting accurately on them. In addition, satellite-derived images are available at <http://www.maps.google.com>. These images can be printed and clearly marked with a pen. An alternative to an aerial photo or satellite image is a topographic map. You may also print copies of topographic maps from the internet at <http://www.topozone.com>. Please use 1:24,000 scale topographic maps only. Please provide either an image or a topographic map, but NOT both. Thank you.

Refer to the DFW website for further information: <http://www.njfishandwildlife.com/ensp/rprtform.htm>

Bald Eagle, *Haliaeetus leucocephalus*

Status: *State:* Endangered

Federal: Threatened (proposed for de-listing)

Identification

Adult bald eagles are distinguished by their large size (7- to 8-foot wingspan), full white heads and tails and dark brown, almost black body. They reach their adult size by the time they can fly. Their adult plumage, however, develops in their fifth year. Prior to that, their juvenile appearance varies from year to year. In their first year, their wings are slightly broader and entirely dark brown. The next year they begin to molt their flight feathers and the trailing edge of their wings appears symmetrically serrated as shorter adult feathers replace the longer juvenile ones. Their plumage is usually mottled, brown and white, and is widely variable with a considerable amount of white on the breast and belly. Bald eagles are even more mottled in their third year and begin to show signs of change from dark brown to light yellow in their eye and bill color, and may have some lighter plumage appearing on their heads and tails.



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During their fourth year, bald eagles begin to appear unmistakable as our national symbol. This is when they are transitioning from juvenile to adult and appear for the first time with a white head and tail. At this age, they retain some brown in the white plumage, giving them a dirty appearance. They also retain some white flecking in the brown of their bodies. In their next molt, they attain the clean white head and tail and solid brown body plumage of a full adult bald eagle.

Habitat

Bald eagle habitat consists of areas of forest that are associated with bodies of water. With fish as their primary diet, bald eagles in New Jersey have historically been associated with the forests near the Delaware River and Bay as well as all the rivers that empty into the Atlantic Ocean and Delaware Bay (Niles 1995). In northern and central New Jersey, bald eagles are resident on inland reservoirs and on the Delaware River. Throughout the state, these large birds require a nesting location that is safe from the threat of human disturbance and usually choose their nest tree accordingly. Typically, the tree they choose for building their large nests is a “super-canopy” tree that is taller than the trees immediately surrounding it. By nesting in such a tree, eagles can place their nest within the shelter of the crown and still be above the surrounding trees, enabling them to arrive and depart from the nest with ease.

In the northern part of the state, where the topography is hilly or mountainous, eagles can nest in trees that are on a slope and therefore have one side that is higher than its neighboring trees on the slope below it. Occasionally,

bald eagles will choose a lone tree in an open field.

In addition to nesting habitat, eagles also have habitat requirements for foraging and wintering, which might overlap their nesting habitat, but not necessarily. Foraging habitat for bald eagles consists of large perch trees near a body of water. Both of these elements are critical due to the “sit and watch” foraging behavior of eagles. Wintering habitat consists of the same, with the added condition of open, ice-free water. Parts of the Delaware River, such as the Delaware Water Gap, where the current is swift and the river remains open, or deep reservoirs with enough current or a dam to keep part of the water ice-free, serve as good wintering habitat for eagles. The tidal areas of southern New Jersey marshes are also ideal locations for winter foraging.

Status and Conservation

Long before the introduction of the pesticide DDT after World War II, habitat destruction, shootings and poisonings had greatly reduced the population of bald eagles in the lower 48 contiguous states. But the widespread use of DDT, which caused eagles to lay thin-shelled eggs that were often crushed during incubation, pushed the bird to the brink of extinction. New Jersey, where DDT was heavily used, in part for mosquito control, was no exception. By 1970, only one eagle nest remained in the state. Consequently, the bald eagle was listed as endangered under New Jersey’s new Endangered Species Act in 1974 and listed as federally endangered throughout the lower 48 states in 1978.

Management of the state’s only nest began in 1982, when biologists began climbing the nest tree to retrieve the thin-shelled eggs. They were then incubated in the lab underneath chickens before being returned to the nest as 10-day-old chicks, which were quickly cared for by the nest’s adults. Shortly thereafter, the state launched a “hacking” program through which 60 eaglets, primarily from Canada, were released into the heart of New Jersey’s bald eagle habitat between 1983 and 1989. Those efforts, combined with the 1972 federal ban on DDT, paid off rather quickly, with the appearance of the state’s second eagle nest in 1988. Since

then, biologists also have been successful in encouraging eagles to nest in certain areas by building “starter nests,” which eagles add to once they adopt them for nesting (Clark and Niles 1998). Building nests for eagles works best when a pair has already claimed a territory, and the birds may be drawn to a sturdy nest in a super-canopy tree.

Since the second nest appeared, the number of eagle nests has increased steadily ever since. In 2001, a record 27 bald eagle nests were active statewide, mostly in southern New Jersey. A record 34 young fledged that year (Smith et al. 2001).

Barred Owl, *Strix varia*

Status:

State: Threatened

Federal: Not listed

Identification

On still spring evenings, the hooting and eerie caterwauling of barred owls resonate throughout the remote, swampy woodlands of New Jersey. The resounding song of the barred owl, often represented as “who cooks for you, who cooks for you alllll,” is often accompanied by loud “hoo-ah” calls and yowling reminiscent of monkeys. Barred owls may vocalize throughout the year, but are most expressive during courtship, from late February to early April. These owls often call at night but may also vocalize during the day.



© Blaine Rothausser

The barred owl is a large fluffy-looking owl with brown barring on the upper breast and brown streaking on the lower breast and belly. The upperparts are brown with buffy-white barring. The tail is patterned with alternating bands of brown and buff-gray. The throat is white and the round head lacks ear tufts. The facial disk is grayish-white with a brown outline. The large facial disk funnels sounds towards the owl's proportionally gigantic ears, providing it with extraordinary hearing for detecting minute noises, such as the rustling of mice in the dark. Unlike all other eastern owls excluding the barn owl, the eyes of the barred owl are dark brown. The hooked bill is buff yellow. The feet and toes are feathered and the talons are dark brownish-black. Sexes are similar in plumage and, although there is much overlap, females may be larger than males. Juveniles resemble adults.

Barred owls fly with slow, moth-like wing beats that are interspersed with glides. In flight, the head appears large and the wings are broad and rounded. Soft feathers and serrated edges on the outer wing feathers minimize noise, enabling these and all other owls to fly silently--an advantage that enables them to surprise their prey.

The barred owl can be distinguished from most other New Jersey owls by its plumage, large size, distinctive vocalizations, and habitat selection. The great horned owl (*Bubo virginianus*), a common breeding species in the state, is also a large owl but has rich brown plumage and yellow eyes. The ear tufts of great horned owls may not be noticeable in flight, making them appear round-headed like a barred owl. The call of the great horned owl is a melancholy “hoo-hoo-hoo.” Great horned owls, which often reside in forested uplands or near human habitation, are less restrictive in their habitat choice than barred owls. The barn owl (*Tyto alba*), the only other New Jersey owl with dark eyes, is white below and golden brown above. In addition, the barn owl, which resides in

open fields and grasslands, has a narrow body, long unfeathered legs, and a heart-shaped facial disk.

Habitat

Traditionally known as the “swamp owl,” the barred owl is a denizen of remote, contiguous, old-growth wetland forests. These owls require mature wet woods that contain large trees with cavities suitable for nesting. Barred owl habitats typically have an open understory through which the owls can fly and hunt. The lack of large nesting cavities is often the primary limiting factor for barred owls. Consequently, these owls may nest immediately outside of a wetland or in sub-climax wetland forests if adequate nest sites are unavailable within a mature wetland forest. Barred owls are typically found in remote wilderness areas that may also contain other rare species such as the red-shouldered hawk (*Buteo lineatus*) or the Cooper’s hawk (*Accipiter cooperii*). Barred owls typically shun human activity by avoiding residential, agricultural, industrial, or commercial areas. In northern New Jersey, barred owls favored sites that were at least 500 meters (1640 ft.) from human habitation and had little or no forest clearings or trails (Bosakowski 1987).

In southern New Jersey, barred owls inhabit both deciduous wetland forests and Atlantic white cedar (*Chamaecyparis thyoides*) swamps associated with stream corridors. Often such lowland forests are buffered by surrounding pine or pine/oak uplands that may protect the owls from human disturbance and provide additional foraging habitat. Mixed hardwood swamps are often dominated by red maple (*Acer rubrum*) and black gum (*Nyssa sylvatica*) and may include highbush blueberry (*Vaccinium corymbosum*), swamp magnolia (*Magnolia virginiana*), or greenbrier (*Smilax spp.*) in the shrub layer. Although barred owls utilize white cedars for roosting, they infrequently provide cavities that are large enough for nesting owls.

In northern New Jersey, barred owls inhabit hemlock ravines and mixed deciduous wetland or riparian forests. Oak hardwood forests containing white oak (*Quercus alba*), red maple, black birch (*Betula lenta*), black willow (*Salix nigra*), hickory (*Carya spp.*), white ash (*Fraxinus americana*), basswood (*Tilia americana*), tulip poplar (*Liriodendron tulipifera*), black cherry (*Prunus serotina*), and black gum may be occupied. Barred owls may also inhabit northern hardwood forests that contain sugar maple (*A. saccharum*), birch (*Betula spp.*), and beech (*Fagus grandifolia*). Dense stands of hemlock (*Tsuga canadensis*), white pine (*Pinus strobus*), Norway spruce (*Picea abies*), or other conifers provide cover for roosting owls and protection from harsh weather. Barred owls prefer flat, lowland terrain and avoid rocky slopes and hillsides.

As a resident species, barred owls establish territories with fairly stable boundaries that are continuously maintained throughout the year. In eastern North America, home range sizes of 86 to 370 hectares (213 to 914 acres) have been documented for barred owls (Johnsgard 1988).

Status and Conservation

The barred owl was traditionally a common resident within the deep wooded swamps of New Jersey. Historically, these owls were shot as trophies or because of alleged poultry predation. Collectors also looted young owls and eggs. Despite human

persecution, the barred owl persisted virtually unscathed until the early 1940s when the cutting of old growth forests and the filling of wetlands greatly reduced habitat throughout the state. Rampant habitat loss and associated barred owl population declines continued for the next several decades. Consequently, these owls were lost from many historic breeding locales.

Due to population declines and habitat loss, the barred owl was listed as a threatened species in New Jersey in 1979. The New Jersey Natural Heritage Program considers the barred owl to be “demonstrably secure globally,” yet “rare in New Jersey” (Office of Natural Lands Management 1992). Currently, barred owl populations appear to be declining due to development and fragmentation of large tracts of private forested lands. The barred owl population has been estimated at 37 pairs in South Jersey and 75 pairs in North Jersey (Sutton and Sutton 1985, Bosakowski 1988). But recent surveys in South Jersey indicate as much as a 30 percent decline there.

Bobcat, *Felis rufus*

Status:

State: Endangered

Federal: Not listed

Identification

Taxonomically, bobcats belong to the order Carnivora, or carnivores, meaning that they are primarily flesh-eaters. They are members of the Felidae family and are commonly known as felines. All members of this family look somewhat similar in appearance. Bobcats have retractable claws and five digits on each foot. Their pelt color varies throughout different parts of their range within the continental United States. In this part of the country, bobcats generally have a tawny to grayish-brown fur



© Blaine Rothouser

with spots and streaks and a whitish-colored underside that is also spotted and streaked. The fur around their lips, chin and underside of the neck are also light-colored. Bobcats have ruffs of fur on both sides of their face and small tufts on the ears. The top of their short tails is tipped black.

Like all other felines, bobcats have vertically shaped pupils that widen to maximize light reception for nocturnal activity. In addition, they have relatively long legs in relation to their bodies, with the hind legs being longer than the front. This posture accentuates the bobbed tail, which ranges in length from 5-7 in. A mature bobcat is approximately 35 in. in length and 20 in. high at the shoulders. Their weight ranges from about 15-25 lbs. for adult females and 20-35 lbs. for adult males. However, large males can weigh up to 40 lbs.

Habitat

Bobcats are extremely adaptable animals that can survive in a variety of habitats. In our western states they are found in deserts and mountains. In the South they inhabit swamps, river bottoms and forests. In the Northeast they can be found in forests, areas of mixed forest and agriculture and even rural areas near cities and small towns. In general, bobcats use rough, broken habitat that has a mix of early and late successional stages. They do not prosper in highly suburbanized areas or in areas that have been severely altered by intense agriculture. This explains their absence from many Midwest states. However, bobcats can survive in agricultural areas that are interspersed with natural cover if they support adequate prey populations (Godin 1977 and McCord 1977).

Bobcats prefer habitats that provide dense cover in the form of understory vines, briars, shrubs, and saplings (Leopold et al 1995). These cover types provide areas for resting, and protection from both weather and predators (Leopold et al 1995 and Godin

1977). In northern New Jersey, typical bobcat habitat consists of large areas of contiguous forest and fragmented forests interspersed with agricultural areas or early succession vegetation. Bobcats often use areas with rock outcrops, caves, and ledges that provide shelter and cover for hunting, resting and rearing young. Where rocky areas are not available, swamps, bogs, conifer stands and rhododendron and mountain laurel thickets provide good cover and excellent hunting grounds (New Jersey Division of Fish, Game and Wildlife 1995). In southern New Jersey, dense thickets of briars and conifers serve as resting and escape cover (New Jersey Division of Fish, Game and Wildlife 1995). Clearly, bobcats are extremely versatile creatures that have the ability to adapt to a wide variety of habitat types and prey species.

Status and Conservation

The bobcat has been extirpated from much of the Midwest due to habitat changes resulting from modern agricultural practices. It is considered endangered in Iowa, Indiana and Ohio. However, Illinois removed the bobcat from its threatened list in 1999 and Pennsylvania, which had permitted no legal hunting between 1970 and 1999, reinstated a limited hunting and trapping season beginning in 2000.

In New Jersey, the bobcat population experienced severe declines near the turn of the 19th century as most forests were cleared for lumber, fuel, charcoal and agricultural use. As the remaining habitat became highly fragmented, bobcat numbers plummeted. During the 1950s and 1960s, reports of bobcat sightings and killings persisted, but by the early 1970s it was thought that the feline had been extirpated from the Garden State. The bobcat gained full legal protection under New Jersey regulations in 1972 when it was classified as a game species with a closed season (Lund 1979).

In 1977, the New Jersey Division of Fish, Game and Wildlife initiated a project to restore the species to suitable habitat within the state. Between 1978 and 1982, 24 bobcats were captured in Maine and released in northern New Jersey (James Sciascia, pers. comm. 1997). In the years that followed, reports of bobcat sightings increased, suggesting that the project had been a success. In 1991 the status of the bobcat was changed again to endangered under New Jersey's Endangered and Nongame Species Conservation Act.

The New Jersey Division of Fish and Wildlife's Endangered and Nongame Species Program (ENSP) conducted a scent post survey in 1995 and confirmed bobcat presence in Sussex, Warren, Morris, and Passaic counties. In addition, reliable bobcat sightings have been reported from Mercer, Somerset, Bergen, Burlington, Ocean, Atlantic, Cape May, Cumberland, and Salem counties (Sciascia, pers. comm. 1997).

In 1996, the ENSP began a pilot project using radio telemetry to monitor the movements of bobcats in northern New Jersey. The objective was to determine the bobcats' home range and habitat preferences in that part of the state. The work is continuing, although technological advances now allow biologists to fit bobcats with satellite transmitters. Bobcat locations can now be monitored on a continual basis using satellites.

Bobolink, *Dolichonyx oryzivorus*

Status:

State: Threatened

Federal: Not listed

Identification

Amid a sea of agriculture, the bubbly “bob-o-link!” song of the bobolink echoes from within an overgrown weedy field. On a fall day at Cape May, a chorus of “plink” notes is heard overhead as a flock of bobolinks passes above a fallow grassland. These are the song and call of the bobolink, a sparrow-sized member of the blackbird family.



Photo by S. Maslowski, courtesy US FWS

Bobolinks exhibit sexual dimorphism (gender differences) in plumage during the breeding season. The nuptial male is black overall with a creamy nape and hindneck, a white rump, and white scapulars (feathers at the base of the wing). The plumage of the female, which camouflages her during nesting, is relatively drab. The female is buffy with dark brown streaking on the back, sides, and rump and has dark stripes on the head. In non-breeding plumage, adult males resemble females. Immature bobolinks also resemble adult females but are more yellow and lack streaking on the sides of the body. All ages and sexes have a short, finch-like bill and pointed tail feathers.

Habitat

Bobolinks inhabit low-intensity agricultural habitats, such as hayfields and pastures, during the breeding season. In addition, lush fallow fields and meadows of grasses, forbs, and wildflowers are occupied. Bobolink nests are often placed in areas of greatest vegetative height and density. Although small numbers of bobolinks may nest in grasslands of 2 to 4 hectares (5-10 acres), larger sized fields support higher densities of nesting pairs (Jones and Vickery 1997a).

Similar habitats are occupied by bobolinks throughout their annual cycle. During migration, bobolinks inhabit fallow and agricultural fields, as well as coastal and freshwater marshes. On their South American wintering grounds, they occur in grasslands, marshes, rice fields, and farm fields.

Status and Conservation

Historic clearing of forests in the eastern United States during the 1700s and 1800s enabled numerous grassland species to expand their ranges, inhabiting the growing agricultural landscape. As a result, the bobolink became a common breeding species in the hayfields and pastures of New Jersey. However, by the early 1900s, bobolink

population declines were noted in the Northeast. The slaughter of migrant bobolinks in rice fields of the southern United States, market hunting, and modernized farming techniques likely caused this decline. During the 1960s and 1970s, changing agricultural practices, the conversion of fallow fields to forests, and the development of agricultural lands further shrunk bobolink populations in New Jersey.

Modern farming techniques, including frequent rotation of hayfields, early mowing of hay, decreased vegetative diversity, and the change from warm-season to cool-season grasses, have rendered agricultural fields less favorable for nesting bobolinks. In addition, alfalfa (*Medicago sativa*) fields, which offer poor nesting habitat for bobolinks, have replaced many timothy (*Phleum* spp.) and clover (Fabaceae) fields. The area of land cultivated as hay fields in the northeastern United States declined from 12.6 to 7.1 million hectares (31.1 to 17.5 million acres) from 1940 to 1986 (Martin and Gavin 1995). During the same period, the percentage of sites where alfalfa replaced hay increased from 20% to 60% (Bollinger and Gavin 1992). Habitat loss is largely responsible for the decline of bobolink populations in the United States and New Jersey detected by the Breeding Bird Survey from 1966 to 1999 (Sauer et al. 2000).

Due to population declines and habitat loss, the bobolink was listed as a threatened species in New Jersey in 1979. The New Jersey Natural Heritage Program considers the bobolink to be “demonstrably secure globally,” yet “imperiled in New Jersey because of rarity” (Office of Natural Lands Management 1992).

Bog Turtle

Bog Turtle - *State Endangered Species* - Pl.3 (*Clemmys muhlenbergii*)

Identification: 3" - 4 1/2". A large orange or yellow patch on each side of the head is a key identifying mark of the Bog Turtle. The carapace varies from light brown to black, with each scute on the carapace showing a pattern of concentric circles; large scutes may have a light center. The moderately domed carapace may be rough or smooth, and is weakly keeled along the midline. The hingeless plastron is dark brown to black; may have some yellow in the middle. The limbs are typically brown, but may be flecked with orange.

Where to find them: The Bog Turtle is among the most difficult to find because of its elusive behavior and rarity as a result of habitat destruction. It prefers marshes, wet meadows, and fens featuring plant species such as sedges, rushes, mosses, skunk cabbage, cattail, jewelweed, and smartweed.

When to find them: Mid-April through June as it basks in the sun on sedge tussocks and matted vegetation litter.

Range: Entire state. The greatest numbers occur in the agricultural landscapes of northwestern and southwestern New Jersey.

Conservation Status: Habitat loss, pollution, and illegal collecting have negatively impacted bog turtle numbers in New Jersey. In addition to protecting sites currently occupied by this species, management of suitable bog turtle habitat is important. Such management includes suppression of vegetative succession and controlling undesirable (often exotic) plant species.

Bog Turtle

(*Clemmys muhlenbergii*)
- text pg. 12

Key Features

- **Orange/yellow patch on head.**
- **Carapace: light brown to black.**
- **Plastron: hingeless; dark brown to black.**



New Jersey Division of Fish and Wildlife ~ 2003



Excerpt from: Schwartz, V. & D. Golden, "Field Guide to Reptiles and Amphibians of New Jersey". New Jersey Division of Fish and Wildlife 2002.

Order the complete guide at - <http://www.state.nj.us/dep/fgw/products.htm>

Cooper's hawk, *Accipiter cooperii*

Status:

State: Endangered

Federal: Not listed

Identification

On a cool fall day at Cape May Point, observers scan the skies as streams of accipiters zip past at tree-level. Darting through the cedars in pursuit of a yellow-rumped warbler is a Cooper's hawk, one of the three species of North American accipiters-hawks that prey chiefly on birds. The Cooper's hawk, as well as its cousins, the sharp-shinned hawk (*Accipiter striatus*) and the northern goshawk (*Accipiter gentilis*), are forest-nesting raptors that are able to quickly maneuver through dense cover while chasing prey.



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About the size of a crow, the Cooper's hawk has short, rounded wings and a long, narrow tail. When soaring, the head extends beyond the wrist, making it appear large-headed. In flight, the silhouette of a Cooper's hawk appears cross-shaped, whereas the similarly plumaged sharp-shinned hawk looks small-headed and T-shaped. Sharp-shinned hawks usually exhibit a shorter, more squared-off tail. In addition, the wing beats of the Cooper's hawk are stiffer and more powerful than the fluttery wing beats of the sharp-shinned hawk.

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The adult Cooper's hawk has a dark cap, blue-gray back, and rusty, barred underparts. The juvenile's back is brown with rufous (reddish brown) feather edges and sparse white spotting, and the underparts are light colored with brown vertical streaking on the breast. In all ages, the tail is usually rounded and has a white edge along the tip. Juveniles molt into adult plumage during their second year. Eye color changes from yellow-green in immature birds to dark orange or red in adults. Females are significantly larger than males. The call of the Cooper's hawk, which is often given during the breeding season, is a loud and nasal "cak-cak-cak."

Habitat

During the breeding season, Cooper's hawks inhabit deciduous, coniferous, and mixed riparian or wetland forests. In southern New Jersey, breeding habitats include large, remote red maple (*Acer rubrum*) or black gum (*Nyssa sylvatica*) swamps and, on occasion, Atlantic white cedar (*Chamaecyparis thyoides*) swamps. Within these sites, high-bush blueberry (*Vaccinium corymbosum*) and greenbrier (*Smilax rotundifolia*) typically dominate the shrub layer. Adjacent upland pine or mixed pine/oak forests

provide an additional habitat buffer for nesting Cooper's hawks. In northern New Jersey, Cooper's hawks inhabit mixed riparian woodlands, eastern hemlock (*Tsuga canadensis*) / white pine (*Pinus strobus*) forests, and conifer plantations. Dominant tree species within such habitats may include red maple, sugar maple (*Acer saccharum*), eastern hemlock, white pine, black birch (*Betula lenta*), white oak (*Quercus alba*), scotch pine (*Pinus sylvestris*), and Norway spruce (*Picea abies*).

Cooper's hawk nest sites are often located within sub-climax forests that provide a closed canopy, moderate to heavy shrub cover, and trees more than 30 years old. Territories often contain forest edges and small openings along streams or roads, which may be used for hunting. In northern New Jersey, Cooper's hawk territories contained over 70% forested habitat within 0.3 km (0.2 miles) of nest sites and were, on average, 0.5 km (0.3 miles) away from the nearest house (Bosakowski et al. 1993). Home ranges of breeding Cooper's hawks in the United States may comprise 105 to 1,800 hectares (260 to 4,450 acres) (Johnsgard 1990, Rosenfield and Bielefeldt 1993).

During the 1970s, when the Cooper's hawk was first listed as an endangered species in New Jersey (1974), breeding was documented only within large, contiguous forests. As the Cooper's hawk population increased, pairs have nested in smaller woodlots containing mature trees and fragmented woods within agricultural, suburban, or urban landscapes. This may be attributed to both a larger breeding population and increased fragmentation of forested habitats. Cooper's hawks may exhibit limited tolerance for human disturbance and habitat fragmentation.

Cooper's hawks, which occur year-round in New Jersey, use many of the same habitats in winter as during the breeding season. However, because of limited prey availability during the winter months, habitat use during this season is less restrictive than during the breeding season. Consequently, Cooper's hawks forage within a variety of forest types as well as woodland edges. Wintering hawks may also frequent residential areas where they hunt songbirds and doves at bird feeders. Cedar forests, conifer groves, and other dense woods that provide protection from harsh weather are favored for roosting.

Status and Conservation

Until the mid-1930s, many raptor species, including the Cooper's hawk, were shot in large numbers during migration and on their breeding grounds because of suspected poultry and game bird predation. Regardless, the Cooper's hawk remained a fairly common breeding species in New Jersey's forests until the 1950s when habitat loss caused population declines. In addition, the pesticide DDT impaired reproduction and contributed to population declines observed from the 1950s to 1970s. Due to the reduction in the state's breeding population and the loss of habitat, the Cooper's hawk was listed as an endangered species in New Jersey in 1974. The New Jersey Natural Heritage Program considers the Cooper's hawk to be "apparently secure globally," yet "rare in the State (breeding)" (Office of Natural Lands Management 1998). Concern for this species is evident in nearby states, such as New Hampshire, Rhode Island, and Connecticut, where it is listed as threatened, and Massachusetts and New York, where it is considered a species of Special Concern. The National Audubon Society also included the Cooper's hawk on its Blue List of Imperiled Species from 1971 to 1982 and in 1986, the final year of the list.

Following the nationwide ban of DDT in 1972 and the reforestation of fallow lands throughout the state, Cooper's hawk populations began to recover. Cooper's hawks experienced increases in New Jersey Christmas Bird Counts from 1959 to 1988 and Breeding Bird Surveys from 1980 to 1999 (Sauer et al. 1996, Sauer et al. 2001). Other recent surveys have also shown a substantial increase in the breeding population of Cooper's hawks in New Jersey. As a result, the status of the Cooper's hawk was reclassified from endangered to threatened in New Jersey in 1999. The loss of large, contiguous forests remains a threat to this species and warrants the continued protection of Cooper's hawk nesting habitats.

Northern Copperhead

Northern Copperhead - *VENOMOUS* - PL.19

(*Agkistrodon contortix mokasen*)

Identification: 22" - 53". The Copperhead, with its red-brown ground color and darker crossbands, is easily camouflaged in the leaf litter of a forest floor. The dark brown, saddle-shaped crossbands are narrow on top and wide on the sides. The Copperhead has scattered dark spots in lighter areas. As the name indicates, the triangular, unmarked head is a copper color. The young have a yellow tail tip. Scales are weakly keeled; anal plate is single.

Where to find them: Favors rocky, wooded uplands and wooded wetlands; may be found hiding in rotting woodpiles, or perfectly camouflaged on leafy forest floor. The Copperhead will den with other species of snakes in the winter, particularly the Timber Rattlesnake.

When to find them: Active May through October.

Range: Rocky talus slopes and forest habitats in the Northern Region. These habitats are scattered throughout the Northern Region, but are primarily located in Sussex, Warren, Hunterdon, and Passaic Counties.

WARNING: Do NOT attempt to handle this snake!

Northern Copperhead - *VENOMOUS!*

(*Agkistrodon contortix mokasen*) - text pg. 28



Key Features

- Coppery-red head.
- Dark "hourglass" shaped bands that are wider on sides than top (compare with water snake - Pl. 10).
- Shovel-shaped head.
- Vertical pupils and facial pit.
- Scales weakly keeled.



New Jersey Division of Fish and Wildlife ~ 2002



Excerpt from: "Field Guide to Reptiles and Amphibians of New Jersey"
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Eastern Box Turtle

Box Turtles are known for their ability to hide in their shells, closing the doors to all threats. New Jersey has one species of Box Turtle, the Eastern Box Turtle.

Eastern Box Turtle (*Terrapene carolina carolina*) - Pl.4

Identification: 4 “ - 8 1/2”. The combination of the high, domed, weakly keeled carapace, and the hinged plastron that can tightly close front and back, make the Eastern Box Turtle distinct from all other turtles in New Jersey. The carapace and plastron have yellow, orange, olive or tan markings on a brown or black background; different animals may show relatively more dark or light coloration. The Eastern Box Turtle has a hooked upper jaw, and four toes on each hind foot. The male has a central concave area in the rear lobe of the plastron, while the female has a flatter or more convex plastron. Most males have red eyes; females have yellow-brown eyes. Young have flatter, less ornate shells.

Where to find them: The Eastern Box Turtle is our most terrestrial species. It prefers woods and meadows. In hot, dry weather it may be found in muddy areas or shallow pools, or hiding under rotten logs or other decaying vegetation.

When to find them: Active April through September.

Range: Entire state.

Eastern Box Turtle

(*Terrapene carolina carolina*)

- text pg. 13



Key Features

- Carapace: highly domed and weakly keeled.
- Plastron: hinged.
- The carapace & plastron both have yellow, orange, olive, or tan markings on a brown or black background.



New Jersey Division of Fish and Wildlife ~ 2003



Excerpt from: Schwartz, V. & D. Golden, “Field Guide to Reptiles and Amphibians of New Jersey”. New Jersey Division of Fish and Wildlife 2002.

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Grasshopper Sparrow, *Ammodramus savannarum*

Status:

State: Threatened

Federal: Not listed

Identification

A small, secretive songbird, the grasshopper sparrow is more often heard than seen as its insect-like melody emits from dense grasses. Its song consists of one to two chips followed by a buzzy trill reminiscent of a grasshopper. This sparrow also sings a series of buzzy notes.



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The grasshopper sparrow has a stocky body that is brown above with buff streaking. On adults, the breast and sides are solid buff and the belly is white. The buff breast and sides of juveniles are marked with dark brown vertical streaking. Grasshopper sparrows have flat heads with relatively large bills. The crown is dark brown with light central stripes atop the head and behind the eye. The lores (between the eyes and the bill) are orange or golden. The tail is short and brown.

Habitat

Grasshopper sparrows breed in grassland, upland meadow, pasture, hayfield, and old field habitats. Nesting grasshopper sparrows may occur on agricultural lands and airports where such habitats occur. Although grasshopper sparrows may use small grasslands, open areas of over 40 hectares (100 acres) are favored. Optimal habitat for these sparrows contains short- to medium-height bunch grasses interspersed with patches of bare ground, a shallow litter layer, scattered forbs, and few shrubs. Clumped grasses, such as poverty grass (*Danthonia spicata*) and broom-sedge (*Andropogon virginicus*), provide cover and foraging areas and are consequently favored over sod or matting grasses. In addition, orchardgrass (*Dactylis glomerata*), alfalfa (*Medicago sativa*), red clover (*Trifolium pratense*), lespedeza (*Lespedeza spp.*), and dewberry (*Rubus spp.*) provide sparrow habitat. Shrubs, fence posts, and tall forbs are used as song perches. However, habitats may become unsuitable for nesting grasshopper sparrows if shrub cover becomes too dense. Consequently, the presence and density of grasshopper sparrows at breeding sites varies annually due to habitat changes. Habitat use during the nonbreeding season is similar, although less restrictive, to that of the breeding season, as these sparrows may inhabit thickets, weedy lawns, vegetated landfills, fence rows, open fields, or grasslands.

Status and Conservation

In the eastern United States, the historic distribution of grasshopper sparrows was restricted to natural grasslands created by fires or flooding. However, the boom in agriculture during the late 1800s and early 1900s enabled this species to spread its range and increase in numbers, making it a fairly common breeder in New Jersey. By the 1950s and 1960s, expanding development of open areas, coupled with dwindling acreage of land devoted to farming or pasture, led to decreases in grasshopper sparrow populations. Continued declines in the northeast were noted in the 1970s and 1980s, when the species was considered locally distributed and uncommon. The number of grasshopper sparrows detected on Breeding Bird Survey routes in New Jersey, the eastern United States, and throughout the country declined from 1966 to 1999 (Sauer et al. 2000).

As the result of population declines and severe habitat loss, the grasshopper sparrow was listed as a threatened species in New Jersey in 1979. The New Jersey Natural Heritage Program considers this species to be “apparently secure globally,” yet “imperiled in New Jersey because of rarity” (Office of Natural Lands Management 1992). Currently, grasshopper sparrows occur in small, localized, and unstable populations in the Northeast. Consequently, other nearby states have listed this species as endangered (Maine, Connecticut), threatened (Massachusetts, Rhode Island), or of special concern (New York). In New Jersey, the survival of grasshopper sparrows is critically linked with management practices for grassland birds on airports, agricultural lands, and pastures.

Jefferson Salamander

Jefferson Salamander (*Ambystoma jeffersonianum*) - Pl.21

Identification: 4 1/4" - 8 1/4". Ground color of this slender salamander is dark brown or gray; the underside is lighter than the sides. The limbs and lower sides of the body are usually marked by tiny bluish-gray speckles. These speckles are bright on young individuals, but fade with age. The Jefferson Salamander closely resembles the Blue-spotted Salamander, but the Jefferson Salamander has a gray area around the vent while the Blue-spotted has a black area around the vent. Also, the snout is wider and extends further forward in the Jefferson Salamander than in the Blue-spotted Salamander.

Where to find them: The Jefferson Salamander breeds in vernal pools located in upland deciduous forests.

When to find them: Breeds in late winter and early spring.

Range: Northern Region: Sussex, Warren, Hunterdon, Morris, Passaic, and Bergen Counties.

Note: The Jefferson and Blue-spotted Salamanders hybridize over most of the Northern Region. Within this area, colors and patterns may vary greatly among hybrids and their parents, and definite identification to either species is extremely difficult. The Audubon guide, although inaccurate in the description of the hybrids' breeding biology, has good examples of how some of these hybrids might look (see plates for Tremblay's Salamander and Silvery Salamander). Genetic analysis is the only method that can definitively distinguish hybrids.

Jefferson Salamander

(*Ambystoma jeffersonianum*) - text pg. 30

Key Features

- Long toes and body with a gray to dark brown base color.
- Belly paler than sides.
- Juveniles may have blueish-white flecks on body.



New Jersey Division of Fish and Wildlife ~ 2002



Excerpt from: "Field Guide to Reptiles and Amphibians of New Jersey"
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MUSSELS

FRESHWATER MUSSELS:

Dwarf wedgemussel, *Alasmidonta heterodon*

Status: *State:* Endangered *Federal:* Endangered

Brook floater, *Alasmidonta varicosa*

Status: *State:* Endangered (pending) *Federal:* Species of Special Concern

Green floater, *Lasmigona subviridis*

Status: *State:* Endangered (pending) *Federal:* Species of Special Concern

Yellow lampmussel, *Lampsilis cariosa*

Status: *State:* Threatened (pending) *Federal:* Species of Special Concern

Eastern lampmussel, *Lampsilis radiata*

Status: *State:* Threatened (pending) *Federal:* Not listed

Eastern pondmussel, *Ligumia nasuta*

Status: *State:* Threatened (pending) *Federal:* Not listed

Tidewater mucket, *Leptodea ochracea*

Status: *State:* Threatened (pending) *Federal:* Not listed

Triangle floater, *Alasmidonta undulata*

Status: *State:* Threatened (pending) *Federal:* Not listed

Identification

All freshwater mussels have a calcium carbonate bivalve shell that is divided into a left and right half. The shell consists of three layers; the outer periostracum, the middle calcium carbonate, and the inner nacre. The periostracum (or epidermis) protects underlying calcium carbonate from the corrosive action of low pH water and damage from moving sand and gravel. A thin prismatic layer of crystalline calcium carbonate lies beneath the periostracum. The nacre or mother-of-pearl is the innermost and often thickest layer of the shell. It is comprised of thin, stacked calcium carbonate plates that lie parallel to the shell's surface. In many species, the color and texture of the nacre are important for identification.

Lateral and pseudocardinal teeth, separated by an interdentum, are located dorsally inside the shell. Lateral teeth are elongated and raised interlocking structures along the hinge line of a valve, whereas pseudocardinal teeth are triangular-shaped hinge teeth near the shell's anterior-dorsal margin. The interdentum is a flattened area of the hinge plate between the lateral and pseudocardinal teeth. The three points of apposition, which are taxonomically important in most species, serve to hold the two valves together. Some groups entirely lack lateral and pseudocardinal teeth. The umbo or beak is the dorsally raised, inflated area of the bivalve shell. Representing the oldest part of the shell, umbones appear as external swellings and are often points of taxonomic significance.

The valves are held closed by internal muscles. Empty shells show scars of former mussel attachment areas. Freshwater mussels have a large, muscular foot that extends between the valves and functions in locomotion and anchorage. The anterior and posterior retractor muscles draw the foot into the shell, while the anterior protractor helps in foot extension. Large anterior and posterior abductors draw the shell together.

Habitat

New Jersey's Endangered and Threatened Freshwater Mussel Species:

The **dwarf wedgemussel** is a rare freshwater mussel with a trapezoid-to-ovate or "humpbacked" shell rarely exceeding 1.5 in. in length. It is characterized by having two lateral teeth on the right valve of the shell, but only one on the left (thus the species name *heterodon*). The ventral margin is mostly straight. The beaks are low and rounded, projecting only slightly above the hinge line. The periostracum, or outer shell, is dark brown or yellowish brown and often exhibits greenish rays in young mussels. The nacre, or inner shell, is bluish or silvery white.

The dwarf wedgemussel once existed in 70 localities within 15 major Atlantic slope drainage basins from New Brunswick, Canada to North Carolina (U.S. Fish and Wildlife Service 1993). Today however, this species is thought to be extirpated from all but approximately 30 small sites in New Hampshire, Vermont, Maryland, North Carolina, New York, Connecticut, Virginia, and New Jersey.

In New Jersey, the dwarf wedgemussel historically inhabited areas of the Delaware, Hackensack, and Passaic rivers. These populations, however, are thought to

be extirpated because of water quality degradation and other factors. There are only three known active state occurrences of this elusive species; the Paulins Kill, Pequest River, and a portion of the upper Delaware River.

Preferred habitat of the dwarf wedgemussel ranges from muddy sand to sand and gravel/pebble bottoms in rivers and creeks with slow to moderate current. Favoring clean and relatively shallow water with little silt deposition, this species is known to co-occur with other freshwater mussels such as the eastern elliptio (*Elliptio complanata*), triangle floater (*Alasmidonta undulata*), creeper (*Strophitus undulatus*), eastern floater (*Pyganodon cataracta*) and eastern lampmussel (*Lampsilis radiata*).

Fish species identified as suitable hosts for the dwarf wedgemussel include the tessellated darter (*Etheostoma olmstedi*), mottled sculpin (*Cottus bairdi*) and Johnny darter (*Etheostoma nigrum*, not found in N.J.) (Michaelson and Neves 1995).

The **brook floater** has a small, kidney-shaped shell that is slightly thicker towards the anterior. There is a conspicuous posterior slope with wavy ridges perpendicular to the growth lines. The ventral margin is straight and slightly concave centrally. The outer shell color ranges from yellowish brown to dark brown and the nacre is a glossy bluish-white to orange in the umbo region. The pseudocardinal teeth exist as weak knobs and lateral teeth are absent. The species has a bright orange to pinkish foot.

The brook floater ranges from the Savannah River Basin in South Carolina north to the St. Lawrence River Basin in Canada and west to the Ohio River Basin of West Virginia. In New Jersey, there are reported occurrences in the Stony Brook, Musconetcong, Raritan, Lamington and upper Delaware rivers.

Habitat of the brook floater includes rapids or riffles on rock and gravel substrates. The species prefers small streams and is commonly associated with the eastern elliptio (*Elliptio complanata*) (Clarke 1981). Reported host fishes for the species that occur in New Jersey include the slimy sculpin (*Cottus cognatus*), longnose dace (*Rhinichthys cataractae*), golden shiner (*Notemigonus crysoleucas*) and pumpkinseed (*Lepomis gibbosus*).

The **green floater** is a small, rare mussel with an ovate trapezoid shell that is fragile and thin. The posterior ridge is rounded. The outer shell is light yellow or brown with many green rays, especially in juveniles. The pseudocardinal and lateral teeth are small and delicate. The beak cavity is shallow. The nacre can be white to blue and is iridescent towards the posterior end.

The green floater can be found from the Cape Fear River Basin in North Carolina north to the Hudson River Basin and westward to St. Lawrence River Basin in New York. In New Jersey, the species once occurred in the Passaic, Raritan, Delaware, and Pequest rivers, but is now represented by a single known individual in the Stony Brook in Mercer County.

This species can be found in smaller streams, most often in pools and eddies with gravelly and sandy bottoms (Ortmann 1919). It is averse to strong currents (Clarke



Photo courtesy North Carolina Wildlife Resources Commission

1985). The host fish is not known. There is some evidence that the green floater may not require a host fish in order to complete its life cycle (Barfield and Watters 1998, Lellis and King 1998).

The **yellow lampmussel** has a medium-sized shell, with males elliptical and somewhat elongate and females more ovate. Shells are moderately inflated and thick. The anterior margin is rounded and the ventral margin is slightly curved. The umbos are swollen and raised above the hinge line. The pseudocardinal teeth are compressed and the beak cavity is somewhat deep. The periostracum is smooth, shiny and usually yellow with brown patches.

The nacre is white to bluish white. There may be green or black rays on the posterior slope.

The species ranges from Georgia to the Lower Ottawa River Canada and eastward to Nova Scotia. New Jersey occurrences of the yellow lampmussel are restricted to the Delaware River.

The yellow lampmussel prefers large rivers that drain more than 1,200 sq. Km (Strayer 1993), and is often found in sand/silt substrates. Although the host fish has not been identified, a migratory species such as the alewife is the suspected host.

Shells of the **eastern lampmussel** are elliptical and have a rounded posterior ridge. The posterior and anterior ends are rounded and swollen umbos extend above the hinge line. The periostracum is brown and extensively rayed. The nacre is white and may be tinged with pink or salmon. This species has long lateral teeth and two pseudocardinal teeth on the left and right valves.

The eastern lampmussel ranges from South Carolina north to the St. Lawrence River Basin. In New Jersey, the species is known from locations in the Ramapo, Pequannock, and Wallkill rivers.

The eastern lampmussel is found in a variety of habitats. It is reported to prefer medium to coarse sands. The host fish is unknown.

The **eastern pondmussel** can be distinguished by its bluntly pointed posterior and distinctive posterior ridge. The shells are elongate and twice as long as wide. The dorsal margin is straight and the ventral margin (the side that opens) is curved. The beaks are low and located in the anterior quarter of the shell. The lateral teeth are long and straight. The pseudocardinal teeth are compressed. The nacre is white, but can also vary



Photo courtesy North Carolina Wildlife Resources Commission

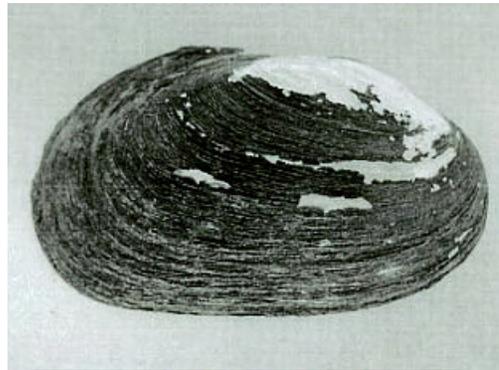


Photo courtesy North Carolina Wildlife Resources Commission

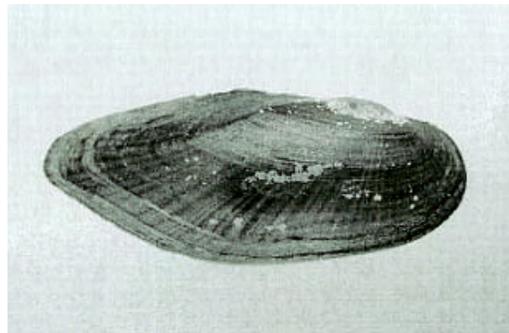


Photo courtesy North Carolina Wildlife Resources Commission

from an iridescent blue to salmon. The periostracum is greenish yellow to dark olive or brown.

The eastern pondmussel occurs from Cape Fear River Basin, North Carolina, to the St. Lawrence River Basin, Canada, and westward through northern parts of the continent's Interior Basin. In New Jersey, the species can be found in the Delaware River and several of its tributaries.

The eastern pondmussel is often associated with tidewaters. The host fish is unknown.

The **tidewater mucket** appears similar to the yellow lampmussel. The shell is small; males are elliptical and females are ovate, subinflated and thin. The anterior end is rounded; the posterior margin is evenly rounded, somewhat pointed in males and truncated in females. The beaks are moderately swollen, raised above the hinge line, and are located near the middle of the shell. The periostracum is yellow to brown or olive green and is often covered with fine green rays. The pseudocardinal teeth are compressed; the lateral teeth are short and curved. The beak cavity is shallow and the nacre is bluish-white and sometimes pink.

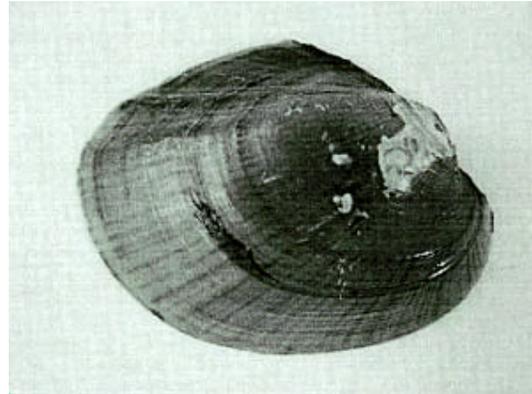


Photo courtesy North Carolina
Wildlife Resources Commission

The tidewater mucket ranges from the Savannah River Drainage Basin in Georgia north into Nova Scotia. In New Jersey, the species occurs in the Delaware River.

This species is associated with tidewaters and can be found in sand/silt substrates. The host fish is undetermined.

The **triangle floater** is a small, ovate to triangular shaped mussel. The lateral teeth are absent, but there is an interdental projection in the left valve. The pseudocardinal teeth are large and well-developed. The periostracum is yellowish-green to black and is extensively rayed. The nacre is pinkish-salmon posteriorly and whitish on the anterior portion.

The triangle floater is a generalist and can be found in a variety of stream and river habitats. The host fish is not determined.

Status and Conservation

The dwarf wedgemussel is afforded protection through federal and state Endangered Species acts, federal and state Clean Water acts, Flood Hazard Area Control Act rules (stream encroachment), and environmental reviews of proposed development projects. The other species listed above are scheduled to be listed as state endangered or threatened in late 2001/early 2002. Federal and state Clean Water acts, stream encroachment rules, environmental reviews of proposed development projects and the state Endangered Species Act will serve to help protect existing populations.

Northern Spring Salamander

Northern Spring Salamander - Pl.26

(*Gyrinophilus porphyriticus porphyriticus*)

Identification: 4 1/4" - 8 5/8". The Northern Spring Salamander has a reddish coloration—typically either pink/orange or light brown with a reddish tinge. Darker markings form a faintly mottled or netlike pattern, but this mottling is not always obvious. Older individuals are darker. A faint light line bordered by a faint gray line runs from eye to tip of snout. The tail is keeled.

Where to find them: Found in cool mountain streams and shaded seepages.

When to find them: Active April through September.

Range: Northern Region: undeveloped mountainous habitat of Warren, Sussex, and Passaic Counties.

Northern Spring Salamander

(*Gyrinophilus porphyriticus porphyriticus*) - text pg. 35



Key Features

- Brownish-pink to red ground color.
- Light line running from eye to nostril.
- Scattered black spots on belly & throat.



New Jersey Division of Fish and Wildlife ~ 2002



Excerpt from: "Field Guide to Reptiles and Amphibians of New Jersey"
Order the complete guide at - <http://www.state.nj.us/dep/fgw/products.htm>

Red-headed woodpecker, *Melanerpes erythrocephalus*

Status:

State: Threatened

Federal: Not listed

Identification

The red-headed woodpecker is a robin-sized bird, readily distinguished by its vibrant black, white, and red plumage. Brilliant red cloaks the head, neck, and throat and is separated from the white breast by a thin black border. The belly, undertail coverts, and rump are white, contrasting with the black tail, back, and upperwing coverts. White inner secondaries and tertials adjacent to black outer secondaries and primaries (flight feathers) form a white patch on the inner wing that is conspicuous in flight.

Though they lack the striking plumage of adults, juvenile red-headed woodpeckers are similarly patterned. The head and wings of juveniles are brown and the white belly has a variable amount of brown streaking. The back is brown with dark brown barring and the white wing patch is also marked with dark barring. During their first fall and winter, juveniles molt into adult plumage.

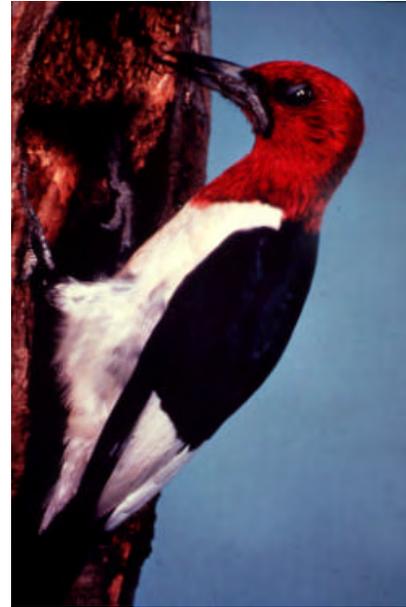


Photo courtesy NJ ENSP

Although the male is slightly larger, the sexes are indistinguishable by plumage. On all ages and sexes, the iris is brown and the legs are gray. The chisel-shaped bill is heavy and colored blue-gray. Like other woodpeckers, the red-headed has zygodactyl feet, in which two toes point forward and two point backward, enabling it to cling vertically to trees. In addition, the tail feathers are stiff and pointed, serving to prop the woodpecker up against a tree. Red-headed woodpeckers fly low over the ground in an undulating manner. The call of the red-headed woodpecker is a repeated “qweer”.

Habitat

Red-headed woodpeckers inhabit open woods, both upland and wetland, that contain dead or dying trees and sparse undergrowth. Such habitat is often created by disturbances such as fire, flooding, or insect outbreaks. A sparse understory is favored for foraging and dead or dying trees are required for nesting. Red-headed woodpeckers occupy similar habitats throughout the year, seeking wintering sites such as open riparian or pine forests and orchards that contain nut and mast producing trees.

In southern New Jersey, typical red-headed woodpecker nesting sites include upland oak or mixed oak/pine forests that contain both living and dead trees. Pitch pine (*Pinus rigida*), white oak (*Quercus alba*), and red oak (*Q. rubra*) are often found in the overstory and lowbush blueberry (*Vaccinium vacillans*) or huckleberry (*Gaylussacia spp.*) dominate the ground cover. In northern New Jersey, red-headed woodpeckers breed in open upland forests, beaver marshes, or wetland forests associated with floodplains or

swamps. Such wetland habitats, which often provide an abundance of dead trees, may contain oak (*Quercus spp.*), hickory (*Carya spp.*), elm (*Ulmus spp.*), and hackberry (*Celtis occidentalis*) in the overstory and sedge (*Carex spp.*) on the ground.

Status and Conservation

During the late 1700s and 1800s, the red-headed woodpecker was a common and widespread species in the Northeast. In the 1870s and 1880s, large concentrations of these birds, including flights of several hundred, were observed during fall migration at New York and Long Island, where it is now an uncommon migrant. Stone (1965) stated that the red-headed woodpecker was a rare fall migrant at Cape May, with only one to two records, on average, per year. Currently, an average of eight per season is observed each fall at Cape May (Sibley 1997). This apparent increase in the number of birds recorded at Cape May is likely due to increased coverage by birders rather than an actual increase in red-headed woodpecker populations. Stone (1908) also described the red-headed woodpecker as a rare breeder in south Jersey that was “never found in the Pine Barrens.” However, this again may reflect a lack of coverage during historic times.

By the turn of the 20th century, red-headed woodpeckers had suffered population declines due to road mortality, competition with European starlings for nesting cavities, and harvesting for the millinery trade in which populations of many avian species were greatly reduced to provide feathers for women’s hats. Farmers at this time also killed red-headed woodpeckers because they damaged fruit and berry crops. Further population declines resulting from habitat loss, limited availability of nesting sites, and road mortality were noted from the 1930s to the 1970s. Red-headed woodpeckers experienced declines survey-wide on Christmas Bird Counts from 1959 to 1988 (Sauer et al. 1996). The Breeding Bird Survey detected annual declines of red-headed woodpeckers in New Jersey and the northeast from 1966 to 1999 (Sauer et al. 2001). Currently, the species is considered to be rare in the Northeast.

Due to population declines, the red-headed woodpecker was listed as a threatened species in New Jersey in 1979. The New Jersey Natural Heritage Program considers the red-headed woodpecker to be “demonstrably secure globally,” yet “imperiled in New Jersey because of rarity” (Office of Natural Lands Management 1998). Loss of breeding habitat and regional population declines in areas such as New Jersey and New York led the National Audubon Society to include the red-headed woodpecker on its Blue List of Imperiled Species in 1972 and from 1976 to 1981 (Arbib 1975, Tate 1986). In addition, the National Audubon Society has recognized the red-headed woodpecker as a species of special concern since 1982 (Tate 1986).

Red-shouldered Hawk, *Buteo lineatus*

Status: *State:* Endangered (breeding population), Threatened (nonbreeding population)
Federal: Migratory Nongame Bird of Management Concern

Identification

The red-shouldered hawk is a crow-sized buteo, or soaring hawk. The adults are strikingly plumed, with rufous (brownish red) shoulder patches and a rufous barred breast. Rufous lesser and median upperwing coverts form the “red shoulders” evident on this species. The flight feathers of adults are barred black and white and show a white crescent-shaped window across the primaries,



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which is visible in flight. The underparts, which are rufous with white barring, often exhibit thin, dark streaks on the chest. The head and back are dark brown. The black tail is bisected by several narrow white bands. Although females average slightly larger than males, plumage is similar for both sexes. The call of the red-shouldered hawk is a series of nasal drawn-out “aahhh” cries.

Juvenile red-shouldered hawks can be distinguished from adults by their overall browner, less brilliant plumage. The shoulder patches of juveniles are paler rufous and the crescents across the primaries are tawny. The underparts are whitish with variable amounts of brown streaking. The tail is brown with several thin pale bands. Adult plumage appears in the second year.

The red-shouldered hawk is a long-tailed buteo with squared-off wings and a protruding head. Characterized by quick choppy wingbeats interspersed with short glides, the flight style of this hawk is similar to that of an accipiter. When soaring, most buteos hold their wings straight out, whereas the red-shouldered hawk bows its wings forward.

Habitat

Mature wet woods such as hardwood swamps and riparian forests typify red-shouldered hawk breeding habitat. Nesting territories, which occur in deciduous, coniferous, or mixed woodlands, are typically located within remote and extensive old growth forests containing standing water. Consequently, breeding barred owls (*Strix varia*) and Cooper’s hawks (*Accipiter cooperii*) are often found in habitats containing red-shouldered hawks.

Red-shouldered hawks select large deciduous and, to a lesser extent, coniferous trees for nesting. Nests have been documented in oak (*Quercus spp.*), pine (*Pinus spp.*), maple (*Acer spp.*), ash (*Fraxinus spp.*), beech (*Fagus grandifolia*), birch (*Betula spp.*),

basswood (*Tilia americana*), chestnut (*Castanea dentata*), hemlock (*Tsuga canadensis*), elm (*Ulmus spp.*), cherry (*Prunus spp.*), hickory (*Carya spp.*), and tulip poplar (*Liriodendron tulipifera*). Forest characteristics include a closed canopy of tall trees, an open subcanopy, and variable amounts of understory cover.

Red-shouldered hawks inhabit wetland forest types unique to the different physiographic regions throughout northern and southern New Jersey. In north Jersey, they occupy riparian forests, wooded wetlands, beaver meadows, and mesic (slightly moist) lowland forests. Within the Pequannock Watershed, red-shouldered hawks are found in stream bottomlands and coniferous or mixed forests containing eastern hemlock or white pine (*Pinus strobus*). Nests are predominately located in wilderness areas where there are abundant wetlands, small forest openings, and limited areas of large open water such as lakes. In the Pequannock Watershed, red-shouldered hawks avoid areas of human inhabitation, steep uplands, dry slopes, open water, areas with limited conifers, and areas with too many or too few forest openings. Although red-shouldered hawks require extensive tracts of forested habitat for nesting, territories may also contain edges where the birds forage.

The majority of red-shouldered hawk nests in southern New Jersey are contained within vast contiguous freshwater wetlands. Hardwood or mixed hardwood/cedar swamps containing red maple (*Acer rubrum*), black gum (*Nyssa sylvatica*), sassafras (*Sassafras albidum*), sweetbay magnolia (*Magnolia virginiana*), and Atlantic white cedar (*Chamaecyparis thyoides*) are occupied by red-shouldered hawks. Often, such large forested tracts are surrounded by oak/pine forests or agricultural fields. Although red-shouldered hawks nest in large contiguous tracts of wet old growth forests in Cumberland County, they occupy younger wet woods, often on private property safeguarded from high levels of human activity, in Cape May County.

An-area sensitive species, the red-shouldered hawk typically nests away from residences, roads, and development. In the Pequannock Watershed, red-shouldered hawk nests were located an average of 1,013 m and a standard deviation of plus or minus 614 m ($3,324 \pm 2,014$ ft.) from the nearest building; and an average of 812 m and a standard deviation of plus or minus 634 m ($2,664 \pm 2,080$ ft) from the nearest road (Bosakowski et al. 1991). Red-shouldered hawks avoid small fragmented woodlots and forests that do not contain trees large enough for nesting.

Red-shouldered hawks require large contiguous wooded tracts of 100 to 250 hectares (250 to 620 acres) (Johnsgard 1990). Eastern populations occupy breeding home ranges of 109 to 339 hectares (270 to 838 acres) (Crocoll 1994). In the Pequannock Watershed, red-shouldered hawk breeding densities were estimated at one nest per 450 hectares (1,112 acres) with an average distance of 1.2 to 1.6 km (0.75 to 1.0 mi.) between nests in areas containing the highest breeding concentrations (Bosakowski et al. 1991). Home range sizes of males exceed those of females, during both the breeding and nonbreeding seasons. Individuals of either sex may expand their home ranges while rearing young or throughout the winter months.

During the nonbreeding season, red-shouldered hawks are less restrictive in their habitat use. They inhabit the traditional wetland forests occupied during the breeding season as well as uplands, fragmented woods, smaller forests, open areas, and edges.

Status and Conservation

The red-shouldered hawk was once considered a common resident of wet lowland forests in New Jersey. Only a century ago, bounties were placed on birds of prey, which were accused of poultry and game predation. This unfortunate practice, coupled with egg collecting and the placement of wild red-shouldered hawks in captivity, may have caused initial population declines. The clearing of forests and filling of wetlands exacerbated red-shouldered hawk declines, which were noted as early as the mid-1920s. Reduced numbers of red-shouldered hawks wintering in New Jersey were documented from the early 1950s to the 1970s, as development increased and forest contiguity and patch size decreased. As a result, the red-shouldered hawk, with an estimated 100 breeding pairs in the state, was listed as a threatened species in New Jersey in 1979. In 1982, the U.S. Fish and Wildlife Service listed the red-shouldered hawk as a Migratory Nongame Bird of Management Concern due to population declines and restricted habitat requirements. In addition, the red-shouldered hawk was included on the National Audubon Society's Blue List of Imperiled Species from 1972 to 1986, the final year of the list.

During the 1980s, habitat loss continued to pose an increasing threat, causing red-shouldered hawk populations to decline ever further. By the late 1980s and early 1990s, the state's breeding population was estimated at only 36 pairs, nearly one-third the population size at the time of original listing. As a result, the breeding population of the red-shouldered hawk was reclassified as endangered in 1991. The nonbreeding population remained listed as threatened. The New Jersey Natural Heritage Program considers the red-shouldered hawk to be "demonstrably secure globally," yet "imperiled in New Jersey because of rarity" (Office of Natural Lands Management 1992). Habitat loss and declines of red-shouldered hawks in the Northeast have resulted in the listing of this species as threatened in New York and of special concern in Connecticut.

Savannah Sparrow, *Passerculus sandwichensis*

Status:

State: Threatened

Federal: Not listed

Identification

The savannah sparrow is a small drab sparrow that is brown above and white below with brown streaking on the breast and sides. The back, nape, and crown are also patterned with variable amounts of dark brown streaking. There is a beige wing bar and the tail is short, brown, and notched. The head is brown with an obscure white crown stripe, a dark brown malar



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(mustache) stripe, yellow lores (between the eyes and the bill) and eyeline, and a white throat. The legs and feet are pink and the bill is a light pinkish-horn color. The sexes are similar in plumage. Juveniles resemble adults, but are buff colored with more streaking.

The savannah sparrow closely resembles the song sparrow (*Melospiza melodia*). However, the song sparrow lacks yellow lores, has a longer, rounded tail, and its streaking forms a distinctive spot on the upper breast. The Ipswich sparrow (*P. sandwichensis princeps*), a race of savannah sparrow that breeds on Sable Island, Nova Scotia and winters along the Atlantic Coast, is larger and paler than the typical eastern race of savannah sparrow (*P. sandwichensis savanna*).

The song of the savannah sparrow consists of two to three chips followed by two buzzy trills. The insect-like melody is represented as, tsit tsit tsit, tsee tsaay. The call is a mild tsip.

Habitat

Indigenous to open habitats, the savannah sparrow nests in hay and alfalfa fields, fallow fields, grasslands, upland meadows, airports, pastures, and vegetated landfills. The species also formerly nested within salt marsh edges and coastal grasslands in New Jersey. Suitable tracks must provide a mix of short and tall grasses, a thick litter layer, dense ground vegetation, and scattered shrubs, saplings, or forbs. Because savannah sparrows are relatively tolerant of vegetative succession, they may occupy fields of varied ages, including those containing early woody growth. During the nonbreeding season, savannah sparrows inhabit coastal dunes, drier portions of salt marshes, roadside edges, agricultural and fallow fields, pastures, airports, vegetated landfills, and golf courses.

Status and Conservation

At the southern edge of its breeding range, the savannah sparrow has been a traditionally local and uncommon breeding species in the Garden State. Historically, the clearing of forests for farmland and the filling of coastal marshes provided habitat for breeding savannah sparrows. As agriculture began to decline in the Northeast, farms were developed or left idle, slowly growing into forests. In areas where farming continued, agricultural practices shifted, resulting in large monocultures and earlier and more frequent mowing of hayfields. Wetlands protection regulations prohibited the filling of coastal marshes, resulting in an inland shift in the distribution of savannah sparrows.

With the decline in traditional agriculture, breeding populations of savannah sparrows also began to fall. From 1966 to 1999, the number of savannah sparrows detected on Breeding Bird Survey routes declined in the Northeast and throughout the United States (Sauer et al. 2000). Likewise, Christmas Bird Counts revealed a significant decrease in wintering savannah sparrows from 1959 to 1988 (Sauer et al. 1996). Due to population declines and habitat loss, the savannah sparrow was listed as a threatened species in New Jersey in 1979. The New Jersey Natural Heritage Program considers this species to be “demonstrably secure globally,” yet “imperiled in New Jersey because of rarity” (Office of Natural Lands Management 1992).

From 1981 to 1982, the breeding population of savannah sparrows in New Jersey was estimated at 45 to 50 pairs (Wander 1981, 1982). In the late 1990s, the New Jersey Breeding Bird Atlas confirmed nesting savannah sparrows in 21 blocks and located probable pairs in an additional 29 blocks (Walsh et al. 1999).

Wood Turtle, *Clemmys insculpta*

Status:

State: Threatened

Federal: Not listed

Identification

As the taxonomic name insculpta indicates, the wood turtle is distinguished by the sculpted or grooved appearance of its carapace, or upper shell. Each season a new annulus, or ridge, is formed, giving each scute (a scale-like horny layer) a distinctive pyramid-shaped appearance. As the turtle ages, natural wear smooths the surface of the shell. While the scutes of the carapace are brown, the plastron, or underneath shell, consists of



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yellow scutes with brown or black blotches on each outer edge. The legs and throat are reddish-orange. The male wood turtle has a concave plastron while that of the female is flat or convex. The male also has a thicker tail than the female. Adult wood turtles measure 14 to 20 cm (5.5 to 8.0 in.) in length (Conant and Collins 1991).

Habitat

Unlike other turtle species that favor either land or water, the wood turtle resides in both aquatic and terrestrial environments. Aquatic habitats are required for mating, feeding, and hibernation, while terrestrial habitats are used for egg laying and foraging. Freshwater streams, brooks, creeks, or rivers that are relatively remote provide the habitat needed by these turtles. Consequently, wood turtles are often found within streams containing native brook trout (Salvelinus fontinalis). These tributaries are characteristically clean, free of litter and pollutants, and occur within undisturbed uplands such as fields, meadows, or forests. Open fields and thickets of alder (Alnus spp.), greenbrier (Smilax spp.), or multiflora rose (Rosa multiflora) are favored basking habitats. Lowland, mid-successional forests dominated by oaks (Quercus spp.), black birch (Betula lenta), and red maple (Acer rubrum) may also be used. Wood turtles may also be found on abandoned railroad beds or agricultural fields and pastures. Nevertheless, wood turtle habitats typically contain few roads and are often over one-half of a mile away from developed or populated areas (Zappalorti et al. 1984). Individuals from relict or declining populations are also sighted in areas of formally good habitat that have been fragmented by roads and development.

Status and Conservation

Historically, the wood turtle was a fairly common species within suitable habitat in New Jersey. By the 1970s, however, declines were noted as wood turtles were absent from many historic sites due to habitat loss and stream degradation. Consequently, the wood turtle was listed as a threatened species in New Jersey in 1979. The New Jersey Natural Heritage Program considers the wood turtle to be “demonstrably secure globally,” yet “rare in New Jersey” (Office of Natural Lands Management 1992).

Since the late 1970s, biologists have monitored and surveyed wood turtle sites in New Jersey, providing valuable data regarding the life history, reproduction, and habitat use of these turtles in the state. There is, however, a continuing need to examine the productivity and juvenile survival of wood turtles, which may be threatened by disturbance or predation.

In 1995, the wood turtle was proposed for inclusion on the federal endangered species list. Despite declines in several northeastern states, populations were considered stable enough throughout the species’ entire range to deny listing. However, the wood turtle was considered by the U.S. Fish and Wildlife Service as a species that, “although not necessarily now threatened with extinction may become so unless trade in them is strictly controlled” (U.S. Fish and Wildlife Service 1995). As a result, international trade of these turtles is strictly monitored and regulated through the CITES Act (Convention on International Trade in Endangered Species of Wild Flora and Fauna Act). The New Jersey Endangered Species Act prohibits the collection or possession of wood turtles.

APPENDIX D: LOCAL & REGIONAL CONSERVATION GROUPS

The following non-profit groups may be of interest to readers of this report. Listing does not constitute an endorsement by Tewksbury Township or Kratzer Environmental Services.

<p>Association of NJ Environmental Commissions</p> <p>ANJEC is a private, nonprofit educational organization for environmental commissioners, concerned individuals and organizations to protect natural resources and improve the quality of life in NJ.</p>	<p>www.anjec.org</p>
<p>Central Jersey Trout Unlimited</p> <p>Our mission is to conserve, protect and restore New Jersey's cold water fisheries and their environments.</p>	<p>www.cjtu.org</p>
<p>ConserveOnline</p> <p>ConserveOnline is a "one-stop" online, public library, created and maintained by The Nature Conservancy in partnership with other conservation organizations.</p>	<p>www.conserveonline.org</p>
<p>Conserve Wildlife Foundation of New Jersey</p> <p>The Conserve Wildlife Foundation of NJ is a private, not-for-profit organization dedicated to conserving and protecting New Jersey's endangered and threatened wildlife.</p>	<p>www.conservewildlifenj.org</p>
<p>Earth Share of New Jersey</p> <p>A coalition of leading environmental organizations working to promote human health and welfare through environmental management, conservation, advocacy, research, education, and grassroots organizing in New Jersey.</p>	<p>www.earthsharenj.org</p>
<p>Garden State EnviroNet</p> <p>New Jersey environmental news and information.</p>	<p>www.gsenet.org</p>
<p>Highlands Coalition</p> <p>The Highlands Coalition seeks to protect and enhance the sustainability of natural and human communities in the Highlands region of PA, NJ, NY and CT</p>	<p>www.highlandscoalition.org</p>
<p>Hunterdon Coalition</p> <p>The Hunterdon Coalition is made up of a mix of local officials and activists to promote public involvement in land use decisions.</p>	<p>www.hunterdoncoalition.org</p>
<p>Hunterdon County Soil Conservation District</p> <p>The New Jersey Department of Agriculture helps to protect and conserve the state's soil, water and related natural resources technical, financial and regulatory assistance and provides educational outreach to landowners throughout the state.</p>	<p>www.state.nj.us/agriculture/rural/natrsrc.htm</p>
<p>Hunterdon County - Rutgers Cooperative Research and Extension</p> <p>The Cooperative Extension serves as the educational outreach arm of the US Dept. of Agriculture to provide research based information concerning agriculture, nutrition and food safety.</p>	<p>www.co.hunterdon.nj.us/depts/rutgers/rutgers.htm</p>
<p>Hunterdon Land Trust Alliance</p> <p>The HLTA's mission is to preserve the county's scenic beauty, and its environmental and historic resources; to provide for the permanent preservation of farmland and to support and foster agricultural viability; and to promote the conservation and appropriate management of woodlands and open space.</p>	<p>www.hlta.org</p>

International Rivers	www.irn.org
International Rivers Network protects rivers and defends the rights of communities that depend on them.	
National Wildlife Federation	www.nwf.org
The National Wildlife Federation promotes wildlife conservation.	
Native Plant Society of New Jersey	www.npsnj.org
The Native Plant Society of NJ is a statewide non-profit organization founded for the appreciation, protection, and study of the native flora of New Jersey.	
Natural Resources Defense Council	www.nrdc.org
The Natural Resources Defense Council's purpose is to safeguard the Earth: its people, its plants and animals and the natural systems on which all life depends.	
NatureServe	www.natureserve.org
NatureServe is a network providing the scientific basis for effective conservation of rare and endangered species and threatened ecosystems. NJ Natural Heritage Program is the local program for NJ: www.state.nj.us/dep/parksandforests/natural/heritage/index.html	
New Jersey Aquarium	www.njaquarium.org
The New Jersey Academy for Aquatic Sciences promotes the understanding, appreciation and protection of aquatic life and habitats through research, education and youth development programs.	
New Jersey Audubon	www.njaudubon.org
The NJAS is a statewide non-profit organization which fosters environmental awareness and a conservation ethic among NJ's citizens; protects NJ's birds, other animals, and plants, especially endangered and threatened species; and promotes preservation of NJ's valuable natural habitats.	
New Jersey Community Water Watch	www.waterwatchonline.org/nj
New Jersey Community Water Watch is a joint program between AmeriCorps and the NJPIRG Law and Policy Center that works to empower students and community members to address water quality problems in NJ's urban areas through education, cleanups and stream monitoring.	
New Jersey Conservation Foundation	www.njconservation.org
The NJCF mission is to preserve New Jersey land and natural resources for the benefit of all now and for future generations. As a leading innovator and catalyst for saving land, NJCF: creates and promotes strong land use policies; protects strategic lands.	
New Jersey Future	www.njfuture.org
New Jersey Future's mission is to achieve smart growth statewide: growth that protects New Jersey's open lands and natural resources, improves communities, transportation and housing choices through research, policy analysis, public education and advocacy.	
New Jersey Chapter Sierra Club	www.newjersey.sierraclub.org
Mission is to explore, enjoy, and protect the wild places of the earth; To practice and promote the responsible use of the earth's ecosystems and resources; To educate and enlist humanity to protect and restore the quality of the natural and human environments.	
New Jersey Section - American Water Works Association	www.njawwa.org
The NJAWWA is dedicated to the promotion of public health and welfare in the provision of drinking water of unquestionable quality and sufficient quantity by advancing the technology, science, management and government policies relative to the stewardship of water.	
New Jersey Water Supply Authority – Watershed Protection Unit	www.njwsa.org/wpu/
The NJWSA formed its Watershed Protection Programs Unit in Fiscal Year 1999 to improve the protection of water resources for the Raritan River Basin, the Manasquan River watershed and the	

Delaware & Raritan Canal and its tributary watersheds.	
PlanSmart NJ	www.plansmart.org
PlanSmart NJ is a statewide civic action group committed to improving the quality of community life through the advancement of sound land use planning and regional cooperation.	
Save Our Resources Today	www.sort.org
Environmental news, links and calendar of events.	
South Branch Watershed Association	www.sbwa.org
The South Branch Watershed Association (SBWA) is a not-for-profit organization dedicated to protecting the environment in the watershed of the South Branch Raritan River.	
Tewksbury Land Trust	PO Box 490 Oldwick, NJ 08858
The Tewksbury Land Trust is a private not-for-profit land trust dedicated to preservation of land in Tewksbury Township. It currently has easements and fee-simple holdings in excess of 200 acres.	
Tewksbury Trail Association	www.tta-nj.org
The Tewksbury Trail Association (TTA) is a nonprofit organization dedicated to preserving green space, open land, and the natural beauty of Tewksbury Township and the surrounding areas of Hunterdon County, New Jersey. The TTA is committed to cultivating and maintaining agriculturally-sensitive bridle paths for horseback riding and other equine-related activities.	
The Nature Conservancy - NJ	www.nature.org/wherewework/northamerica/states/newjersey/
The mission of the Nature Conservancy is to preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive.	
Upper Raritan Watershed Association	www.urwa.org
URWA's mission is to ensure the protection of the natural resources of the Upper Raritan Watershed through education, advocacy, land preservation and stewardship.	
Watershed Partnership for New Jersey	www.wpnj.org
The Watershed Partnership for NJ is a statewide network of watershed education and outreach representatives from more than 70 non-profit, government, educational and private organizations.	
Wild New Jersey	www.wildnj.com/
Created to foster an understanding of, and respect for, wildlife and wild places in the Garden State.	

APPENDIX E: MODULE 4: HIGHLANDS ENVIRONMENTAL RESOURCE INVENTORY FOR TEWKSBURY TOWNSHIP

Revised November 2009

(86 pages)