

Region B

According to the U.S. Census Bureau, the rate of growth of the housing supply in Region B has increased since 1990. The total number of housing units in the region grew from 95,560 in 1990 to 102,163 in 2000, an increase of 6.9%. Between 2000 and 2010, the total number of housing units increased to 111,185, an increase of 8.8%. (see Table 2.63) (USCB 1990b, 2000c, 2010).

Table 2.63 - Region B: Total Housing Units - 1990, 2000, 2010 (New August 2011)

	Total Housing Units (1990)	Total Housing Units (2000)	Total Housing Units (2010)	Percent Change (1990-2000)	Percent Change (2000-2010)
Delaware County	27,361	28,952	31,222	5.8%	7.8%
Otsego County	26,385	28,481	30,777	7.9%	8.1%
Sullivan County	41,814	44,730	49,186	7.0%	10.0%
Region B	95,560	102,163	111,185	6.9%	8.8%

Source: USCB 1990b, 2000c, 2010.

A majority of housing units in Region B are single-family units. In 2009 an estimated 76,883 units, or 70.7% of all housing units in the region, were single-family units. Mobile homes accounted for 12.7% of the total housing units (see Table 2.64).

Table 2.64 - Region B: Total Housing Units by Type of Structure 2009¹ (New August 2011)

	Number of Units	% of Total
Region B		
Single Family	76,883	70.7
Duplex	6,025	5.5
Multi-family	12,097	11.1
Mobile Home	13,731	12.7
Other	6	<0.1
Total	108,742	100
Delaware		
Single Family	21,876	73.6
Duplex	1,502	5.0
Multi-family	2,400	8.1
Mobile Home	3,949	13.3
Other	0	0
Total	29,727	100
Otsego		
Single Family	20,576	67.1
Duplex	1,791	5.9

	Number of Units	% of Total
Multi-family	3,868	12.6
Mobile Home	4,405	14.4
Other	6	<0.1
Total	30,646	100
Sullivan		
Single Family	34,431	71.2
Duplex	2,732	5.6
Multi-family	5,829	12.1
Mobile Home	5,377	11.1
Other	0	0
Total	48,369	100

Source: USCB 2009c.

¹ Data from the 2010 Census of Population and Housing on housing units by type of structure had not been released at the time of this report; therefore, estimated 2009 data from the 2005-2009 American Community Survey are provided herein.

As shown in Table 2.65, the housing market in Region B experienced a general decline in total sales and price in the single-family home market from 2008 to 2010. In the region as a whole, the number of single-family homes sold each year from 2008 to 2010 declined by 8.7%, from 785 homes in 2008 to 717 homes in 2010.

Median sale prices in the region experienced similar trends. From 2008 to 2010, the median sale price of single-family homes in Sullivan and Otsego Counties decreased by 16.4% and 8.8%, respectively. In contrast, the median sale price of homes in Delaware County remained relatively constant from 2008 to 2010 (see Table 2.65).

Table 2.65- Region B: Number of Sales and Annual Median Sale Price of Single-Family Homes Sold, 2008-2010 (New August 2011)

	2008		2009		2010	
	Number of Sales	Median Sale Price	Number of Sales	Median Sales Price	Number of Sales	Median Sales Price
Delaware County	160	\$109,250	171	\$110,000	149	\$110,000
Otsego County	309	\$131,000	304	\$126,523	319	\$119,500
Sullivan County	316	\$149,450	269	\$125,000	249	\$125,000
Region B	785	NA	744	NA	717	NA

Source: NYS Association of Realtors 2011a, 2011b.

NA = Not available.

In 2010, Region B had approximately 52,860 owner-occupied housing units and 21,797 renter-occupied housing units. The homeowner vacancy rate was 2.6%, and the rental vacancy rate was 10.6% (USCB 2010).

There were 2,604 units for rent, 1,989 units for sale, and 27,240 units for seasonal, recreational, or occasional use in the area (see Table 2.66). The percentage of vacant seasonal, recreational, or occasional use units was very high, largely due to the region's proximity to the Catskill Mountains (USCB 2010).

Table 2.66 - Region B: Housing Characteristics, 2010 (New August 2011)

	Housing Units			
	Region B	Delaware County	Otsego County	Sullivan County
Occupied	74,657	19,898	24,620	30,139
Owner Occupied	52,860	14,768	17,885	20,207
Renter Occupied	21,797	5,130	6,735	9,932
Vacant	36,528	11,324	6,157	19,047
For Rent	2,604	565	615	1,424
Rented, Not Occupied	157	36	45	76
For Sale Only	1,989	446	514	1,029
Sold, Not Occupied	461	117	127	217
For Seasonal, Recreational, or Occasional Use	27,240	9,276	3,621	14,343
All Other Vacant	4,077	884	1,235	1,958
Total	111,185	31,222	30,777	49,186
Homeowner Vacancy Rate	2.6%	2.9%	2.8%	4.8%
Rental Vacancy Rate	10.6%	9.9%	8.3%	12.5%

Source: USCB 2010.

In addition to the permanent housing discussed above, there are also numerous short-term accommodations including hotels, motels, inns, and campgrounds available in the area. Table 2.67 lists the number of hotels/motels available in Region B that was registered with the I Love New York Tourism Agency. As of 2011 there were 78 hotels/motels with approximately 3,705 rooms in Region B (see Table 2.67).

Table 2.67 - Region B: Short-Term Accommodations (Hotels/Motels) (New August 2011)

	Total Hotels/Motels	Total Rooms
Delaware County	27	1,123
Otsego County	34	1,373
Sullivan County	17	1,209
Region B	78	3,705

Source: Official New York State Tourism Site (ILOVENY) 2011.

Region C

In 2010, Region C had a total of 108,031 housing units. The total number of housing units increased by 8.1% between 1990 and 2000, and by 3.2% between 2000 and 2010 (see Table 2.68) (USCB 1990b, 2000c, 2010). Approximately 62% of the housing units are located in Chautauqua County, and 38% are located in Cattaraugus County.

Table 2.68 - Region C: Total Housing Units - 1990, 2000, 2010 (New August 2011)

	Total Housing Units (1990)	Total Housing Units (2000)	Total Housing Units (2010)	Percent Change (1990-2000)	Percent Change (2000-2010)
Cattaraugus County	36,839	39,839	41,111	8.1%	3.2%
Chautauqua County	62,682	64,900	66,920	3.5%	3.1%
Region C	99,521	104,739	108,031	5.2%	3.1%

Source: USCB 1990b, 2000c, 2010.

Most of the housing units in Region C are single-family units. In 2009 an estimated 106,519 units, or 68.7% of all housing units in the region, were single-family units (see Table 2.69)

Table 2.69 - Region C: Total Housing Units by Type of Structure, 2009¹ (New August 2011)

	Number of Units	% of Total
Region C		
Single Family	73,183	68.7
Duplex	10,802	10.1
Multi-family	12,432	11.7
Mobile Home	10,090	9.5
Other	12	<0.1
Total	106,519	100
Cattaraugus		
Single Family	28,451	70.1
Duplex	2,850	7.0
Multi-family	3,797	9.3
Mobile Home	5,502	13.6
Other	12	<0.1
Total	40,612	100
Chautauqua		
Single Family	44,732	67.9
Duplex	7,952	12.0
Multi-family	8,635	13.1
Mobile Home	4,588	7.0
Other	0	0
Total	65,907	100

Source: USCB 2009c.

¹ Data from the 2010 Census of Population and Housing on housing units by type of structure had not been released at the time of this report; therefore, estimated 2009 data from the 2005-2009 American Community Survey are provided herein.

As shown on Table 2.70, the market for single-family homes in Region C declined over the past three years. In the region as a whole, the number of single-family homes sold each year from 2008 to 2010 declined by 14.1%, from 1,492 homes in 2008 to 1,281 homes in 2010 (NYS Association of Realtors 2011a, 2011b).

Table 2.70 - Region C: Number of Sales and Annual Median Sale Price of Single-Family Homes Sold, 2008-2010 (New August 2011)

	2008		2009		2010	
	Number of Sales	Median Sale Price	Number of Sales	Median Sales Price	Number of Sales	Median Sales Price
Cattaraugus County	577	\$69,000	501	\$70,000	434	\$73,000
Chautauqua County	915	\$75,000	843	\$74,521	847	\$80,000
Region C	1,492	NA	1,344	NA	1,281	NA

Source: NYS Association of Realtors 2011a, 2011b.
NA = Not available.

In 2010 Region C had approximately 60,182 owner-occupied housing units and 26,325 renter-occupied housing units. The homeowner vacancy rate was 1.4%, and the rental vacancy rate was 9.0% (see Table 2.71) (USCB 2010).

Table 2.71 - Region C: Housing Characteristics, 2010 (New August 2011)

	Region C	Cattaraugus County	Chautauqua County
Occupied	86,507	32,263	54,244
Owner Occupied	60,182	23,306	36,876
Renter Occupied	26,325	8,857	17,368
Vacant	21,524	8,848	12,676
For Rent	2,624	748	1,876
Rented, Not Occupied	178	82	96
For Sale Only	1,278	483	795
Sold, Not Occupied	426	157	269
For Seasonal, Recreational, or Occasional Use	13,308	6,035	7,573
All Other Vacant	3,410	1,343	2,067
Total	108,031	41,111	66,920
Homeowner Vacancy Rate	1.4%	2.0%	2.1%
Rental Vacancy Rate	9.0%	7.6%	9.7%

Source: USCB 2010.

There were 2,624 units for rent, 1,278 units for sale, and 13,608 units for seasonal, recreational, or occasional use in the area. The percentage of vacant seasonal, recreational, or occasional use units was very high, largely due to the cottages around Lake Chautauqua, Chautauqua Institute, and other natural areas in these counties (USCB 2010).

In addition to the permanent housing discussed above, there are also numerous short-term accommodations including hotels, motels, inns, and campgrounds available in the area. Table 2.72 lists the number of hotels/motels available in Region C that was registered with the I Love New York Tourism Agency. As of 2011 there were 41 hotels/motels with approximately 1,987 rooms in Region C (see Table 2.72).

Table 2.72 - Region C: Short-Term Accommodations (Hotels/Motels) (New August 2011)

	Total Hotels/Motels	Total Rooms
Cattaraugus County	17	634
Chautauqua County	24	1,353
Region C	41	1,987

Source: Official New York State Tourism Site (ILOVENY) 2011.

2.4.11.4 Government Revenues and Expenditures

New York State

Table 2.73 lists the main sources of tax revenues for New York State. For fiscal year (FY) ending March 31, 2010, revenues collected in New York State totaled approximately \$55 billion.

Revenue from personal income taxes is the largest source of tax revenue for the state, accounting for approximately 63% of the total revenue (New York State Department of Taxation and Finance [NYSDTF] 2010a, 2010b).

Table 2.73 - New York State Revenues Collected for FY Ending March 31, 2010 (New August 2011)

	Personal Income Taxes	Corporation and Business Taxes	Sales and Excise Taxes and User Fees	Property Transfers	Other Taxes and Fees	Total Revenues
Total Revenues (\$ billions)	\$34.8	\$6.6	\$12.2	\$1.4	\$0.2	\$55.2
Percent of Total	63.0	12.0	22.1	2.5	0.4	100.0

Source: NYSDTF 2010a, 2010b.

Totals may not equal sum of components due to rounding.

Currently, no specific state tax is levied on the extraction of natural gas in New York State; however, the state government receives revenues from the natural gas industry and from natural gas development primarily through income and sales taxes. The state assesses personal income tax on wages earned by workers in the industry, and income received by individuals as royalty payments and lease payments from natural gas operators. Further, the state also collects revenue from sales taxes receipts from the purchase of non-exempt materials and equipment needed to construct and operate natural gas wells. In some cases, the state may receive revenue from corporate and business taxes assessed on the corporate income of natural gas operators, though these taxes are subject to various exemptions and incentives that reduce the amount of revenue that the state is able to collect from the natural gas industry. In addition, New York State receives revenues from leases for oil and natural gas development on state lands. Lease revenues are acquired through delay rentals; bonus bids; royalties; and storage fees. Delay rentals are the annual fees that oil and natural gas developers pay to hold a leased property before development occurs. Bonus bids are additional fees above the delay rental fee for a specific tract. All bonus bids are subject to a sealed competitive bidding process. Once the gas well is developed, the delay rental payments are waived and the developer is assessed royalty fees of 12.5% of gross revenues. Storage fees are fees that are levied on the operators of underground natural gas storage facilities. A summary of the acreage and number of leases on state lands is provided in Table 2.74. Table 2.75 provides a summary of state revenues received between 2000 and 2010 from oil and gas lease payments.

Table 2.74 - New York State: Number of Leases and Acreage of State Land Leased for Oil and Natural Gas Development, 2010 (New August 2011)

County	Acreage of State Land Leased				Number of Leases			
	Rental	Royalty	Storage	Total	Rental	Royalty	Storage	Total
Allegany		126		126		1		1
Broome	512			512	1			1
Cattaraugus		62	9,981	10,043		2	8	10
Cayuga		62		62		4		4
Chautauqua		15,715		15,715		29		29
Chemung	730	667		1,397	3	10		13
Cortland	7,791			7,791	4			4
Erie		10	255	265		2	2	4
Ontario			55	55			1	1
Schuyler	2,416	10,019	1	12,436	1	6	1	8
Seneca		17		17		1		1
Steuben	685	5,859	1,620	8,164	1	8	2	11
Tioga	6,179			6,179	6			6
Tompkins	915			915	1			1
Total	19,228	32,537	11,912	63,677	17	63	14	94

Source: NYSDEC 2010.

Table 2.75 - 2000-2010 Leasing Revenue by Payment Type for New York State (New August 2011)

Year	Bonus Bids	Delay Rentals	Royalties	Storage Fees	Yearly Total
2000	-	\$42,280	\$75,327	\$9,781	\$127,388
2001	-	\$118,732	\$150,922	\$178,128	\$447,782
2002	-	\$79,435	\$96,620	\$73,617	\$249,672
2003	\$4,583,239	\$16,486	\$609,821	\$117,381	\$5,326,927
2004	-	\$130,746	\$525,050	\$109,986	\$765,782
2005	-	\$80,534	\$3,235,206	\$123,930	\$3,439,670
2006	-	\$75,305	\$3,096,620	\$125,007	\$3,296,932
2007	\$9,001,335	\$166,868	\$2,466,312	\$133,298	\$11,767,813
2008	-	\$97,269	\$1,866,519	\$211,927	\$2,175,715
2009	-	\$96,136	\$637,254	\$50,960	\$784,350
2010	\$2,922	\$96,377	\$581,824	\$65,010	\$746,133

Source: NYSDEC 2010.

In New York State, local government entities have taxing authority for real property tax purposes.

However, the New York State Department of Taxation and Finance provides a uniform, statewide method of valuing natural-gas-producing properties for real property tax purposes. Valuations of natural-gas-producing properties are based on a “unit of production” value - a dollar amount per Mcf of gas produced. The total valuation is then equalized across four natural gas producing regions within the state, and then taxed at the local millage rate, similar to any other real property within the local jurisdiction.

Spending on community services is generally divided between the state and local governments (i.e., counties, municipalities, fire districts, and school districts). For public safety, New York State funds state troopers, counties fund county sheriffs, and municipalities commonly fund local police services.

Emergency services such as fire protection/EMT are largely volunteer efforts in smaller towns, with some financial support received from smaller cities, suburban and rural towns, and villages. Major cities generally support their own fire departments, which generally have their own EMT operation.

Roadways are also supported by various levels of government. New York State provides funding for state and local highways, the operation of which is the responsibility of the NYSDOT as well as the New York State Thruway Authority. Counties finance county highways, while municipalities generally provide the funds to administer and maintain local roadways.

In regards to education, New York State financially supports the State University of New York (SUNY), a system of higher education institutions. Funding for K-12 education is generally provided by local school districts, which in turn receive revenues from a variety of sources, including federal aid, state aid, and real property taxes, among others.

Recreation services, including public parks, are another expenditure in which both state and local governments contribute. New York State provides funding to OPRHP, which operates recreational facilities at the state level, including the state park system. County governments generally provide funds for recreational facilities in towns and villages, while cities and larger suburban areas generally support their own recreational services.

Health, including Medicaid, is an expenditure that is largely carried by the state. Medicaid is a joint federal-state program. However, counties and major cities in New York State also contribute funds. Counties and local governments also have miscellaneous health care costs, including public health administration, public health services, mental health services, environmental services, and public health facilities, among others.

Expenditures for water and waste water treatment are generally made by counties and local municipalities.

Region A

Table 2.76 lists the main sources of public revenues for Region A. Revenues collected in Region A totaled approximately \$736 million for the fiscal year ending December 31, 2009. The majority of revenues were derived from local sources. Local revenue, including ad valorem (real and personal property) tax receipts and services, accounted for approximately 67.5% of total revenues in Region A (NYS Office of the State Comptroller 2010a).

Table 2.76 - Region A: Total Revenue for FY Ending December 31, 2009 (\$ millions) (New August 2011)

	Taxes¹ (% of total)	Services² (% of total)	Subtotal Local Revenue (% of total)	State/Federal Aid (% of total)	Subtotal Local// (% of total)	Other Sources³ (% of total)	Total Revenue⁴
Broome County	\$169.4 (37.0)	\$139.6 (30.4)	\$309.0 (67.4)	\$127.5 (27.8)	\$436.5 (95.2)	\$22.1 (4.8)	\$458.6
Chemung County	\$80.6 (42.0)	\$47.3 (24.7)	\$127.9 (66.7)	\$54.8 (28.6)	\$182.7 (95.3)	\$9.1 (4.7)	\$191.8
Tioga County	\$39.4 (46.2)	\$20.6 (24.1)	\$60.0 (70.2)	\$20.4 (23.9)	\$80.4 (94.0)	\$5.1 (6.0)	\$85.5
Region A	\$289.4 (39.4)	\$207.5 (28.2)	\$496.9 (67.5)	\$202.7 (27.5)	\$699.6 (95.1)	\$36.3 (4.9)	\$735.9

Source: NYS Office of the State Comptroller 2010a.

¹ Taxes include real property taxes and assessments, other real property tax items, sales and use taxes, and other non-property taxes.

² Services include charges for services, charges to other governments, use and sale of property, and other local revenues.

³ Other revenues include proceeds of debt and all other sources of revenue.

⁴ Totals may not equal sum of components due to rounding.

As shown in Table 2.77, the total local tax revenue collected in Region A during the FY ending on December 31, 2009, was approximately \$289.4 million. Of the total tax collected, 59.8% was derived from sales tax and distribution. Real property taxes, special assessments, and other real property tax items accounted for about 39.1% of the total local revenue (NYS Office of the State Comptroller 2010a).

Table 2.77 - Region A: Local Tax Revenue for FY Ending December 31, 2009 (\$ millions) (New August 2011)

	Real Property Taxes (% of total)	Special Assessments (% of total)	Other Real Property Tax Items¹ (% of total)	Sales Tax and Distribution (% of total)	Miscellaneous Use Taxes (% of total)	Other Non-Property Taxes² (% of total)	Total Tax Collection³
Broome County	\$59.1 (34.9)	\$0 (0)	\$4.0 (2.4)	\$104.1 (61.4)	\$1.5 (0.9)	\$0.7 (0.4)	\$169.4
Chemung County	\$26.8 (33.3)	\$0 (0)	\$1.9 (2.4)	\$51.2 (63.5)	\$0.6 (0.7)	\$0.1 (0.1)	\$80.6
Tioga County	\$19.2 (48.7)	\$0 (0)	\$2.2 (5.6)	\$17.7 (44.9)	\$0.1 (0.3)	\$0.2 (0.5)	\$39.4
Region A	\$105.1 (36.3)	\$0 (0)	\$8.1 (2.8)	\$173.0 (59.8)	\$2.2 (0.7)	\$1.0 (0.4)	\$289.4

Source: NYS Office of the State Comptroller 2010a.

¹ Other real property tax items include STAR payments, payments in lieu of taxes, interest penalties, gain from sale of tax acquired property, and miscellaneous tax items.

² Other non-property taxes include franchises, emergency telephone system surcharges, city income taxes, and other miscellaneous non-property taxes.

³ Totals may not equal sum of components due to rounding.

The production value (e.g., gas economic profile), state equalization rate, and millage rate for gas-producing properties in Region A are shown in Table 2.78. Broome, Chemung, and Tioga Counties are within the Medina Region 3, natural-gas-producing region designated by New York State. The final gas unit of production value for gas-producing properties within Medina Region 3 was \$11.19 in 2010 (NYSDTF 2011). The overall full-value millage rates for Broome, Chemung, and Tioga Counties were 35.50, 34.30 and 30.80, respectively. These rates have already been equalized and include the rates of all taxing districts in the county, including county, town, village, school district, and other special district rates.

Table 2.78 - Gas Economic Profile for Medina Region 3 (New August 2011)

	2010 Final Gas Unit of Production Value^a	Millage Rate^b (2010)
Broome County	\$11.19	35.50
Chemung County	\$11.19	34.30
Tioga County	\$11.19	30.80

Sources:

^a NYSDTF 2011.

^b NYS Office of the State Comptroller 2010b. Millage rates represent the “overall full-value tax rate” and include the rates of all taxing districts in the county, including county, town, village, school district, and special districts rates.

Table 2.79 presents local government expenditures for Region A during the FY ending December 31, 2009. Social services combined to create the largest single expenditure in each of the counties of Region A. Approximately 28.7% of the counties' collective operating and capital budgets were spent on social services during the FY ending December 31, 2009. Expenditure categories within social services include social service administration, financial assistance, Medicaid, non-Medicaid medical assistance, housing assistance, employment services, youth services, public facilities, and miscellaneous social services. Other major expenditures in Region A included general government (20.5%), employee benefits (15.3%), and health (9.9%). Public safety accounted for approximately 7.0% of total expenditures in Region A, including \$15,299,556 for police and \$118,376 for fire protection. No county in Region A spent any monies on emergency response. Broome and Chemung Counties did not financially support any fire protection services (NYS Office of the State Comptroller 2010a).

Table 2.79 - Region A: Expenditures for FY Ending December 31, 2009 (\$ millions) (New August 2011)

	Broome County		Chemung County		Tioga County		Region A	
	Total \$	% of Total	Total \$	% of Total	Total \$	% of Total	Total \$	% of Total
General Government	\$91,817,010	20.4	\$33,090,334	17.8	\$21,682,356	27.0	\$146,589,700	20.5
Education	\$20,406,276	4.5	\$4,412,651	2.4	\$5,191,138	6.5	\$30,010,065	4.2
Public Safety	\$30,483,583	6.8	\$12,944,032	7.0	\$6,467,954	8.1	\$49,895,569	7.0
Health	\$39,151,049	8.7	\$24,028,632	12.9	\$7,398,260	9.2	\$70,577,941	9.9
Transportation	\$22,685,968	5.1	\$14,625,859	7.9	\$6,181,134	7.7	\$43,492,961	6.1
Social Services	\$122,931,621	27.4	\$61,987,864	33.4	\$20,346,458	25.4	\$205,265,943	28.7
Economic Development	\$6,005,330	1.3	\$60,000	<0.1	\$636,502	0.8	\$6,701,832	0.9
Culture and Recreation	\$10,186,350	2.3	\$2,349,947	1.3	\$232,827	0.3	\$12,769,124	1.8
Community Services	\$6,768,148	1.5	\$2,978,999	1.6	\$569,025	0.7	\$10,316,172	1.4
Utilities	\$0	0.0	\$0	0.0	\$0	0.0	\$0	0.0
Sanitation	\$954,025	0.2	\$5,780,216	3.1	\$1,176,043	1.5	\$7,910,284	1.1
Employee Benefits	\$82,228,270	18.3	\$17,926,465	9.6	\$9,460,820	11.8	\$109,615,555	15.3
Debt Service	\$15,410,760	3.4	\$5,620,336	3.0	\$862,138	1.1	\$21,893,234	3.1
Total Expenditures	\$449,028,390	100.0	\$185,805,335	100.0	\$80,204,655	100.0	\$715,038,380	100.0

Source: NYS Office of the State Comptroller 2010a.

Region B

Table 2.80 lists 2.4 the main sources of county government revenues for Region B. Revenues collected in Region B totaled approximately \$429.0 million for the fiscal year ending December 31, 2009. Most of the revenues were derived from local sources. Local revenue, including ad valorem (real and personal property) tax receipts and services, accounted for approximately 65.6% of total revenues in Region B (NYS Office of the State Comptroller 2010a).

Table 2.80 - Region B: Total Revenue for FY Ending December 31, 2009 (\$ millions) (New August 2011)

	Taxes¹ (% of total)	Services² (% of total)	Subtotal Local Revenue (% of total)	State/Federal Aid (% of total)	Subtotal Local// (% of total)	Other Sources³ (% of total)	Total Revenue⁴
Delaware County	\$43.1 (37.6)	\$21.1 (18.4)	\$64.2 (56.0)	\$33.0 (28.8)	\$97.1 (84.8)	\$17.4 (15.2)	\$114.5
Otsego County	\$44.7 (41.6)	\$30.7 (28.5)	\$75.4 (70.1)	\$25.2 (23.4)	\$100.6 (93.5)	\$7.0 (6.5)	\$107.6
Sullivan County	\$84.2 (40.7)	\$57.5 (27.8)	\$141.7 (68.5)	\$44.2 (21.4)	\$186.0 (89.9)	\$20.9 (10.1)	\$206.9
Region B	\$172.0 (40.1)	\$109.3 (25.5)	\$281.3 (65.6)	\$102.4 (23.9)	\$383.7 (89.4)	\$45.3 (10.6)	\$429.0

Source: NYS Office of the State Comptroller 2010a.

¹ Taxes include real property taxes and assessments, other real property tax items, sales and use taxes, and other non-property taxes.

² Services includes charges for services, charges to other governments, use and sale of property, and other local revenues.

³ Other revenues include proceeds of debt and all other sources of revenue.

⁴ Totals may not equal sum of components due to rounding.

As shown in Table 2.81, the total local tax revenue in Region B during the fiscal year ending on December 31, 2009, was approximately \$173.7 million. Of the total tax collected, 49.2% was derived from taxes levied on real property, special assessments, and other real property tax items. Sales tax and distribution accounted for approximately 48.4% of the total (NYS Office of the State Comptroller 2010a).

Table 2.81 - Region B: Local Tax Revenue for FY Ending December 31, 2009 (\$ millions) (New August 2011)

	Real Property Taxes (% of total)	Special Assessments (% of total)	Other Real Property Tax Items¹ (% of total)	Sales Tax and Distribution (% of total)	Miscellaneous Use Taxes (% of total)	Other Non-Property Taxes² (% of total)	Total Revenue
Delaware County	\$23.4 (54.2)	\$0 (0)	\$1.7 (3.9)	\$17.9 (41.4)	\$0 (0)	\$0.2 (0.5)	\$43.2
Otsego County	\$9.5 (20.5)	\$1.1 (2.4)	\$1.4 (3.0)	\$33.1 (71.3)	\$1.1 (2.4)	\$0.2 (0.4)	\$46.4
Sullivan County	\$42.1 (50.1)	\$0 (0)	\$6.3 (7.5)	\$33.1 (39.4)	\$1.1 (1.3)	\$1.5 (1.8)	\$84.1
Region B	\$75.0 (43.2)	\$1.1 (0.6)	\$9.4 (5.4)	\$84.1 (48.4)	\$2.2 (1.3)	\$1.9 (1.1)	\$173.7

Source: NYS Office of the State Comptroller 2010a.

¹ Other real property tax items include STAR payments, payments in lieu of taxes, interest penalties, gain from sale of tax acquired property, and miscellaneous tax items.

² Other non-property taxes include franchises, emergency telephone system surcharges, city income taxes, and other miscellaneous non-property taxes.

³ Totals may not equal sum of components due to rounding.

Delaware, Otsego, and Sullivan Counties are within Medina Region 4, natural-gas-producing region designated by New York State. The final gas unit of production value for gas-producing properties within the Medina Region 4 was \$11.19 in 2010; the 2011 tentative gas unit of production value is \$11.32 (NYSDTF 2011). The 2010 overall full-value millage rates for Delaware, Otsego, and Sullivan Counties were 21.20, 19.60 and 26.20, respectively (see Table 2.82). These rates have already been equalized and include the rates of all taxing districts in the county, including county, town, village, school district, and other special district rates.

Table 2.82 - Gas Economic Profile for Medina Region 4 and State Equalization Rates and Millage Rates for Region B (New August 2011)

	Final Gas Unit of Production Value (2010)^a	Millage Rate^b (2010)
Delaware County	\$11.19	21.20
Otsego County	\$11.19	19.60
Sullivan County	\$11.19	26.20

Sources:

^a NYSDTF 2011.

^b NYS Office of the State Comptroller 2010b. Millage rates represent the “overall full-value tax rate” and include the rates of all taxing districts in the county, including county, town, village, school district, and special districts rates.

Table 2.83 presents local government expenditures for Region B during the FY ending December 31, 2009. Social services combined to create the largest single expenditure in each of the counties in Region B. Approximately 30% of the counties' collective operating and capital budgets were spent on social services during the FY ending December 31, 2009. Expenditure categories within social services include social service administration, financial assistance, Medicaid, non-Medicaid medical assistance, housing assistance, employment services, youth services, public facilities, and miscellaneous social services. Other major expenditures in Region B included employee benefits (14.5%), general government (12.4%), and transportation (12.3%). Public safety accounted for approximately 7.7% of total expenditures in Region B, including \$9,103,208 for police and \$70,719 for fire protection. No county in Region B spent any monies on emergency response. Delaware and Otsego Counties did not financially support any fire protection services (NYS Office of the State Comptroller 2010a).

Table 2.83 - Region B: Expenditures for FY Ending December 31, 2009 (\$ millions) (New August 2011)

	Delaware County		Otsego County		Sullivan County		Region B	
	Total \$	% of Total	Total \$	% of Total	Total \$	% of Total	Total \$	% of Total
General Government	\$8,960,337	9.7	\$18,661,059	17.9	\$20,991,003	10.7	\$48,612,399	12.4
Education	\$623,530	0.7	\$2,546,555	2.4	\$6,342,470	3.2	\$9,512,555	2.4
Public Safety	\$5,541,817	6.0	\$6,882,871	6.6	\$17,902,819	9.1	\$30,327,507	7.7
Health	\$8,405,703	9.1	\$5,563,650	5.3	\$29,995,278	15.3	\$43,964,631	11.2
Transportation	\$18,081,013	19.5	\$11,588,286	11.1	\$18,465,889	9.4	\$48,135,188	12.3
Social Services	\$28,776,564	31.1	\$37,215,496	35.6	\$51,657,658	26.4	\$117,649,718	30.0
Economic Development	\$610,060	0.7	\$1,069,964	1.0	\$2,390,941	1.2	\$4,070,965	1.0
Culture and Recreation	\$702,837	0.8	\$277,033	0.3	\$2,802,213	1.4	\$3,782,083	1.0
Community Services	\$3,172,734	3.4	\$2,047,629	2.0	\$1,087,185	0.6	\$6,307,548	1.6
Utilities	\$0	0.0	\$0	0.0	\$0	0.0	\$0	0.0
Sanitation	\$3,906,766	4.2	\$1,065,180	1.0	\$4,312,952	2.2	\$9,284,898	2.4
Employee Benefits	\$10,972,513	11.9	\$15,976,297	15.3	\$30,048,837	15.4	\$56,997,647	14.5
Debt Service	\$2,826,085	3.1	\$1,606,314	1.5	\$9,742,478	5.0	\$14,174,877	3.6
Total Expenditures	\$92,579,959	100.0	\$104,500,334	100.0	\$195,739,723	100.0	\$392,820,016	100.0

Source: NYS Office of the State Comptroller 2010a.

Region C

Table 2.84 lists the main sources of county government revenues for Region C. Revenues collected in Region C totaled approximately \$501.4 million for the fiscal year ending December 31, 2009. Most of the revenues were derived from local sources. Local revenue, including ad valorem (real and personal property) tax receipts and services, accounted for approximately 70.8% of total revenues in Region C (NYS Office of the State Comptroller 2010a).

Table 2.84 - Region C: Revenues for FY Ending December 31, 2009 (\$ millions) (New August 2011)

	Taxes¹ (% of total)	Services² (% of total)	Subtotal Local Revenue (% of total)	State/Federal Aid (% of total)	Subtotal Local// (% of total)	Other Sources³ (% of total)	Total Revenue⁴
Cattaraugus County	\$78.1 (36.4)	\$73.6 (34.3)	\$151.7 (70.6)	\$42.7 (19.9)	\$194.4 (90.5)	\$20.4 (9.5)	\$214.8
Chautauqua County	\$114.8 (40.1)	\$88.5 (30.9)	\$203.3 (70.9)	\$65.0 (22.7)	\$268.3 (93.6)	\$18.3 (6.4)	\$286.6
Region C	\$192.9 (38.5)	\$162.1 (32.3)	\$355.0 (70.8)	\$107.7 (21.5)	\$462.7 (92.3)	\$38.7 (7.7)	\$501.4

Source: NYS Office of the State Comptroller 2010a.

¹ Taxes include real property taxes and assessments, other real property tax items, sales and use taxes, and other non-property taxes.

² Services include charges for services, charges to other governments, use and sale of property, and other local revenues.

³ Other revenues include proceeds of debt and all other sources of revenue.

⁴ Totals may not equal sum of components due to rounding

As shown in Table 2.85, the total local tax revenue in Region C during the fiscal year ending on December 31, 2009, was approximately \$192.8 million. Of the total receipts, 53.2% was derived from taxes levied on real property, special assessments, and other real property tax items. Sales tax and distribution accounted for approximately 45.1% of the total (NYS Office of the State Comptroller 2010a).

Table 2.85 - Region C: Local Tax Revenue for FY Ending December 31, 2009 (\$ millions) (New August 2011)

	Real Property Taxes (% of total)	Special Assessments (% of total)	Other Real Property Tax Items¹ (% of total)	Sales Tax and Distribution (% of total)	Miscellaneous Use Taxes (% of total)	Other Non-Property Taxes² (% of total)	Total Tax Collection³
Cattaraugus County	\$42.0 (53.8%)	\$0 (0%)	\$2.6 (3.3%)	\$33.1 (42.4%)	\$0 (0%)	\$0.3 (0.4%)	\$78.0
Chautauqua County	\$54.2 (47.2%)	\$0 (0%)	\$3.7 (3.2%)	\$53.8 (46.9%)	\$1.2 (1.0%)	\$1.9 (1.7%)	\$114.8
Region C	\$96.2 (49.9%)	\$0 (0%)	\$6.3 (3.3%)	\$86.9 (45.1%)	\$1.2 (0.6%)	\$2.2 (1.1%)	\$192.8

Source: NYS Office of the State Comptroller 2010a.

¹ Other real property tax items include STAR payments, payments in lieu of taxes, interest penalties, gain from sale of tax acquired property, and miscellaneous tax items.

² Other non-property taxes include franchises, emergency telephone system surcharges, city income taxes, and other miscellaneous non-property taxes.

³ Totals may not equal sum of components due to rounding.

Cattaraugus and Chautauqua Counties are both split between Medina Region 2 and Medina Region 3, natural-gas-producing regions designated by New York State. The final gas unit of production value for Medina Region 2 and Medina Region 3 was \$11.19 in 2010; the 2011 tentative gas unit of production value is \$11.32 (NYSDTF 2011). The 2010 overall full-value millage rates for Cattaraugus and Chautauqua Counties were 35.50 and 32.10, respectively (see Table 2.86). These rates have already been equalized and include the rates of all taxing districts in the county, including county, town, village, school district, and other special district rates.

Table 2.86 - Gas Economic Profile for Medina Region 2 and State Equalization Rates and Millage Rates for Region C (New August 2011)

	Final Gas Unit of Production Value (2010)^a	Millage Rate^b (2010)
Cattaraugus County	\$11.19	35.50
Chautauqua County	\$11.19	32.10

Sources:

^a NYSDTF 2011.

^b NYS Office of the State Comptroller 2010b. Millage rates represent the “overall full-value tax rate” and include the rates of all taxing districts in the county, including county, town, village, school district, and special districts rates.

Table 2.87 presents local government expenditures for Region C during the fiscal year ending December 31, 2009. Social services combined to create the largest single expenditure in both Cattaraugus and Chautauqua Counties, and thus in Region C. Approximately 30% of the counties' collective operating and capital budgets were spent on social services during the fiscal year ending December 31, 2009. Expenditure categories within social services include social service administration, financial assistance, Medicaid, non-Medicaid medical assistance, housing assistance, employment services, youth services, public facilities, and miscellaneous social services. Other major expenditures in Region C included general government (19.7%), employee benefits (13.4%), and transportation (10.2%). Public safety accounted for approximately 7.2% of total expenditures in Region C, including \$12,866,430 for police, \$260,959 for fire protection, and \$100,667 for emergency response (NYS Office of the State Comptroller 2010a).

Table 2.87 - Region C: Expenditures for FY Ending December 31, 2009 (New August 2011)

	Cattaraugus County		Chautauqua County		Region B	
	Total \$	% of Total	Total \$	% of Total	Total \$	% of Total
General Government	\$38,547,702	20.2	\$51,753,045	19.4	\$90,300,747	19.7
Education	\$6,779,075	3.5	\$10,119,356	3.8	\$16,898,431	3.7
Public Safety	\$13,349,284	7.0	\$19,805,376	7.4	\$33,154,660	7.2
Health	\$23,233,153	12.2	\$14,164,348	5.3	\$37,397,501	8.2
Transportation	\$20,346,282	10.7	\$26,489,032	9.9	\$46,835,314	10.2
Social Services	\$49,828,802	26.1	\$87,553,524	32.8	\$137,382,326	30.0
Economic Development	\$1,278,250	0.7	\$3,395,624	1.3	\$4,673,874	1.0
Culture and Recreation	\$1,489,536	0.8	\$694,416	0.3	\$2,183,952	0.5
Community Services	\$2,877,290	1.5	\$3,752,921	1.4	\$6,630,211	1.4
Utilities	\$0	0.0	\$21,402	<0.1	\$21,402	<0.1
Sanitation	\$2,004,345	1.0	\$7,288,201	2.7	\$9,292,546	2.0
Employee Benefits	\$23,122,461	12.1	\$38,268,359	14.4	\$61,390,820	13.4
Debt Service	\$8,144,509	4.3	\$3,368,753	1.3	\$11,513,262	2.5
Total Expenditures	\$191,000,689	100.0	\$266,674,357	100.0	\$457,675,046	100.0

Source: NYS Office of the State Comptroller 2010a.

2.4.11.5 *Environmental Justice*

New York State

Nearly each county in New York State has census block groups that may be considered potential EJ areas. The term "environmental justice" refers to a Federal policy established by Executive Order 12898 (59 Federal Register [FR] 7629) under which each Federal agency identifies and

addresses, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority or low-income populations. In response to EO 12898 the U.S. Environmental Protection Agency developed a definition of EJ as follows:

The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including a racial, ethnic, or socioeconomic group, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies.

The Department's Commissioner Policy 29 (the Policy) on Environmental Justice and Permitting expands upon Executive Order 12898, defining a potential EJ area as a minority or low-income community that bears a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies.

The New York State Policy defines a minority population as a group of individuals that are identified or recognized as African-American, Asian American/Pacific Islander, American Indian, or Hispanic. A minority community exists where a census block group, or multiple census block groups, has a minority population equal to or greater than 51.1% in urban areas or 33.8% in rural areas. Rural and urban area classifications are established by the USCB. Urban area means all territory, population, and housing units located in urbanized areas and in places of 2,500 or more inhabitants outside of an urbanized area. An urbanized area is a continuously built-up area with a population of 50,000 or more. Rural area means territory, population, and housing units that are not classified as an urban area.

A low-income population is defined by the Policy as a group of individuals having an annual income that is less than the poverty threshold established by the USCB. A low-income community is a census block group, or area with multiple census block groups, having a low-

income population equal to or greater than 23.59% of the total population for whom poverty status is determined.

The Policy applies to applications for major projects and major modifications for the permits authorized by the following sections of the Environmental Conservation Law:

- Titles 7 and 8 of Article 17, SPDES (implemented by 6 NYCRR Part 750 et seq.);
- Article 19, Air Pollution Control (implemented by 6 NYCRR Part 201 et seq.);
- Title 7 of Article 27, solid waste management (implemented by 6 NYCRR Part 360): including minor modifications involving any tonnage increases beyond the approved design capacity and minor modifications involving an increase in the amount of putrescible solid waste beyond the amount that has already been approved in the existing permit;
- Title 9 of Article 27, industrial hazardous waste management (implemented by 6 NYCRR Part 373); and
- Title 11 of Article 27, siting of industrial hazardous waste facilities (implemented by 6 NYCRR Part 361).

A Department permit applicant must conduct a preliminary screen to identify whether the proposed action is located in a potential EJ area. The applicant also must identify potential adverse environmental impacts within the area to be affected. The Department provides online mapping for each New York State county to assist applicants in identifying potential EJ areas. Census block data is utilized to identify these areas. The mapping referenced in this section was last updated in 2005.

The following provides a discussion of the minority and low-income populations in the state and in each of the representative regions for background information.

In 2010, the percent minority population in New York State was 34.25%. The Hispanic population was 17.6% in 2010; and the percent of persons living below poverty level in 2009 was 13.9%.

According to the 2010 Census of Population and Housing, approximately 97.0% of residents of New York State identify themselves as being of a single race: 65.8% of the population of New

York State self-identify as White; 15.9% as Black or African American; 0.6% as American Indian and Alaska Native; 7.3% as Asian; less than (<) 0.1% as Native Hawaiian and Other Pacific Island; and 7.4% as some other race (USCB 2010). The remaining 3.0% of the population self-identifies as two or more races (see Table 2.88).

Persons of Hispanic or Latino origin are defined as individuals who identified themselves as Hispanic or Latino on the 2010 Census, regardless of race. In New York State, 17.6% of the population self-identifies as being Hispanic or Latino.

Table 2.88 presents a summary of the total population of New York State by the race/ethnicity categories defined by the USCB.

Table 2.88 - Racial and Ethnicity Characteristics for New York State (New August 2011)

Population Category	Population	Percentage of Total 2010 Population
Total 2010 Population	19,378,102	100.0%
White Only	12,740,940	65.8%
Black or African American Only	3,073,800	15.9%
American Indian and Alaska Native Only	106,906	0.6%
Asian Only	1,420,244	7.3%
Native Hawaiian and Other Pacific Islander Only	8,766	< 0.1%
Some Other Race Only	1,441,563	7.4%
Total Population of One Race	18,792,219	97.0%
Two or more races	585,849	3.0%
Hispanic or Latino	3,416,922	17.6

Source: USCB 2010.

The categories presented in this table are defined by the USCB. A person must have self-identified during the 2010 census to be included within any of these categories in the *2010 Census of Population and Housing*.

Region A

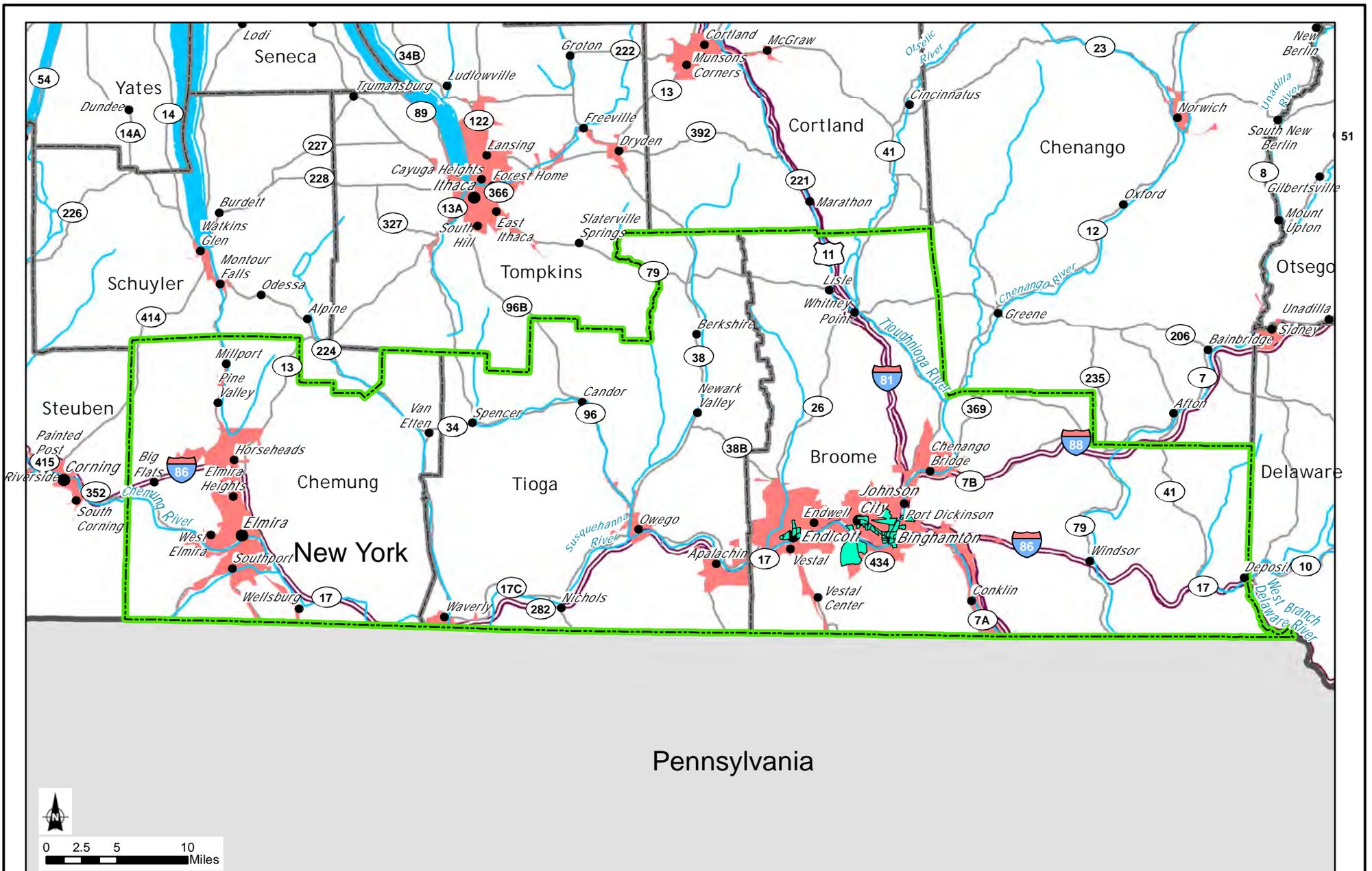
In 2010, the combined percent minority for Region A was 10.51%. Chemung and Broome Counties had similar percentages of minority population, while Tioga County had a relatively low percentage (3.07% minority). Region A had a combined percent Hispanic population of 1.82%. The counties which comprise Region A, both collectively and individually, are not considered minority communities.

The combined poverty level of Region A in 2009 was 14.4% in 2009, while Tioga County had a lower percentage (10.0%) than Broome and Chemung Counties. The poverty level for Region A is lower than the New York State EJ threshold for a low-income community (23.59%).

The Department's 2005 preliminary screen mapping for each county identifies potential EJ areas at the census block group level. These maps were combined to illustrate potential EJ areas in Region A (Figure 2.7). The mapping indicates that some census blocks in Chemung County (towns of Elmira and Ashland); Tioga County (towns of Barton and Owego); and Broome County (towns of Vestal and Kirkwood) are potential EJ areas based on their minority and/or low-income populations.

According to the 2010 Census of Population and Housing, approximately 97.6% of the individuals in Region A identify themselves as being of a single race: 89.5% of the population of Region A self-identifies as White; 4.6% as Black or African American; 0.2% as American Indian and Alaska Native; 2.5% as Asian; less than (<) 0.1% as Native Hawaiian and Other Pacific Island; and 0.8% as some other race (USCB 2010). The remaining 2.4% self-identifies as two or more races.

In Region A, 1.8% of the population self-identifies as being Hispanic or Latino. Table 2.89 presents a summary of the total population of Region A by the race/ethnicity categories defined by the USCB.



Pennsylvania

- Representative Region A
- County Boundary
- State Boundary
- Urban Area
- ~ River/Stream
- Highway/Major Road
- Secondary Road
- Potential Environmental Justice Area

Figure 2.7: Potential Environmental Justice Areas for Region A

Source: NY DEC, 2005, http://www.dec.ny.gov/docs/permits_ej_operations_pdf/broomeco.pdf; USGS, 2002

Table 2.89 - Region A: Racial and Ethnicity Characteristics (New August 2011)

Population Category	Population	Percentage of Total 2010 Population
Broome County		
Total 2010 Population	200,600	100.0%
White Only	176,444	88.0%
Black or African American Only	9,614	4.8%
American Indian and Alaska Native Only	396	0.2%
Asian Only	7,065	3.5%
Native Hawaiian and Other Pacific Islander Only	82	<0.1%
Some Other Race Only	1,912	1.0%
Total Population of One Race	195,513	97.5%
Two or more races	5,087	2.5%
Hispanic or Latino	4,334	2.2%
Chemung County		
Total 2010 Population	88,830	100.0%
White Only	78,771	88.7%
Black or African American Only	5,828	6.6%
American Indian and Alaska Native Only	233	0.3%
Asian Only	1,057	1.2%
Native Hawaiian and Other Pacific Islander Only	20	< 0.1%
Some Other Race Only	539	0.6%
Total Population of One Race	86,448	97.4%
Two or more races	2,372	2.7%
Hispanic or Latino	1,436	1.6%
Tioga County		
Total 2010 Population	51,125	100.0%
White Only	49,556	96.9%
Black or African American Only	375	0.7%
American Indian and Alaska Native Only	86	0.2%
Asian Only	372	0.7%
Native Hawaiian and Other Pacific Islander Only	15	<0.1%
Some Other Race Only	146	0.3%
Total Population of One Race	50,550	98.9%
Two or more races	575	1.1%
Hispanic or Latino	412	0.8%
Region A Total		
Total 2010 Population	340,555	100.0%
White Only	304,771	89.5%
Black or African American Only	15,817	4.6%
American Indian and Alaska Native Only	715	0.2%
Asian Only	8,494	2.5%
Native Hawaiian and Other Pacific Islander Only	117	< 0.1%
Some Other Race Only	2,597	0.8%
Total Population of One Race	332,511	97.6%
Two or more races	8,034	2.4%
Hispanic or Latino	6,182	1.8%

Source: USCB 2010.

The categories presented in this table are defined by the USCB. A person must have self-identified during the 2010 census to be included within any of these categories in the *2010 Census of Population and Housing*.

Region B

Region B comprises three counties: Sullivan, Delaware, and Otsego Counties. The 2010 combined percent minority for Region B was 10.45%. Delaware and Otsego Counties had similar percentages of minority population, while Sullivan County had a relatively higher percentage (18.04% minority). Region B had a combined percent Hispanic population of 5.02%, with Sullivan County having a slightly higher percentage of Hispanic persons at approximately 9% of total population. The counties which comprise Region B are not considered minority communities. The combined poverty level of Region B was 15.0% in 2009. The poverty level for Region B is lower than the New York State EJ threshold for a low-income community (23.59%).

The Department's 2005 preliminary screen mapping for each county identifies potential EJ areas at the census block group level. These maps were combined to illustrate potential EJ areas in Region B (Figure 2.8). The mapping indicates that some census blocks in Otsego County (town of Oneonta) and Sullivan County (towns of Delaware, Rockland, Liberty, Fallsburg, Bethel, and Thompson) are potential EJ areas based on their minority and/or low-income populations. There are no mapped potential EJ areas in Delaware County.

According to the 2010 Census of Population and Housing, approximately 97.9% of the individuals in Region B identify themselves as being of a single race: 89.6% of the population of Region B self-identifies as White; 4.7% as Black or African American; 0.3% as American Indian and Alaska Native; 1.1% as Asian; less than (<) 0.01% as Native Hawaiian and Other Pacific Island; and 2.1% as some other race (USCB 2010). The remaining 2.1% self-identify as being of two or more races.

Persons of Hispanic or Latino origin are defined as individuals who identified themselves as a Hispanic or Latino on the 2010 Census, regardless of race. In Region B, 5.0% of the population self-identifies as being Hispanic or Latino.

Table 2.90 presents a summary of the total population of Region B by the race/ethnicity categories defined by the USCB.

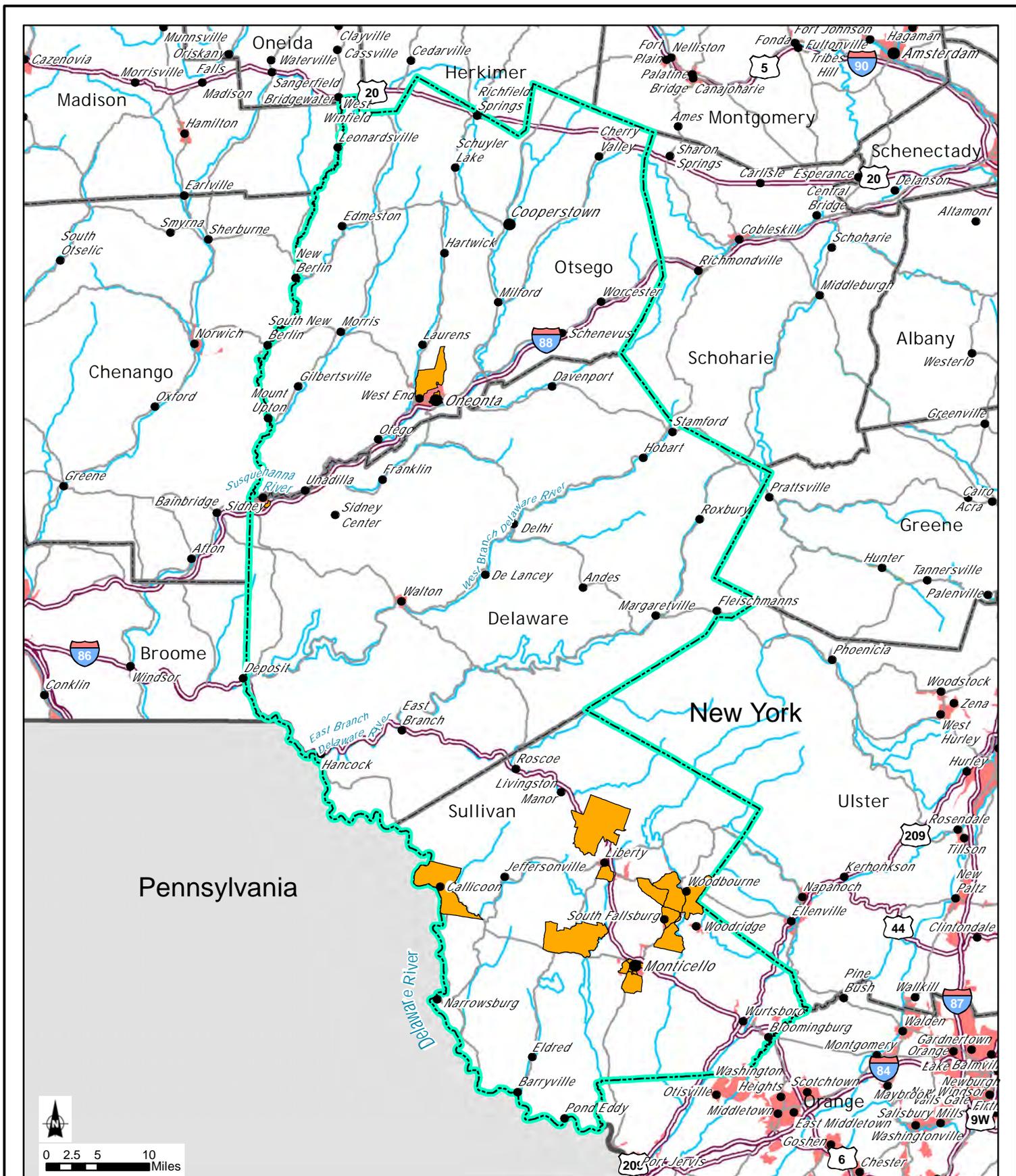


Figure 2.8: Potential Environmental Justice Areas for Region B

Source: NY DEC, 2005, http://www.dec.ny.gov/docs/permits_ej_operations_pdf/broomeco.pdf; USGS, 2002

Table 2.90 - Region B: Racial and Ethnicity Characteristics (New August 2011)

Population Category	Population	Percentage of Total 2010 Population
Delaware County		
Total 2010 Population	47,980	100.0%
White Only	45,675	95.2%
Black or African American Only	779	1.6%
American Indian and Alaska Native Only	131	0.3%
Asian Only	367	0.8%
Native Hawaiian and Other Pacific Islander Only	12	< 0.1%
Some Other Race Only	394	0.8%
Total Population of One Race	47,358	98.7%
Two or more races	622	1.3%
Hispanic or Latino	1,058	2.2%
Otsego County		
Total 2010 Population	62,259	100.0%
White Only	58,935	94.7%
Black or African American Only	1,066	1.7%
American Indian and Alaska Native Only	121	0.2%
Asian Only	674	1.1%
Native Hawaiian and Other Pacific Islander Only	18	< 0.1%
Some Other Race Only	413	0.7%
Total Population of One Race	61,227	98.4%
Two or more races	1,032	1.7%
Hispanic or Latino	1,391	2.2%
Sullivan County		
Total 2010 Population	77,547	100.0%
White Only	63,560	82.0%
Black or African American Only	7,039	9.1%
American Indian and Alaska Native Only	354	0.5%
Asian Only	1,075	1.4%
Native Hawaiian and Other Pacific Islander Only	24	< 0.1%
Some Other Race Only	3,229	4.2%
Total Population of One Race	75,281	97.2%
Two or more races	2,266	2.9%
Hispanic or Latino	6,986	9.0%
Region B Total		
Total 2010 Population	187,786	100.0%
White Only	168,170	89.6%
Black or African American Only	8,884	4.7%
American Indian and Alaska Native Only	606	0.3%
Asian Only	2,116	1.1%
Native Hawaiian and Other Pacific Islander Only	54	< 0.1%
Some Other Race Only	4,036	2.1%
Total Population of One Race	183,866	97.9%
Two or more races	3,920	2.1%
Hispanic or Latino	9,435	5.0%

Source: USCB 2010.

The categories presented in this table are defined by the USCB. A person must have self-identified during the 2010 census to be included within any of these categories in the *2010 Census of Population and Housing*.

Region C

Region C comprises Chautauqua and Cattaraugus Counties. The 2010 combined percent minority for Region C was 7.30%. Region C had a combined percent Hispanic population of 2.68%, with Chautauqua County having a higher percentage (3.70%) than Cattaraugus County. Region C is not considered a minority community. The combined poverty level of Region C was 2.3% in 2009. The poverty level for Region C is lower than the New York State EJ threshold for a low-income community (23.59%).

The Department's 2005 preliminary screen mapping was combined to illustrate potential EJ areas in Region C (Figure 2.9). The mapping indicates that some census blocks in Cattaraugus County are potential EJ areas based on their minority and/or low-income populations. These municipalities include Perrysburg, Leon, New Albion, Conewango, Albion, South Valley, Cold Spring, Red House, Salamanca, Carrolton, and Allegany. Some census blocks in Chautauqua County (Jamestown, Portland, Pomfret, Dunkirk and Hanover) are potential EJ areas.

According to the 2010 Census of Population and Housing, 98.2% of the individuals in Region C identify themselves as being of a single race: 92.7% of the population of Region C self-identifies as White; 2.0% as Black or African American; 1.5% as American Indian and Alaska Native; 0.6% as Asian; less than 0.1% as Native Hawaiian and Other Pacific Island; and 1.4% as some other race (USCB 2010). The remaining 1.9% self-identify as being of two or more races.

Persons of Hispanic or Latino origin are defined as individuals who identified themselves as Hispanic or Latino on the 2010 Census, regardless of race. In Region C, 2.7% of the population self-identifies as being Hispanic or Latino.

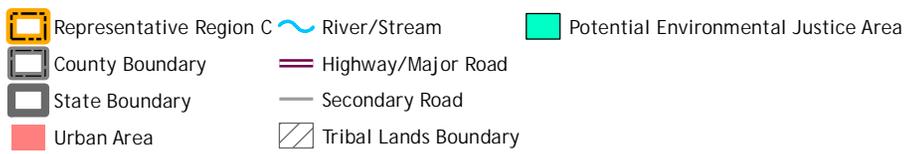
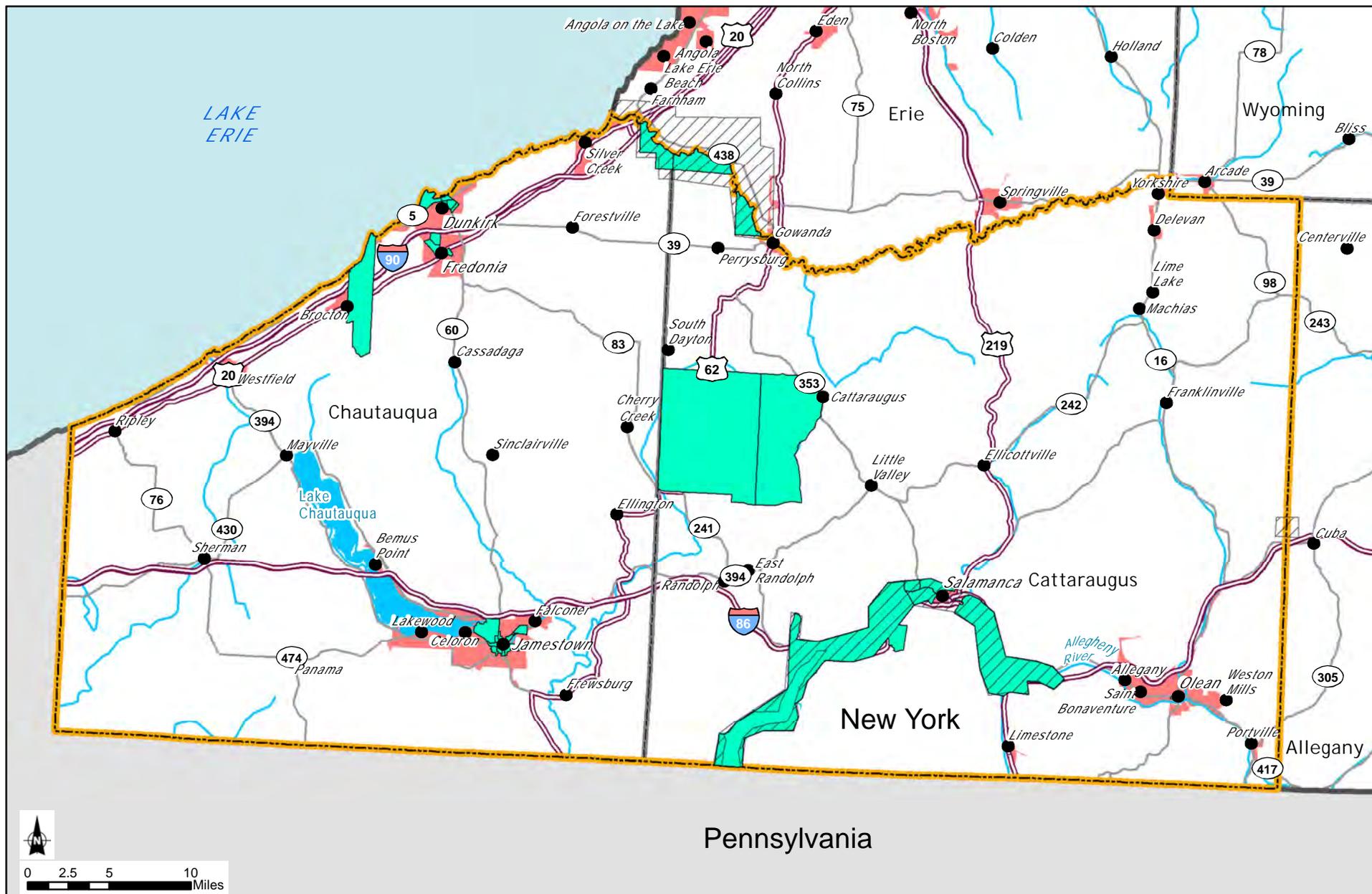


Figure 2.9: Potential Environmental Justice Areas for Region C

Source: NY DEC, 2005, http://www.dec.ny.gov/docs/permits_ej_operations_pdf/broomeco.pdf; USGS, 2002

Table 2.91 presents a summary of the total population of Region C by the race/ethnicity categories defined by the USCB.

Table 2.91 - Region C: Racial and Ethnicity Characteristics (New August 2011)

Population Category	Population	Percentage of Total 2010 Population
Cattaraugus County		
Total 2010 Population	80,317	100.0%
White Only	74,639	92.9%
Black or African American Only	1,024	1.3%
American Indian and Alaska Native Only	2,443	3.0%
Asian Only	528	0.7%
Native Hawaiian and Other Pacific Islander Only	15	< 0.1%
Some Other Race Only	305	0.4%
Total Population of One Race	78,954	98.3%
Two or more races	1,363	1.7%
Hispanic or Latino	786	1.0%
Chautauqua County		
Total 2010 Population	134,905	100.0%
White Only	124,875	92.6%
Black or African American Only	3,197	2.4%
American Indian and Alaska Native Only	689	0.5%
Asian Only	688	0.5%
Native Hawaiian and Other Pacific Islander Only	36	< 0.1%
Some Other Race Only	2,669	2.0%
Total Population of One Race	132,154	98.0%
Two or more races	2,751	2.0%
Hispanic or Latino	4,991	3.7%
Region C Total		
Total 2010 Population	215,222	100.0%
White Only	199,514	92.7%
Black or African American Only	4,221	2.0%
American Indian and Alaska Native Only	3,132	1.5%
Asian Only	1,216	0.6%
Native Hawaiian and Other Pacific Islander Only	51	< 0.1%
Some Other Race Only	2,974	1.4%
Total Population of One Race	211,108	98.2%
Two or more races	4,114	1.9%
Hispanic or Latino	5,777	2.7%

Source: USCB 2010.

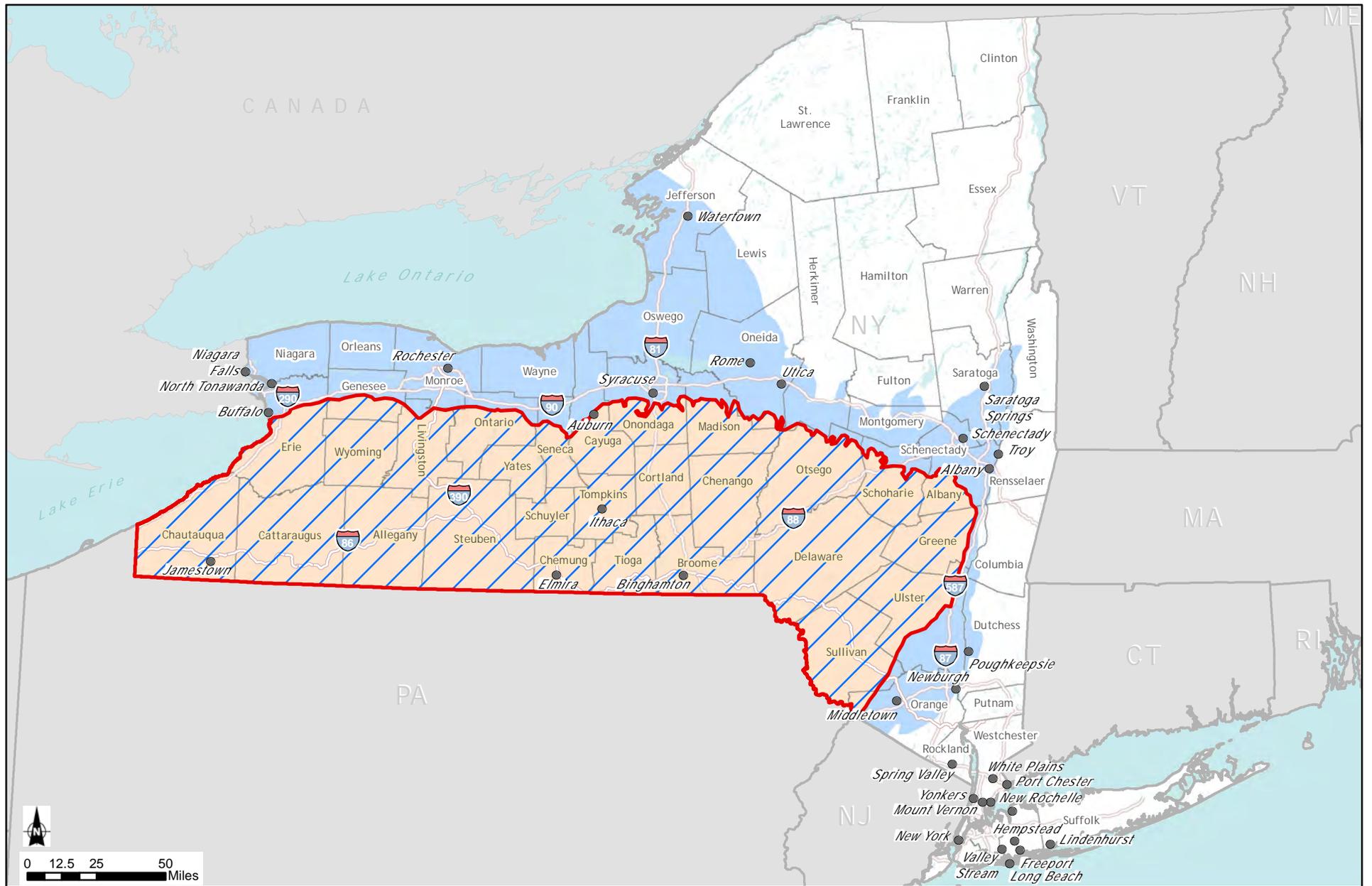
The categories presented in this table are defined by the USCB. A person must have self-identified during the 2010 census to be included within any of these categories in the *2010 Census of Population and Housing*.

2.4.12 Visual Resources⁵⁵

As stated in Section 1.3, oil and gas drilling is expected to occur statewide, with the exceptions of (1) state-owned lands that constitute the Adirondack and Catskill Forest Preserves (the state constitution requires that these areas remain forever wild and not be leased or sold), and (2) those areas of the Adirondacks region, NYC, and Long Island where subsurface geology renders drilling for hydrocarbons unlikely. No site-specific project locations are being evaluated in the SGEIS; however, the Marcellus and Utica Shales are the most prominent shale formations in New York State, and the prospective region for the extraction of natural gas from these formations generally extends from Chautauqua County eastward to Greene, Ulster, and Sullivan Counties, and from the Pennsylvania border north to the approximate location of the east-west portion of the New York State Thruway between Schenectady and Auburn (Figure 2.10). This region covers all or parts of 30 counties. Fourteen counties are located entirely within this area, and 16 counties are located partially within the area.

For the purposes of impact analysis, visual resources located within the areas underlain by the Marcellus and Utica Shales in New York may be considered representative of the types of visual resources that would be encountered statewide. Therefore, this section describes the existing federally and state-designated visual resources within the boundaries of this area in New York. The potential for other visual resources and visually sensitive areas within the areas underlain by the Marcellus and Utica Shales in New York, which are defined by regional planning entities, county and town agencies, and local communities and their residents, is also acknowledged in this section. All of these types of visual resources and visually sensitive areas (federal, state, and local) also contribute to the ‘sense of place’ that defines the character of a community, which is discussed in Section 2.4.10.

⁵⁵ Subsection 2.4.12, in its entirety, was provided by Ecology and Environment Engineering, P.C., August 2011 and was adapted by the Department.



- City with Year 2000 Population Greater than 25,000
- Major Water Bodies
- County Boundary
- State Boundary
- Boundary of Area of Interest for Visual Resources
- Marcellus Shale Extent in New York State
- Utica Shale Extent in New York State
- /// Extent of Marcellus and Utica Shales in New York State

Figure 2.10: Area of Interest for Visual Resources

Source: ESRI, 2010; USGS, 2002

Criteria for identifying visual resources are defined in the Department's Program Policy DEP-00-2, "Assessing and Mitigating Visual Impacts" (NYSDEC 2000). Federally designated visual resources include, but are not limited to, National Historic Landmarks (NHL); properties listed in the National Register of Historic Places (NRHP); National Natural Landmarks (NNL); National Wildlife Refuges; National Parks, Recreation Areas, Seashores and Forests, as applicable; National Wild and Scenic Rivers and American Heritage Rivers; and National Scenic, Historic and Recreation Trails.

State-designated visual resources include, but are not limited to, properties listed or eligible for listing in the State Register of Historic Places; Heritage Areas (formerly Urban Cultural Parks); State Forest Preserves; State Game Refuges, State Wildlife Management Areas and Multiple Use Areas; State Parks, Day Use Areas, Nature Preserves and Historic Preserves; State Wild, Scenic and Recreational Rivers; State Scenic Byways, Parkways and Roads; State Conservation Areas and other sites, areas, lakes, or reservoirs designated or eligible for designation as scenic in accordance with ECL Article 49 or the DOT equivalent; Critical Environmental Areas; Scenic Areas of Statewide Significance; State Trails; and Bond Act Properties purchased under the Exceptional Scenic Beauty or Open Space Category. The New York Statewide Trails Plan, Open Space Conservation Plan, and Statewide Comprehensive Outdoor Recreation Plan were also consulted during the development of the existing environmental setting for visual resources (OPRHP 2008, 2009, 2010).

Based on NYSDEC Program Policy DEP-00-2, the visual resources analysis for this draft SGEIS includes the following:

- The definitions of the specific visual resource or visually sensitive area, including descriptions of relevant regulations, where appropriate.
- The number of the specific visual resources or visually sensitive areas within the area underlain by the Marcellus and Utica Shales in New York organized by county, where appropriate.
- Figures showing the locations of specific visual resources or visually sensitive areas within the area underlain by the Marcellus and Utica Shales in New York.

- Where appropriate, a table summarizing information for specific visual resources or visually sensitive areas, generally focusing on visual, aesthetic, or scenic qualities of the resource, if known, and organized by county.

2.4.12.1 Historic Properties and Cultural Resources

This section discusses historic properties and other cultural resources that are considered visual resources per NYSDEC Program Policy DEP-00-2, including properties listed in the National and State Registers of Historic Places (including National Historic Landmarks), state historic sites, state historic parks, and state heritage areas (formerly urban cultural parks) (NYSDEC 2000). Historic properties and cultural resources are often considered significant partly because of their associated visual or aesthetic qualities. These visual or aesthetic qualities may be related to the integrity of the appearance of these properties or resources, or to the integrity of their settings. Viewsheds can also contribute to the significance of historic properties or cultural resources, and viewsheds that contain historic properties and cultural resources may be considered significant because of their presence in the landscape.

A property on or eligible for inclusion in the National or State Register of Historic Places (16 U.S.C. §470a et seq., Parks, Recreation and Historic Preservation Law Section 14.07)

Historic properties are defined as those properties that have been listed in, or determined eligible for listing in, the NRHP (Advisory Council on Historic Preservation 2011). The NRHP, which is the official list of the nation's historic places worthy of preservation, was established under the National Historic Preservation Act of 1966, as amended (NPS 2011a; OPRHP 2011a). In general, historic properties are 50 years old or older, and they retain much of their original appearance because of the integrity of their location, design, setting, materials, workmanship, feeling, and association (OPRHP 2011a).

The National Park Service (NPS) maintains a database of properties listed in the NRHP. (This database does not include information for other properties determined to be eligible for listing in the NRHP.) At least 1,050 NRHP-listed properties have been identified within the area underlain by the Marcellus and Utica Shales in New York (Table 2.92) (NPS 2011b, ESRI 2011). The significance of properties listed or eligible for listing on the NRHP may be derived in varying degrees from scenic or aesthetic qualities that may be considered visually sensitive.

Table 2.92 - Number of NRHP-Listed Historic Properties within the Area Underlain by the Marcellus and Utica Shales in New York (New August 2011)

County Name	Number of NRHP-listed Historic Properties within Entire County
Albany*	7
Allegany	27
Broome	52
Cattaraugus	26
Cayuga*	44
Chautauqua	45
Chemung	32
Chenango	39
Cortland	25
Delaware	62
Erie*	28
Genesee*	6
Greene*	45
Livingston*	74
Madison*	48
Oneida*	2
Onondaga*	18
Ontario*	37
Orange*	3
Otsego*	53
Schoharie*	15
Schuyler	14
Seneca*	10
Steuben	49
Sullivan*	64
Tioga	53
Tompkins	57
Ulster*	32
Wyoming	18
Yates	65
Total	1,050

Sources: NPS 2011b; ESRI 2010.

* Only a portion of the county is located within the area underlain by the Marcellus and Utica Shales in New York.

The State Register of Historic Places, which is the official list of New York State’s historic places worthy of preservation, was established under the New York State Historic Preservation act of 1980. The eligibility criteria for properties listed in the State Register of Historic Places are the same as the eligibility criteria for the NRHP (OPRHP 2011a). The OPRHP maintains the database of records for properties listed in, or determined eligible for listing in, the State and

National Registers of Historic Places (OPRHP 2011b). Over 250,000 properties located across New York State are included in this database, and the database provides information on whether the properties have been evaluated for State and/or National Register eligibility, and if evaluated, the eligibility status of the resource (OPRHP 2011c). The significance of properties listed or eligible for listing in the State Register of Historic Places may be derived in varying degrees from scenic or aesthetic qualities that may be considered visually sensitive.

National Heritage Areas

National Heritage Areas (NHAs) are designated by Congress. For an area to be considered for designation, certain key elements must be present. Of primary importance, the landscape must have nationally distinctive natural, cultural, historic, and scenic resources that, when linked together, tell a unique story about the nation. NHAs are not units of the NPS, nor are they owned or managed by the NPS. Each NHA is governed by separate authorizing legislation and operates under provisions unique to its resources and desired goals. The heritage area concept offers an innovative method for citizens, in partnership with local, state, and federal governments and nonprofit and private sector interests, to shape the long-term future of their communities (NPS 2010d, 2011g).

Two NHAs are located partially within the area underlain by the Marcellus and Utica Shales in New York (Figure 2.11): portions of the Erie Canalway National Heritage Corridor in Erie, Ontario, Yates, Seneca, Cayuga, Schuyler, and Tompkins Counties; and portions of the Hudson River Valley NHA in Albany, Greene, Ulster, and Sullivan Counties (OPRHP 2007; NPS 2010d, 2011e; Erie Canalway National Heritage Corridor 2008; Hudson River Valley National Heritage Corridor 2011). These NHAs are likely to contain scenic or aesthetic areas that may be considered visual resources or visually sensitive.

Properties Designated as National Historic Landmarks

National Historic Landmarks (NHLs) are nationally significant historic places designated by the Secretary of the Interior because they possess exceptional value or quality in illustrating or interpreting the heritage of the United States (NPS 2011c). There are 19 NHLs located within the area underlain by the Marcellus and Utica Shales in New York (Table 2.93 and Figure 2.11). Generally, these NHLs are historic buildings (residences, churches, civic buildings, and

institutional buildings), but other types of historic properties are also represented, including battlefields and canals (Table 2.93). The significance of NHL-designated properties may be derived in varying degrees from scenic or aesthetic qualities that may be considered visual resources or visually sensitive.

State Historic Sites and Historic Parks

State Historic Sites and State Historic Parks are historic and cultural places that tell the story of the New York State's rich heritage. Owned by New York State, these places are preserved and interpreted for the public's enjoyment, education, and enrichment (OPRHP 2011d). There are 12 State Historic Sites and two State Historic Parks in the counties located entirely or partially within the area underlain by the Marcellus and Utica Shales in New York (OPRHP 2008). Of these 14 historic and cultural places, only two are within the area underlain by the Marcellus and Utica Shales in New York: Genesee Valley Canal State Historic Site in Livingston County and Lorenzo State Historic Site in Madison County (see Figure 2.11) (OPRHP 2011d). State Historic Sites and State Historic Parks may contain scenic or aesthetic qualities that may be considered visually sensitive.

Local Visually Sensitive Resources or Areas

The counties that are entirely or partially located within the area underlain by the Marcellus and Utica Shales in New York are expected to contain numerous other local visual resources or visually sensitive areas. These local visual resources or visually sensitive areas would be identified, defined and/or designated by regional planning entities and local (county and town) communities and their residents and would be in addition to the visual resources or visually sensitive areas described above that are defined or designated by federal and state agencies and guidance.

Table 2.93 - National Historic Landmarks (NHLs) Located within the Area Underlain by the Marcellus and Utica Shales in New York (New August 2011)

County Name*	Number of NHLs within County	Names of NHLs
Broome	1	<ul style="list-style-type: none"> ● New York State Inebriate Asylum
Cayuga**	6	<ul style="list-style-type: none"> ● William H. Seward House ● Harriet Tubman Home for the Aged ● Harriet Tubman Residence ● Thompson A.M.E. Zion Church ● Willard Memorial Chapel-Welch Memorial Hall ● Jethro Wood House
Chautauqua	2	<ul style="list-style-type: none"> ● Chautauqua Historic District ● Lewis Miller Cottage, Chautauqua Institute
Chemung	1	<ul style="list-style-type: none"> ● Newton Battlefield
Delaware	1	<ul style="list-style-type: none"> ● John Burroughs Memorial (Woodchuck Lodge)
Erie**	2	<ul style="list-style-type: none"> ● Millard Fillmore House ● Roycroft Campus
Madison**	1	<ul style="list-style-type: none"> ● Gerrit Smith Estate
Orange**	1	<ul style="list-style-type: none"> ● Delaware and Hudson Canal***
Otsego**	1	<ul style="list-style-type: none"> ● Hyde Hall
Seneca**	1	<ul style="list-style-type: none"> ● Rose Hill
Sullivan**	1	<ul style="list-style-type: none"> ● Delaware and Hudson Canal***
Tompkins	1	<ul style="list-style-type: none"> ● Morrill Hall, Cornell University
Ulster**	2	<ul style="list-style-type: none"> ● John Burroughs Riverby Study ● Delaware and Hudson Canal***
Total	19	

Sources: ESRI 2010; NPS 2011d; OPRHP 2008.

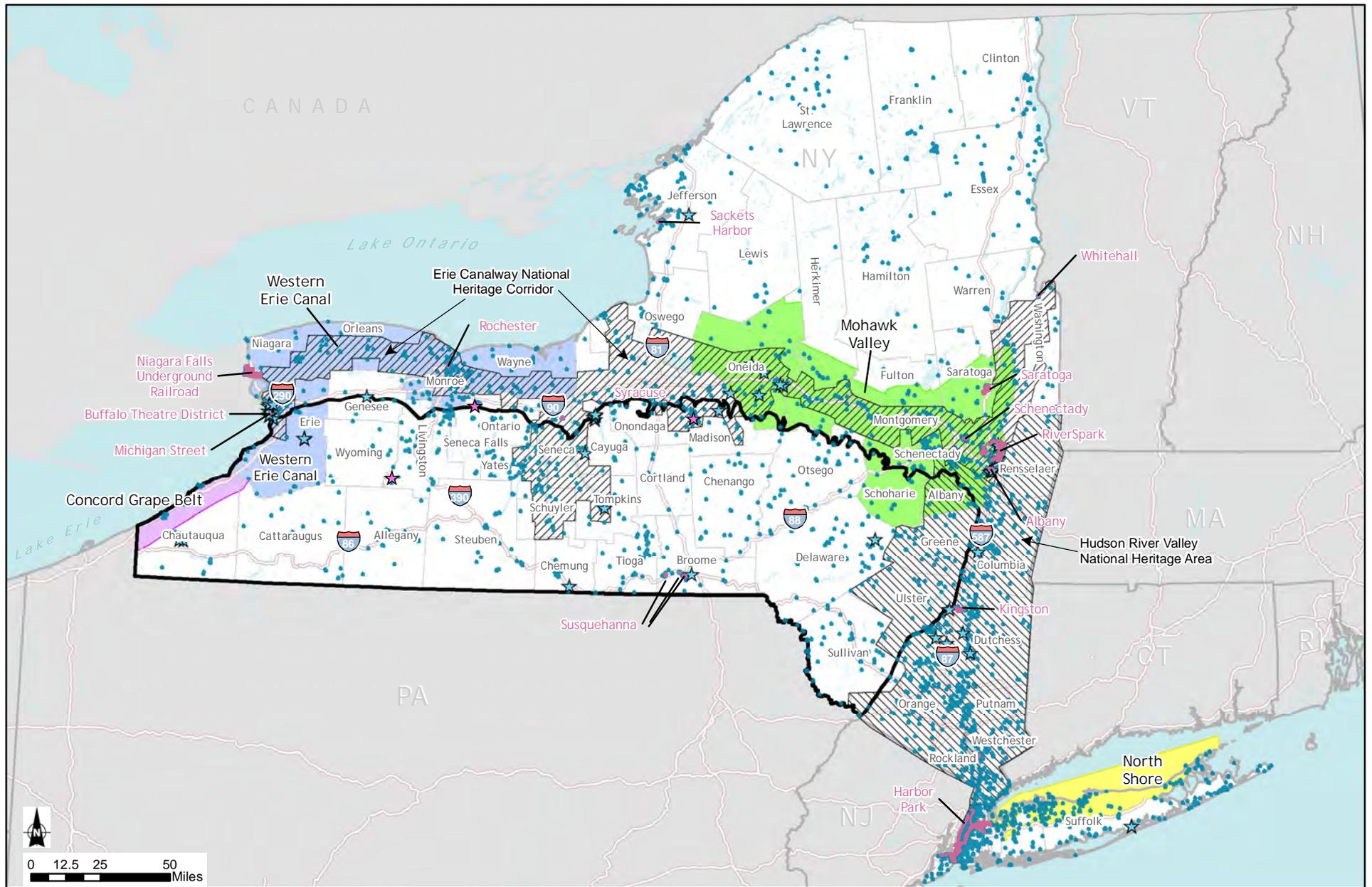
* There are no NHLs within other counties located entirely or partially within the area underlain by the Marcellus and Utica Shales in New York.

** Only a portion of the county is located within the area underlain by the Marcellus and Utica Shales in New York.

*** The Delaware and Hudson Canal NHL traverses portions of three counties (Orange, Sullivan, and Ulster).

State Heritage Areas (former Urban Cultural Parks [Parks, Recreation and Historic Preservation Law Section 35.15])

The State Heritage Area System, formerly known as the Urban Cultural Park System, is a state and local partnership established to preserve and develop areas that have special significance to New York State (OPRHP 2011e). New York State Heritage Areas are places where unique qualities of geography, history, and culture create a distinctive identity that becomes the focus of four heritage goals: preservation of significant resources; education that interprets lessons from the past; recreation and leisure activities; and economic revitalization for sustainable communities (OPRHP 2011f). Four regional or urban heritage areas or corridors are located entirely or partially within the area underlain by the Marcellus and Utica Shales in New York (Figure 2.11): the Concord Grape Belt (Lake Erie) Heritage Area in Chautauqua and Cattaraugus Counties; portion of the Western Erie Canal Heritage Area in southern Erie County; portions of the Mohawk Valley Heritage Area in Oneida, Schoharie, and Albany Counties; and the Susquehanna Heritage Area in Broome County (OPRHP 2007, 2011e; 2011f; Concord Grape Belt Heritage Association 2011; Western Erie Canal Alliance 2010-2011). These State Heritage Areas are likely to contain scenic or aesthetic areas that may be considered visual resources or visually sensitive.



- | | | | |
|---------------------------------------------------|---------------------------|------------------------------|-------------------------------------------|
| Major Water Bodies | Erie Canalway NHA | State Regional Heritage Area | National Register of Historic Places Site |
| County Boundary | Hudson River Valley NHA | Western Erie Canal | National Historic Landmark |
| State Boundary | State Urban Heritage Area | Concord Grape Belt | State Historic Site |
| Boundary of Area of Interest for Visual Resources | Mohawk Valley | | |
| | North Shore | | |

Figure 2.11: Visually Sensitive Areas Associated with Historic Properties and Cultural Resources

Source: ESRI, 2010; USGS, 2002; OPRHP, 2007, 2009, 2011; NYCSCIC, 2005; NPS, 2007

2.4.12.2 Parks and Other Recreation Areas

This section discusses parks and other recreation areas that are considered visual resources per NYSDEC Program Policy DEP-00-2, “Assessing and Mitigating Visual Impacts,” including state parks; properties included in the National Park System and areas defined as national recreation areas, seashores and forests; and state or federally designated trails (NYSDEC 2000). These recreation areas often contain scenic areas and/or are developed partly because of their associated visual or aesthetic qualities.

State Parks [Parks, Recreation and Historic Preservation Law Section 14.07]

State Parks contain natural, historic, cultural, and/or recreational resources of significance to New York State. (Note that State Historic Parks are discussed separately in Section 2.4.12.1). Owned by New York State, these parks are maintained for the public’s use. Thirty-four state parks are located partially or entirely within the area underlain by the Marcellus and Utica Shales in New York (Table 2.94 and Figure 2.12) (OPRHP 2008). These parks may contain scenic or aesthetic areas that may be considered visual resources or visually sensitive.

Table 2.94 - State Parks Located within the Area Underlain by the Marcellus and Utica Shales in New York (New August 2011)

County Name*	Number of State Parks within County	Names of State Parks within County
Albany**	1	● John Boyd Thacher State Park
Broome	2	● Chenango Valley State Park ● Oquaga Creek State Park
Cattaraugus	1	● Allegany State Park
Cayuga**	2	● Fillmore Glen State Park ● Long Point State Park
Chautauqua	2	● Lake Erie State Park ● Long Point on Lake Chautauqua State Park
Chemung	1	● Mark Twain State Park
Chenango	2	● Hunts Pond State Park ● Bowman Lake State Park
Delaware	1	● Oquaga Creek State Park
Erie**	3	● Evangola State Park ● Woodlawn Beach State Park ● Knox Farm State Park
Genesee**	1	● Darien Lakes State Park
Livingston**	1	● Letchworth State Park
Madison**	2	● Chittenango Falls State Park ● Helen L McNitt State Park (undeveloped)
Otsego**	3	● Gilbert Lake State Park ● Betty and Wilbur Davis State Park ● Glimmerglass State Park
Schoharie**	2	● Max V. Shaul State Park ● Mine Kill State Park
Schuyler	1	● Watkins Glen State Park
Seneca**	3	● Seneca Lake State Park ● Sampson State Park ● Taughannock Falls State Park
Steuben	2	● Stony Brook State Park ● Pinnacle State Park
Sullivan**	1	● Lake Superior State Park
Tompkins	3	● Taughannock Falls State Park ● Robert H. Treman State Park ● Buttermilk Falls State Park
Wyoming	2	● Letchworth State Park ● Silver Lake State Park (undeveloped)
Yates	1	● Keuka Lake State Park
Total	34***	

Sources: ESRI 2010; OPRHP 2008.

* No state parks within other counties entirely or partially within the area underlain by the Marcellus and Utica Shales in NYS.

** Only a portion of the county is located within the area underlain by the Marcellus and Utica Shales in New York.

***Letchworth State Park is in two counties (Wyoming and Livingston); Oquaga Creek State Park is in two counties (Broome and Delaware); Taughannock Falls State Park is in two counties (Seneca and Tompkins).

The National Park System, Recreation Areas, Seashores, Forests (16 U.S.C. 1c)

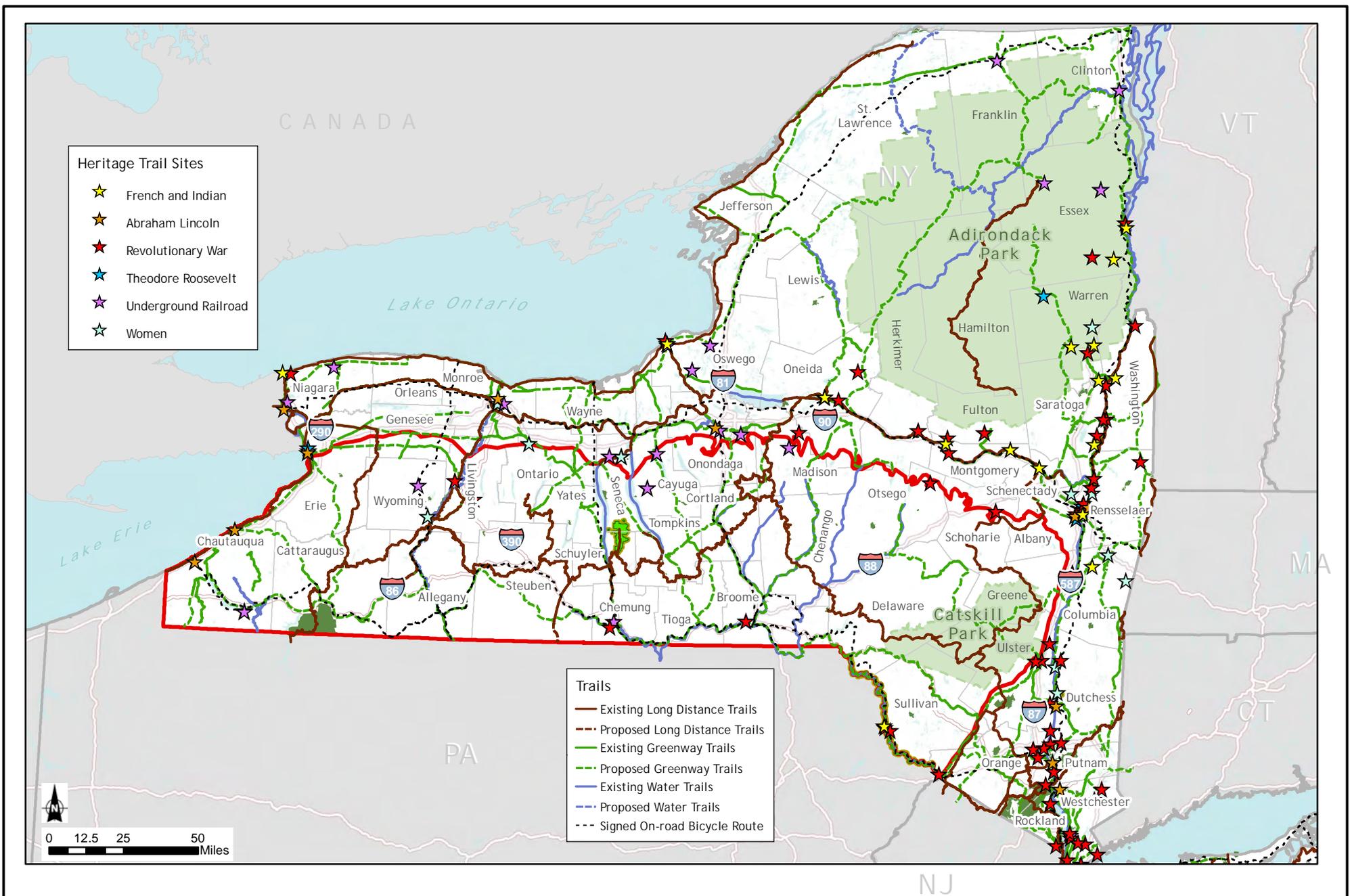
Properties included in the National Park System and areas defined as National Recreation Areas, Seashores and Forests contain natural, historic, cultural, and recreational resources of significance to the nation. Owned by the U.S. government and operated by various federal agencies, they are maintained for the public's use. At least five properties included in the National Park System are located in counties that are partially or entirely within the area underlain by the Marcellus and Utica Shales in New York: Women's Rights National Historic Park in Seneca County; Fort Stanwix National Monument in Oneida County; the North Country National Scenic Trail, which traverses New York State; Old Blenheim Covered Bridge in Schoharie County; and the Upper Delaware Scenic & Recreational River in Orange, Sullivan, and Delaware Counties (OPRHP 2008). One National Forest, the Finger Lakes National Forest in Seneca and Schuyler Counties, is located within the area underlain by the Marcellus and Utica Shales in New York (Figure 2.12) (OPRHP 2008). No National Recreation Areas or National Seashores are located within the area underlain by the Marcellus and Utica Shales in New York (OPRHP 2008). The federally-owned National Park System properties and the National Forest may contain scenic or aesthetic areas that may be considered visual resources or visually sensitive.

A state or federally designated trail, or one proposed for designation (16 U.S.C. Chapter 27 or equivalent)

New York State's natural and cultural resources provide for a broad range of land and water-based trails that offer multiple recreational experiences (Table 2.95). Each region of the state offers a unique setting and different opportunities for trails (OPRHP 2008). New York State breaks the existing system of trails into three general categories: primary trails that are of national, statewide, or regional significance and that are considered long-distance trails; secondary trails, which typically connect to a primary trail system but are generally within parks or open space areas; and stand-alone trails, which are trails of local significance that do not connect to a primary trail system. Stand-alone trails are generally loop trails, trails that connect to points of interest, or trails that provide short connections between parks, open spaces, historic sites and/or communities, or elements of a community (OPRHP 2008).

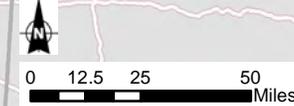
Additional state-designated trails include heritage trails, greenway trails, and/or water trails. Heritage trails are existing non-linear resources associated with historical movements or themes (OPRHP 2007, 2010). Greenway trails are existing and proposed multi-use trails located within linear corridors of open space that connect public places, connect people with nature, and protect areas for environmentally sustainable purposes that include recreation, conservation, and transportation (OPRHP 2007, 2010). Water trails, also known as blueways, are existing and proposed designated recreational water routes suitable for canoes, kayaks, and small motorized watercraft (OPRHP 2010).

One federally recognized trail, the North Country National Scenic Trail, traverses portions of the area underlain by the Marcellus and Utica Shales in New York. The North Country National Scenic Trail, an approximately 3,200-mile-long trail extending from eastern New York State to North Dakota, is administered by the NPS (NPS 2010a, 2010b). The portion of the trail in New York is included in the system of trails shown on Figure 2.12. National Scenic Trails are designated under Section 5 of the National Trails System Act and are defined as extended trails located to provide for maximum outdoor recreation potential and for the conservation and enjoyment of the nationally significant scenic, historic, natural, or cultural qualities of the areas through which they pass (NPS 2010a). A number of these types of trails are shown on Figure 2.12. All of these types of trails are likely to contain scenic or aesthetic areas that may be considered visual resources or visually sensitive



- Heritage Trail Sites**
- ★ French and Indian
 - ★ Abraham Lincoln
 - ★ Revolutionary War
 - ★ Theodore Roosevelt
 - ★ Underground Railroad
 - ★ Women

- Trails**
- Existing Long Distance Trails
 - - - Proposed Long Distance Trails
 - Existing Greenway Trails
 - - - Proposed Greenway Trails
 - Existing Water Trails
 - - - Proposed Water Trails
 - - - Signed On-road Bicycle Route



- Boundary of Area of Interest for Visual Resources
- County Boundary
- State Boundary
- Major Water Bodies
- National Park System Properties
- National Forest
- State Park

Figure 2.12: Parks and Recreational Resources that May be Visually Sensitive

Source: ESRI, 2010; USGS, 2002; NYCSCIC, 2005; NPS, 2010; National Atlas US and USGS, 2010; OPRHP, 2011; NYSDOT, 2011

Table 2.95 - Select Trails Located within the Area Underlain by the Marcellus and Utica Shales in New York (New August 2011)

Name of Trail	Type of Trail
North County National Scenic Trail*	● Long-distance trail of national significance
Long Path*	● Long-distance trail of statewide significance
Finger Lakes Trail*	● Long-distance trail of statewide significance
Canalway Trail*	● Long-distance trail of statewide significance
Hudson River Valley Greenway Trail System*	● Long-distance trail of statewide significance
Hudson River Greenway Water Trail*	● Long-distance trail of statewide significance
Genesee Valley Greenway*	● Long-distance trail of statewide significance
The statewide Snowmobile Trail System*	● Long-distance trail of statewide significance
Conservation Trail*	● Long-distance hiking trail of regional significance
Letchworth Trail*	● Long-distance hiking trail of regional significance
Bristol Hills Trail*	● Long-distance hiking trail of regional significance
Link Trail*	● Long-distance hiking trail of regional significance
Shawangunk Ridge Trail	● Long-distance hiking trail of regional significance
Abraham Lincoln Heritage Trail	● State-designated Heritage Trail consisting of resources in Chautauqua, Onondaga, and Albany Counties
Women Heritage Trail	● State-designated Heritage Trail consisting of resources in Chautauqua, Wyoming, Ontario, Seneca, and Cayuga Counties
Underground Railroad Heritage Trail	● State-designated Heritage Trail consisting of resources in Wyoming, Chemung, Seneca, Cayuga, Onondaga, and Madison Counties
Revolutionary War Heritage Trail	● State-designated Heritage Trail consisting of resources in Chemung, Broome Madison, Otsego Schoharie, Sullivan and Orange Counties
French and Indian Heritage Trail	● State-designated Heritage Trail consisting of resources in Sullivan County
Catherine Valley Trail	● Multi-use trail located within linear corridors of open space in Chemung and Schuyler Counties
Catskill Scenic Trail	● Multi-use trail located within linear corridors of open space in Delaware County
Delaware & Hudson Canal Trail	● Multi-use trail located within linear corridors of open space in Sullivan and Ulster Counties
Erie Canalway Trail*	● Multi-use trail located within linear corridors of open space
Genesee Valley Greenway*	● Multi-use trail located within linear corridors of open space
Ontario Pathways Rail Trail	● Multi-use trail located within linear corridors of open space in Ontario County
Orange Heritage Trail	● Multi-use trail located within linear corridors of open space in Orange County
Pat McGee Trail	● Multi-use trail located within linear corridors of open space in Cattaraugus County
Wallkill Valley Rail Trail	● Multi-use trail located within linear corridors of open space in Ulster County
Marden Cobb Waterway Trail	● Recreational water route
Cayuga-Seneca Canal Trail, which is a component of the larger NYS Canalway Water Trail*	● Recreational water route
Chemung Basin River Trail*	● Recreational water route
Headwaters River Trail(s)*	● Recreational water route
Upper Delaware Scenic and Recreational River*	● Recreational water route
Proposed Triple Divide Water Trail*	● Proposed recreational water route

Sources: ESRI 2010; OPRHP 2007, 2010; NPS 2010a, 2010b.

* Trail traverses one or more counties

2.4.12.3 Natural Areas

This section discusses natural areas that are considered visual resources per NYSDEC Program Policy DEP-00-2, including state forest preserve areas; state nature and historic preserves; state or national wild, scenic and recreational rivers (designated and potential); national wildlife refuges, state game refuges, and state wildlife management areas; and national natural landmarks (NYSDEC 2000). These natural areas often contain scenic areas and/or are developed partly because of their associated visual or aesthetic qualities.

The State Forest Preserve (NYS Constitution Article XIV)

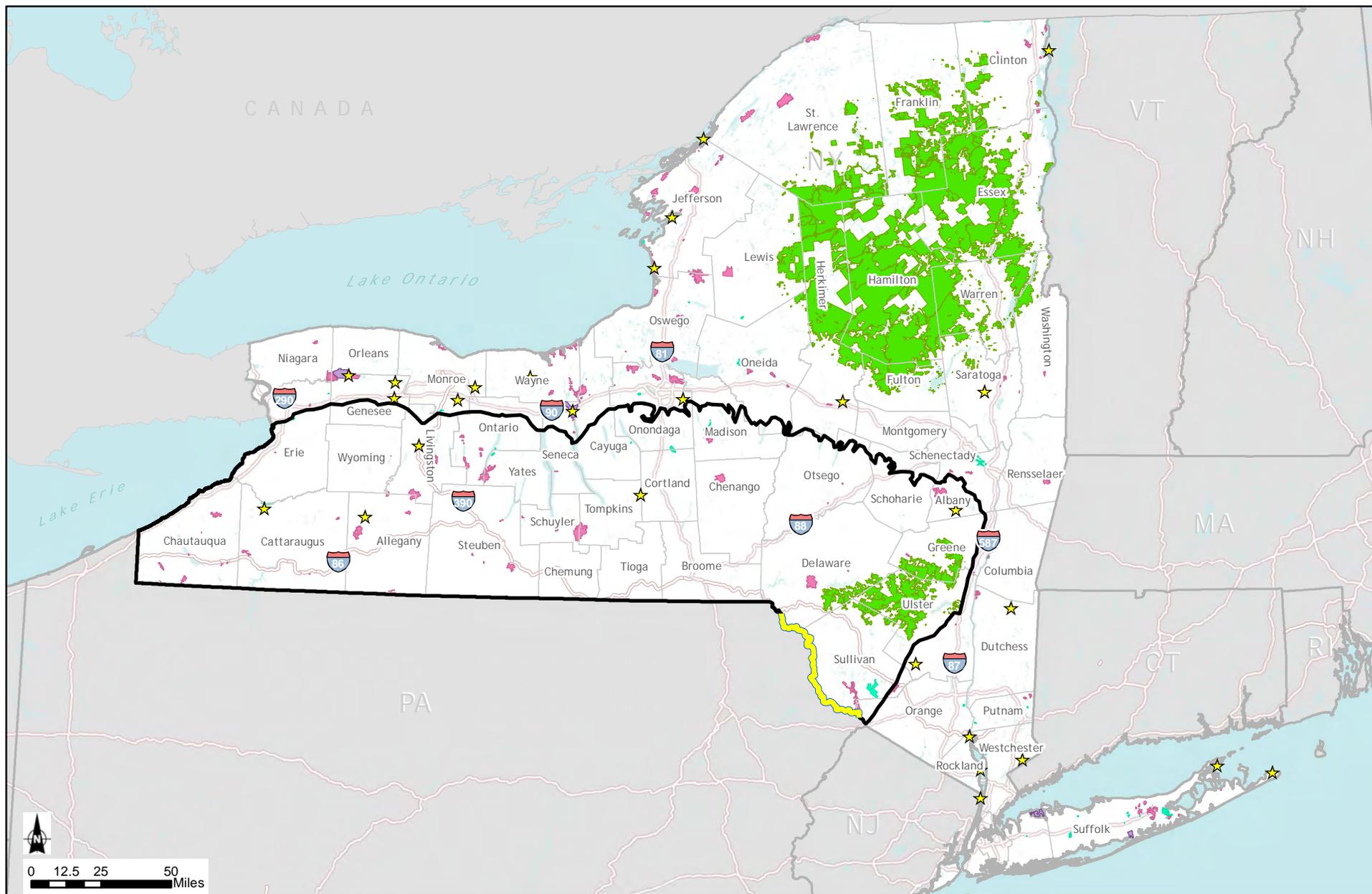
The State Forest Preserve consists of lands included in the Adirondack Forest Preserve (approximately 2.6 million acres) and the Catskill Forest Preserve (approximately 290,000 acres). These lands, which represent the majority of all state-owned property within the Adirondack and Catskill Parks, are protected as “forever wild” under Article XIV of the New York State Constitution. They are recognized as having exceptional scenic, recreational, and ecological value (NYSDEC 2011a, 2011b, 2011c).

The Adirondack Forest Preserve, located entirely within the Adirondack Park boundaries, is outside the area underlain by the Marcellus and Utica Shales in New York. The Catskill Forest Preserve, located entirely within the Catskill Park boundaries, is located within the eastern part of this area in portions of Delaware, Greene, Ulster, and Sullivan Counties (Figure 2.12). Lands included in the Catskill Forest Preserve are likely to contain scenic or aesthetic areas that may be considered visual resources or visually sensitive.

State Nature and Historic Preserves (Section 4 of Article XIV of State Constitution)

State nature and historic preserves are parcels of land owned by the state that were acquired to protect the biological diversity of plants, animals, and natural communities, and which may provide a field laboratory for the observation of and education in these relationships. These areas may also provide for the protection of places of historical and natural interest, and may be used by the public for passive recreational pursuits that are compatible with protection of the ecological significance, historic features, and/or natural character of the areas designated as state nature and historic preserves (NYSDEC 2011d).

Eight state nature and historic preserves are located in the counties within the area underlain by the Marcellus and Utica Shales in New York (Table 2.96). These state nature and historic preserves may contain scenic or aesthetic areas that may be considered visual resources or visually sensitive.



- Major Water Bodies
- County Boundary
- State Boundary
- Boundary of Area of Interest for Visual Resources
- National Natural Landmark
- National Wild and Scenic River
- National Wildlife Refuge
- State Forest Preserve
- State Unique Area
- State Wildlife Management Area

Figure 2.13: Natural Areas that May be Visually Sensitive

Source: ESRI, 2010; USGS, 2002; NYDEC, 2010; NPS, 2011; National Atlas US and USGS, 2010

Table 2.96 - State Nature and Historic Preserves in Counties Located within the Area Underlain by the Marcellus and Utica Shales in New York (New August 2011)

County Name*	Number of State Nature and Historic Preserves within County	Names of State Nature and Historic Preserves
Allegany	1	<ul style="list-style-type: none"> • Showy Lady Slipper Parcel (Town of New Hudson)
Cattaraugus	1	<ul style="list-style-type: none"> • Zoar Valley Unique Area (Towns of Otto and Persia)
Cortland	2	<ul style="list-style-type: none"> • Bog Brook (Towns of Southeast and Patterson) • Labrador Hollow (Town of Truxton)
Erie**	2	<ul style="list-style-type: none"> • Reinstein Woods (Town of Cheektowaga) • Zoar Valley Unique Area (Town of Collins)
Onondaga**	1	<ul style="list-style-type: none"> • Labrador Hollow (Town of Fabius)
Ontario**	1	<ul style="list-style-type: none"> • Squaw Island (Town of Canandaigua)
Yates	2	<ul style="list-style-type: none"> • Parish Gully (Town of Italy) • Clark Gully (Towns of Middlesex and Italy)
Total	8***	

Sources: ESRI 2010; OPRHP 2008; NYSDEC 2011d.

* There are no State Nature and Historic Preserves within other counties located entirely or partially within the area underlain by the Marcellus and Utica Shales in New York.

** Only a portion of the county is located within the area underlain by the Marcellus and Utica Shales in New York.

*** Labrador Hollow is in two counties (Onondaga and Cortland); Zoar Valley Unique Area is in two counties (Cattaraugus and Erie).

Rivers designated as National or State Wild, Scenic or Recreational (16 U.S.C. Chapter 28, ECL 15-2701 et seq.)

National Wild, Scenic or Recreational Rivers are those rivers designated by Congress or the Secretary of the Interior in accordance with the Wild and Scenic Rivers Act of 1968. The purpose of such designation is to preserve those rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations. Wild rivers are those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watershed or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America. Scenic rivers are those rivers or sections of rivers that are free of impoundments, with shorelines or a watershed still largely primitive and shorelines largely undeveloped, but accessible in places by roads. Recreational rivers are those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past (National Wild and Scenic Rivers System 2011a).

A portion of only one river, the Delaware River (also known as the Upper Delaware Scenic and Recreational River), has been designated a National Wild and Scenic River in New York State (National Wild and Scenic Rivers System 2011b, 2011c; NPS 2010c). This portion of the Delaware River, located in Delaware County along the New York-Pennsylvania border, is within the area underlain by the Marcellus and Utica Shales in New York (see Table 2.97 and Figure 2.13). Designated in part for its scenic qualities, this portion of the Delaware River contains scenic areas that may be considered visual resources or visually sensitive.

A portion of one other water body in New York State, the East Branch of Fish Creek, located in Lewis County, was studied for its potential for inclusion in the National Wild and Scenic Rivers System (National Wild and Scenic Rivers System 2011d). This portion of Fish Creek is located in Oneida County, which is partially located within the area underlain by the Marcellus and Utica Shales in New York (Table 2.97).

Section 5(d) of the National Wild and Scenic Rivers Act of 1968 requires federal agencies to consider the effects of planned use and development on potential national wild and scenic river areas. In partial fulfillment of this requirement, the NPS has compiled and maintains a Nationwide Rivers Inventory (NRI), which is a register of river segments that potentially qualify as National Wild, Scenic or Recreational River areas (NPS 2008a).

In order to be listed on the NRI, a river must be free-flowing and possess one or more Outstanding Remarkable Values (ORVs). In order to be assessed as outstandingly remarkable, a river-related value must be a unique, rare, or exemplary feature that is significant at a comparative regional or national scale. Such values must be directly river-related: located in the river or on its immediate shorelands (generally within 0.25 mile on either side of the river); contribute substantially to the function of the river ecosystem; and/or owe their location or existence to the presence of the river. ORVs may involve values associated with scenery, recreation, geology, fish, wildlife, prehistory, history, cultural, or other values (e.g., hydrology, paleontology, or botany resources) (NPS 2008a).

Portions of 17 NRI-listed rivers or water bodies are located partially or entirely within the area underlain by the Marcellus and Utica Shales in New York (Table 2.97). Many of these rivers or water bodies have been designated in part for their scenic qualities, and all of these rivers or water bodies may contain scenic areas that may be considered visual resources or visually sensitive.

State-designated Wild, Scenic and Recreational Rivers are those rivers or portions of rivers of the state of New York protected by the state's Wild Scenic and Recreational Rivers Act. This act protects those rivers of the state that possess outstanding scenic, ecological, recreational, historic, and scientific values. Attributes of these rivers may include value derived from fish and wildlife and botanical resources, aesthetic quality, archaeological significance, and other cultural and historic features. State policy is to preserve designated rivers in a free-flowing condition, protecting them from improvident development and use, and to preserve the enjoyment and benefits derived from these rivers for present and future generations (NYSDEC 2011e).

Portions of two state-designated Wild, Scenic and Recreational Rivers - the Genesee River and the Upper Delaware River - flow within counties located partially or entirely within the area underlain by the Marcellus and Utica Shales in New York (Table 2.97). These rivers have been designated, in part, for their scenic qualities, and both of these rivers may contain scenic areas that may be considered visual resources or visually sensitive.

Table 2.97 - National and State Wild, Scenic and Recreational Rivers (designated or potential) Located within the Area Underlain by the Marcellus and Utica Shales in New York (New August 2011)

County Name*	Name of River or Water Body	Designation Status
Albany**	<ul style="list-style-type: none"> • Portion of Catskill Creek*** 	<ul style="list-style-type: none"> • Listed in NRI in 1982
Allegany	<ul style="list-style-type: none"> • Portions of Genesee River*** 	<ul style="list-style-type: none"> • Listed in NRI in 1982; updated in 1995 • Designated a State Wild, Scenic and Recreational River
Cattaraugus	<ul style="list-style-type: none"> • Portions of Allegheny River • Portions of Cattaraugus Creek*** • Portion of Conewango Creek *** 	<ul style="list-style-type: none"> • Listed in NRI in 1982, updated in 1995 • Listed in NRI in 1982; updated in 1995 • Listed in NRI in 1982
Cayuga**	<ul style="list-style-type: none"> • Portion of Fall Creek*** 	<ul style="list-style-type: none"> • Designated a State Wild, Scenic and Recreational River
Chautauqua	<ul style="list-style-type: none"> • Portion of Cattaraugus Creek*** • Portion of Chautauqua Creek • Portion of Conewango Creek*** 	<ul style="list-style-type: none"> • Listed in NRI in 1982; updated in 1995 • Listed in 1982 • Listed in NRI in 1982
Chemung	<ul style="list-style-type: none"> • Portion of Chemung River 	<ul style="list-style-type: none"> • Listed in NRI in 1982
Delaware	<ul style="list-style-type: none"> • Delaware River (Upper)*** • Portions of Delaware River, East Branch 	<ul style="list-style-type: none"> • Designated a National Wild & Scenic River in 1978 • Listed in NRI in 1982 and 1995
Erie**	<ul style="list-style-type: none"> • Portions of Cattaraugus Creek*** 	<ul style="list-style-type: none"> • Listed in NRI in 1982; updated in 1995
Greene**	<ul style="list-style-type: none"> • Portion of Batavia Kill 	<ul style="list-style-type: none"> • Listed in NRI in 1982
Livingston**	<ul style="list-style-type: none"> • Portions of Genesee River*** 	<ul style="list-style-type: none"> • Listed in NRI in 1982; updated in 1995 • Designated a State Wild, Scenic and Recreational River
Orange**	<ul style="list-style-type: none"> • Portion of Basher Kill *** 	<ul style="list-style-type: none"> • Listed in NRI in 1995
Steuben	<ul style="list-style-type: none"> • Portion of Canisteo River • Portion of Cohocton River 	<ul style="list-style-type: none"> • Listed in NRI in 1995 • Listed in NRI in 1995
Sullivan**	<ul style="list-style-type: none"> • Delaware River (Upper)*** • Portion of Basher Kill*** • Portion of Beaver Kill*** • Portions of Neversink River, including East and West Branches • Portion of Mongaup Creek 	<ul style="list-style-type: none"> • Designated a National Wild and Scenic River in 1978 • Listed in NRI in 1995 • Listed in NRI in 1992; updated in 1995 • Listed in 1982 and 1995 • Listed in NRI in 1995
Tompkins	<ul style="list-style-type: none"> • Portion of Fall Creek*** 	<ul style="list-style-type: none"> • Designated a State Wild, Scenic and Recreational River
Ulster**	<ul style="list-style-type: none"> • Portion of Beaver Kill*** • Portion of Esopus Creek • Portions of Neversink River, including East and West Branches 	<ul style="list-style-type: none"> • Listed in NRI in 1992; updated in 1995 • Listed in NRI in 1995 • Listed in 1982 and 1995
Wyoming	<ul style="list-style-type: none"> • Portions of Genesee River*** 	<ul style="list-style-type: none"> • Listed in NRI in 1982; updated in 1995 • Designated a State Wild, Scenic and Recreational River

Sources: ESRI 2010; NPS 2008a, 2009a, 2010c; OPRHP 2008; NYSDEC 2011f.

* There are no national or state Wild, Scenic and Recreational Rivers within other counties located entirely or partially within the area underlain by the Marcellus and Utica Shales in New York.

** Only a portion of the county is located within the area underlain by the Marcellus and Utica Shales in New York.

*** Portions of the Genesee River are in three counties (Allegany, Wyoming, and Livingston); portions of the Beaver Kill are in two counties (Ulster and Sullivan); portions of Cattaraugus Creek are in three counties (Erie, Cattaraugus, and Chautauqua); Conewango Creek is in two counties (Chautauqua and Cattaraugus); Basher Kill is in two counties (Orange and Sullivan); the Upper Delaware River is in two counties (Delaware and Sullivan); Fall Creek is in two counties (Cayuga and Tompkins).

National Wildlife Refuges (16 U.S.C. 668dd), State Game Refuges and State Wildlife Management Areas (ECL 11-2105)

National Wildlife Refuges (NWRs) are a network of lands and waters included in the National Wildlife Refuge system and managed by the U.S. Fish and Wildlife Service. These lands and waters are set aside for the conservation, management and, where appropriate, restoration of fish, wildlife, and plant resources and their habitats. In addition to the task of conserving wildlife, NWRs may also be managed for six wildlife-dependent recreational uses: hunting, fishing, wildlife observation, photography, and environmental education and interpretation. There are three NWRs in counties that are partially within the area underlain by the Marcellus and Utica Shales of New York: The Iroquois NWR in Genesee and Orleans Counties; the Montezuma NWR in Seneca and Wayne Counties; and the Shawangunk Grasslands NWR in Ulster County (USFWS 2011). However, none of the NWRs are located within the area underlain by the Marcellus and Utica Shales in New York (Figure 2.13).

New York State's ECL (11-2105) defines state game refuges as lands set aside or established for the protection of wildlife and fish. Such lands remain game refuges until the state permits the taking of wildlife or fish within these lands. State Wildlife Management Areas (WMAs) are lands owned by New York State that have been acquired primarily for the production and use of wildlife, including research on wildlife species and habitat management. WMAs are under the control and management of the Department's DFWMR. While fishing, hunting and trapping are the most widely practiced recreational activities on many WMAs, most also provide opportunities for hiking, cross-country skiing, bird watching, or enjoying nature (NYSDEC 2011g).

There are 42 state game refuges or WMAs within the area underlain by the Marcellus and Utica Shales in New York (Table 2.98 and Figure 2.13). Many of the lands included in state game refuges or WMAs contain scenic areas that may be considered visual resources or visually sensitive.

Table 2.98 - State Game Refuges and State Wildlife Management Areas Located within the Area Underlain by the Marcellus and Utica Shales in New York (New August 2011)

County Name*	Number of State Game Refuges and WMAs	Name of State Game Refuges or WMA
Albany**	2	<ul style="list-style-type: none"> • Louise E. Keir WMA • Partridge Run WMA
Allegany	4	<ul style="list-style-type: none"> • Alma Pond • Genesee Valley WMA • Hanging Bog WMA • Keeney Swamp WMA
Cattaraugus	2	<ul style="list-style-type: none"> • Conewango Swamp WMA • Harwood Lake MUA
Chautauqua	8	<ul style="list-style-type: none"> • Alder Bottom WMA • Canadaway Creek WMA • Clay Pond WMA • Hartson Swamp WMA • Jacquins Pond WMA • Kabob WMA • Tom's Point WMA • Watts Flats WMA
Chenango	1	<ul style="list-style-type: none"> • Pharsalia WMA
Delaware	2	<ul style="list-style-type: none"> • Bear Spring Mountain WMA • Wolf Hollow WMA
Erie**	1	<ul style="list-style-type: none"> • Hampton Brook Woods WMA
Greene**	1	<ul style="list-style-type: none"> • Vinegar Hill WMA
Livingston**	2	<ul style="list-style-type: none"> • Conesus Inlet WMA • Rattlesnake Hill WMA
Madison**	1	<ul style="list-style-type: none"> • Tioughnioga WMA
Ontario**	2	<ul style="list-style-type: none"> • Honeoye Creek WMA • Stid Hill MUA
Orange**	1	<ul style="list-style-type: none"> • Cherry Island WMA
Otsego**	2	<ul style="list-style-type: none"> • Crumhorn Mountain WMA • Hooker Mountain WMA
Schoharie**	1	<ul style="list-style-type: none"> • Franklinton Vlaie WMA
Schuyler	2	<ul style="list-style-type: none"> • Catharine Creek WMA • Waneta-Lamoka WMA
Seneca**	1	<ul style="list-style-type: none"> • Willard WMA
Steuben	4	<ul style="list-style-type: none"> • Cold Brook WMA • Erwin WMA • Helmer Creek WMA • West Cameron WMA
Sullivan**	2	<ul style="list-style-type: none"> • Bashakill WMA • Mongaup Valley WMA
Tompkins	1	<ul style="list-style-type: none"> • Connecticut Hill WMA
Wyoming	1	<ul style="list-style-type: none"> • Silver Lake Outlet WMA
Yates	1	<ul style="list-style-type: none"> • High Tor WMA
Total	42	

Source: ESRI 2010; NYSDEC 2011g, 2011h; USFWS 2011.

* No other NWRs or state game refuges or wildlife management areas in New York State are located within the area underlain by the Marcellus and Utica Shales in New York.

** Only a portion of the county is located within the area underlain by the Marcellus and Utica Shales in New York State.

National Natural Landmarks [36 CFR Part 62]

National Natural Landmarks (NNLs) are sites that contain outstanding biological and/or geological resources, regardless of land ownership, and are selected for their outstanding condition, illustrative value, rarity, diversity, and value to science and education. NNL sites are designated by the Secretary of the Interior, with landowner concurrence (NPS 2008b, 2009b, 2011e). Five NNLs are located within the area underlain by the Marcellus and Utica Shales in New York (Figure 2.13 and Table 2.99). These NNLs are a combination of unique ecological settings such as bogs or marshes and geological features (NPS 2011f). They are likely to contain aesthetic areas that may be considered visual resources or visually sensitive.

Table 2.99 - National Natural Landmarks Located within the Area Underlain by the Marcellus and Utica Shales in New York (New August 2011)

County Name*	Name of National Natural Landmark	Description
Albany	<ul style="list-style-type: none"> ● Bear Swamp 	<ul style="list-style-type: none"> ● Designated in 1973 ● Low, swampy woodland with relict stands of great laurel
Allegany	<ul style="list-style-type: none"> ● Moss Lake Bog 	<ul style="list-style-type: none"> ● Designated in 1973 ● Post-glacial sphagnum bog in a small kettle lake
Cattaraugus	<ul style="list-style-type: none"> ● Deer Lick Nature Sanctuary 	<ul style="list-style-type: none"> ● Designated in 1967 ● Gorge and mature northern hardwood forest
Livingston	<ul style="list-style-type: none"> ● Fall Brook Gorge 	<ul style="list-style-type: none"> ● Designated in 1970 ● Gorge exposing Upper and Middle Devonian Age geological strata with fossil remains and a waterfall ● Series of ecological communities developed in response to sharply contrasting microclimates
Tompkins	<ul style="list-style-type: none"> ● McLean Bogs 	<ul style="list-style-type: none"> ● Designated in 1973 ● Two spring-fed bogs, one acidic and one alkaline ● Rare plant species and one of the best examples of a northern deciduous forest in New York

Sources: ESRI 2010; NPS 2011f.

* None of the other NNLs in New York State, including those in Genesee, Onondaga, Seneca, and Ulster Counties, are located within the area underlain by the Marcellus and Utica Shales in New York

2.4.12.4 Additional Designated Scenic or Other Areas

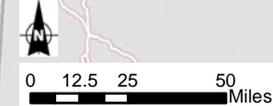
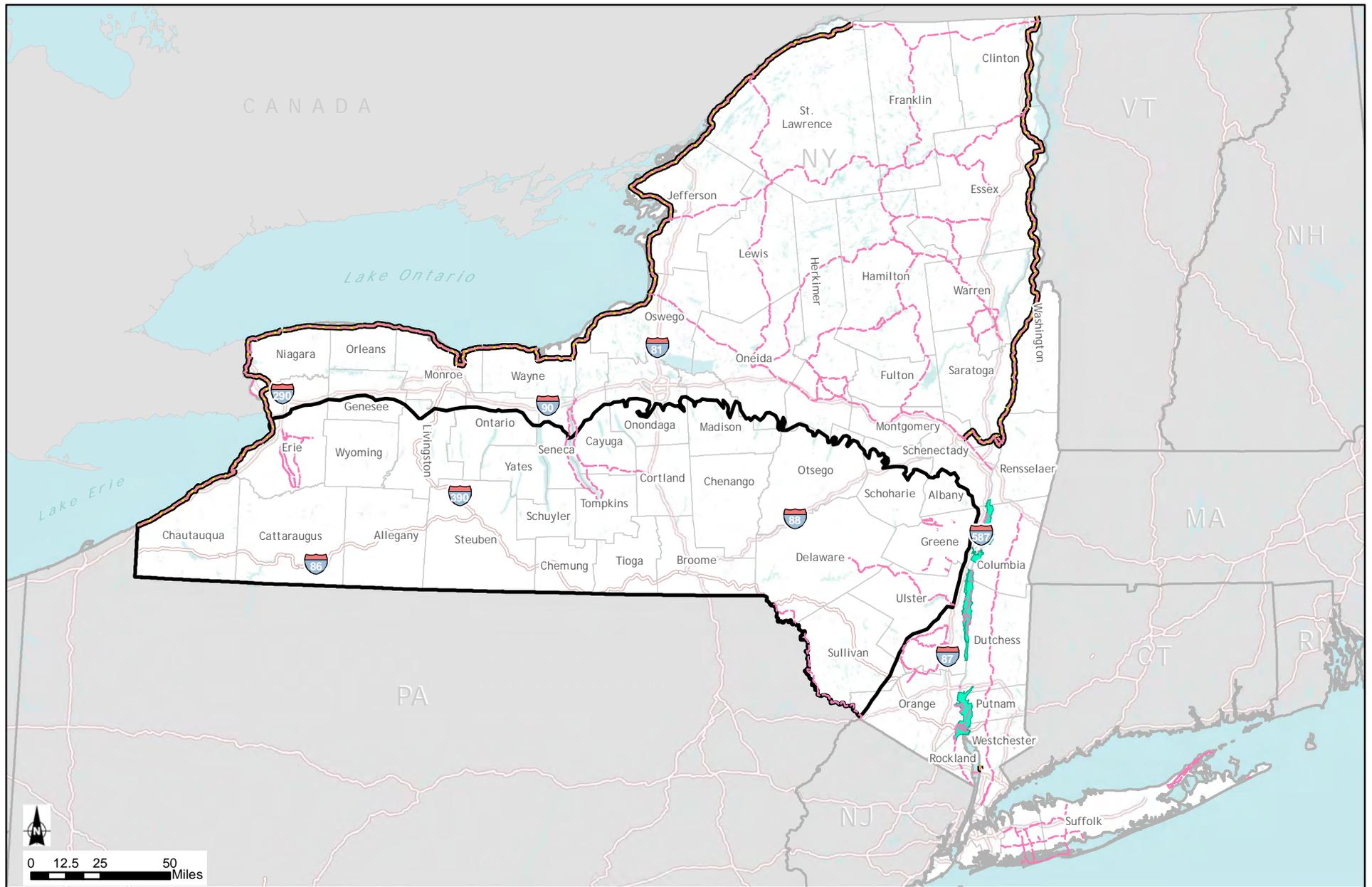
This section discusses additional designated scenic or other areas that are considered visual resources or visually sensitive per NYSDEC Program Policy DEP-00-2, including sites, areas, lakes, reservoirs, or highways designated or eligible for designation as scenic; scenic areas of statewide significance; Adirondack Park scenic vistas; Palisades Park system components; and national heritage areas (NYSDEC 2000). These areas often contain scenic areas and/or are developed partly because of their associated visual or aesthetic qualities.

A site, area, lake, reservoir, or highway designated or eligible for designation as scenic (ECL Article 49 or DOT equivalent and APA), Designated State Highway Roadside (Article 49 Scenic Road)

Resources designated or eligible for designation as scenic can include sites, areas, lakes, reservoirs, or highways. Many of these types of resources are discussed in other areas of the Visual Resources section. This subsection focuses on designated scenic roads.

New York State Scenic Byways are transportation corridors that are of particular statewide interest. They are representative of a region's scenic, recreational, cultural, natural, historic, or archaeological significance (NYSDOT 1999-2011). There are nine state-designated and three proposed scenic byways within the area underlain by the Marcellus and Utica Shales in New York (see Table 2.100). The locations of many of these are shown on Figure 2.14. There are also a number of state-designated scenic roads in New York (NYSDOT 1999-2011). While there are 28 roads in portions of Orange and Greene Counties, these are all located outside the area underlain by the Marcellus and Utica Shales in New York.

The Great Lakes Seaway Trail, one of the state-designated scenic byways, is also a designated National Scenic Byway (Table 2.100 and Figure 2.14). The National Scenic Byways Program is managed by the U.S. Department of Transportation, Federal Highway Administration. National Scenic Byways are roads that are recognized based on one or more archaeological, cultural, historic, natural, recreational, and scenic qualities (USDOT 2011). State and national scenic byways and roads are resources designated specifically for scenic or aesthetic areas or qualities and which would be considered visual resources or visually sensitive.



- Major Water Bodies
- Boundary of Area of Interest for Visual Resources
- National Scenic Byway
- State Scenic Byway
- Scenic Areas of Statewide Significance
- County Boundary
- State Boundary

Figure 2.14: Additional Designated Scenic or other Areas that May be Visually Sensitive

Source: ESRI, 2010; USGS, 2002; NYDEC, 2010; NPS, 2011; National Atlas US and USGS, 2010

Table 2.100 - Designated and Proposed National and State Scenic Byways, Highways, and Roads Located within the Area Underlain by the Marcellus and Utica Shales in New York (New August 2011)

Name	Description
Great Lakes Seaway Trail	<ul style="list-style-type: none"> ● National Scenic Byway ● State-designated scenic byway ● Great Lakes/Canadian border ● Scenic, recreational, historic, and natural themes
Western New York Southtowns Scenic Byway	<ul style="list-style-type: none"> ● State-designated scenic byway ● Lake Erie ● Scenic, historical, natural, recreational themes
Cayuga Lake Scenic Byway	<ul style="list-style-type: none"> ● State-designated scenic byway ● Finger Lakes region of New York State ● Scenic and recreational themes
Scenic Route 90	<ul style="list-style-type: none"> ● State-designated scenic byway ● Finger Lakes region of New York State ● Scenic, recreational, natural, and historic themes
Route 417/36 Scenic Byway	<ul style="list-style-type: none"> ● State-designated scenic byway ● Finger Lakes region of New York State ● Scenic, recreational, natural, and historical themes
Seneca Lake, Hector and Lodi Scenic Byway	<ul style="list-style-type: none"> ● State-designated scenic byway ● Finger Lakes region of New York State ● Scenic, historical, recreational, and natural themes
Route Twenty Scenic Byway (U.S. Route 20)	<ul style="list-style-type: none"> ● State-designated scenic byway ● Central New York State ● Scenic, natural and historic themes
Shawangunk Mountains Scenic Byway*	<ul style="list-style-type: none"> ● State-designated scenic byway ● Shawangunk Mountains ● Scenic and natural themes
Route 28 Central Catskills Scenic Byway	<ul style="list-style-type: none"> ● Proposed scenic byway ● Catskill Mountains
Mountain Cloves Scenic Byway	<ul style="list-style-type: none"> ● Proposed scenic byway ● Catskill Mountains
Durham Valley Scenic Byway	<ul style="list-style-type: none"> ● Proposed scenic byway ● Catskill Mountains
Upper Delaware Scenic Byway	<ul style="list-style-type: none"> ● State-designated scenic byway ● Delaware River Valley ● Scenic, natural, historic, and recreational themes

Sources: NYSDOT 1999-2011; USDOT 2011; Catskill Center for Conservation and Development 2011; Durham Valley Scenic Byway Corridor Coordinating Committee (undated); Mountain Cloves Scenic Byway Steering Committee 2011.

* Shawangunk Mountains Scenic Byway is adjacent to and immediately outside of the western edge of the area underlain by the Marcellus and Utica Shales in New York.

Scenic Areas of Statewide Significance (Article 42 of Executive Law)

Scenic Areas of Statewide Significance (SASS) are areas designated by the Department of State based on a scenic assessment program developed by the Division of Coastal Resources. This program identifies the scenic qualities of coastal landscapes, evaluates them against criteria for determining aesthetic significance, and recommends areas for designation. An SASS designation protects scenic landscapes through the review of projects requiring state or federal actions, including direct actions, permits, or funding (NYSDOS 2004).

Six areas within the Hudson River Valley coastal regions in Columbia, Greene, Dutchess, and Ulster Counties were designated as SASSs in 1993. All six of these areas are outside the area underlain by the Marcellus and Utica Shales in New York (Figure 2.14).

Adirondack Park Scenic Vistas (Adirondack Park Land Use and Development Map)

The Adirondack Park was created in 1892 by the State of New York and is the largest publicly protected area in the contiguous United States. The boundary of the Park encompasses approximately 6 million acres in northern New York State, including portions of Saint Lawrence, Franklin, Clinton, Lewis, Herkimer, Hamilton, Essex, Oneida, Fulton, Warren, Saratoga, and Washington Counties. Nearly half of the Adirondack Park is publicly-owned and belongs to the people of New York State; this public land is constitutionally protected to remain “forever wild” forest preserve (Adirondack Park Agency 2003). No Adirondack Park Scenic Vistas are located within the boundary of the area underlain by the Marcellus and Utica Shales in New York (State of New York 2001).

Palisades Park (Palisades Interstate Park Commission)

The Palisades are a unique geological feature consisting of cliffs extending from southeastern New York State to northwestern New Jersey. While there is no Palisades Park in New York State, there are a number of state, county, and town parks in Orange and Rockland Counties, New York, that are located along the Palisades, many of which are operated in conjunction with the Palisades Interstate Park Commission. These parks include: Bear Mountain Park, Blauvelt State Park, Bristol Beach Park, Buttermilk Falls County Park, Clausland Mountain County Park, Franny Reese State Park, Goosepond Mountain Park, Harriman Park, Haverstraw Park, High Tor State Park, Highland Lakes Park, Hook Mountain State Park, Lake Superior Park, Minnewaska

Preserve, Mountain View Nature County Park, Nyack Beach State Park, Rockland Lake State Park, Schunemunk Ridge Park, Sean Hunter Ryan Memorial County Park, Sterling Forest Park, Storm King Mountain Park, Tackamack Town Park (North and South), and Tallman State Park (New York-New Jersey Trails Conference 1999-2011, Palisades Parks Conservancy 2003-2007). None of these parks are located within the area underlain by the Marcellus and Utica Shales in New York.

Bond Act Properties purchased under Exceptional Scenic Beauty or Open Space category
Bond Act Properties are properties purchased under the “Exceptional Scenic Beauty” or “Open Space” categories of the Environmental Bond Act of 1986. Properties included in the “Exceptional Scenic Beauty” category are defined as land forms, water bodies, geologic formations, and vegetation that possess significant scenic qualities or significantly contribute to scenic value. Properties included in the “Open Space” category are defined as open or natural land in or near urban or suburban areas necessary to serve the scenic or recreational needs thereof. Such properties are purchased by individual municipalities using grants from New York State; grants consist of moneys raised through the sale of environmental bonds. Municipalities can include cities; counties, towns, villages, and public benefit corporations; school districts or improvement districts within a city, county, town or village; or Indian tribes residing within New York state; or any combination thereof (FindLaw 2011).

The OPRHP’s Open Space Conservation Plan identifies 38 regional priority conservation projects within the area underlain by the Marcellus and Utica Shales in New York (Table 2.101). These projects represent the unique and irreplaceable open-space resources that encompass exceptional ecological, wildlife, recreational, scenic, and historical values. They were identified as a result of extensive analysis of New York State’s open-space conservation needs by nine Regional Advisory Committees, in consultation with NYSDEC and OPRHP (OPRHP 2009). If acquired, these projects would be considered Bond Act properties purchased under the Open Space category. Additional previous Bond Act Properties may be located throughout the counties located entirely or partially within the area underlain by the Marcellus and Utica Shales in New York. Bond Act Properties purchased under the “Exceptional Scenic Beauty” or “Open Space” categories contain, or may contain, scenic or aesthetic qualities that may be considered visual resources or visually sensitive.

Table 2.101 - Recommended Open Space Conservation Projects Located in the Area Underlain by the Marcellus and Utica Shales in New York (New August 2011)

County Name*	Number of Recommended Conservation Projects in County	Name of Recommended Conservation Project
Albany**	3	<ul style="list-style-type: none"> ● Black Creek Marsh/Vly Swamp (Project 44) – expand protection of wetland complex ● Five Rivers Environmental Education Center (Project 46) – protect Phillipinkill stream corridor to north and east of education center ● Helderberg Escarpment (Project 48) – protect southern extent of this natural feature
Allegany	1	<ul style="list-style-type: none"> ● Inland Lakes (Project 124)*** – protect undeveloped shoreline associated with wetlands and critical tributary habitat; protect water quality and important fish and wildlife habitat; and secure adequate public access for recreational opportunities
Cattaraugus	3	<ul style="list-style-type: none"> ● Allegheny River Watershed (Project 117) – protect areas for conservation, recreational, educational, and public access purposes ● Cattaraugus Creek and Tributaries (Project 119)*** – protect fisheries, recreational access, and unique geological areas ● Significant wetlands (Project 127)*** – protect significant natural wetland communities and provide recreational, educational, and ecological enhancement opportunities (e.g., Keeney Swamp, Bird Swamp, and Hartland Swamp)
Cayuga**	2	<ul style="list-style-type: none"> ● Carpenter Falls/Bear Swamp Corridor (Project 91)*** – protect water quality, preserve scenic resources, and expand the trail system in Bear Swamp State Forest ● Summerhill Fen and Forest Complex (Project 102) – secure upland forests, wetlands, and adjacent upland buffers along Fall Creek that are recognized for biological and recreational significance
Chautauqua	5	<ul style="list-style-type: none"> ● Cattaraugus Creek and Tributaries (Project 119)*** – protect fisheries, recreational access, and unique geological areas ● Chautauqua Lake Access, Vistas, Shore Lands and Tributaries (Project 120) – secure public access for recreational fishing and boating, preserve undeveloped shoreline, and protect water quality ● Lake Erie Tributary Gorges (Project 125)*** – acquire public access to various gorges along tributaries to Lake Erie ● Trails and Trailways (Project 126) – protect existing trail corridors and acquire new corridor for trails ● Inland Lakes (Project 124)*** – protect undeveloped shoreline associated with wetlands and critical tributary habitat; protect water quality and important fish and wildlife habitat; and secure adequate public access for recreational opportunities
Chemung	2	<ul style="list-style-type: none"> ● Catharine Valley Complex (Project 108) – preserve unique geological and ecological areas and acquire land for recreational use of historic Chemung Canal towpath ● Chemung River Greenbelt (Project 109)*** – expand and enhance significant recreational resources in a unique scenic landscape and protect important wildlife habitat
Chenango	1	<ul style="list-style-type: none"> ● Genny Green Trail/Link Trail (Project 94) – acquire land for major trail connections
Cortland	1	<ul style="list-style-type: none"> ● Develop a State Park in Cortland County (Project 92) – develop a state park

County Name*	Number of Recommended Conservation Projects in County	Name of Recommended Conservation Project
Delaware	3	<ul style="list-style-type: none"> ● Catskill River and Road Corridors (Project 36)*** – protect lands that serve as riparian buffers, preserve or restore floodplain areas, protect scenic areas and vistas along principal road corridors and on visible ridgelines, protect flood-prone areas, and enhance public access and recreational opportunities in the following areas: Beaverkill/Willowemoc/Route 17 (future Interstate 86) Corridor; Delaware River Branches and Main Stem Corridors; Mongaup Valley WMA; and Route 28 Corridor (Blue Stone Wild Forest, Ticetenevck Mt./Tonshi Mt./Kenozia Lake, Catskill Interpretive Center area, and Meade Hill/Fleischmann Mountain) ● Upper Delaware Highlands (Project 42)*** – provide contiguous natural resource protection for one of key remaining ecological regions in the continental U.S through easements for forestland and farmlands and along the Upper Delaware Scenic Byway. ● Susquehanna River Valley Corridor (Project 53)*** - protect areas within the Chesapeake Bay drainage basin for water quality, fisheries, public recreation, public access, birding, and agricultural conservation
Erie**	2	<ul style="list-style-type: none"> ● Buffalo River Watershed (Project 118)*** – protect the Buffalo River corridor and three of its tributaries and improve access for recreational users ● Lake Erie Tributary Gorges (Project 125)*** – acquire public access to various gorges along tributaries to Lake Erie
Livingston**	2	<ul style="list-style-type: none"> ● Genesee River Corridor (Project 107)*** – protect various habitats and landscapes along the Genesee River ● Western Finger Lakes: Conesus, Hemlock, Canadice and Honeoye (Project 113)*** - protect Finger Lakes shorelines that are wholly or largely undeveloped
Madison**	2	<ul style="list-style-type: none"> ● Nelson Swamp (Project 95) – reduce ownership fragmentation of swamp, protect biologically significant swamp, further management objective of perpetual protection, and enhance compatible public use opportunities ● Central Leatherstocking – Mohawk Grasslands Area (Project 87)*** – multi-regional project for conservation of habitat for grassland birds (grasslands occur in portions of Schoharie, Otsego, Oneida, Madison, and Onondaga Counties)
Oneida**	1	<ul style="list-style-type: none"> ● Central Leatherstocking – Mohawk Grasslands Area (Project 87)*** – multi-regional project for conservation of habitat for grassland birds (grasslands occur in portions of Schoharie, Otsego, Oneida, Madison and Onondaga Counties)
Onondaga**	2	<ul style="list-style-type: none"> ● Camillus Valley/Nine Mile Creek (Project 90) – buffer important attributes of the Nine Mile Creek Valley from development and provide public waterway access ● Carpenter Falls/Bear Swamp Corridor (Project 91)*** – protect water quality, preserve scenic resources, and expand the trail system in Bear Swamp State Forest
Ontario**	2	<ul style="list-style-type: none"> ● Hi Tor/Bristol Hills (Project 110)*** – ensure that key tracts of land remain as open space in this area ● Western Finger Lakes: Conesus, Hemlock, Canadice and Honeoye (Project 113)*** - protect Finger Lakes shorelines that are wholly or largely undeveloped ● Wolf Gully (Project 114) – protect for its exceptional biological diversity
Orange**	1	<ul style="list-style-type: none"> ● Catskill River and Road Corridors (Project 36)*** – protect lands that serve as riparian buffers, preserve or restore floodplain areas, protect scenic areas and vistas along principal road corridors and on visible ridgelines, protect flood-prone areas, and enhance public access and recreational opportunities in

County Name*	Number of Recommended Conservation Projects in County	Name of Recommended Conservation Project
		the following areas: Beaverkill/Willowemoc/Route 17 (future Interstate 86) Corridor; Delaware River Branches and Main-stem Corridors; Mongaup Valley WMA; and Route 28 Corridor (Blue Stone Wild Forest, Ticeteneyck Mt./Tonshi Mt./Kenozia Lake, Catskill Interpretive Center area and Meade Hill/Fleischmann Mountain)
Otsego**	2	<ul style="list-style-type: none"> ● Susquehanna River Valley Corridor (Project 53)*** - protect areas within the Chesapeake Bay drainage basin for water quality, fisheries, public recreation, public access, birding and agricultural conservation ● Central Leatherstocking – Mohawk Grasslands Area (Project 87)*** – multi-regional project for conservation of habitat for grassland birds (grasslands occur in portions of Schoharie, Otsego, Oneida, Madison, and Onondaga Counties)
Schoharie**	1	<ul style="list-style-type: none"> ● Central Leatherstocking – Mohawk Grasslands Area (Project 87)*** – multi-regional project for conservation of habitat for grassland birds (grasslands occur in portions of Schoharie, Otsego, Oneida, Madison, and Onondaga Counties)
Seneca**	1	<ul style="list-style-type: none"> ● Seneca Army Depot Conservation Area (Project 111) – protect a unique population of white deer
Steuben	1	<ul style="list-style-type: none"> ● Chemung River Greenbelt (Project 109)*** – expand and enhance significant recreation resources in a unique scenic landscape and protect important wildlife habitat
Sullivan**	4	<ul style="list-style-type: none"> ● Neversink Highlands (Project 28) – protect significant natural attractions and resources, hunting and fishing opportunities, and wildlife habitat in the following areas: Tomsco Falls, Neversink Gorge vicinity, Basha Kill vicinity and Harlen Swamp Wetland Complex ● Catskill River and Road Corridors (Project 36)*** – protect lands that serve as riparian buffers, preserve or restore floodplain areas, protect scenic areas and vistas along principal road corridors and on visible ridgelines, protect flood-prone areas, and enhance public access and recreational opportunities in the following areas: Beaverkill/Willowemoc/Route 17 (future Interstate 86) Corridor; Delaware River Branches and Main-stem Corridors; Mongaup Valley WMA; and Route 28 Corridor (Blue Stone Wild Forest, Ticeteneyck Mt./Tonshi Mt./Kenozia Lake, Catskill Interpretive Center area and Meade Hill/Fleischmann Mountain) ● New York City Watershed Lands (Project 39) – identify and protect high-priority sites on land that have potential for development, for forestry, or for fisheries and relatively large and/or link area already protected by private or public entities and/or allow for improved long-term management of land and water resources ● Upper Delaware Highlands (Project 42)*** – provide contiguous natural resource projection for one of key remaining ecological regions in the continental U.S through easements for forestland and farmlands and along the Upper Delaware Scenic Byway
Tioga	2	<ul style="list-style-type: none"> ● Two Rivers State Park (Project 103) – develop a state park ● Emerald Necklace (Project 104) – consolidate existing state holdings while ensuring linkage between public land in the vicinity of Ithaca, conserve lands, and enhance recreational opportunities
Tompkins	2	<ul style="list-style-type: none"> ● State Parks Greenbelt/Tompkins County (Project 101) – protect valuable open-space recreational resources between four state park facilities connected by the Black Diamond Trail Corridor ● Finger Lakes Shorelines (Project 105) – preserve portions of the shoreline of the Finger Lakes for public access or wildlife in the following areas or projects: Finger Lakes Water Trails, Owasco Flats, Camp Barton, On Cayuga

County Name*	Number of Recommended Conservation Projects in County	Name of Recommended Conservation Project
		Lake, B&H Railroad property at the south end of Keuka Lake in Hammondsport, extending the eastern terminus of the Outlet Trail to the Seneca Lake shoreline at Dresden, and undeveloped shoreline on Seneca Lake
Ulster**	3	<ul style="list-style-type: none"> ● Great Rondout Wetlands (Project 24) – protect several large wetlands in the following areas: Great Pacama Vly, Cedar Swamp and Beer Kill Wetlands/Cape Pond ● Catskill River and Road Corridors (Project 36)*** – protect lands that serve as riparian buffers, preserve or restore floodplain areas, protect scenic areas and vistas along principal road corridors and on visible ridgelines, protect flood-prone areas, and enhance public access and recreational opportunities in the following areas: Beaverkill/Willowemoc/Route 17 (future Interstate 86) Corridor; Delaware River Branches and Main-stem Corridors; Mongaup Valley WMA; and Route 28 Corridor (Blue Stone Wild Forest, Ticeteneyck Mt./Tonshi Mt./Kenozia Lake, Catskill Interpretive Center area, and Meade Hill/Fleischmann Mountain) ● Catskills Unfragmented Forest (Project 37) – securing additional large unfragmented areas of forestlands in the Catskill High Peaks areas, including the following sites : Overlook Mountain; Guardian Mountain; Indian Head Wilderness Consolidation; Balsam, Graham and Doubletop Mountains/Dry Brook Valley; Peekamoose Gorge; Frost Valley; Fir Brook/Round Pond/Black Bear Road Vicinity; West Shokan/Sampsonville Area Lands; Bearpen/Vly/Roundtop Mountains; Catskill Escarpment North and Windham High Peak; Rusk Mountain Wild Forest; Hunter West Kill Wilderness; and Catskill Mountain Heritage Trail
Wyoming	3	<ul style="list-style-type: none"> ● Buffalo River Watershed (Project 118)*** – protect the Buffalo River corridor and three of its tributaries and improve access for recreational users ● Inland Lakes (Project 124)*** – protect undeveloped shoreline associated with wetlands and critical tributary habitat; protect water quality and important fish and wildlife habitat; and secure adequate public access for recreational opportunities ● Inland Lakes (Project 124)*** – protect undeveloped shoreline associated with wetlands and critical tributary habitat; protect water quality and important fish and wildlife habitat; and secure adequate public access for recreational opportunities
Yates	1	<ul style="list-style-type: none"> ● Hi Tor/Bristol Hills (Project 110)*** – ensure that key tracts of land remain as open space in this area
Total	38***	

Source: OPRHP 2009.

* No other recommended conservation projects are located within the area underlain by the Marcellus and Utica Shales in New York.

** Only a portion of the county is located within the area underlain by the Marcellus and Utica Shales.

*** Susquehanna River Valley Corridor (Project 53) is in two counties (Otsego and Delaware); Cattaraugus Creek and Tributaries (Project 119) is in two counties (Cattaraugus and Chautauqua); Carpenter Falls/Bear Swamp Corridor (Project 91) may be in two counties (Cayuga and Onondaga); Lake Erie Tributary Gorges (Project 125) may be in two counties (Chautauqua and Erie); Central Leatherstocking – Mohawk Grasslands Area (Project 87) may occur in multiple counties (Schoharie, Otsego, Oneida, Madison and Onondaga); Catskill River and Road Corridors (Project 36) may occur in multiple counties (Delaware, Sullivan, Orange and Ulster); Catskill River and Road Corridors (Project 36) may occur in two counties (Delaware and Sullivan); Buffalo River Watershed (Project 118) will occur in two counties (Erie and Wyoming); Genesee River Corridor (Project 107) may occur in multiple counties from the New York/Pennsylvania state line to Lake Ontario; Western Finger Lakes: Conesus, Hemlock, Canadice and Honeoye (Project 113) will occur in two counties (Livingston and Ontario); Chemung River Greenbelt (Project 109) will occur in two counties (Chemung and Steuben); Inland Lakes (Project 124) is in three counties (Allegany, Chautauqua, and Wyoming); Hi Tor/Bristol Hills (Project 110) is in two counties (Yates and Ontario); Significant wetlands (Project 127) may occur in numerous counties.

2.4.13 Noise⁵⁶

2.4.13.1 Noise Fundamentals

Noise is defined as any unwanted sound. Sound is defined as any pressure variation that the human ear can detect. Humans can detect a wide range of sound pressures, but only the pressure variations occurring within a particular set of frequencies are experienced as sound. However, the acuity of human hearing is not the same at all frequencies. Humans are less sensitive to low frequencies than to mid-frequencies, and so noise measurements are often adjusted (or weighted) to account for human perception and sensitivities. The unit of noise measurement is a decibel (dB). The most common weighting scale used is the A-weighted scale, which was developed to allow sound-level meters to simulate the frequency sensitivity of human hearing. Sound levels measured using this weighting are noted as dBA (A-weighted decibels). (“A” indicates that the sound has been filtered to reduce the strength of very low and very high frequency sounds, much as the human ear does.) The A-weighted scale is logarithmic, so an increase of 10 dB actually represents a sound that is 10 times louder. However, humans do not perceive a 10-dBA increase as 10 times louder but as only twice as loud.

The following is typical of human responses to changes in noise level:

- A 3-dBA change is the threshold of change detectable by the human ear;
- A 5-dBA change is readily noticeable; and
- A 10-dBA change is perceived as a doubling (or halving) of noise level.

The decrease in sound level from any single noise source normally follows the “inverse square law.” That is, sound pressure level (SPL) changes in inverse proportion to the square of the distance from the sound source. At distances greater than 50 feet from a sound source, every doubling of the distance produces a 6-dB reduction in the sound level. Therefore, a sound level of 70 dB at 50 feet would have a sound level of approximately 64 dB at 100 feet. At 200 feet, sound from the same source would be perceived at a level of approximately 58 dB.

⁵⁶ Subsection 2.4.13, in its entirety, was provided by Ecology and Environment Engineering, P.C., August 2011 and was adapted by the Department.

The total sound pressure created by multiple sound sources does not create a mathematical additive effect. For example, two proximal noise sources that are 70 dBA each do not have a combined noise level of 140 dBA. In this case the combined noise level is 73 dBA. As the difference between the two sound levels is 0 dB, 3 dB are added to the sound level to compensate for the additive effects of the sound.

To characterize the average ambient noise (“noise”) environment in a given area, noise level descriptors are commonly used. The Leq (sound level equivalent) is generally used to characterize the average sound energy that occurs during a relatively short period, such as an hour. The Ldn (day-night level) would be used for an entire 24-hour period. To account for peoples’ greater sensitivity to sound during nighttime hours, the Ldn noise metric descriptor places a stronger emphasis on noise that occurs during nighttime hours (10 p.m. to 7 a.m.) by applying a 10-dB “penalty” to those hours. The Lmax refers to the maximum A-weighted noise level recorded for a single noise event during a given period.

Although both the sound power and sound pressure characteristic of sound share the same unit of measure, the decibel (dB), and the term “sound level” is commonly substituted for each, they have different properties. Sound power is the acoustical energy emitted by the sound source, and is an absolute value; it is not affected by the environment. The SPL is the varying difference, at a fixed point, between the pressure caused by a sound wave and atmospheric pressure. Sound pressure is what our ears hear and what sound level meters measure. The sound power level is always considerably higher than the sound pressure level near a source because it takes into account the effective radiating surface area of the source.

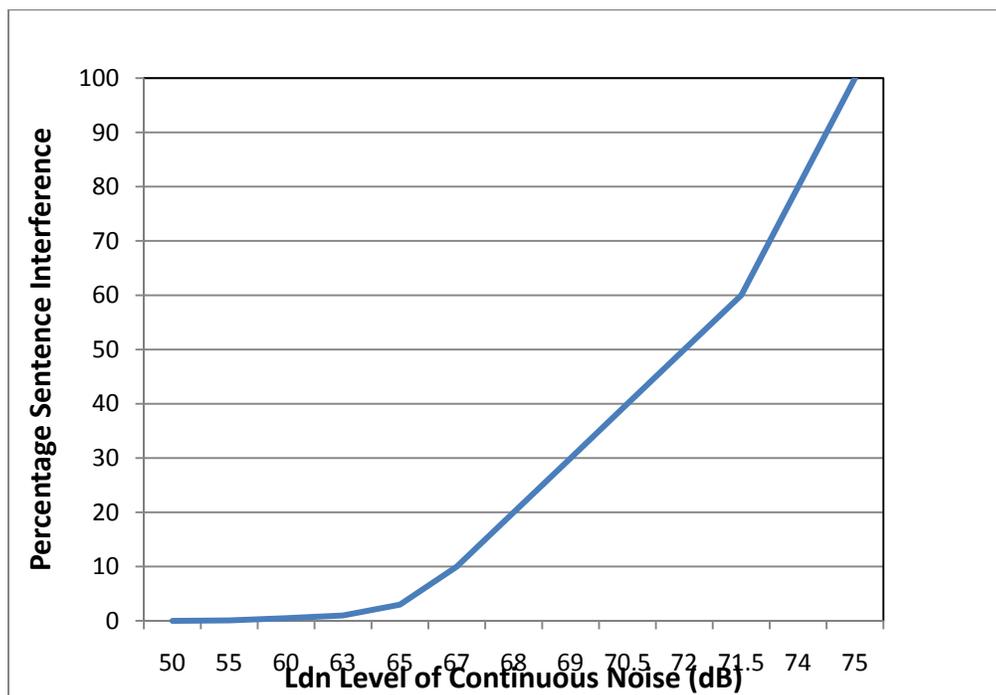
2.4.13.2 Common Noise Effects

Common noise effects include speech interference, sleep disturbance, and annoyance.

Speech Interference

The interference with speech comprehension is a masking process in which environmental noise curtails or prevents speech perception. The United States Environmental Protection Agency (USEPA) established the relationship between percent speech intelligibility and continuous noise level (USEPA 1974). This relationship is presented in Figure 2.15

Figure 2.15 - Level of Continuous Noise Causing Speech Interference (New August 2011)



Source: USEPA 1974.

Sleep Disturbance

Exposure to noise can produce disturbances of sleep in terms of difficulty to fall asleep, alterations of sleep pattern and depth, and awakening. It should be noted that the adverse effect of noise on sleep partly depends on the nature of the noise source, and there are considerable differences in individual reactions to the same noise. To avoid sleep disturbance, the World Health Organization (WHO) recommends an indoor level in bedrooms of 30 dBA for continuous noise and an Lmax of 45 dBA for single sound events (WHO 2000).

Annoyance

The capacity of noise to induce annoyance depends upon many of its physical characteristics, including its SPL and spectral characteristics, as well as the variations of these properties over time. Numerous studies have been conducted to assess community annoyance in response to transportation noise sources. A summary of community annoyance is presented in Table 2.102.

Table 2.102 - Effects of Noise on People (New August 2011)

Ldn (dBA)	Percent Annoyance	Average Community Reaction	General Community Attitude Towards Area
≥75	37	Very Severe	Noise is likely to be the most important of all adverse aspects of the community environment.
70	22	Severe	Noise is one of the most important adverse aspects of the community environment.
65	12	Significant	Noise is one of the important adverse aspects of the community environment.
60	7	Moderate	Noise may be considered an adverse aspect of the community environment.
≤55	3	Slight	Noise is considered no more important than various other environmental factors.

Source: Cowan 1994.

2.4.13.3 Noise Regulations and Guidance

Federal

In 1974 the USEPA published *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety* (USEPA 1974). This publication evaluates the effects of environmental noise with respect to health and safety. The document provides information for state and local governments to use in developing their own ambient noise standards. The USEPA has determined that in order to protect the public from activity interference and annoyance outdoors in residential areas, noise levels should not exceed an Ldn of 55 dBA (Table 2.103). The USEPA considers an Ldn of 55 dBA to be the maximum sound level that will not adversely affect public health and welfare by interfering with speech or other activities in outdoor areas.

Table 2.103 - Summary of Noise Levels Identified as Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety (New August 2011)

Effect	Level	Area
Hearing Loss	Leq ₍₂₄₎ =< 70 dB	All areas
Outdoor activity interference and annoyance	Ldn =< 55 dB	Outdoors in residential areas and farms and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis for use
	Leq ₍₂₄₎ =< 55 dB	Outdoor areas where people spend limited amounts of time, such as school yards, playgrounds, etc.
Indoor activity interference and annoyance	Ldn =< 45 dB Leq ₍₂₄₎ =< 45 dB	Indoor residential areas Other indoor areas with human activities such as schools, etc.

Source: USEPA 1974.

New York State

The Department has issued Program Policy DEP-00-1, Assessing and Mitigating Noise Impacts, which is intended to provide direction to Department staff for the evaluation of sound levels and characteristics generated from proposed or existing facilities. Under this policy, in the review of an application for a permit, the Department is to evaluate the potential for adverse impacts of sound generated and emanating to receptors outside of the facility or property. When a sound level evaluation indicates that receptors may experience sound levels or characteristics that produce significant noise impacts or impairment of property use, the Department is to require the permittee or applicant to employ reasonable and necessary measures to either eliminate or mitigate adverse noise effects.

In the Department policy, noise is defined as any loud, discordant, or disagreeable sound or sounds. More commonly, in an environmental context, noise is defined simply as unwanted sound. The environmental effects of sound and human perceptions of sound can be described in terms of the following four characteristics:

1. SPL, or perceived loudness, as expressed in decibels (dB) or A-weighted decibel scale dBA, which is weighted towards those portions of the frequency spectrum, between 20 and 20,000 Hertz, to which the human ear is most sensitive. Both measure sound pressure in the atmosphere.
2. Frequency (perceived as pitch), the rate at which a sound source vibrates or makes the air vibrate.

3. Duration, i.e., recurring fluctuation in sound pressure or tone at an interval; sharp or startling noise at recurring interval; the temporal nature (continuous vs. intermittent) of sound.
4. Pure tone, which is comprised of a single frequency. Pure tones are relatively rare in nature but, if they do occur, they can be extremely annoying.

The initial evaluation for most facilities should determine the maximum amount of sound created at a single point in time by multiple activities for the proposed project. All facets of the construction and operation that produce noise should be included, such as land-clearing activities (chain saw and equipment operation), drilling, equipment operation for excavating, hauling or conveying materials, pile driving, steel work, material processing, and product storage and removal. Land clearing and construction may be only temporary noise at the site, whereas the ongoing operation of a facility would be considered permanent noise.

The Department Noise Guidelines state that increases ranging from 0 to 3 dB will have no appreciable effect on receptors, and that increases from 3 to 6 dB have potential for adverse noise impact only in cases where the most sensitive receptors are present. Sound pressure increases of more than 6 dB may require additional analysis of impact potential, depending on existing sound pressure levels and the character of surrounding land uses and receptors, and an increase of 6 dB(A) may cause complaints. Therefore, a cumulative increase in the total ambient sound level of 6 dBA or less is unlikely to constitute an adverse community impact.

To aid staff in its review of a potential noise impact, Program Policy DEP-00-1 identifies three major categories of noise sources:

- Fixed equipment or process operations,
- Mobile equipment or process operations, and
- Transport movements of products, raw material or waste.

2.4.13.4 Existing Noise Levels

The ambient sound level of a region is defined by the total noise generated, including sounds from natural and man-made sources. The magnitude and frequency of environmental noise may vary considerably over a day and throughout the week because of changing weather conditions and the

effects of seasonal vegetative cover. Table 2.104 presents SPLs that are characteristic for the land use described. Most of the high-volume hydraulic fracturing would occur in quiet rural areas where the noise levels are typically as low as 30 dBA, depending on weather conditions and natural noise sources.

Table 2.104 - Common Noise Levels (New August 2011)

Description	SPL (dBA)
Rural area at night	30
Quiet suburban area at night	40
Typical suburban area	50
Typical urban area	60

Source: Cowan 1994.

SPL = sound pressure level.

2.4.14 Transportation - Existing Environment⁵⁷

This section presents a general overview of the vehicle and road classification system, major roadways and roadway use in the regional areas, and the primary funding sources for the roadway improvements. Although roadways would be the primary transportation system used to access well sites, railroads and airports may also be used to transport equipment and supplies. These other transportation modes are also briefly discussed.

2.4.14.1 Terminology and Definitions

The following terms are defined at the federal level to describe roadway classifications and vehicle classes and are used by transportation planners and engineers at the state and local levels.

Federal Functional Classification Codes

The federal functional classification (FC) codes group streets, roads, and highways into several classes based on the construction type and the type of service the roads provide. This discussion focuses on the roads prevalent in rural areas, where most of the horizontal drilling and high-volume hydraulic fracturing is assumed to occur.

⁵⁷ Subsection 2.4.14, in its entirety, was provided by Ecology and Environment Engineering, P.C., August 2011 and was adapted by the Department.

Rural areas have five basic classifications of roads:

- FC01/FC02 - Principal Arterial (Interstate or Other);
- FC06 - Minor Arterial;
- FC07 – Major Collector;
- FC08 – Minor Collector; and
- FC09 – Local.

Typically, the higher the road classification, the higher the level of service a road can supply to vehicles, whether measured by vehicle class/weight or number of vehicle trips.

The arterial system of roadways provides the highest level of mobility at the highest speed, for long, uninterrupted travel. The construction of roads in the arterial system follows stringent guidelines, and high-grade materials are used. These roads can support more of the heavy vehicle truck traffic than smaller, local roads. The minor collectors (FC08) and, to a larger extent, the local roads (FC09) show signs of deterioration with an increase in heavy-truck traffic.

- Principal Arterial. The Principal Arterial categories are often divided into Principal Arterial - Interstate, and Principal Arterial - Other. Arterials generally are constructed according to higher design standards than other roads, often have multiple lanes traveling in the same direction, and have some degree of access control, such as on ramps.

The rural principal arterial highway network is an interstate and inter-county roadway that connects developed areas with an urban population typically greater than 50,000 people.

- Minor Arterial. A rural minor arterial highway is a roadway that is considered serving an urban area if it comes within 2 miles of the urban boundary.

Collector roadways provide a lower degree of mobility than arterials and are not designed for long-distance or high-speed travel. They typically consist of two-lane roads that collect and distribute traffic from the arterial system. They are divided into two categories in the rural setting - Major Collectors and Minor Collectors.

- Major Collector. Major Collectors provide service to any county seat not on an arterial route and can also connect or serve larger towns that are not provided services by their arterial roads.

- Minor Collector. Minor Collectors are roadways that are spaced consistently and proportional to population densities present in the rural community. They collect traffic from local roads and provide access to higher-level roads.

Local roads are the largest category of roads in terms of mileage in the road network. In rural areas, they include all public roads below the collector system, including basic residential and commercial roads.

There is an inverse relationship between the speeds and distances traveled on roads versus the actual existing mileage of the various road systems. The arterial systems account for higher average vehicle miles per trip (VMT), while local road systems account for the vast majority of actual roads (Table 2.105).

Table 2.105 - Guidelines on Extent of Rural Functional Systems (New August 2011)

System	Range (Average Vehicle Miles per Trip [VMT])	Miles of Road (percent)
Principal Arterial System	30-55	2-4
Principal Arterial plus Minor Arterial Road System	45-75	6-12 ¹
Collector Road System	20-35	20-25
Local Road System	5-20	65-75

Source: FHWA 2011.

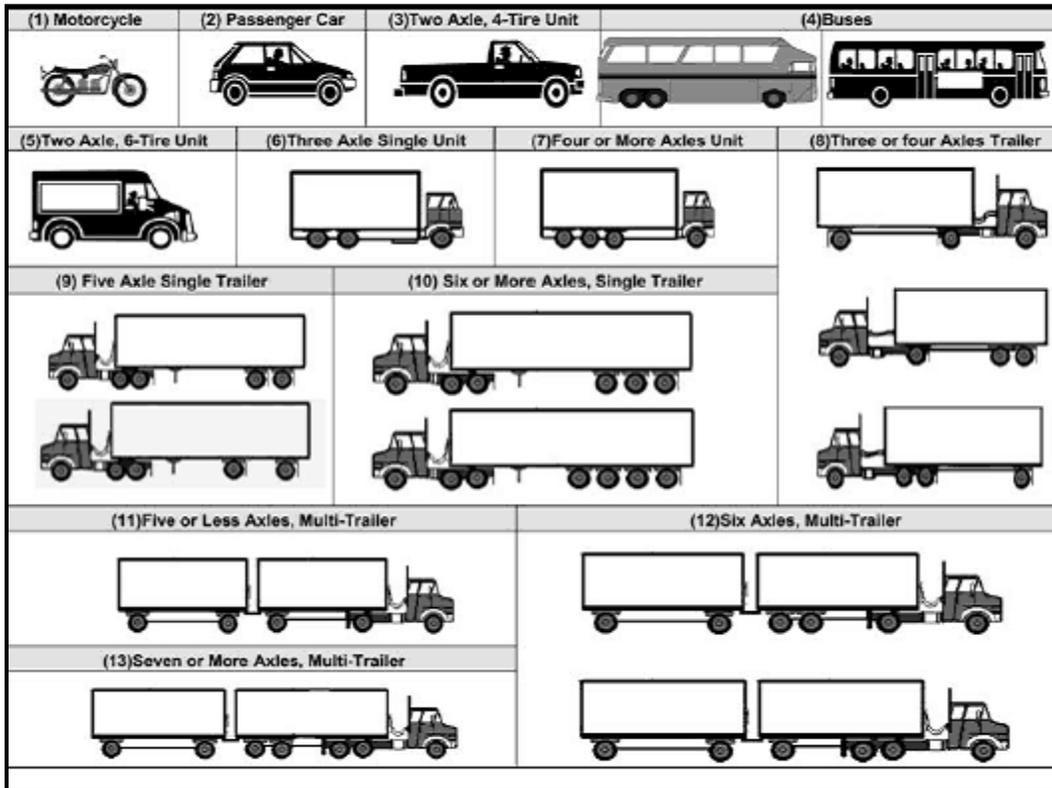
¹ Most states fall in the 7-10% range.

The FC codes have recently been updated; however, the codes presented in this section correspond to the codes used in data compilations that are currently available.

FHWA Vehicle Classes with Definitions

Figure 2.16 presents the Federal Highway Administration's (FHWA) vehicle class definitions (FHWA 2011). Table 2.106 provides descriptions of the 13 vehicle classes designated by the FHWA.

Figure 2.16 - FHWA Vehicle Classifications (New August 2011)



Source: Diamond Traffic Products 2011.

Table 2.106 - Descriptions of the Thirteen FHWA Vehicle Classification Categories (New August 2011)

Vehicle Class	Description
1	Motorcycles. All two- or three-wheeled motorized vehicles. Typical vehicles in this category have saddle-type seats and are steered by handlebars rather than steering wheels. This category includes motorcycles, motor scooters, mopeds, motor-powered bicycles, and three-wheel motorcycles. This vehicle type may be reported at the option of the state.
2	Passenger Cars. All sedans, coupes, and station wagons manufactured primarily for the purpose of carrying passengers and including those passenger cars pulling recreational or other light trailers.
3	Other Two-Axle, Four-Tire Single Unit Vehicles. All two-axle, four-tire vehicles other than passenger cars. Included in this classification are pickup and panel trucks, vans, and other vehicles such as campers, motor homes, ambulances, hearses, carryalls, and minibuses. Other two-axle, four-tire single-unit vehicles pulling recreational or other light trailers are included in this classification. (Note: Because automatic vehicle classifiers have difficulty distinguishing class 3 from class 2, these two classes may be combined into class 2).
4	Buses. All vehicles manufactured as traditional passenger-carrying buses with two axles and six tires or three or more axles. This category includes only traditional buses (including school buses) functioning as passenger-carrying vehicles. Modified buses should be considered to be a truck and should be appropriately classified.
5	Two-Axle, Six-Tire, Single-Unit Trucks. All vehicles on a single frame, including trucks, camping and recreational vehicles, motor homes, etc., with two axles and dual rear wheels.
6	Three-Axle, Single-Unit Trucks. All vehicles on a single frame, including trucks, camping and recreational vehicles, motor homes, etc., with three axles.
7	Four or More Axle, Single-Unit Trucks. All trucks on a single frame with four or more axles.
8	Four or Fewer Axle, Single-Trailer Trucks. All vehicles with four or fewer axles, consisting of two units, one of which is a tractor or straight truck power unit.
9	Five-Axle, Single-Trailer Trucks. All five-axle vehicles consisting of two units, one of which is a tractor or straight truck power unit.
10	Six or More Axle, Single-Trailer Trucks. All vehicles with six or more axles, consisting of two units, one of which is a tractor or straight truck power unit.
11	Five or Fewer Axle, Multi-Trailer Trucks. All vehicles with five or fewer axles, consisting of three or more units, one of which is a tractor or straight truck power unit.
12	Six-Axle, Multi-Trailer Trucks. All six-axle vehicles consisting of three or more units, one of which is a tractor or straight truck power unit.
13	Seven or More Axle, Multi-Trailer Trucks. All vehicles with seven or more axles, consisting of three or more units, one of which is a tractor or straight truck power unit.

Source: FHWA 2001.

Notes: In reporting information on trucks, the following criteria should be used:

- Truck tractor units traveling without a trailer will be considered single-unit trucks.
- A truck tractor unit pulling other such units in a "saddle mount" configuration will be considered one single-unit truck and will be defined only by the axles on the pulling unit.
- Vehicles are defined by the number of axles in contact with the road. Therefore, "floating" axles are counted only when in the down position.
- The term "trailer" includes both semi- and full trailers.

Not included in the FHWA Vehicle Classification Categories are farm and agricultural equipment, which are common in the rural areas. Many of the rural roads are shared by passenger traffic, truck traffic, and farm and agricultural equipment.

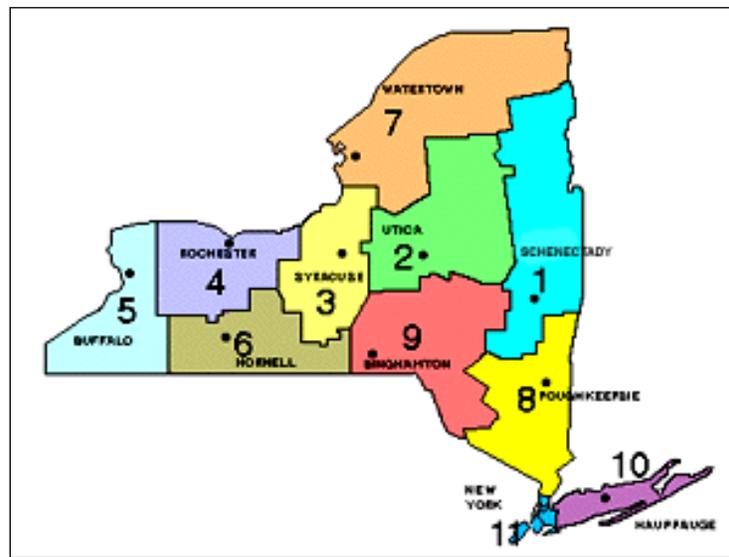
2.4.14.2 Regional Road Systems

New York State

The NYSDOT, acting through the Commissioner of Transportation, has general supervision of roads, highways, and bridges in the State of New York. The functions, powers and duties of the Commissioner of Transportation and the NYSDOT, respectively, are more fully described in Article II of the Highway Law and Article 2 of the Transportation Law. It is the mission of the NYSDOT to ensure that those who live, work, and travel in New York State have a safe, efficient, balanced, and environmentally sound transportation system.

The NYSDOT is divided into 11 regions to better manage the roadways, duties, and users (Figure 2.17).

Figure 2.17 - New York State Department of Transportation Regions (New August 2011)



Source: NYSDOT 2011a

The network of roads within New York State consists of federal, state, county, local, and private roads. Overall, there are an estimated 114,546 miles of highway roads in the state. This includes 32 interstate highways (principal arterials) totaling 1,705 miles, which are primarily maintained by the NYSDOT.

Figure 2.18 depicts the main interstate highways in New York State. The New York State Thruway, also known as the Governor Thomas E. Dewey Thruway (Interstate (I-) 90) is the main east-west route that crosses the midsection of the state, linking Buffalo, Rochester, Syracuse, and Albany. The New York State Thruway is a system of limited-access highways in New York State operated by the New York State Thruway Authority (NYSTA). It includes a total of approximately 570 miles (that is comprised of portions of I-87, I-90, I-95, I-190, and I-287). The Southern Tier Expressway, I-86, also is a major east-west route that services that southern portion of the state, connecting Jamestown, Olean, Elmira, and Binghamton. From Binghamton, I-86 runs southeast, providing access to New York City, and I-88 runs northeast providing access to Albany. Major north-south routes include I-81, which extends from Pennsylvania north through Binghamton and Syracuse to the border crossing with Canada, and I-87, which extends from New York City north to Montreal.

The state's transportation and road network also includes over 15,000 miles of state routes and 97,000 miles of county and local roads (NYSDOT 2009a). Each region examined as part of this analysis is discussed individually below.

The NYSDOT has specific, statutory authority to regulate work within the state highway rights-of-way (ROWs) (see Highway Law Section 52). This authority extends to granting, conditioning, or denying permits for, among many other things, curb cuts or breaks in access to state highways, utility work within the state ROWs that would be necessary for the operation of hydraulic fracturing facilities, and design approval for any new culverts, bridges, access roads, etc., on state ROWs that may become necessary for the construction or operation of hydraulic fracturing facilities.

Region A

Region A comprises Chemung, Tioga, and Broome Counties, which are within NYSDOT Regions 6 (Chemung) and 9 (Tioga and Broome). Table 2.107 presents a summary of the mileage of highways within each county. The Highway Mileage Report developed by NYSDOT provides current information on the public highway mileage in New York State by county (NYSDOT 2009a).

Table 2.107 - Region A: Highway Mileage by County, 2009 (New August 2011)

	Town or Village	County	NYSDOT Owned	Other	Total
Chemung	766.7	243.7	118.4	3.6	1,132.4
Tioga	823.7	141.7	155.2	0.0	1,120.6
Broome	1,340.1	339.1	297.3	19.6	1,996.1
Total Region A	2,930.5	724.5	570.9	23.2	4,249.1

Source: NYSDOT 2009a.

The principal arterial in Region A is the Southern Tier Expressway (I-86/NY-17), which runs east-west through the three counties that constitute Region A. This highway connects Elmira and areas west of the region with Binghamton and areas east of the region. Another major highway, I-81, intersects I-86 in Binghamton and runs north to Syracuse and south to Scranton, Pennsylvania. In addition, I-88 originates in Binghamton and runs northeast to Albany (Figure 2.18)

Numerous other arterials, collectors, and local roadways cover this region and connect smaller towns and villages. Heavy vehicles (i.e., Vehicle Classifications 04 through 13) primarily use major roadways. NYSDOT conducted a study of the road use by heavy vehicle traffic, based on 2004 to 2009 data (NYSDOT 2010a). The data for rural areas in NYSDOT Regions 6 and 9 are presented in Table 2.108.

Table 2.108 - Heavy Vehicles as a Percentage of Total Vehicles in Rural Areas in NYSDOT Regions 6 and 9, 2004-2009 (New August 2011)

Functional Classification (FC) Code	NYSDOT Region 6	NYSDOT Region 9	Statewide
01	36.0%	25.1%	25.2%
02	15.5%	13.6%	12.5%
06	10.2%	10.2%	9.5%
07	10.9%	8.7%	8.9%
08	5.7%*	6.8%	6.8%
09	-*	6.4%	7.1%

Source: NYSDOT 2010a.

* No data or insufficient data (i.e., data from <10 highway segments).

Heavy-vehicle traffic is concentrated on major roadways, with FC road classifications 01 and 02 handling 51.5% and 38.7%, respectively, of heavy-vehicle traffic in NYSDOT Regions 6 and 9. Compared to the statewide percentage (37.7%), in both Regions 6 and 9, heavy-vehicle traffic is concentrated more on principal arterial roadways and less on other roads. Since FC01 and FC02 are arterials used primarily for long-distance, high-speed travel, the majority of this traffic is assumed to pass through the counties.

Region B

Region B comprises Otsego, Delaware, and Sullivan Counties, all of which are in NYSDOT Region 9. Table 2.109 presents a summary of the mileage of highways within each county. The Highway Mileage Report developed by NYSDOT provides current information on the public highway mileage in New York State by county (NYSDOT 2009a).

Table 2.109 - Region B: Highway Mileage by County, 2009 (New August 2011)

	Town or Village	County	NYSDOT Owned	Other	Total
Otsego	1,326.2	476.6	290.4	4.2	2,097.4
Delaware	1,608.4	262.0	341.1	37.5	2,248.9
Sullivan	1,462.1	385.3	201.9	10.6	2,059.9
Total Region B	4,396.7	1,123.9	833.4	52.3	6,406.2

Source: NYSDOT 2009a.

The road network in Region B has two main roadway corridors running through different sections of the three counties. One is I-88, which runs in a southwest-northeast direction along the border of Otsego and Delaware Counties. In addition, NY-17 runs from the western portion of Delaware County to the east and southeast, along the Catskill Forest Preserve, into Sullivan County and towards New York City (Figure 2.18).

Numerous other arterials, collectors, and local roadways cover this region and connect smaller towns and villages. Heavy vehicles primarily use major roadways. A NYSDOT study used vehicle classification data from 2004 to 2009 to estimate the percentage of heavy vehicles on various road classifications in rural and urban settings (NYSDOT 2010a). The data for rural areas in NYSDOT Region 9 are presented in Table 2.110.

Table 2,110 - Heavy Vehicles as a Percentage of Total Vehicles in Rural Areas in
NYSDOT Region 9, 2004-2009 (New August 2011)

Functional Classification (FC) Code	NYSDOT Region 9	Statewide
01	25.1%	25.2%
02	13.6%	12.5%
06	10.2%	9.5%
07	8.7%	8.9%
08	6.8%	6.8%
09	6.4%	7.1%

Source: NYSDOT 2010a.

Heavy-vehicle traffic is concentrated on major roadways, with FC road classifications 01 and 02 handling 38.7% of heavy-vehicle traffic in NYSDOT Region 9. Compared to the statewide percentage (37.7%), in Region 9, heavy-truck traffic is concentrated more on principal arterials and a less on other roads.

Region C

Region C comprises Chautauqua and Cattaraugus Counties, both of which are in NYSDOT Region 5. Table 2,111 presents a summary of the mileage of highways in each county. The *Highway Mileage Report* developed by NYSDOT provides current information on the public highway mileage in New York State, by county (NYSDOT 2009a).

Table 2,111 - Region C: Highway Mileage by County, 2009 (New August 2011)

	Town or Village	County	NYSDOT Owned	Other	Total
Cattaraugus	1,379.8	397.7	315.2	54.1	2,146.8
Chautauqua	1,531.5	551.5	353.1	47.1	2,483.2
Total Region C	2,911.3	949.2	668.3	101.2	4,630.0

Source: NYSDOT 2009a.

The two main roadway corridors in Region C run through different sections of the two counties. One is I-90, which runs northeast from the Pennsylvania border in Chautauqua County and along Lake Erie towards Buffalo, New York. The other corridor, I-86/NY-17, runs east-west through both Chautauqua and Cattaraugus Counties, crossing into Pennsylvania in western Chautauqua County. I-86/NY-17 crosses over Chautauqua Lake and runs north of the major population center

of Jamestown. It also connects other cities such as Randolph, Salamanca, and Olean (Figure 2.18).

Numerous other arterials, collectors, and local roadways cover this region and connect smaller towns and villages; these include Route 16, Route 19, Route 60, and Route 219. Heavy vehicles primarily use major roadways. A NYSDOT study used vehicle classification data from 2004 to 2009 to estimate the percentage of heavy vehicles on various road classifications in rural and urban settings (NYSDOT 2010a). The data for rural areas in NYSDOT Region 5 are presented in Table 2.112.

Table 2.112 - Heavy Vehicles as a Percentage of Total Vehicles in Rural Areas in NYSDOT Region 5, 2009 (New August 2011)

Functional Classification (FC) Code	NYSDOT Region 5	Statewide
01	23.5%	25.2%
02	10.9%	12.5%
06	11.3%	9.5%
07	8.8%	8.9%
08	6.3%	6.8%
09	7.1%	7.1%

Source: NYSDOT 2010a.

Heavy-vehicle traffic is concentrated on major roadways, with FC classifications 01 and 02 handling 34.4% of heavy-vehicle traffic in NYSDOT Region 5. However, the percentages are less than the corresponding statewide percentage. This may be a result of the city of Buffalo being located in NYSDOT Region 5, where heavy-vehicle traffic may use smaller roads in industrial/manufacturing areas for pickups and deliveries.

2.4.14.3 Condition of New York State Roads

New York State reports annually on the condition of bridges and pavements. Based on data submitted to the FHWA in April 2010, about 12% of the highway bridges in New York State are classified, under the broad federal standards, as structurally deficient, and about 25% are classified as functionally obsolete. Those classifications do not mean the bridges are unsafe, rather that they would require repairs or modifications to restore their condition or improve their functionality (NYSDOT 2011b).

The condition of pavements is scored on a 10-point scale, as shown in Table 2.113. New York State road conditions are ranked 42nd in the nation (NYSDOT 2009b). This makes any impacts on road conditions an important consideration.

Table 2.113 - Ranking System of Pavement Condition in New York State (New August 2011)

9-10	Excellent	No significant surface distress
7-8	Good Surface	Distress beginning to show
6	Fair	Surface distress is clearly visible
1-5	Poor	Distress is frequent and severe
U	Under Construction	Not rated due to ongoing work

Source: NYSDOT 2010b.

2.4.14.4 NYSDOT Funding Mechanisms

The construction, reconstruction, or maintenance (including repair, rehabilitation, and replacement) of transportation infrastructure under the State's jurisdiction are performed by the NYSDOT. The state has statutorily established a number of funds that collect dedicated taxes and fees to fund NYSDOT's capital and operating activities. Most of the tax and fee sources for these funds are related to transportation and collected from transportation users. They include:

- Petroleum business tax;
- Highway use tax;
- Motor fuel tax;
- Motor vehicle fees;
- Auto rental tax; and
- Miscellaneous special revenues.

The Petroleum Business Tax (PBT) is a tax imposed on petroleum businesses operating in New York State. The tax is paid by registered distributors and is imposed at a cents-per-gallon rate on petroleum products sold or used in the State. The tax imposition occurs at different points in the distribution chain, depending on the type of petroleum product: For motor fuel, the PBT is imposed upon importation into the State; for diesel motor fuel, the PBT is imposed on the first sale or use in the State; for non-automotive diesel fuel and residual oil, the PBT is imposed on

final sale or use; for kero-jet fuel, the PBT is imposed on fuel consumed on take-off from points in the State. The tax is jointly administered and collected with the State's motor fuel tax (NYSDTF 2011a).

The Highway Use Tax (HUT) is a tax on motor carriers operating certain motor vehicles on New York State public highways (excluding toll-paid portions of the New York State Thruway). The tax is based on mileage traveled on NYS public highways and is computed at a rate determined by the weight of the motor vehicle and the reporting method. A HUT certificate of registration is required for any truck, tractor, or other self-propelled vehicle with a gross weight over 18,000 pounds or for any truck with an unloaded weight over 8,000 pounds and any tractor with an unloaded weight over 4,000 pounds. An automotive fuel carrier (AFC) certificate of registration is required for any truck, trailer, or semi-trailer transporting automotive fuel (NYSDTF 2011b).

New York State has a motor fuel tax on motor fuel and diesel motor fuel sold in the State. The tax is imposed when motor fuel is produced in or imported into New York State and when diesel motor fuel is first sold or used in the State. It is jointly administered and collected with the petroleum business tax. The tax is paid by registered motor fuel and diesel motor fuel distributors (NYSDTF Finance 2011c).

Motor vehicle fees, which are collected by the New York State Department of Motor Vehicles, are another large source of income for the NYSDOT. Other taxes collected for the NYSDOT include the auto rental tax, corporation and utility tax, and other miscellaneous receipts, although the PBT, HUT, motor fuel tax, and motor vehicle fees are the main sources of revenue.

Table 2.114 shows the actual total receipts for years 2009-2010 and 2010-2011 for the NYSDOT, as well as the estimated receipts for year 2011-2012. Total receipts allotted to the NYSDOT increased from 2009 to 2011 and are expected to continue to increase through 2012.

Table 2.114 - NYSDOT Total Receipts, 2009-2012 (\$ thousands) (New August 2011)

	2009-2010 Actual	2010-2011 Actual	2011-2012 Estimated
Petroleum Business Tax	612,502	605,945	614,000
Highway Use Tax	137,247	129,162	144,000
Motor Fuel Tax	401,099	407,725	404,000
Motor Vehicle Fees	626,589	813,264	827,000
Auto Rental Tax	51,726	60,032	65,000
Corporation and Utility Tax	19,641	16,400	15,000
Other Miscellaneous Receipts	635,045	467,876	578,902
Total Tax Receipts	1,848,804	2,032,528	2,069,000
Total Receipts	2,483,849	2,500,404	2,647,902

Source: Zerrillo 2011.

The actual amount of total receipts in the year 2010-2011 was \$2.5 billion. Approximately \$1.4 billion, or 45.7%, came from business taxes, including the motor fuel, petroleum, and highway use taxes. Approximately \$813 million, or 32.5%, came from motor vehicle fees, and \$544 million, or 21.8% came from auto rental and corporation and utility uses taxes and other miscellaneous receipts. In the estimated receipts for next year (2011-2012), all income related to taxes is estimated to remain relatively constant, whereas there is expected to be a \$200 million increase in motor vehicle fees due to increases in fees (Table 2.114).

Collectively, revenues from these taxes flow into the state's Dedicated Highway and Bridge Trust Fund (DHBTF), which is the primary funding source for the NYSDOT highway and bridge capital program, engineering and program administration, DMV administration, as well as capital programs for transit, rail and aviation. In addition to these tax revenues, state general fund support is required to sustain the DHBTF and provide for new project commitments.

NYSDOT is implementing the final year of a two-year capital program for which approximately \$1.8 billion is annually dedicated to capital rehabilitation and replacement of the state and local road and bridge system. Despite past investment, the condition of the state's highway pavements and bridges is declining. Given the age of the state's highway system, the capital program, by necessity, invests largely in safety and asset preservation projects to meet the urgent needs of the transportation system.

In addition to state investment in roads and bridges, local governments invest in local roads and bridge infrastructure maintenance and improvement, largely through local property and other local taxes.

2.4.14.5 Rail and Air Services

New York State is served by an extensive system of rail lines for passengers and freight. Amtrak, operating primarily over rail lines owned by freight railroads, is the solitary provider of intercity rail passenger service in New York State. Over approximately 782 route miles, Amtrak links downstate with upstate cities that include Albany, Utica, Syracuse, Rochester, Buffalo, and many other intermediate points. CSX Transportation, Canadian Pacific Railway, and Norfolk Southern Railway are the primary owners and operators of freight corridors in New York State. CSX Transportation is the largest among these railroads, operating 1,292 of the total 4,208 miles of freight rail in the state. Fifty-nine of New York State's 62 counties are served by one of New York's freight railroads, which connect to all adjacent states and Canadian provinces (NYSDOT 2009). The principal rail lines in New York State are shown on Figure 2.18.

Freight carried by railroad is off-loaded at rail yards and transported to specific locations from the railroads by truck. The rail network in New York State is capable of carrying much of the drill equipment that might be required, although it would still have to be moved by truck from the rail yards to the well heads.

Many of the communities in and near the gas development areas are serviced by commercial airliners, including those associated with airports in smaller cities such as Jamestown, Binghamton, and Elmira, and in larger cities such as Buffalo, Rochester, and Syracuse. Figure 2.18 shows the location of Commercial - Primary airports, which are publicly-owned airports that receive scheduled passenger service and have more than 10,000 enplaned passengers per year. A list of Commercial - Primary airports in New York State is provided below. Some airports that are not categorized as Primary airports, because they fall below the 10,000 passenger per year passenger count, also are serviced by scheduled air carriers. The Jamestown airport is one such facility that lies within the area of potential shale gas development.

- Albany International Airport;
- Greater Binghamton Airport;
- Buffalo Niagara International Airport;
- Elmira/Corning Regional Airport;
- Long Island MacArthur Airport;
- Ithaca Tompkins Regional Airport;
- John F. Kennedy International Airport;
- LaGuardia Airport;
- Stewart International Airport;
- Plattsburgh International Airport;
- Greater Rochester International Airport;
- Syracuse Hancock International Airport; and
- Westchester County Airport.

In addition to Commercial - Primary airports, there are many other public use airports that can be utilized by charter operations. None of these airports are at or near capacity and can be available to service an influx of temporary workers.

2.4.15 Community Character⁵⁸

A community's character is defined by a combination of natural physical features, history, demographics and socioeconomics, and culture (Robinson 2005). Key attributes or features used to define community character generally include local natural features and land uses; local history and oral traditions; social practices and festivals; unique local restaurants and cuisine; and local arts. In addition, New York State's Environmental Quality Review Act acknowledges community character as a component of the environment, including existing patterns of

⁵⁸ Subsection 2.4.15, in its entirety, was provided by Ecology and Environment Engineering, P.C., August 2011 and was adapted by the Department.

population concentration, distribution or growth, and existing community or neighborhood character.

Local and regional planning are important in defining a community's character and long-term goals. In New York State, planning, zoning, and local law are implemented and enforced at the local level, through county and municipal boards or councils. The local entities set forth the community's goals and objectives through planning or zoning documents, which provide the most tangible and formal expression of a community's character. Notably, a 2007 New York State Court of Appeals decision (Village of Chestnut Ridge vs. Town of Ramapo) observed that "[t]he power to define the community character is a unique prerogative of a municipality acting in its governmental capacity" and, that, generally, through the exercise of their zoning and planning powers, municipalities are given the job of defining their own character (NYSDEC 2007).

A sense of place also is central to community character or identity. "Sense of place" can be described as those tangible and intangible characteristics which, over a period of time, have given a place its distinctiveness, identity, and authenticity (Robinson 2005). Distinctiveness can be globally, nationally, or regionally important, as well as locally or personally important. The various elements that comprise sense of place include, but are not limited to, regional and local planning, population density, transportation and access, and services and amenities.

To be a defined "place" a bounded area must be recognized by those within and without it as being a distinctive community and having a distinctive character. A sense of place and community character cannot be described for New York State as a whole due to the vast area it covers and the range of differences in communities across the state. Residents of a single place share their history, resources, and common concerns and have a similar way of life. Regions A, B, and C (Figure 2.3) were developed for the purposes of the SGEIS to generally describe representative areas of impact within the area underlain by the Marcellus Shale in New York State. Because they encompass numerous counties and municipalities with diverse land uses, planning goals, and identities, it is difficult to fully describe community character at the regional level. Each community within these regions has its own set of distinctiveness, authenticity, and identity. For the purposes of this analysis, the sense of place for a county or region was described utilizing regional, county, and local comprehensive plans, economic development plans, and Web

sites. These resources were used to piece together the sense of place for the representative regions.

Region A

Region A comprises Broome, Tioga, and Chemung Counties (Figure 2.4a). It is located in the eastern portion of the Southern Tier of New York, along the New York/Pennsylvania border. The Southern Tier Expressway (Interstate 86) crosses the southern portion of Region A, providing east/west access, and connecting the cities of Elmira in Chemung County, Waverly and Oswego in Tioga County, and Binghamton, Endicott and Johnson City in Broome County. Most of the urban development occurs along this corridor. The remainder of the region is rural; the rural landscape is dominated by the hills and valleys along the Susquehanna and Chemung Rivers. Collectively, the counties within Region A comprise 38 towns/cities, 18 villages, and many unincorporated areas. There are 21 combined school districts in the Region.

Generally, Region A can be described as having relatively small urban centers and quaint villages surrounded by small, scattered, and picturesque rural communities, largely set within the hills and valleys along the Susquehanna and Chemung Rivers. The Susquehanna and Chemung River valleys are a large part of the natural landscape and create vistas important to local communities. The natural landscape is home to a variety of wildlife, which is enjoyed by residents and visitors both passively (e.g., hiking and bird watching) and actively (e.g., fishing and hunting). Rural elements include scenic drives/routes, farmland, woodlands, forests, waterways, and natural areas. Villages and towns in Region A are quaint and historic and are also home to many musicians and artisans. In Region A, officials and residents describe their communities as being friendly and having a small-town feel and their residents as hard-working and ethical. Many note their country fairs, unique shops, and overall rural characteristics as contributing to their community's character.

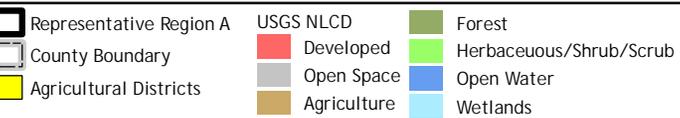
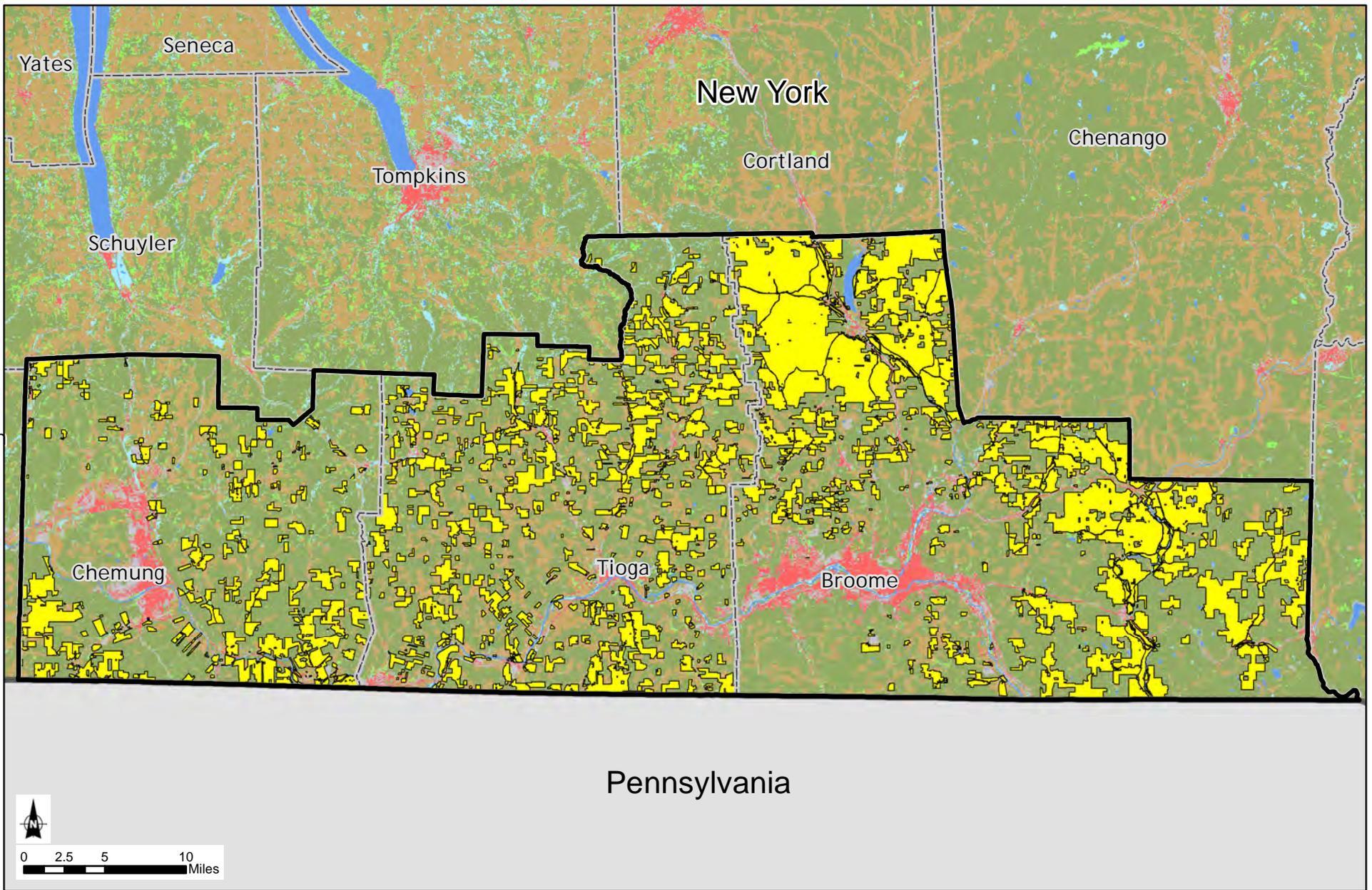
Within the counties that comprise Region A, agriculture is an important part of community character. There are over 1,500 farms within Region A, and approximately 279,000 acres of land within the Region are located within 11 state-designated agricultural districts (NYSDAM 2011). Figure 2.19 provides an overview of the agricultural districts within Region A.

Region A is rich in history and historic preservation opportunities. Chemung County and the city of Elmira are considered to be “Mark Twain Country,” because it is the area where Mark Twain lived a large portion of his life and where he died. The character of Region A is influenced by numerous sites and events associated with Native American history, the Revolutionary War and Civil War, and the Underground Railroad, as well as historic villages, towns, and farms (Chemung County Chamber of Commerce 2011). The town of Owego, in Tioga County, has 151 homes that are located in historic districts (Visit Tioga 2011), and numerous Victorian homes throughout the region contribute to the historical aspect of its region’s character.

The region aims to maintain a “Main Street” and small local business attitude by promoting economic growth and maintaining a rural character.

Agri-tourism in the form of petting zoos, U-pick farms, and farmers markets is a large part of the community character of the region. An abundance of outdoor recreational activities, including hiking, biking, fishing, boating, hunting, cross-country skiing, and bird-watching, contributes to the high quality of life these communities all strive for. These activities are counterbalanced by many opportunities to enjoy art, music, and other cultural amenities provided by the region’s cities and towns.

Drilling for natural gas has been performed to a limited extent in Region A; in 2009 there were only 46 gas wells in the region (NYSDEC 2009). Of these, 45 active gas wells are located in Chemung County and one is in Tioga County. In addition, there are 13 underground gas storage wells in operation in Tioga County (NYSDEC 2011).



NOTE: Agricultural district boundaries are overlaid on the land cover data. The land cover within agricultural district boundaries includes land cover other than agriculture; however, land cover within the agricultural district boundaries is predominately agriculture.

Figure 2.19:
Land Cover and Agricultural Districts
Representative Region A

Source: ESRI, 2010; NYS/DAM, 2011

Broome County. Broome County is the furthest east in the region. The county has a total area of 715 square miles, including 707 square miles of land and 8 square miles of surface water (lakes, ponds, rivers, and streams). Broome County is more densely populated than the other counties in Region A, with a population density of 284 persons per square mile.

Within Broome County are 17 towns/cities and seven villages, and 12 school districts (Broome County 2011; New York Schools 2011a). The Binghamton-Johnson City-Endicott Tri-City Area is the predominant urban area of the county, which is surrounded by suburban development (Greater Binghamton Chamber of Commerce 2011). Major manufacturers located in Binghamton include Lockheed Martin (systems integration), BAE Systems (mission systems) and IBM Corporation (technology). Large healthcare facilities are also located in Binghamton, including United Health Services and Lourdes Hospital. The State University of New York at Binghamton is also a large employer within the region.

The Southern Tier Expressway (Interstate 86/NYS Route 17) crosses the southern portion of Broome County in an east-west direction, and Interstate 81 provides northern access to the cities of Cortland and Syracuse and the New York State Thruway.

The remaining land area in Broome County is largely rural. As reported by the Census of Agriculture, in 2007 there were 580 farms in Broome County, covering approximately 98,000 acres of land (22% of the total land area of the county). The average size of a farm in Broome County in 2007 was 150 acres. Principal sources of farm income include milk, cattle/calves, other crops/hay and nursery, greenhouse, floriculture, and sod. Dairy products account for approximately 70% of agricultural sales in the county (USDA 2007). As of 2011, there were approximately 153,000 acres of land within three state-designated agricultural districts in Broome County (NYSDAM 2011). Agri-tourism in Broome County focuses on farmers markets, U-pick farms, alpaca farms, apples, botanical gardens, and maple syrup (Visit Binghamton 2011).

Broome County and Tioga County are a part of the Susquehanna Heritage Area, which seeks to use the historic, cultural, and natural resources of the counties to strengthen the region's identity, enhance the local quality of life, support the local economy, and promote stewardship (Susquehanna Heritage Area 2009).

Broome County's Department of Planning and Economic Development "serves to promote the sound and orderly economic and physical growth of Broome County and its constituent municipalities...it implements projects and programs designed to improve the economy, environment and physical infrastructure of the county" (Broome County 2009). Development of comprehensive plans is generally left to the discretion of city and town zoning and planning boards, which originally adopted traditional forms of regulation in an effort to protect land use and natural resources. Local and regional development is guided by a number of open space plans, local comprehensive plans, and strategic plans. These documents broadly reflect a community's history, values, future goals, and character.

Broome County does not have a comprehensive or master plan, but many of its larger municipalities have a comprehensive/master plan, land use regulations/laws, and zoning maps. A brief review of representative local planning documents indicated that several communities in the county are concerned with protecting and maintain agricultural activities in order to preserve open space, promote historic preservation, and preserve and enhance the sense of community identities. As an example, the Town of Union's Unified Comprehensive Plan outlines the following goals and objectives: "protect and maintain agricultural activities as a land use option in order to preserve open space . . . promote a balance between the need to use and the need to preserve resources . . . [and] . . . promote historic preservation" (Town of Union 2009).

Tioga County. Tioga County is located in the Southern Tier of New York State, west of Broome County. This county has a total area of 523 square miles, including 519 square miles of land and 4 square miles of surface waters (lakes, ponds, rivers, and streams). Tioga County has the lowest population density in Region A, with 98.6 persons per square mile.

Within Tioga County are nine towns and six villages, as well as six school districts (Tioga County 2011a; New York Schools 2011b). The largest urban developments are Owego (19,883 persons in the town and 3,896 persons in the village) and Waverly (4,444 persons). The Binghamton-Johnson City-Endicott Tri-City Area also extends from Broome County into the eastern edge of Tioga County. The existing land use pattern in Tioga County has been influenced by the historic pattern of highway-oriented transportation and employment provided by IBM Corporation and later Lockheed Martin (Tioga County 2005). The presence of technologically advanced industries

in the southern portion of the county, along the Southern Tier Expressway and near Owego, led to that portion of the county being more densely populated than the northern portion. There are no major roadways running east-west in the northern portion of the county.

The remaining land area in Tioga County is largely rural. As reported by the Census of Agriculture, in 2007 there were 565 farms in this county, covering approximately 106,800 acres of land (32% of the land area of the county). The average size of a farm in Tioga County in 2007 was 189 acres (USDA 2007). The principal source of farm income is dairy products, which accounted for approximately 75% of agricultural products sold in 2007. Other farming in the county includes beef cows, horses, sheep, and poultry. Hay is the largest crop grown in Tioga County, followed by oats and vegetables. Farming operations in Tioga County also produce over 800 gallons of maple syrup (Tioga County 2011a). In recent years, Tioga County has seen decreases in the number of farms, the productivity of farms, and farmed acreage (Tioga County 2005). As of 2011, there were approximately 84,000 acres of land within three state-designated agricultural districts in the county (NYSDAM 2011). Tioga County continues to encourage farm owners to enroll in and work with the NYSDAM to establish agricultural districts to preserve the agricultural character of the county (Tioga County 2005).

Tioga County's physical environment ranges from farming communities to historic town centers with charming "Main Streets" (Visit Tioga County 2011; Tioga County 2005). The county is defined as rural and suburban, but not urban (Tioga County 2011b). The portion of the Susquehanna River basin in Tioga County provides recreational and visual benefits to the county. Tioga County prides itself in its unspoiled beauty, human resources, and central geographic location (Tioga County 2011c).

Tioga County encourages local municipalities to develop their own planning documents (Tioga County 2005). Development of comprehensive plans is generally left to the discretion of village and town zoning and planning boards, which originally adopted traditional forms of regulation in an effort to protect land use and natural resources. Local and regional development is guided by a number of open space plans, local comprehensive plans, and strategic plans. These documents broadly reflect a community's history, values, future goals, and character.

Tioga County does not have a comprehensive or master plan, but many of its municipalities have a comprehensive/master plan, land use regulations/laws, and/or zoning maps. A brief review of representative local planning documents indicated that several communities in the county are concerned with promoting economic development while preserving and maintaining their small town/hometown atmosphere and rural character. The towns also emphasize the importance of conservation and preservation of natural areas and open space, including both agriculture land use and future expansion of recreational community areas. For example, the first goal of the Town of Candor Comprehensive Plan is to “attract and recruit desirable small business and light industry in order to help create a stable tax base and maintain the small town/hometown atmosphere” (Town of Candor 1999).

Chemung County. Chemung County is located west of Tioga County. The county has a total area of 411 square miles, including 408 square miles of land and 3 square miles of surface water. Chemung County has a population density of 218 persons per square mile.

Within Chemung County are 12 towns/cities and five villages, as well as three school districts (Chemung County 2011a; New York Schools 2011c). The existing land use pattern in Chemung County has been significantly influenced by the topography of the region, including the Chemung River Valley. The region’s climate, topography, and soils support productive agricultural, forestry, and wood product industries (Susquehanna – Chemung 2011). The region is rural, with rolling hills, scenic farmlands, rural vistas, and outdoor recreation opportunities, which are all major contributors to the region’s appeal.

The city of Elmira is the largest population center in Chemung County. Located along the Southern Tier Expressway (Interstate 86/17), the city is the historical and cultural center of the county and has numerous historical markers, museums, and tours. The city has the “largest concentration of Victorian-era homes in the State of New York” (Chemung County Chamber of Commerce 2011). Chemung County has many manufacturing industries, which make products such as subway cars, electronic equipment, structural steel products, helicopters, automotive-related products, and paper products (Chemung County 2008).

As reported by the Census of Agriculture, in 2007 there were 373 farms in the county, covering approximately 65,000 acres of land (approximately 25% of the land area of the county). The average size of a farm in Chemung County in 2007 was 175 acres (USDA 2007). Agricultural activities include the production of corn, wheat, hay silage, vegetables, poultry, eggs, beef, milk, milk products, and pork (Chemung County 2008). Approximately 42,000 acres of farmland in Chemung County are located in five agricultural districts (NYSDAM 2011). Farming operations in Chemung County have also decreased over the years, but agriculture is still a major industry in this county.

Chemung County's topography consists of hills and valleys, with the principal valley being the Chemung River valley (Chemung County 2008). The majority of the county is naturally forested and classified as woodland, but up to 18% of the land area is active agricultural land (Chemung County 2008). Described as the "Gateway to the Finger Lakes," Chemung County itself has sufficient waterways, rolling hills, scenic farmlands, and outdoor recreational resources to provide a high quality of life for residents and tourists (Susquehanna-Chemung 2011).

Chemung County's Planning Department assists local communities with comprehensive planning, land use and zoning, floodplains and watersheds, and grant proposals (Chemung County 2011b). Chemung County empowers the local municipalities to develop their own planning documents and periodically presents specialized training workshops for local planning and zoning officials (Chemung County 2011b, 2011c). Development of comprehensive plans is generally left to the discretion of village and town zoning and planning boards, which originally adopted traditional forms of regulation in an effort to protect land use and natural resources. Local and regional development is guided by a number of open-space plans, comprehensive plans, and strategic plans. These documents broadly reflect a community's history, values, future goals, and character. The Chemung County Planning Department participates actively in the Rural Leadership program of the Southern Tier Regional Planning and Development Board (Chemung County 2011b).

Chemung County does not have a comprehensive or master plan, but many of its municipalities have a comprehensive/master plan, land use regulations/laws, and/or zoning maps. A brief review of representative local planning documents indicated that several communities in the

county are concerned with protecting their small town feel, maintaining a similar population size, enhancing recreational amenities, and protecting environmentally significant and/or sensitive areas while minimizing anthropogenic adverse impacts on the land and, consequently, the quality of life of the residents. For example, the Village of Horseheads Comprehensive Plan states their village "... is an inviting place where diverse residents choose to live, work, and play; it is a blend of residential neighborhoods, commercial and manufacturing businesses, parks, and open spaces. Residents and Village officials take pride in the surroundings by assuring the maintenance and beauty of homes, land, and property" (Village of Horseheads 2010).

Region B

Region B comprises Delaware, Sullivan, and Otsego Counties (Figure 2.4b). Region B is located in the Catskill Mountains and the Leatherstocking region of New York and has a rich natural and human history. The National Baseball Hall of Fame is located in Cooperstown, in Otsego County, and is a destination for thousands of people annually. Glass museums, history museums, and other tourist attractions exist throughout the region. The Catskills are an attraction for outdoor enthusiasts. Various manufacturing companies are located across the region, mainly occurring in the larger towns. The region is known for manufacturing communications equipment, integrated circuits, pharmaceuticals, transportation equipment, plastic and rubber products, and food and beverages. Other large employers include insurance companies, colleges, health care facilities, and retailers. NYSEG, Verizon, and other electronics companies are located in the city of Oneonta (City of Oneonta 2011). Having manufacturing and cultural hubs surrounded by natural areas contributes to the community character of the region.

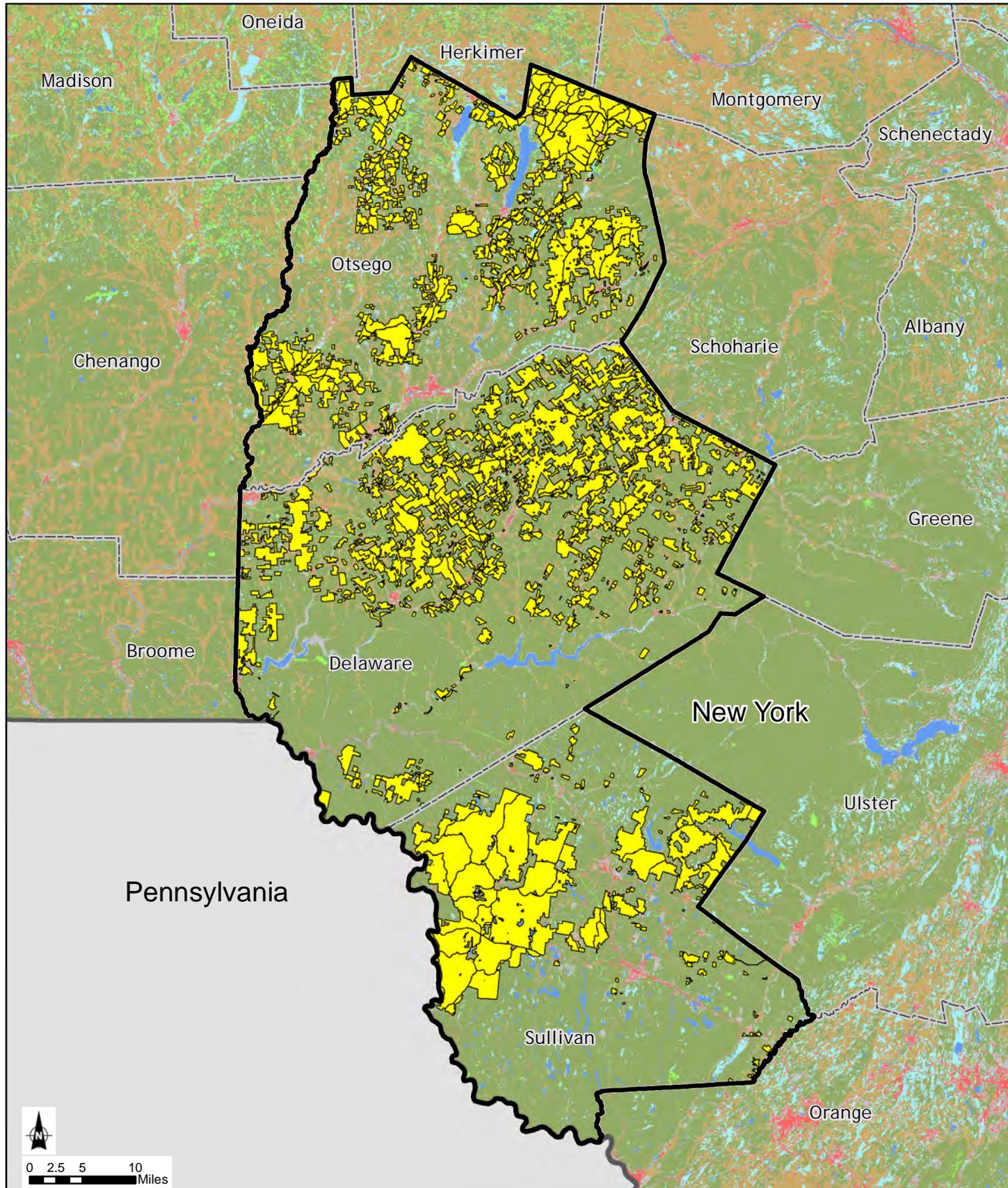
Within the region there are 60 towns, 26 villages, and over 75 hamlets; 42 combined school districts. Gas drilling is relatively new to these counties and is not an integral part of the industrial or rural landscape of the region. In 2009 there were no natural gas wells in production in Region B (NYSDEC 2009). Several exploratory wells were developed in 2007 and 2009, but no production has been reported.

Generally, Region B can be described as having relatively small urban centers and villages surrounded by numerous small, scattered, and picturesque rural hamlets within a setting of sparsely populated hills, mountains, and valleys. Some communities boast about their clean

water, land, and air and panoramic views of natural beauty, while others are particularly proud of their proximity to larger metropolitan areas. Local Web sites and planning documents describe the less densely populated segments of each community as having a rural character, with few buildings, structures, or development (Catskills Region 2011). Rural elements include meandering, tree-lined streets, farmland, woodlands and forests, and natural areas. With the exception of communities immediately along state or county transportation corridors, the hamlets, villages, and towns in Region B generally are pedestrian-friendly or are in the process of revitalizing their neighborhoods to be more walkable (Sullivan County Chamber of Commerce 2011a). Within Region B, views and vistas are dominated by undeveloped open space (Town of Otsego 2005). In Delaware County, this was reinforced by the 1997 Watershed Memorandum of Agreement with NYC.

There are over 1,900 farms within the three counties that comprise Region B; consequently, agriculture is an important part of community character within the Region. Approximately 588,000 acres of land within Region B are located within 15 state-designated agricultural districts (NYSDAM 2011). Figure 2.20 provides an overview of the agricultural districts within Region B.

In Region B, many of the inhabited places are small and the pace of life is slow. Some local officials and residents describe their communities as being friendly and having a small-town feel. Many note their country fairs, specialty shops, and team sports as contributing to their community's character. Delaware and Sullivan Counties are described as rural retreats for urban tourists from NYC. The City of Oneonta, in Otsego County, describes itself as a religious community, known for its many places and worship. All of the counties in Region B describe active and passive recreational activities as being essential to their community character. Available outdoor recreational activities include hiking, fishing, boating, biking, bird-watching, hunting, skiing, and snowmobiling.



- Representative Region B USGS NLCD
- County Boundary
- Agricultural Districts
- Agriculture
- Forest
- Herbaceous/Shrub/Scrub
- Open Water
- Developed
- Open Space
- Wetlands

NOTE: Agricultural district boundaries are overlaid on the land cover data. The land cover within agricultural district boundaries includes land cover other than agriculture; however, land cover within the agricultural district boundaries is predominately agriculture.

Figure 2.20:
Land Cover and Agricultural Districts
Representative Region B

Source: ESRI, 2010; NYS/DAM, 2010, 2011

Region B, while rural and slow-paced in some areas, also has several centers of commerce, high-quality health care facilities, institutions of higher education, and noteworthy cultural activities, including art galleries, theatre groups, and music events. These assets significantly contribute to their “sense of place.” For centuries the Catskills Mountains in Delaware County have been a place where art colonies flourished. In Cooperstown, in Otsego County, the Baseball Hall of Fame, Glimmerglass Opera, art galleries, and specialty shops draw throngs of visitors each year. Sullivan County describes itself as offering value and convenience for visitors seeking an escape closer to home, with museums, antiques, boutiques and theater, as well as outdoor recreational activities. It is best known as the home of the Woodstock music festival and the Monticello Raceway. Agri-tourism also is important to Sullivan County.

Delaware County. Geographically, Delaware County is the largest county in Region B and is one of the larger counties in New York State (Delaware County Chamber of Commerce 2011a). Delaware County is located in the southeastern part of the state and is bordered to the south by the Delaware River. The Catskill Mountains are partially located in Delaware County. The county has a total area of 1,468 square miles, including 1,446 square miles of land and 22 square miles of surface water (lakes, ponds, rivers, and streams). Delaware County is one of the least populated counties in New York State, with 33 persons per square mile. The county has 19 cities/towns, 10 villages, two hamlets, and 13 school districts (Delaware County 2011; Delaware County Chamber of Commerce 2011b; New York Schools 2011d). The largest population centers are the villages of Sidney (3,900 persons), Walton (3,088 persons), and Delhi (3,087 persons). Interstate 86/Route 17 crosses the southern boundary of Delaware County.

The remaining areas in Delaware County are rural. As reported by the Census of Agriculture, in 2007, there were 747 farms in the county, covering approximately 200,000 acres (22% of the land area in the county). The average size of a farm in Delaware County in 2007 was 222 acres. The principal sources of farm income include milk, vegetables, other crops/hay and nursery, greenhouse, floriculture, and sod (USDA 2007). According to more recent data from the Delaware County Chamber of Commerce, dairy products account for approximately 80% of agricultural sales in the county, and Delaware County represents 80% of the dairy farms in the NYC watershed area (Delaware County Chamber of Commerce 2011b). As of 2011, there were

approximately 237,000 acres of land within eight state-designated agricultural districts in Delaware County (NYSDAM 2011).

The existing land use pattern in Delaware County has been influenced by the historic pattern of hamlet development, highway-oriented transportation, and state land ownership. In addition, a major land-acquisition program is underway in Delaware County and other Catskills/Delaware Watershed communities that help to provide an unfiltered drinking water supply to NYC. The acquisition of this land will preclude future development in designated areas (NYC Watershed 2009).

Delaware County does not have a comprehensive plan, but it empowers its municipalities to develop their own planning documents. Development is generally left to the discretion of village and town zoning and planning boards, which originally adopted traditional forms of regulation in an effort to protect land use and natural resources. Local and regional development is guided by a number of open-space plans, comprehensive plans, and strategic plans. These documents broadly reflect a community's history, values, future goals, and character.

Delaware County does not have a comprehensive or master plan, but many of its municipalities have a comprehensive/master plan, land use regulations/laws, and zoning maps. A brief review of representative local planning documents indicated that several communities in the county are concerned with protecting and preserving agricultural land, including niche farming, forestry, and other sensitive areas; maintaining a rural character and the historical context of the communities; preserving existing development patterns and the appearance of residential development; maintaining the natural environment; and minimizing impacts on scenic transportation routes and vistas. For example, the Town of Stamford states in its Final Draft Comprehensive Plan that the town "will be a place that continues to maintain and celebrate its small town, rural character and natural beauty . . . maintain our open spaces and the pristine nature of the environment . . . [and] . . . our quality of life will be enhanced because of the Towns' strong sense of community through its caring, friendly people and the dedicated organizations and volunteers that serve us well" (Town of Stamford 2011).

Sullivan County. Sullivan County is located south of Delaware County. The county has a total area of 1,038 square miles, including 1,011 square miles of land and 27 square miles of surface water (lakes, ponds, rivers, and streams). The county's physical environment ranges from historic urban centers to farming communities nestled within an open-space network that includes the Upper Delaware Scenic and Recreation River (to the west), Catskill Park (to the north) Basherkill Watershed, and Shawangunk Ridge (Sullivan County Catskills 2011a).

Sullivan County has a population density of 76 persons per square mile. Within the county are 15 cities/towns, six villages, and over 30 hamlets; and eight school districts (Sullivan County Catskills 2011b; Sullivan County Chamber of Commerce 2011b). The largest population centers are the Village of Monticello (6,726 persons), and the Village of Liberty (4,392 persons). Interstate 86/Route 17 crosses through the middle of Sullivan County, providing access to New York City, which is approximately 60 miles southeast of Sullivan County.

The remaining portions of Sullivan County are rural and open space. According to the Census of Agriculture, in 2007 there were 323 farms in Sullivan County, covering approximately 63,600 acres (approximately 10% of the land area of the county). The average size of a farm in 2007 was 156 acres (USDA 2007). In 2007, the principal sources of farm income included poultry and eggs, milk and other dairy products from cows (USDA 2007). Poultry and eggs accounted for approximately 65% of agricultural sales in the county in 2007. In recent years, however, Sullivan County has seen a decrease in traditional dairy and livestock farms (it now has only two major egg producers and 28 dairy farms) and an increase in smaller niche and diversified vegetable and livestock farms. As of 2011, there were approximately 162,000 acres of land within two state-designated agricultural districts in Sullivan County (NYSDAM 2011).

In its Comprehensive Plan, the county describes itself as being on the verge of becoming urban, with rapid growth and development that will change its character and have an impact on its resources (Sullivan County Catskills 2005). The county's vision and community land use goals include avoiding heavy traffic, strip malls, and loss of open space and ensuring the availability of affordable housing. While development decisions are made at the local level, the county encourages collective support of a unified vision in its Comprehensive Plan (Sullivan County Catskills 2005). As stated in the Comprehensive Plan, current development patterns often

mandate a separation of land uses; however, revitalization efforts are focused on mixed-used in-fill development (i.e., development within vacant or under-utilized spaces within the built environment), walkable communities, and streetscape improvements (Sullivan County Catskills 2005). The county also is committed to preserving viewsheds, natural resources, and environmentally sensitive areas through zoning. Lastly, the county encourages coordinated zoning among its municipalities and intends to provide resources to municipalities to upgrade local zoning and land use regulations every 10 years.

Otsego County. Otsego County is located in central New York State, north of Delaware County. It is situated in the foothills of the Catskill Mountains, at the headwaters of the Susquehanna River (Otsego County 2011). The County has a total area of 1,015 square miles, including 1,003 square miles of land and 12 square miles of surface water (lakes, ponds, rivers, and streams). The county has a population density of 62 persons per square mile.

Within the county are 25 cities/towns, nine villages, and 47 hamlets; and 21 school districts. The city of Oneonta, the county seat, has a population of 13,901 persons, and is surrounded by suburbs, and villages, hamlets, and farm communities that stretch across the remainder of the county. Interstate 88 crosses the southern portion of Otsego County, connecting the City of Oneonta to Binghamton to the south, and the Albany area to the north.

Farming operations in Otsego County have decreased over the years, but agriculture is still a major industry in the county. Active farmland is concentrated in the mid- to northern portions of the county (Otsego County 1999). According to the Census of Agriculture, in 2007 there were 908 farms in Otsego County, covering approximately 206,000 acres (approximately 30% of the land area of the county). The average size of a farm in Otsego County in 2007 was 201 acres (USDA 2007). The principal sources of farm income include milk, cattle/calves, other crops and hay and nursery, greenhouse, floriculture, and sod. Dairy products account for approximately 70% of agricultural sales in the county (USDA 2007). As of 2011, there were approximately 189,000 acres of land within five state-designated agricultural districts in Otsego County (NYS DAM 2011).

Otsego County does not have a comprehensive or master plan, but most of its 34 municipalities have a comprehensive/master plan, land use regulations/laws, and zoning maps. A brief review of representative comprehensive plans indicated that several communities in the county are concerned with protecting sensitive areas, maintaining a low residential density, preserving existing patterns of land use in hamlets and rural areas, maintaining the natural environment, and minimizing visual blight. For example, the Town of Otsego Comprehensive Plan's vision statement states the following: "We foresee the future Town of Otsego as continuing to have a clean environment, beautiful landscape, and rural character. We foresee carefully managed growth and development, maintaining access to our natural areas. We foresee a place of safety for us and our families." (Town of Otsego 2008). According to the Otsego County Department of Planning, affordable housing and real estate is also important to the county (Otsego County 2009).

Region C

Region C comprises Chautauqua and Cattaraugus Counties (Figure 2.4c). Generally, Region C can be described as largely rural in character, with commercial/industrial hubs located along the Southern Tier Expressway and agri-tourism spread across the region. Some communities boast about their access to water bodies and the recreational opportunities they provide, while others are particularly proud of their proximity to lively cities. Local Web sites and planning documents describe the less densely populated portions of each community as having a rural character and charm. Rural elements include scenic drives/routes, farmlands, woodlands and forests, waterways, and natural areas. Hamlets, villages, and towns in the region are quaint and historic and many are home to museums and historical sites. The unique geological history of the region has endowed it with numerous natural attractions, including the deeply incised valleys of Allegany State Park, the deep gorges of Zoar Valley, and numerous lakes and rivers, all of which contribute to the region's character.

Distinct features in each county contribute to the type of agriculture they support, which in turn influences the character of each county. The floodplains of large streams such as Cattaraugus Creek support dairy farms in Cattaraugus County, whereas the climatic influences of nearby Lake Erie support grape production in Chautauqua County.

The city of Salamanca in Cattaraugus County is the only U.S. city east of the Mississippi River that is located within a Native American tribal land (Seneca Nation of Indians). The proximity to Native American tribal lands and the Native American history of the area are important to this community's character. The residents of Region C are proud of their history and work diligently to preserve and promote it. The promotion of this history is evidenced by historical sites and museums found throughout the region, including the Chautauqua Institution in Chautauqua, New York. This renowned institution opened in the late 1800s and serves as a community center and resource "where the human spirit is renewed, minds are stimulated, faith is restored, and art is valued" (Chautauqua County Chamber of Commerce 2011a). This is another example of heritage forming an important part of community character in Region C.

Region C has a vibrant and diverse agricultural industry, which can be found throughout the rolling hills, rural countryside, and woodlands. The agricultural heritage of the region includes Amish communities in both Cattaraugus and Chautauqua Counties. There are over 2,700 farms in Region C. Approximately 632,000 acres of land within Region C are located within 17 state-designated agricultural districts (NYSDAM 2011). Figure 2.21 provides an overview of the agricultural districts within Region C.

Although agriculture is an important aspect of Region C, there is a balance between rural preservation and urban development. There are numerous small villages and communities within Region C, many of which are rich in historic sites and museums. For example, Jamestown in Chautauqua County is home to the Roger Tory Peterson Institute of Natural History, the Fenton History Center, the Lucy-Desi Museum, and the Desilu Playhouse and Theater. Jamestown's unique character and Victorian heritage are echoed throughout the region.

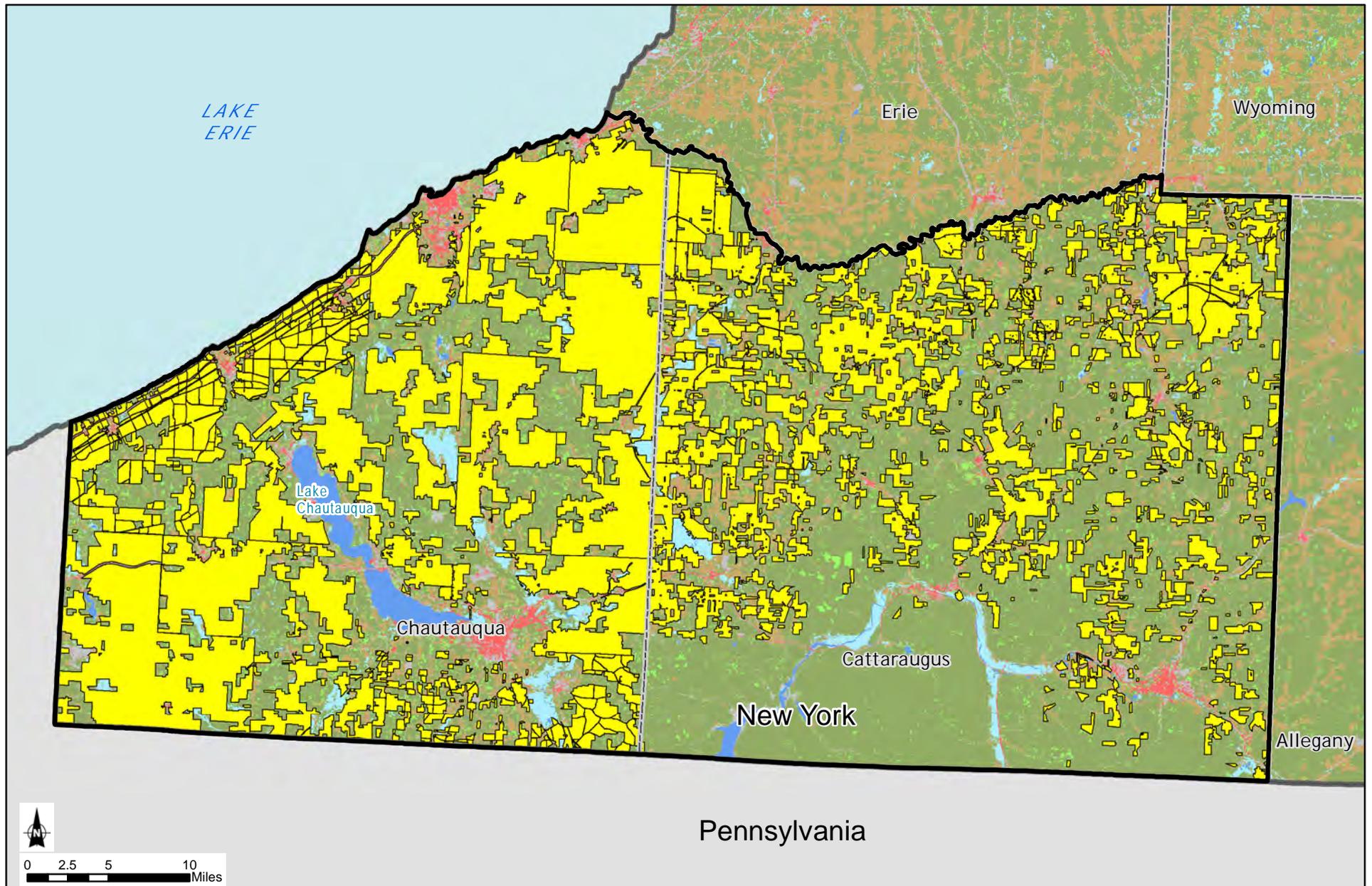
Tourism is also a large part of the community character of the region. Recreational activities that draw tourists to the region include bicycling, boating, fishing, gaming (on Native American tribal land), geo-caching (a treasure-hunting game using GPS technology), golfing, hiking, horseback riding, motor sports, scenic driving, hunting, mountain biking, downhill skiing, cross-country skiing, snowmobiling, snowshoeing, and white water rafting. This abundance of the recreational activities is a significant aspect of the community character in Region C. Within the region are 63 cities/towns, 28 villages, and other unincorporated areas, as well as 30 combined school districts.

Gas drilling is not new to Region C; in 2009 approximately 3,917 gas wells were in production in this region (NYSDEC 2009).

Chautauqua County. Located in the southwestern corner of the state, Chautauqua County is considered the western gateway to New York State (Chautauqua County 2011a). The county is bordered by Lake Erie to the northwest, Pennsylvania to the south and west, the Seneca Nation of Indians and Erie County to the northeast, and Cattaraugus County to the east (Chautauqua County 2011b). The center of the county is Chautauqua Lake; five smaller lakes are located throughout the county. The Southern Tier Expressway crosses the mid-section of the county, and the New York State Thruway crosses the county along its northern border near Lake Erie. Chautauqua County has a total area of 1,500 square miles, including 1,062 square miles of land and 438 square miles of surface water (lakes, ponds, rivers, and streams).

There are two cities within the county, Jamestown to the south and Dunkirk along Lake Erie, which are surrounded by rural areas and lakes. Due to the presence of the two cities, Chautauqua County has an average population density of 127 persons per square mile. Within the county are 29 cities/towns and 15 villages, as well as 18 school districts (Chautauqua County 2011a; New York Schools 2011e).

According to the Census of Agriculture, in 2007 there were 1,658 farms in Chautauqua County, which cover approximately 235,858 acres (35% of the land area of the county) (USDA 2007). In 2007 the average size of a farm in this county was 142 acres (USDA 2007). In Chautauqua County, the principal sources of farm income are grape and dairy products (USDA 2007). Grapes and grape products account for approximately 30% of agricultural sales in the county, and dairy products account for approximately 50.5% of agricultural sales (USDA 2007). Grape growers in Chautauqua County produce approximately 65% of New York State's total annual grape harvest (Tour Chautauqua 2011a). As of 2011, there were approximately 392,000 acres of land within 11 state-designated agricultural districts in Chautauqua County (NYSDAM 2011).



NOTE: Agricultural district boundaries are overlaid on the land cover data. The land cover within agricultural district boundaries includes land cover other than agriculture; however, land cover within the agricultural district boundaries is predominately agriculture.

Figure 2.21:
Land Cover and Agricultural Districts
Representative Region C

Source: ESRI, 2010; NYS/DAM, 2010, 2011

Agri-tourism in Chautauqua County focuses on wineries in the northern portion of the county and scenic drives and farmers markets in the southern and eastern portions of the county. Another large part of agri-tourism here centers on the county's Amish Country (Tour Chautauqua 2011b).

Other industries also play important roles in the community character of Region C. In Chautauqua County, tourism based on recreational opportunities and historical and cultural sites and events is important throughout the county. Dunkirk, which is strategically located along Lake Erie, is described by the Chautauqua County Chamber of Commerce as having financial and technological support networks that provide businesses with competitive opportunities for growth (Chautauqua County Chamber of Commerce 2011b). The village of Fredonia is home to the State University of New York (SUNY) Fredonia campus, and the educational industry forms a large part of the community's character (Chautauqua County Chamber of Commerce 2011c).

Jamestown serves as an industrial, commercial, financial, and recreational hub for southwestern New York, and the city is home to several museums and historical resources (Chautauqua County Chamber of Commerce 2011d). The city of Salamanca is located along the Allegheny River and describes itself as filled with country charm. It is the only city in the U.S. that lies almost completely within the borders of an Indian Reservation (Seneca Nation) (City of Salamanca 2011). The city is located on the northern border of Allegany State Park and serves as a year-round access point to the park. Salamanca is a center for the forestry and wood products industry and has plentiful supplies of maple, oak, and cherry (City of Salamanca 2011).

Chautauqua County has a comprehensive plan called *Chautauqua County 20/20 Comprehensive Plan* (Chautauqua County 2011b), which is designed to assist the county government in making decisions that affect the county's future (Chautauqua County 2011b). The plan identifies strategic issues and goals and is intended to ensure that there is cooperation between municipalities to achieve these goals (Chautauqua County 2011b). The plan states that Chautauqua County has an unusually high number of natural resource assets and unique attractions, including but not limited to farms (dairy and grape), lakes, historic towns, and the Chautauqua Institution (Chautauqua County 2011b). The county considers its traditional agricultural base to have preserved its open space and rural charm, which is a significant aspect of the county's community character (Chautauqua County 2011b).

Cattaraugus County. Cattaraugus County is located directly east of Chautauqua County and is also located within the Southern Tier of New York. The county has a total area of 1,322 square miles, including 1,310 square miles of land and 12 square miles of surface water (lakes, ponds, rivers, and streams). Cattaraugus County has a much lower population density than Chautauqua County, at 61 persons per square mile. Within the county are 34 cities/towns and 13 villages, as well as 12 school districts (Cattaraugus County 2011; New York Schools 2011f).

Cattaraugus County is much more rural than Chautauqua County, with small towns and rural characteristics. There are three Native American reservations wholly or partially within Cattaraugus County. The county's geology was sculpted by glaciers during the last glacial period, and the county is drained by two significant waterways, the Allegheny River in the south and Cattaraugus Creek in the north (Enchanted Mountains 2011a).

The existing land use pattern in Cattaraugus County has been significantly influenced by the topography of the region. Glaciers and rivers have sculpted the county into a mountainous region ideal for a wide variety of outdoor recreational activities, including skiing, hiking, hunting, and camping, and the fertile valleys support productive agricultural communities.

According to the Census of Agriculture, in 2007 there were 1,122 farms in Cattaraugus County, which cover approximately 183,000 acres (USDA 2007). In 2007 the average size of a farm in the county was 163 acres (USDA 2007). The principal sources of farm income are dairy products; nursery, greenhouse, floriculture, and sod; and cattle/calves (USDA 2007). Dairy products account for approximately 68% of agricultural sales in the county (USDA 2007). However, in recent years, dairy farming has declined in Cattaraugus County, especially in areas around towns/cities where the majority of commerce is not based on agriculture, such as around Ellicottville, where tourism is the main source livelihood (Cattaraugus County 2007). As of 2011, there were approximately 240,000 acres of land within six state-designated agricultural districts in Chautauqua County (NYSDAM 2011).

Agri-tourism is an important industry in Cattaraugus County. Agri-tourism in this county centers on maple syrup production and the Amish Trail, which is located in the western portion of Cattaraugus County (Enchanted Mountains 2011b; GOACC 2011).

The city of Olean is the commercial and industrial hub of Cattaraugus County (GOACC 2011). The city has a rich commercial and industrial history and is currently home to several large corporations, including manufacturers such as Dresser-Rand and Cutco-Alcas. This regional industrial and commercial center is necessary to maintain the rural character of the rest of Cattaraugus County.

The role of the Cattaraugus County Planning Department is to assist local communities with comprehensive planning, land use and zoning, floodplains and watersheds, census data and demographics, planning for agriculture, and any downtown revitalization projects (Cattaraugus County 2011). Cattaraugus County empowers the local municipalities to develop their own planning documents (Cattaraugus County 2011). Development of comprehensive plans is generally left to the discretion of county and town zoning and planning boards, which originally adopted traditional forms of regulation in an effort to protect land use and natural resources. Local and regional development is guided by a number of open-space plans, comprehensive plans, and strategic plans. These documents broadly reflect a community's history, values, future goals, and character.

Cattaraugus County does not have a comprehensive or master plan, but many of its municipalities have a comprehensive/master plan, land use regulations/laws, and zoning maps. A brief review of representative local planning documents indicated that several communities in the county are concerned with protecting sensitive areas, promoting tourism through recreation activities, maintaining a small town/rural feel, maintaining the natural environment, and creating a balance of the rural character and protection of the environment with appropriate economic development. Affordable housing and real estate also is important to the communities. For example, the Town of Portville Comprehensive Plan outlines the following goals: "... maintain the rural character of the Town, and at the same time provide for anticipated growth and development ... [and] ... maintain the predominantly rural character by preserving natural woodlands and floodplains, conserving the productive farms as much as possible, encouraging open space areas as a integral part to any new residential development, and concentrating intensive residential and commercial uses into selected centers of activity" (Town of Portville 2003).

In Cattaraugus County, Allegany State Park and the Enchanted Mountains provide recreational opportunities and associated jobs. The village of Ellicottville flourishes on the tourism industry, which centers on two major ski resorts. In the city of Olean, commerce is centered on industry (GOACC 2011).

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Chapter 3

Proposed SEQRA Review Process

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Chapter 3 - Proposed SEQRA Review Process

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Chapter 3 PROPOSED SEQRA REVIEW PROCESS

3.1 Introduction – Use of a Generic Environmental Impact Statement

The Department’s regulations to implement SEQRA¹ authorize the use of a generic environmental impact statement (EIS) to assess the environmental impacts of separate actions having similar types of impacts.² Additionally, a generic EIS and its findings “should set forth specific conditions or criteria under which future actions will be undertaken or approved, including requirements for any subsequent SEQRA compliance”³ such as the need for a supplemental environmental impact statement (SEIS). The course of action following a final generic EIS depends on the level of detail within the generic EIS, as well as the specific follow-up actions being considered. In considering a subsequent action such as permitting horizontal drilling and high-volume hydraulic fracturing in the Marcellus Shale and other low-permeability reservoirs, the Department must evaluate the generic EIS to determine whether the impacts from the subsequently proposed action (i.e., approval of the permit application) are not addressed, or are inadequately addressed, in the generic EIS, and, in either case, whether the subsequent action is likely to have one or more significant adverse environmental impacts. If significant adverse impacts of the subsequent action are identified, and they are not adequately addressed in the generic EIS, then a site- or project-specific SEIS must be prepared. Under the regulations, generic EISs and their findings should identify the environmental issues or thresholds that would trigger the need for a SEIS. However, if the Department determines that the final generic EIS adequately addresses all potential significant adverse impacts of the subsequently proposed action, then no SEIS is necessary. The SEQRA regulations pertaining to generic EISs (6 NYCRR §617.10[d][1]) provide that when a final generic EIS has been filed, “no further SEQRA compliance is required if a subsequent proposed action will be carried out in conformance with the conditions and thresholds established for such actions” in the generic EIS.⁴

¹ SEQRA regulations are available at <http://www.dec.ny.gov/regs/4490.html>.

² 6 NYCRR §617.10(a). The regulations define the uses and functions of generic EISs. Frequently asked questions on the use of generic environmental impact statements are posted on the Department’s website at <http://www.dec.ny.gov/permits/56701.html>.

³ 6 NYCRR §617.10(c).

⁴ 6 NYCRR §617.10(d)(1).

3.1.1 1992 GEIS and Findings

Drilling and production of separate oil and gas wells, and other wells regulated under ECL 23 have common types of impacts. Therefore, the Department issued the 1992 GEIS and Findings Statement to cover oil, gas and solution mining activities regulated under ECL 23. The 1992 GEIS is incorporated by reference into this document.⁵ Based on the 1992 GEIS, the Department found that issuance of a standard, individual oil or gas well drilling permit anywhere in the state, when no other permits are involved, would not have a significant environmental impact.⁶ See Appendix 2.

Also, in the 1992 Findings Statement, the Department found that issuance of a drilling permit for a location in a State Parkland, in an Agricultural District, or within 2,000 feet of a municipal water supply well, or for a location which requires other Department permits, may be significant and required a site-specific SEQRA determination. Under the 1992 GEIS, the only instance where issuance of an individual permit to drill an oil or gas well is always deemed significant and therefore always requires an SEIS is when the proposed location is within 1,000 feet of a municipal water supply well.

As part of the 1992 GEIS, the Department also evaluated the action of leasing of state land for oil and gas development and found no significant environmental impacts associated with that action.⁷ Specifically, the Department concluded that lease clauses and the permitting process with its attendant environmental review would result in mitigation of any potential impacts that could result from a proposal to drill. See Appendix 3.

3.1.2 Need for a Supplemental GEIS

As mentioned above, the SEQRA regulations require preparation of a supplement to a final generic EIS if a subsequent proposed action may have one or more significant adverse environmental impacts that were not addressed in the 1992 GEIS.⁸ In 2008, the Department determined that some aspects of the current and anticipated application of horizontal drilling and

⁵ <http://www.dec.ny.gov/energy/45912.html>.

⁶ http://www.dec.ny.gov/docs/materials_minerals_pdf/geisfindorig.pdf.

⁷ Sovas GH, April 19, 2003 (http://www.dec.ny.gov/docs/materials_minerals_pdf/geisfindsup.pdf).

⁸ 6 NYCRR §617.10(d)(4).

high-volume hydraulic fracturing warranted further review in the context of a SGEIS, or Supplement. This determination was based primarily upon three concerns, as follows: (1) high-volume hydraulic fracturing would require water volumes far in excess of generic EIS descriptions (in the 1992 GEIS), (2) the possibility of drilling taking place in the NYC Watershed, in or near the Catskill Park, and near the federally-designated Upper Delaware Scenic and Recreational River, and (3) the longer duration of disturbance likely to take place at multi-well drilling sites.

- 1) *Water Volumes*: Multi-stage hydraulic fracturing of horizontal shale wells may require the use and management of millions of gallons of water for each well. This raised concerns about the volume of chemical additives present on a site, withdrawal of large amounts of water from surface water bodies, and the management and disposal of flowback water;
- 2) *Anticipated Drilling Locations*: While the 1992 GEIS does address drilling in watersheds that are major sources of drinking water supply, areas of rugged topography, unique habitats and other sensitive areas, oil and gas activity in the eastern third of the State was rare to non-existent at the time of publication. Although the 1992 Findings have statewide applicability, the revised draft SGEIS examines whether additional regulatory controls are needed in any of the new geographic areas of interest given the attributes and characteristics of those areas. For example, the 1992 GEIS did not address the possibility of drilling in the vicinity of the NYC watershed area which lies in the prospective area for Marcellus Shale drilling; and
- 3) *Multi-well pads*: Well operators previously suggested that as many as 16 horizontal wells could be drilled at a single well site, or pad. As stated in the following chapters, current information suggests that 6 to 10 wells per pad is the likely distribution. While this method will result in fewer well pads and thus fewer disturbed surface locations, it will also result in a longer duration of disturbance at each drilling pad than if only one well were to be drilled there, and a greater intensity of activity at those sites. ECL §23-0501(1)(b)(1)(vi) requires that all horizontal infill wells in a multi-well shale unit be drilled within three years of the date the first well in the unit commences drilling. The potential impacts of this type of multi-well project were not analyzed in the 1992 GEIS.

3.2 Future SEQRA Compliance

The 1992 Findings Statement describes the well permit and attendant environmental review processes for individual oil and gas wells. Under the 1992 Findings Statement, each application to drill a well is deemed by the Department an individual project, meaning each application

requires individual review. In terms of SEQRA compliance, the Department considers itself the appropriate lead agency for purposes of SEQRA review involving such applications inasmuch as the Department is the agency principally responsible under ECL §23-0303(2) for regulating oil and gas development activities with local government jurisdiction being limited to local roads and the rights of local governments under the Real Property Tax Law. The Department does not propose to change these aspects of its review.

3.2.1 Scenarios for Future SEQRA Compliance under the SGEIS

- **FIRST SCENARIO:** Applications that conform with the 1992 GEIS and the SGEIS.

Generally, when application documents⁹ demonstrate conformance with the thresholds and conditions for such actions to proceed under the 1992 GEIS and the SGEIS, SEQRA would be deemed satisfied, and no further SEQRA process would be required. Upon receipt of an application for a well permit, which will be accompanied by the detailed project-specific information described in Appendix 6, Department staff will determine based on detailed project-specific information whether the application conforms to the conditions and thresholds described in the 1992 GEIS and the SGEIS that entitle the application to be covered by the 1992 GEIS and the SGEIS. If the application conforms to the 1992 GEIS and the SGEIS, Department staff will file a record of consistency statement and no further review under SEQRA will occur in connection with the processing of the well permit application. Permit conditions will be added on a site-specific basis to ensure compliance with the requirements of the 1992 GEIS, the SGEIS, and ECL 23.

- **SECOND SCENARIO:** Proposed action is adequately addressed in the 1992 GEIS or the SGEIS but not in respective Findings Statement.

A supplemental findings statement must be prepared if the proposed action and impacts are adequately addressed in the 1992 GEIS and the SGEIS but are not addressed in the previously adopted 1992 GEIS Findings Statement or the SGEIS Findings Statement.

⁹ See Appendix 4 for a copy of the Application for Permit to Drill, Deepen, Plug Back or Convert a Well Subject to the Oil, Gas and Solution Mining Regulatory Program.

- **THIRD SCENARIO:** Permit applications that are not addressed, or not adequately addressed, in the 1992 GEIS or the SGEIS.

If the proposed action and its impacts are not addressed in the 1992 GEIS or SGEIS, then additional information would be required to determine whether the project may result in one or more additional significant adverse environmental impacts not assessed in the 1992 GEIS or the SGEIS. The projects that categorically fall into this category are listed in Section 3.2.3.

Depending on the nature of the action, the additional information would include an environmental assessment form or EAF; topographic, geologic or hydrogeologic information; air impact analysis; chemical information or other information deemed necessary by the Department to determine the potential for a significant adverse environmental impact. A project-specific SEQRA determination will either result in 1) a negative declaration (determination of no potentially significant impact), or 2) a positive declaration (requiring the preparation of a site-specific SEIS for the drilling application).

Examples since 1992 where such site-specific determinations have been made include the following actions: i) underground gas storage projects, ii) well sites where special noise mitigation measures are required, iii) well sites that disturb more than two and a half acres in designated Agricultural Districts, and iv) geothermal wells drilled in proximity to NYC water tunnels. As stated above, under the 1992 GEIS wells closer than 2,000 feet to a municipal water supply well would also require further site-specific review. None have been permitted since 1992.

The following sections explain how this Supplement will be used, together with the previous 1992 GEIS, to satisfy SEQRA in certain instances when high-volume hydraulic fracturing is proposed.

3.2.2 Review Parameters

In conducting SEQRA reviews, the Department will handle the topics of i) SGEIS applicability, ii) individual project scope, iii) project size and iv) lead agency as follows.

3.2.2.1 SGEIS Applicability - Definition of High-Volume Hydraulic Fracturing

High-volume hydraulic fracturing is done in multiple stages, typically using 300,000-600,000 gallons of water per stage (Chapter 5). High-volume hydraulic fracturing in a vertical well would be comparable to a single stage. Wells hydraulically fractured with less water are generally associated with smaller well pads and many fewer truck trips, and do not trigger the same potential water sourcing and disposal impacts as high-volume hydraulically fractured wells. Therefore, for purposes of the SGEIS and application of the mitigation requirements described herein, high-volume hydraulic fracturing is defined as hydraulic fracturing that uses 300,000 or more gallons of water, regardless of whether the well is vertical, directional or horizontal. Wells requiring 299,999 or fewer gallons of water to fracture low-permeability reservoirs are not considered high-volume, and will be reviewed and permitted pursuant to the 1992 GEIS and Findings Statement.

Potential impacts directly related to water volume are associated with i) water withdrawals, ii) the volume of materials present on the well pad for fracturing, iii) the handling and disposition of flowback water, and iv) road use by trucks to haul both fresh water and flowback water. The Department proposes the following methodology, applicable to both vertical and horizontal wells that will be subjected to hydraulic fracturing:

≤ 299,999 gallons of water: Not considered high-volume; 1992 GEIS mitigation is sufficient; and

≥ 300,000 gallons of water: Always considered high-volume. The applicant must complete the EAF Addendum. All relevant procedures and mitigation measures set forth in this Supplement are required to satisfy SEQRA without a site-specific determination.

3.2.2.2 Project Scope

As was the case under the 1992 GEIS, each application to drill a well will continue to be considered as an individual project with respect to well drilling, construction, hydraulic fracturing (including additive use), and any aspects of water and materials management (source, containment and disposal) that vary between wells on a pad. Well permits will be individually

issued and conditioned based on review of well-specific application materials. However, location screening for well pad setbacks and other required permits, review of access road location and construction, and the required stormwater permit coverage will be for the well pad based on submission of the first well permit application for the pad.

The only case where the project scope extends beyond the well pad and its access road is when the application documents propose surface water withdrawals that have not been previously approved by the Department. Such proposed withdrawals will be considered part of the project scope for the first well permit application that indicates their use, and all well permit applications that propose their use will be considered incomplete until the Department has approved the withdrawal.

Gathering lines and pipelines are not within the scope of project review as the PSC has exclusive jurisdiction to review these activities under Public Service Law Article VII. Compressor stations associated with gathering lines and pipelines are also under the PSC's Public Service Law Article VII review authority except that the Department has jurisdiction under ECL Article 19 (Air Pollution Control) to review air emissions and ECL Article 17 for the SPDES program. The foregoing is discussed in greater detail in Chapter 3 of the GEIS and Section 1.5 of the Final Scope. Chapter 5 of this Supplement describes the facilities likely to be associated with a multi-well shale gas production site, and Chapter 8 provides details on the PSC's environmental review process for these facilities.

3.2.2.3 Size of Project

The size of the project will continue to be defined as the surface acreage affected by development, including the well pad, the access roads, and any other physical alteration necessary. The Department's well drilling and construction requirements, including the supplementary permit conditions proposed herein, preclude any subsurface impacts other than the permitted action to recover hydrocarbons. Most wells will be drilled on multi-well pads, described in Chapter 5 as likely an average of 3.5 acres in size, with larger pads possible, during the drilling and hydraulic fracturing stages of operations. Average production pad size, after reclamation, is likely to be 1.5 acres for a multi-well pad. Pads for vertical wells would be smaller. Access road acreage depends on the location, the length of the road and other factors.

In general, each 150 feet of access road adds 1/10th of an acre to the total surface acreage disturbance.

Surface water withdrawal sites will generally consist of hydrants, meters, power facilities, a gravel pad for water truck access, and possibly one or more storage tanks. These sites would generally be expected to be rather small, less than an acre or two in size.

3.2.2.4 Lead Agency

For the reasons set out in section 3.2 above, the Department would in most, if not all, instances continue to assert the lead agency role under SEQRA. If the proposed action falls under the jurisdiction of more than one agency, based, for example, on the need for a local floodplain development permit, the lead agency must in the first instance be determined by agreement among the involved agencies. Disputes are decided by the Department's Commissioner pursuant to 6 NYCRR §617.6(b)(5). Where there is an involved agency or agencies other than the Department (meaning another agency with jurisdiction to fund, approve, or undertake the action), to the extent practicable, the Department will seek lead agency designation, which is consistent with the criteria for such designation under SEQRA.

3.2.3 EAF Addendum and Additional Informational Requirements

The 1992 Findings authorized use of a shortened, program-specific environmental assessment form (EAF), which is required with every well drilling permit application.¹⁰ (See Appendices 2 and 5). The EAF and well drilling application form¹¹ do not stand alone, but are supported by the four-volume 1992 GEIS, the applicant's well location plat, proposed site-specific drilling and well construction plans, Department staff's site visit, and geographic information system (GIS) - based location screening, using the most current data available. Oil and gas staff within the Department consults and coordinates with staff in other Department programs administered by the Department when site review and the application documents indicate an environmental concern or potential need for another Department permit.

¹⁰ http://www.dec.ny.gov/docs/materials_minerals_pdf/eaf_dril.pdf. Under 6 NYCRR §617.2(m) of the SEQRA regulations, the model full and short EAFs may be modified by an agency to better serve it in implementing SEQR, provided the scope of the modified form is as comprehensive as the model.

¹¹ http://www.dec.ny.gov/docs/materials_minerals_pdf/dril_req.pdf.

The Department has developed an EAF Addendum for gathering and compiling the information needed to evaluate high-volume hydraulic fracturing projects (≥300,000 gallons) in the context of this SGEIS and its Findings Statement, and to identify the required site-specific mitigation measures. The EAF Addendum will be required as follows:

- 1) With the application to drill the first well on a pad constructed for high-volume hydraulic fracturing, regardless of whether the well is vertical or horizontal;
- 2) With the applications to drill subsequent wells for high-volume hydraulic fracturing on the pad if any of the information changes; and
- 3) Prior to high-volume re-fracturing of an existing well.

Categories of information required with the EAF addendum are summarized below, and Appendix 6 provides a full listing of the proposed EAF Addendum requirements.

3.2.3.1 Hydraulic Fracturing Information

Required information will include the minimum depth and elevation of the top of the fracture zone, estimated maximum depth and elevation of the bottom of potential fresh water, identification of the proposed fracturing service company and additive products, the proposed volume of fracturing fluid and percent by weight of water, proppants and each additive.

Documentation of the operator's evaluation of alternatives to the proposed additive products will also be required.

3.2.3.2 Water Source Information

The operator will be required to identify the source of water to be used for hydraulic fracturing, and provide information about any newly proposed surface water source that has not been previously approved by the Department as part of a well permit application. The proposed withdrawal location and type of source (e.g., stream, lake, pond, groundwater, etc.) and other detailed information will be required to allow the Department to analyze potential impacts and, in the case of stream withdrawals, to ensure the operator's compliance relative to passby flow and the narrative flow standard in 6 NYCRR §703.2.

3.2.3.3 Distances

Distances to the following resources or cultural features will be required, along with a topographic map of the area showing the well pad, well location, and scaled distances from the proposed surface location of the well and the closest edge of the well pad to the relevant resources and features.

- Any known public water supply reservoir, river or stream intake, public or private water well or domestic supply spring within 2,640 feet;
- Any primary or principal aquifer boundary, perennial or intermittent stream, wetland, storm drain, lake or pond within 660 feet;
- Any residences, occupied structures or places of assembly within 1,320 feet.
- Capacity of rig fueling tank(s) and distance to:
 - Any public or private water well, domestic-supply spring, reservoir, river or stream intake, perennial or intermittent stream, storm drain, wetland, lake or pond within 500 feet of the planned location(s) of the fueling tank(s); and
- Distance from the surface location of the proposed well to the surface location of any existing well that is listed in the Department's Oil & Gas Database¹² or any other abandoned well identified by property owners or tenants within a) the spacing unit of the proposed well and/or b) within 1 mile (5,280 feet) of the proposed well location, whichever results in the greatest number of wells. For each well identified, the following information would be required, if available:
 - Well name and API Number;
 - Well type;
 - Well status;
 - Well orientation; and
 - Quantity and type of any freshwater, brine, oil or gas encountered during drilling, as recorded on the Department's Well Drilling and Completion Report.

¹² The Department's Oil & Gas Database contains information on more than 35,000 oil, gas, storage, solution salt, stratigraphic, and geothermal wells categorized under Article 23 of the ECL as Regulated Wells. The Oil & Gas database can be accessed on the Department's website at <http://www.dec.ny.gov/cfm/xtapps/GasOil/>.

3.2.3.4 Water Well Information

The EAF addendum for high-volume hydraulic fracturing will require evidence of diligent efforts by the well operator to determine the existence of public or private water wells and domestic-supply springs within half a mile (2,640 feet) of any proposed drilling location. The operator will be required to identify the wells and provide available information about their depth, and completed interval, along with a description of their use. Use information will include whether the well is public or private, community or non-community and the type of facility or establishment if it is not a private residence. Information sources available to the operator include:

- direct contact with municipal officials;
- direct communication with property owners and tenants;
- communication with adjacent lessees;
- EPA's Safe Drinking Water Act Information System database, available at http://oaspub.epa.gov/enviro/sdw_form_v2.create_page?state_abbr=NY; and
- The Department's Water Well Information search wizard, available at <http://www.dec.ny.gov/cfm/xtapps/WaterWell/index.cfm?view=searchByCounty>.

Additionally, geodata on water wells in New York State is available from the Department in KML (Keyhole Markup Language) and shape file formats. To access and download water well information, go to: <http://www.dec.ny.gov/geodata/ptk>.

Upon receipt of a well permit application, Department staff will compare the operator's well list to internally available information and notify the operator of any discrepancies or additional wells that are indicated within half a mile of the proposed well pad. The operator will be required to amend its EAF Addendum accordingly.

3.2.3.5 Fluid Disposal Plan

The Department's oil and gas regulations, specifically 6 NYCRR §554.1(c)(1), require a fluid disposal plan to be approved by the Department prior to well permit issuance for "any operation in which the probability exists that brine, salt water or other polluting fluids will be produced or

obtained during drilling operations in sufficient quantities to be deleterious to the surrounding environment . . .” To fulfill this obligation, the EAF Addendum will require information about flowback water and production brine disposition, including:

- Planned transport off of well pad (truck or piping), and information about any proposed piping;
- Planned disposition (e.g., treatment facility, disposal well, reuse, or centralized tank facility); and
- Identification and permit numbers for any proposed treatment facility or disposal well located in New York.

3.2.3.6 *Operational Information*

Other required information about well pad operations will include:

1. Information about the planned construction and capacity of the reserve pit;
2. Information about the number and individual and total capacity of receiving tanks on the well pad for flowback water;
3. Indication of the timing of the use of a closed-loop tank system (e.g., surface, intermediate and/or production hole);
4. Information about any off-site cuttings disposal plan;
5. If proposed flowback vent/flare stack height is less than 30 feet, then documentation that previous drilling at the pad did not encounter H₂S is required;
6. Description of planned public access restrictions, including physical barriers and distance to edge of well pad;
7. Identification of the EPA Tiers of the drilling and hydraulic fracturing engines used, if these use gasoline or diesel fuel. If particulate traps or SCR are not used, a description of other control measures planned to reduce particulate matter and nitrogen oxide emissions during the drilling and hydraulic fracturing processes;
8. If condensate tanks are to be used, their capacity and the vapor recovery system to be used;

9. If a wellhead compressor is used, its size in horsepower and description the control equipment used for nitrogen oxides (NO_x); and

10. If a glycol dehydrator is to be used at the well pad, its stack height and the capacity of glycol to be used on an annual basis.

3.2.3.7 *Invasive Species Survey and Map*

The Department will require that well operators submit, with the EAF Addendum, a comprehensive survey of the entire project site, documenting the presence and identity of any invasive plant species. As described in Chapter 7, this survey will establish a baseline measure of percent aerial coverage and, at a minimum, must include the plant species identified on the Interim List of Invasive Plant Species in New York State. A map (1:24,000) showing all occurrences of invasive species within the project site must be produced and included with the survey as part of the EAF Addendum.

3.2.3.8 *Required Affirmations*

The EAF Addendum will require operator affirmations to address the following:

- passby flow for surface water withdrawals;
- review of local floodplain maps;
- residential water well sampling and monitoring;
- access road location;
- stormwater permit coverage;
- use of ultra-low sulfur fuel;
- preparation of site plans to address visual and noise impacts, invasive species mitigation and greenhouse gas emissions;
- adherence to all well permit conditions; and
- adherence to best management practices for reducing direct impacts to terrestrial habitats and wildlife.

3.2.3.9 Local Planning Documents

The EAF Addendum will require the applicant to identify whether the location of the well pad, or any other activity under the jurisdiction of the Department, conflicts with local land use laws, regulations, plans or policies. The applicant will also be required to identify whether the well pad is located in an area where the affected community has adopted a comprehensive plan or other local land use plan and whether the proposed action is inconsistent with such plan(s).

3.2.3.10 Habitat Fragmentation

Applicants proposing well pads in Forest or Grassland Focus Areas that involve a disturbance in a contiguous forest patch of 150 acres or more in size or a contiguous grassland patch of 30 acres or more in size should not submit the EAF or a well permit application prior to conducting a site-specific ecological assessment in accordance with a detailed study plan that has been approved by the Department. The need and plan for an ecological assessment should be determined in consultation with the Department and will consider information such as existing site conditions, existing vegetative cover and ongoing and historical land management activities. The completed ecological assessment must be attached to the EAF and must include, at a minimum:

- A compilation of historical information about use of the area by forest interior birds or grassland birds;
- Results of pre-disturbance biological studies, including a minimum of one year of field surveys at the site to determine the current extent, if any, of use of the site by forest interior birds or grassland birds;
- An evaluation of potential impacts on forest interior or grassland birds from the project;
- Additional mitigation measures proposed by applicant; and
- Protocols for monitoring of forest interior or grassland birds during the construction phase of the project and for a minimum of two years following well completion.

3.2.4 Prohibited Locations

The Department will not issue well permits for high-volume hydraulic fracturing at the following locations:

- 1) Any proposed well pad within the NYC and Syracuse watersheds;

- 2) Any proposed well pad within a 4,000-foot buffer around the NYC and Syracuse watersheds;
- 3) Any proposed well pad within a primary aquifer (subject to reconsideration 2 years after issuance of the first permit for high-volume hydraulic fracturing);
- 4) Any proposed well pad within a 500-foot buffer around primary aquifers (subject to reconsideration 2 years after issuance of the first permit for high-volume hydraulic fracturing);
- 5) Any proposed well pad within 2,000 feet of public water supply wells, river or stream intakes and reservoirs (subject to reconsideration 3 years after issuance of the first permit for high-volume hydraulic fracturing);
- 6) Any proposed well pad within 500 feet of private drinking water wells or domestic use springs, unless waived by the owner; and
- 7) Any proposed well pad within a 100-year floodplain.

3.2.5 *Projects Requiring Site-Specific SEQRA Determinations of Significance*

The Department proposes that site-specific environmental assessments and SEQRA determinations of significance be required for the high-volume hydraulic fracturing projects listed below, regardless of the target formation, the number of wells drilled on the pad and whether the wells are vertical, directional or horizontal.

- 1) Any proposed high-volume hydraulic fracturing where the top of the target fracture zone is shallower than 2,000 feet along any part of the proposed length of the wellbore;
- 2) Any proposed high-volume hydraulic fracturing where the top of the target fracture zone at any point along any part of the proposed length of the wellbore is less than 1,000 feet below the base of a known fresh water supply;
- 3) Any proposed well pad within 500 feet of a principal aquifer;
- 4) Any proposed well pad within 150 feet of a perennial or intermittent stream, storm drain, lake or pond;
- 5) A proposed surface water withdrawal that is found not to be consistent with the Department's preferred passby flow methodology as described in Chapter 7;

- 6) Any proposed water withdrawal from a pond or lake;
- 7) Any proposed ground water withdrawal within 500 feet of a private well;
- 8) Any proposed ground water withdrawal within 500 feet of a wetland that pump test data shows would have an influence on the wetland;
- 9) Any proposed well location determined by NYCDEP to be within 1,000 feet of its subsurface water supply infrastructure; and
- 10) Any proposed centralized flowback water surface impoundment.

The Department will re-evaluate the need for site-specific SEQRA determinations within 500 feet of principal aquifers two years after issuance of the first permit for high-volume hydraulic fracturing.

The Department is not proposing to alter its 1992 Findings that proposed disposal wells require individual site-specific review or that proposed disturbances larger than 2.5 acres in designated Agricultural Districts require a site-specific SEQRA determination. According to the information received to date, the drilling of all high-volume hydraulically fractured wells will create surface disturbances in excess of 2.5 acres. The Department will consult with the Department of Agriculture and Markets to develop permit conditions, best management practices (BMP) requirements and reclamation guidelines to be followed when the proposed disturbance is larger than 2.5 acres on a farm in an Agricultural District. Staff will perform the SEQRA review and publish the results in the Environmental Notice Bulletin (ENB). A large number of agricultural districts are currently located in areas where high-volume hydraulic fracturing drilling is expected to occur but many of these districts have reverted to forestlands and are no longer in agricultural production. Mineral Resources will provide guidance to gas well operators to achieve the goal of reducing or minimizing the surface disturbance to agricultural farmlands. Examples of the proposed Agricultural District requirements include but are not limited to:

- decompaction and deep ripping of disturbed areas prior to topsoil replacement;
- removal of construction debris from the site;
- no mixing of cuttings with topsoil;

- removal of spent drilling muds from active agricultural fields;
- location of well pads/access roads along field edges and in nonagricultural areas (where possible);
- removal of excess subsoil and rock from the site; and
- fencing of the site when drilling is located in active pasture areas to prevent livestock access.

Proposed projects that require other Department permits will continue to require site-specific SEQRA determinations regarding the activities covered by those permits, with one exception. Required coverage under a general stormwater permit does not result in the need for a site-specific SEQRA determination, as the Department issues its general permits pursuant to a separate process.

3.3 Regulations

The Department's oil and gas well regulations, located at 6 NYCRR Parts 550 - 559, contain permitting, recordkeeping, and operating requirements for oil and gas wells. More detailed requirements applicable to drilling operations are routinely attached as conditions to well drilling permits issued pursuant to the ECL. Additionally, the Department's regulations concerning water withdrawals, stormwater control, and the use of state lands, among others, would apply to various aspects of high-volume hydraulic fracturing operations considered in this revised draft SGEIS. Appendix 10 of this revised draft SGEIS contains proposed supplementary permit conditions for high-volume hydraulic fracturing that will be attached to well drilling permits. Although conditions incorporated into well drilling are enforceable pursuant to ECL Article 71, a number of the application requirements specific to high-volume hydraulic fracturing as well as many of the mitigation measures discussed in this revised draft SGEIS will be set forth in regulations. Accordingly, draft revisions and additions to the Department's regulations will be considered as part of the SGEIS process, pursuant to the State Administrative Procedures Act (SAPA) for agency rulemaking.

The enactment of revisions or additions to the Department's regulations relating to high-volume hydraulic fracturing would have a positive effect on the environment by mitigating or otherwise

addressing potential environmental impacts from this activity. However, because these regulations would be enacted as part of an action that would authorize high-volume hydraulic fracturing the enactment of such regulatory revisions or additions will be considered in conjunction with the Department's consideration of the significant environmental impacts under SEQRA.

SAPA contains other potential impact areas for state agencies to consider, such as the impact of proposed rules on jobs, rural areas and the regulated community. Some of these types of impacts are discussed in this revised draft SGEIS, but a complete examination of those types of impacts will be evaluated within the rulemaking process. The Department will consider all information generated by the SGEIS and SAPA processes to make determinations on how high-volume hydraulic fracturing operations would be regulated.



Chapter 4

Geology

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Chapter 4 - Geology

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Chapter 4 - GEOLOGY

This Chapter supplements and expands upon Chapter 5 of the 1992 GEIS. Sections 4.1 through 4.5 and the accompanying figures and tables were provided in essentially the form presented here by Alpha Environmental, Inc., under contract to NYSERDA to assist the Department with research related to this SGEIS.¹ Alpha's citations are retained for informational purposes, and are listed in the "consultants' references" section of the Bibliography. Section 4.6 discusses how NORM in the Marcellus Shale is addressed in the SGEIS.

The influence of natural geologic factors with respect to hydraulic fracture design and subsurface fluid mobility is discussed Chapter 5, specifically in Sections 5.8 (hydraulic fracture design) and 5.11.1.1 (subsurface fluid mobility).

4.1 Introduction

The natural gas industry in the US began in 1821 with a well completed by William Aaron Hart in the upper Devonian Dunkirk Shale in Chautauqua County. The "Hart" well supplied businesses and residents in Fredonia, New York with natural gas for 37 years. Hundreds of shallow wells were drilled in the following years into the shale along Lake Erie and then southeastward into western New York. Shale gas fields development spread into Pennsylvania, Ohio, Indiana, and Kentucky. Gas has been produced from the Marcellus since 1880 when the first well was completed in the Naples field in Ontario County. Eventually, as other formations were explored, the more productive conventional oil and natural gas fields were developed and shale gas (unconventional natural gas) exploration diminished.

The terms "conventional" and "unconventional" are related more to prevailing technology and economics surrounding the development of a given play than to the reservoir rock type from which the oil or natural gas resources are derived. Gas shales (also called "gas-containing shales") are one of a number of reservoir types that are explored for unconventional natural gas, and this group includes such terms as: deep gas; tight gas; coal-bed methane; geopressurized zones; and Arctic and sub-sea hydrates.

The US Energy Research and Development Administration (ERDA) began to evaluate gas resources in the US in the late 1960s. The Eastern Gas Shales Project was initiated in 1976 by

¹ Alpha, 2009.

the ERDA (later the US Department of Energy) to assess Devonian and Mississippian black shales. The studies concluded that significant natural gas resources were present in these tight formations.

The interest in development of shale gas resources increased in the late 20th and early 21st century as the result of an increase in energy demand and technological advances in drilling and well stimulation. The total unconventional natural gas production in the US increased by 65% and the proportion of unconventional gas production to total gas production increased from 28% in 1998 to 46% in 2007.²

A description of New York State geology and its relationship to oil, gas, and salt production is included in the 1992 GEIS. The geologic discussion provided herein supplements the information as it pertains to gas potential from unconventional gas resources. Emphasis is placed on the Utica and Marcellus Shales because of the widespread distribution of these units in New York.

4.2 Black Shales

Black shales, such as the Marcellus Shale, are fine-grained sedimentary rocks that contain high levels of organic carbon. The fine-grained material and organic matter accumulate in deep, warm, quiescent marine basins. The warm climate favors the proliferation of plant and animal life. The deep basins allow for an upper aerobic (oxygenated) zone that supports life and a deeper anaerobic (oxygen-depleted) zone that inhibits decay of accumulated organic matter. The organic matter is incorporated into the accumulating sediments and is buried. Pressure and temperature increase and the organic matter are transformed by slow chemical reactions into liquid and gaseous petroleum compounds as the sediments are buried deeper. The degree to which the organic matter is converted is dependent on the maximum temperature, pressure, and burial depth. The extent that these processes have transformed the carbon in the shale is represented by the thermal maturity and transformation ratio of the carbon. The more favorable gas producing shales occur where the total organic carbon (TOC) content is at least 2% and

² Alpha, 2009, p. 121.

where there is evidence that a significant amount of gas has formed and been preserved from the TOC during thermal maturation.³

Oil and gas are stored in isolated pore spaces or fractures and adsorbed on the mineral grains.⁴ Porosity (a measure of the void spaces in a material) is low in shales and is typically in the range of 0 to 10 percent.⁵ Porosity values of 1 to 3 percent are reported for Devonian shales in the Appalachian Basin.⁶ Permeability (a measure of a material's ability to transmit fluids) is also low in shales and is typically between 0.1 to 0.00001 millidarcy (md).⁷ Hill et al. (2002) summarized the findings of studies sponsored by NYSERDA that evaluated the properties of the Marcellus Shale. The porosity of core samples from the Marcellus in one well in New York ranged from 0 to 18%. The permeability of Marcellus Shale ranged from 0.0041 md to 0.216 md in three wells in New York State.

Black shale typically contains trace levels of uranium that is associated with organic matter in the shale.⁸ The presence of naturally occurring radioactive materials (NORM) induces a response on gamma-ray geophysical logs and is used to identify, map, and determine thickness of gas shales.

The Appalachian Basin was a tropical inland sea that extended from New York to Alabama (Figure 4.1). The tropical climate of the ancient Appalachian Basin provided favorable conditions for generating the organic matter, and the erosion of the mountains and highlands bordering the basin provided clastic material (i.e., fragments of rock) for deposition. The sedimentary rocks that fill the basin include shales, siltstones, sandstones, evaporites, and limestones that were deposited as distinct layers that represent several sequences of sea level rise and fall. Several black shale formations, which may produce natural gas, are included in these layers.⁹

³ Alpha, 2009, p. 122.

⁴ Alpha, 2009, p. 122.

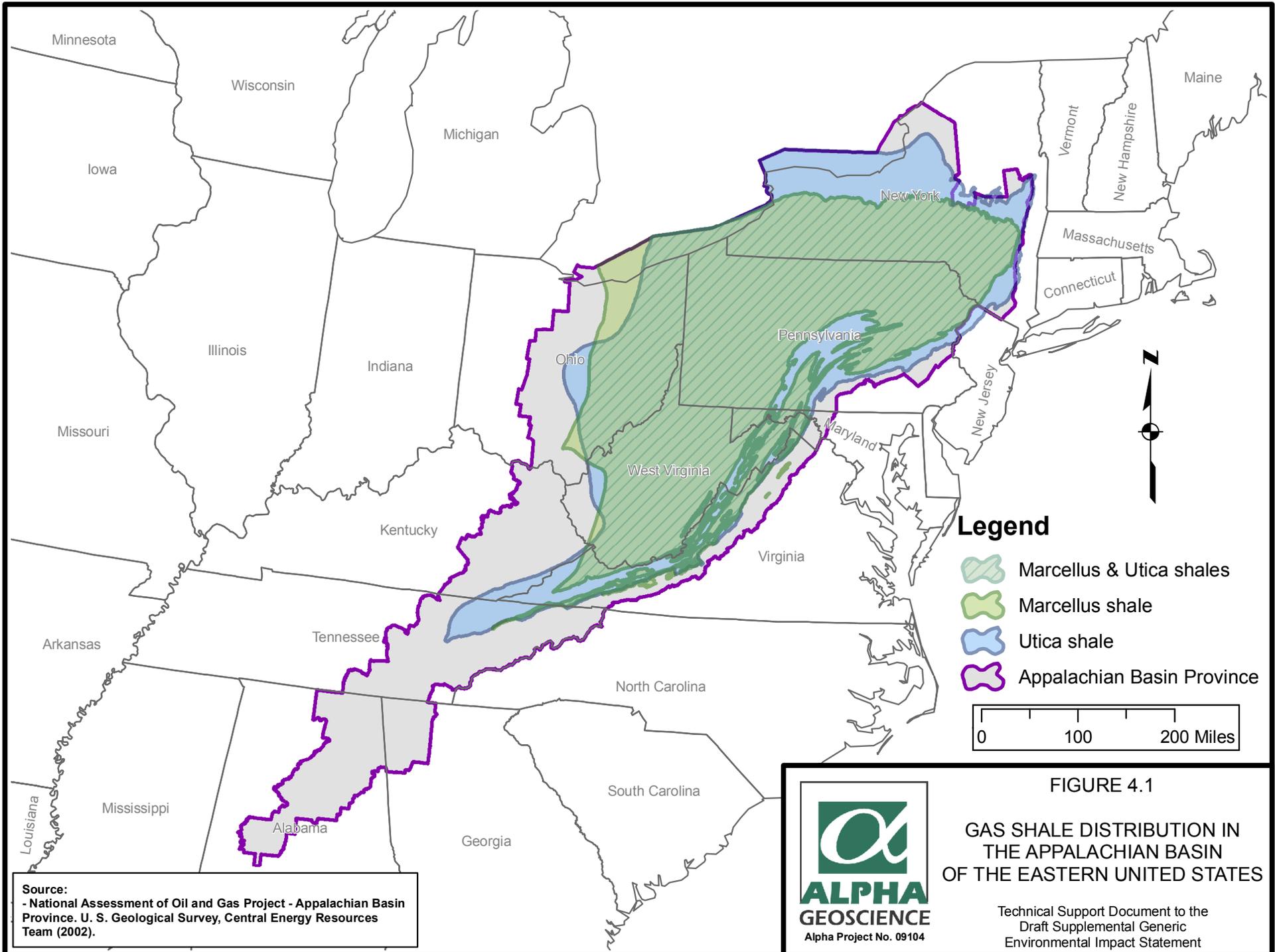
⁵ Alpha, 2009, p.122.

⁶ Alpha, 2009, p.122.

⁷ Alpha, 2009, p.122.

⁸ Alpha, 2009, p. 122.

⁹ Alpha, 2009, p. 123.



Source:
 - National Assessment of Oil and Gas Project - Appalachian Basin Province. U. S. Geological Survey, Central Energy Resources Team (2002).

The stratigraphic column for southwestern New York State is shown in Figure 4.2 and includes oil and gas producing horizons. This figure was initially developed by Van Tyne and Copley,¹⁰ from the analysis of drilling data in southwestern New York State, and it has been modified several times since then as various authors have cited it in different studies. The version presented as Figure 4.2 can also be found on the Department’s website at <http://www.dec.ny.gov/energy/33893.html>. Figure 4.3 is a generalized cross-section from west to east across the southern tier of New York State and shows the variation in thickness and depth of the different stratigraphic units. This figure was initially developed by the Reservoir Characterization Group of the New York State Museum. It is important to note that the geographic areas represented in Figure 4.2 and Figure 4.3 are not precisely the same, and the figures were originally developed by different authors. For example, the Marcellus Shale is shown in Figure 4.2 as the basal unit of the Hamilton Group, but it appears as a discrete unit below the Hamilton Group in Figure 4.3 to highlight its gas-bearing potential. Similarly, the “Devonian Sandstone and Shale” of Figure 4.3 correlates to the Conewango, Conneaut, Canadaway, West Falls, Sonyea, and Genesee Groups of Upper Devonian age shown in Figure 4.2.

The Ordovician-aged Utica Shale and the Devonian-aged Marcellus Shale are of particular interest because of recent estimates of natural gas resources and because these units extend throughout the Appalachian Basin from New York to Tennessee. There are other black shale formations (Figures 4.2 and 4.3) in New York that may produce natural gas on a localized basis.¹¹ The following sections describe the Utica and Marcellus Shales in greater detail.

4.3 Utica Shale

The Utica Shale is an upper Ordovician-aged black shale that extends across the Appalachian Plateau from New York and Quebec, Canada, south to Tennessee. It covers approximately 28,500 square miles in New York and extends from the Adirondack Mountains to the southern tier and east to the Catskill front (Figure 4.4). The Utica Shale is exposed in outcrops along the southern and western Adirondack Mountains, and it dips gently south to depths of more than 9,000 feet in the southern tier of New York.

¹⁰ Van Tyne and Copley, 1983.

¹¹ Alpha, 2009, p. 123.

The Utica Shale is a massive, fossiliferous, organic-rich, thermally-mature, black to gray shale. The sediment comprising the Utica Shale was derived from the erosion of the Taconic Mountains at the end of the Ordovician, approximately 440 to 460 million years ago. The shale is bounded below by Trenton Group strata and above by the Lorraine Formation and consists of three members in New York State that include: Flat Creek Member (oldest), Dolgeville Member, and the Indian Castle Member (youngest).¹² The Canajoharie Shale and Snake Hill Shale are found in the eastern part of the state and are lithologically equivalent, but older than the western portions of the Utica.¹³

There is some disagreement over the division of the Utica Shale members. Smith & Leone (2009) divide the Indian Castle Member into an upper low-organic carbon regional shale and a high-organic carbon lower Indian Castle. Nyahay et al. (2007) combines the lower Indian Castle Member with the Dolgeville Member. Fisher (1977) includes the Dolgeville as a member of the Trenton Group. The stratigraphic convention of Smith and Leone is used in this document.

Units of the Utica Shale have abundant pyrite, which indicates deposition under anoxic conditions. Geophysical logs and cutting analyses indicate that the Utica Shale has a low bulk density and high total organic carbon content.¹⁴

The Flat Creek and Dolgeville Members are found south and east of a line extending approximately from Steuben County to Oneida County (Figure 4.4). The Dolgeville is an interbedded limestone and shale. The Flat Creek is a dark, calcareous shale in its western extent and grades to an argillaceous calcareous mudstone to the east. These two members are time-equivalent and grade laterally toward the west into Trenton limestones.¹⁵ The lower Indian Castle Member is a fissile, black shale and is exposed in road cuts, particularly at the New York State Thruway (I-90) exit 29A in Little Falls. Figure 4.5 shows the depth to the base of the Utica Shale.¹⁶ This depth corresponds approximately with the base of the organic-rich section of the Utica Shale.

¹² Alpha, 2009, p. 124.

¹³ Alpha, 2009, p. 124.

¹⁴ Alpha, 2009, p. 124.

¹⁵ Alpha, 2009, p. 124.

¹⁶ Alpha, 2009, p. 124.

Figure 4.2 - Stratigraphic Section of Southwestern New York State

Period		Group	Unit	Lithology		
Penn.		Pottsville	Olean	Quartz pebble conglomerate & sandstone, quartz pebble, conglomerate, sandstone & minor shale		
Miss.		Pocono	Knapp			
Dev.	Upper	Conewango		Shale & sandstone, scattered conglomerates		
		Conneaut	Chadakoin	Shale & siltstone, scattered conglomerates		
		Canadaway	Undifferentiated ¹	O G O G	Shale & siltstone Minor sandstone	
			Perrysburg ²	O G O G	Shale & siltstone Minor sandstone	
		West Falls	Java Nunda Rhinestreet	G	Shale & siltstone Argillaceous limestone	
		Sonyea	Middlesex	G	Shale & siltstone	
		Genesee			Shale with minor siltstone & limestone	
	Middle		Tully	G	Limestone with minor siltstone & sandstone	
		Hamilton	Moscow Ludlowville Skaneateles Marcellus	G	Shale with minor sandstone & conglomerate	
			Onondaga	O G	Limestone	
	Lower	Tristates	Oriskany	G	Sandstone	
		Helderberg	Manlius Rondout		Limestone & dolostone	
	Sil.	Upper		Akron	O G	Dolostone
			Salina	Camillus Syracuse Vernon	S S	Shale, siltstone, anhydrite & halite
Lockport			Lockport	G	Limestone & dolostone	
Lower			Rochester Irondequoit		Shale & sandstone	
		Clinton	Sodus Reynales Thorold		Limestone & dolostone	
		Medina	Grimsby Whirlpool	G G	Sandstone & shale Quartz sandstone	
Ord.	Upper		Queenston Oswego Lorraine Utica	G G	Shale & siltstone with minor sandstone	
	Middle	Trenton - Black River	Trenton Black River	G	Limestone and minor dolostone	
	Lower	Beekmantown	Tribes Hill Chuctanunda		Limestone & dolostone	
Camb.	Upper		Little Falls Galway (Theresa) Potsdam	G G	Quartz sandstone & dolostone; sandstone & sandy dolomite; conglomerate base	
PreCamb.			Gneiss, Marble, Quartzite, etc...		Metamorphic & igneous rocks	

1 - Includes: Glade, Bradford 1st, Chipmunk, Bradford 2nd, Harrisburg Run, Scio, Penny and Richburg.

2 - Includes: Bradford 3rd, Humphrey, Clarksville, Waugh & Porter, and Fulmer Valley.

O: Oil producing

G: Gas producing

S: Salt producing

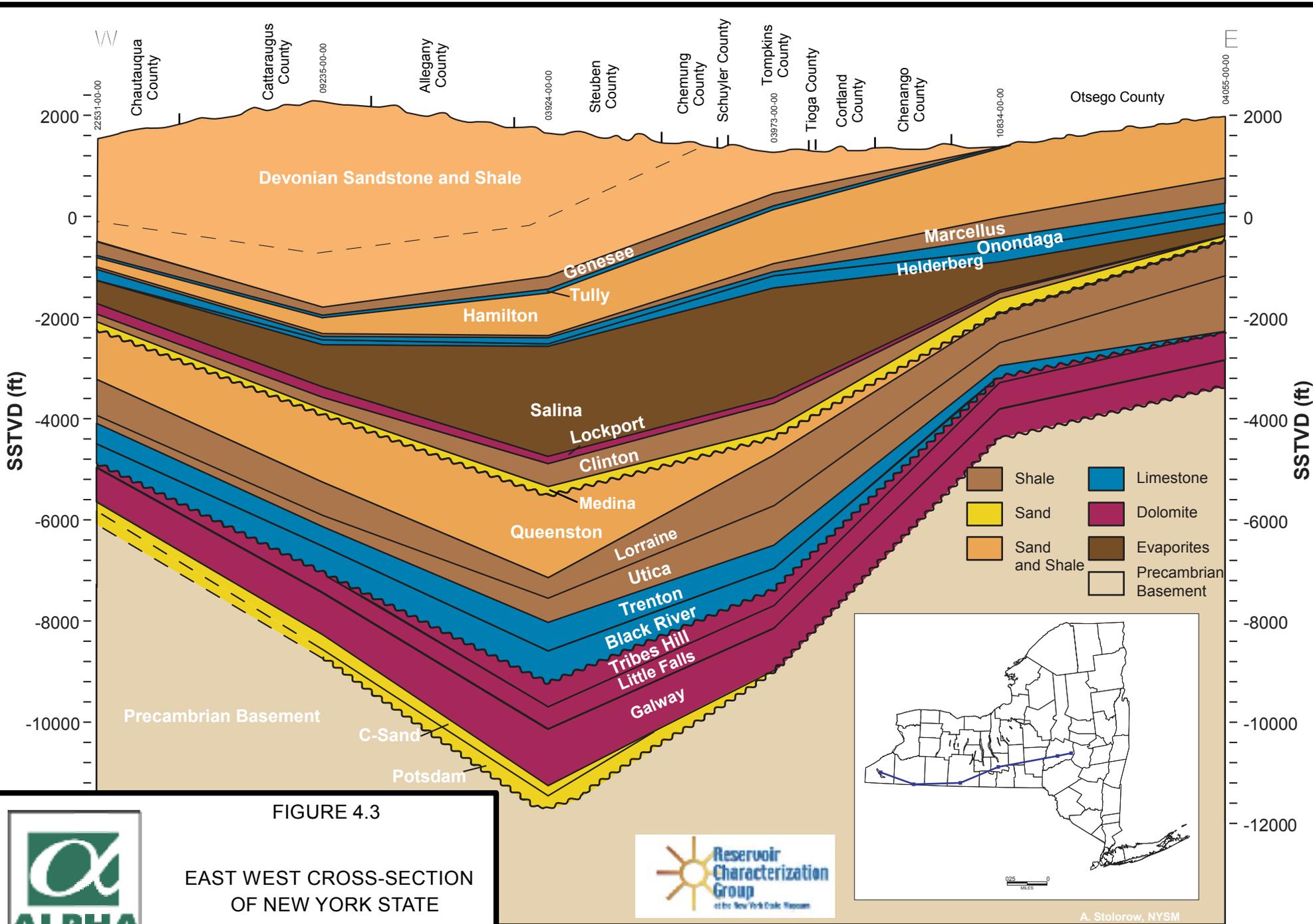


FIGURE 4.3

EAST WEST CROSS-SECTION OF NEW YORK STATE

Technical Support Document to the Draft Supplemental Generic Environmental Impact Statement



Legend

-  Utica Shale Outcrop*
-  Extent of the Utica Shale in New York

Source:
- New York State Museum - Reservoir Characterization Group (2009).
- Nyahay et al. (2007).
- U. S. Geological Survey, Central Energy Resources Team (2002).
- Fisher et al. (1970).

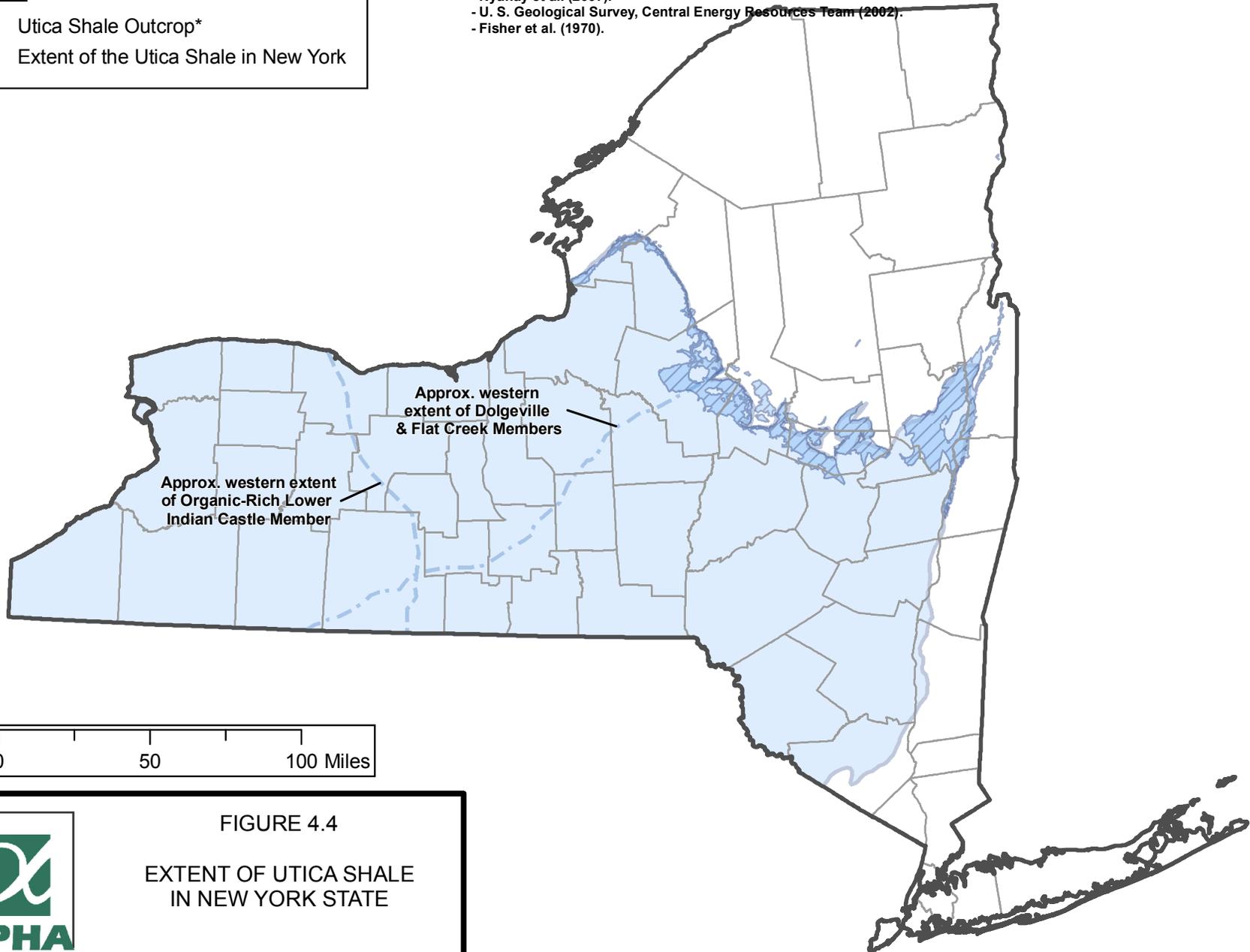


FIGURE 4.4

EXTENT OF UTICA SHALE
IN NEW YORK STATE

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4.3.1 Total Organic Carbon

Measurements of TOC in the Utica Shale are sparse. Where reported, TOC has been measured at over 3% by weight.¹⁷ Nyahay et al. (2007) compiled measurements of TOC for core and outcrop samples. TOC in the lower Indian Castle, Flat Creek, and Dolgeville Members generally ranges from 0.5 to 3%. TOC in the upper Indian Castle Member is generally below 0.5%. TOC values as high as 3.0% in eastern New York and 15% in Ontario and Quebec were also reported.¹⁸

The New York State Museum Reservoir Characterization Group evaluated cuttings from the Utica Shale wells in New York State and reported up to 3% TOC.¹⁹ Jarvie et al. (2007) showed that analyses from cutting samples may underestimate TOC by approximately half; therefore, it may be as high as 6%. Figure 4.6 shows the combined total thickness of the organic-rich (greater than 1%, based on cuttings analysis) members of the Utica Shale. As shown on Figure 4.6, the organic-rich Utica Shale ranges from less than 50 feet thick in north-central New York and increases eastward to more than 700 feet thick.

¹⁷ Alpha, 2009, p. 124.

¹⁸ Alpha, 2009, p. 125.

¹⁹ Alpha, 2009, p. 125.

Legend

- Depth to Base of Utica Shale*
- ▨ Utica Shale Outcrop
- Extent of the Utica Shale in New York

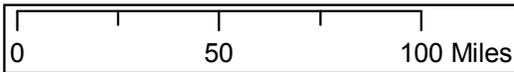
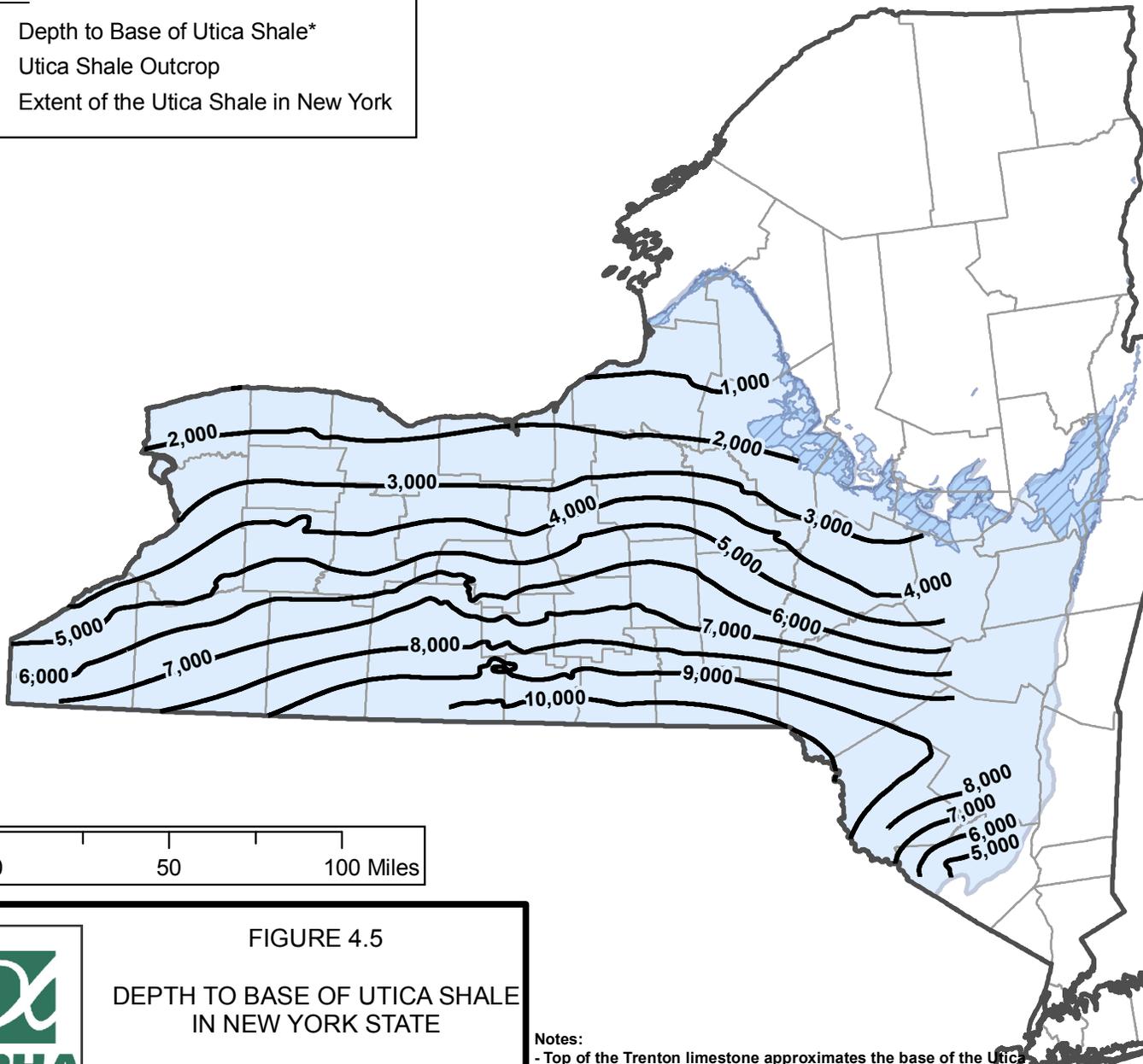


FIGURE 4.5

DEPTH TO BASE OF UTICA SHALE
IN NEW YORK STATE



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Notes:

- Top of the Trenton limestone approximates the base of the Utica shale (New York State Museum - Reservoir Characterization Group, 2009).
- U. S. Geological Survey, Central Energy Resources Team (2002).

Legend

- Utica Shale Thickness Contour (in feet)
- ▨ Utica Shale Outcrop
- Extent of the Utica Shale in New York

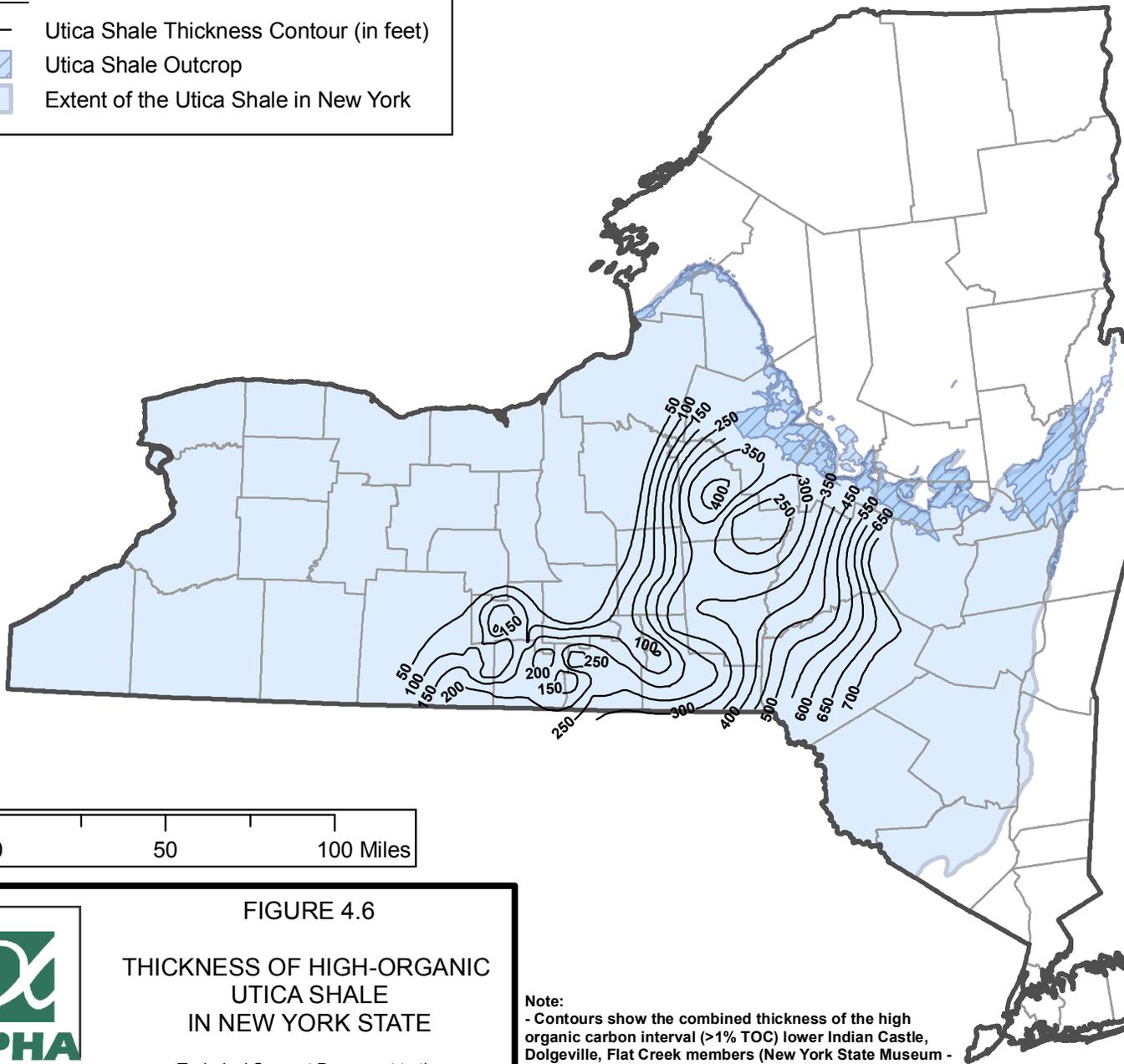


FIGURE 4.6

**THICKNESS OF HIGH-ORGANIC
UTICA SHALE
IN NEW YORK STATE**

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Draft Supplemental Generic
Environmental Impact Statement

Note:

- Contours show the combined thickness of the high organic carbon interval (>1% TOC) lower Indian Castle, Dolgeville, Flat Creek members (New York State Museum - Reservoir Characterization Group, 2009).



4.3.2 *Thermal Maturity and Fairways*

Nyahay, et. al. (2007) presented an assessment of gas potential in the Marcellus and Utica Shales. The assessment was based on an evaluation of geochemical data from core and outcrop samples using methods applied to other shale gas plays, such as the Barnett Shale in Texas. A gas production “fairway”, which is a portion of the shale most likely to produce gas based on the evaluation, was presented. Based on the available, limited data, Nyahay et al. (2007) concluded that most of the Utica Shale is supermature and that the Utica Shale fairway is best outlined by the Flat Creek Member where the TOC and thickness are greatest. This area extends eastward from a northeast-southwest line connecting Montgomery to Steuben Counties (Figure 4.7). The fairway shown on Figure 4.7 correlates approximately with the area where the organic-rich portion of the Utica Shale is greater than 100 feet thick shown on Figure 4.6.²⁰ The fairway is that portion of the formation that has the potential to produce gas based on specific geologic and geochemical criteria; however, other factors, such as formation depth, make only portions of the fairway favorable for drilling. Operators consider a variety of these factors, besides the extent of the fairway, when making a decision on where to drill for natural gas.

The results of the 2007 evaluation are consistent with an earlier report by Weary et al. (2000) that presented an evaluation of thermal maturity based on patterns of thermal alteration of conodont microfossils across New York State. The data presented show that the thermal maturity of much of the Utica Shale in New York is within the dry natural gas generation and preservation range and generally increases from northwest to southeast.

4.3.3 *Potential for Gas Production*

The Utica Shale historically has been considered the source rock for the more permeable conventional gas resources. Fresh samples containing residual kerogen and other petroleum residuals reportedly have been ignited and can produce an oily sheen when placed in water.²¹ Significant gas shows have been reported while drilling through the Utica Shale in eastern and central New York.²²

²⁰ Alpha, 2009, p. 125.

²¹ Alpha, 2009, p. 126.

²² Alpha, 2009, p. 126.

No Utica Shale gas production was reported to the Department in 2009. Vertical test wells completed in the Utica in the St. Lawrence Lowlands of Quebec have produced up to one million cubic feet per day (MMcf/d) of natural gas.

4.4 Marcellus Formation

The Marcellus Formation is a Middle Devonian-aged member of the Hamilton Group that extends across most of the Appalachian Plateau from New York south to Tennessee. The Marcellus Formation consists of black and dark gray shales, siltstones, and limestones. The Marcellus Formation lies between the Onondaga limestone and the overlying Stafford-Mottville limestones of the Skaneateles Formation²³ and ranges in thickness from less than 25 feet in Cattaraugus County to over 1,800 feet along the Catskill front.²⁴ The informal name “Marcellus Shale” is used interchangeably with the formal name “Marcellus Formation.” The discussion contained herein uses the name Marcellus Shale to refer to the black shale in the lower part of the Hamilton Group.

The Marcellus Shale underlies an area of approximately 18,700 square miles in New York (Figure 4.8). The Marcellus is exposed in outcrops to the north and east and reaches depths of more than 5,000 feet in the southern tier (Figure 4.8).

The Marcellus Shale in New York State consists of three primary members.²⁵ The oldest (lower-most) member of the Marcellus is the Union Springs Shale which is laterally continuous with the Bakoven Shale in the eastern part of the state. The Union Springs and Bakoven Shales are bounded below by the Onondaga and above by the Cherry Valley Limestone in the west and the correlative Stony Hollow Member in the East. The upper-most member of the Marcellus Shale is the Oatka Creek Shale (west) and the correlative Cardiff-Chittenango Shales (east). The members of primary interest with respect to gas production are the Union Springs and lower-most portions

²³ Alpha, 2009, p. 126.

²⁴ Alpha, 2009, p. 126.

²⁵ Alpha, 2009, p. 127.

of the Oatka Creek Shale.²⁶ The cumulative thickness of the organic-rich layers ranges from less than 25 feet in western New York to over 300 feet in the east (Figure 4.9). Gamma ray logs indicate that the Marcellus Shale has a slightly radioactive signature on gamma ray geophysical logs, consistent with typical black shales. Concentrations of uranium ranging from 5 to 100 parts per million have been reported in Devonian gas shales.²⁷

4.4.1 Total Organic Carbon

Figure 4.10 shows the aerial distribution of TOC in the Marcellus Shale based on the analysis of drill cuttings sample data.²⁸ TOC generally ranges between 2.5 and 5.5 percent and is greatest in the central portion of the state. Ranges of TOC values in the Marcellus were reported between 3 to 12%²⁹ and 1 to 10.1%.³⁰

4.4.2 Thermal Maturity and Fairways

Vitrinite reflectance is a measure of the maturity of organic matter in rock with respect to whether it has produced hydrocarbons and is reported in percent reflection (% Ro). Values of 1.5 to 3.0 % Ro are considered to correspond to the “gas window,” though the upper value of the window can vary depending on formation and kerogen type characteristics.

VanTyne (1993) presented vitrinite reflection data from nine wells in the Marcellus Shale in Western New York. The values ranged from 1.18 % Ro to 1.65 % Ro, with an average of 1.39 % Ro. The vitrinite reflectance values generally increase eastward. Nyahay et al (2007) and Smith & Leone (2009) presented vitrinite reflectance data for the Marcellus Shale in New York (Figure 4.11) based on samples compiled by the New York State Museum Reservoir Characterization Group. The values ranged from less than 1.5 % Ro in western New York to over 3 % Ro in eastern New York.

Nyahay et al. (2007) presented an assessment of gas potential in the Marcellus Shale that was based on an evaluation of geochemical data from rock core and outcrop samples using methods

²⁶ Alpha, 2009, p. 127.

²⁷ Alpha, 2009, p. 127.

²⁸ Alpha, 2009, p. 127.

²⁹ Alpha, 2009, p. 127.

³⁰ Alpha, 2009, p. 127.

applied to other shale gas plays, such as the Barnett Shale in Texas. The gas productive fairway was identified based on the evaluation and represents the portion of the Marcellus Shale most likely to produce gas. The Marcellus fairway is similar to the Utica Shale fairway and is shown on Figure 4.12. The fairway is that portion of the formation that has the potential to produce gas based on specific geologic and geochemical criteria; however, other factors, such as formation depth, make only portions of the fairway favorable for drilling. Operators consider a variety of these factors, besides the extent of the fairway, when making a decision on where to drill for natural gas. Variation in the actual production is evidenced by Marcellus Shale wells outside the fairway that have produced gas and wells within the fairway that have been reported dry.

4.4.3 *Potential for Gas Production*

Gas has been produced from the Marcellus since 1880 when the first well was completed in the Naples field in Ontario County. The Naples field produced 32 MMcf during its productive life and nearly all shale gas discoveries in New York since then have been in the Marcellus Shale.³¹

All gas wells completed in New York's Marcellus Shale as of the publication date of this document are vertical wells.³²

The Department's summary production database includes reported natural gas production for the years 1967 through 1999. Approximately 544 MMcf of gas was produced from wells completed in the Marcellus Shale during this period.³³ In 2010, the most recent reporting year available, a total of 34 MMcf of gas was produced from 15 Marcellus Shale wells in Livingston, Steuben, Schuyler, Chemung, Chautauqua, Wyoming and Allegany Counties.

Volumes of in-place natural gas resources have been estimated for the entire Appalachian Basin. Charpentier et al. (1982) estimated a total in-place resource of 844.2 Tcf in all Devonian shales within the basin, including the Marcellus Shale. Approximately 164.1 Tcf, or 19%, of that estimated total, was attributed to the Devonian shales in New York State. NYSERDA estimates that approximately 15% of the total Devonian shale gas resource of the Appalachian Basin lies beneath New York State.

³¹ Alpha, 2009, p. 129.

³² Alpha, 2009, p. 129.

³³ Alpha, 2009, p. 129.

Legend

- Depth to the Top of the Marcellus Shale
- ▨ Marcellus Shale and Hamilton Group Outcrop
- Extent of the Marcellus Shale in New York

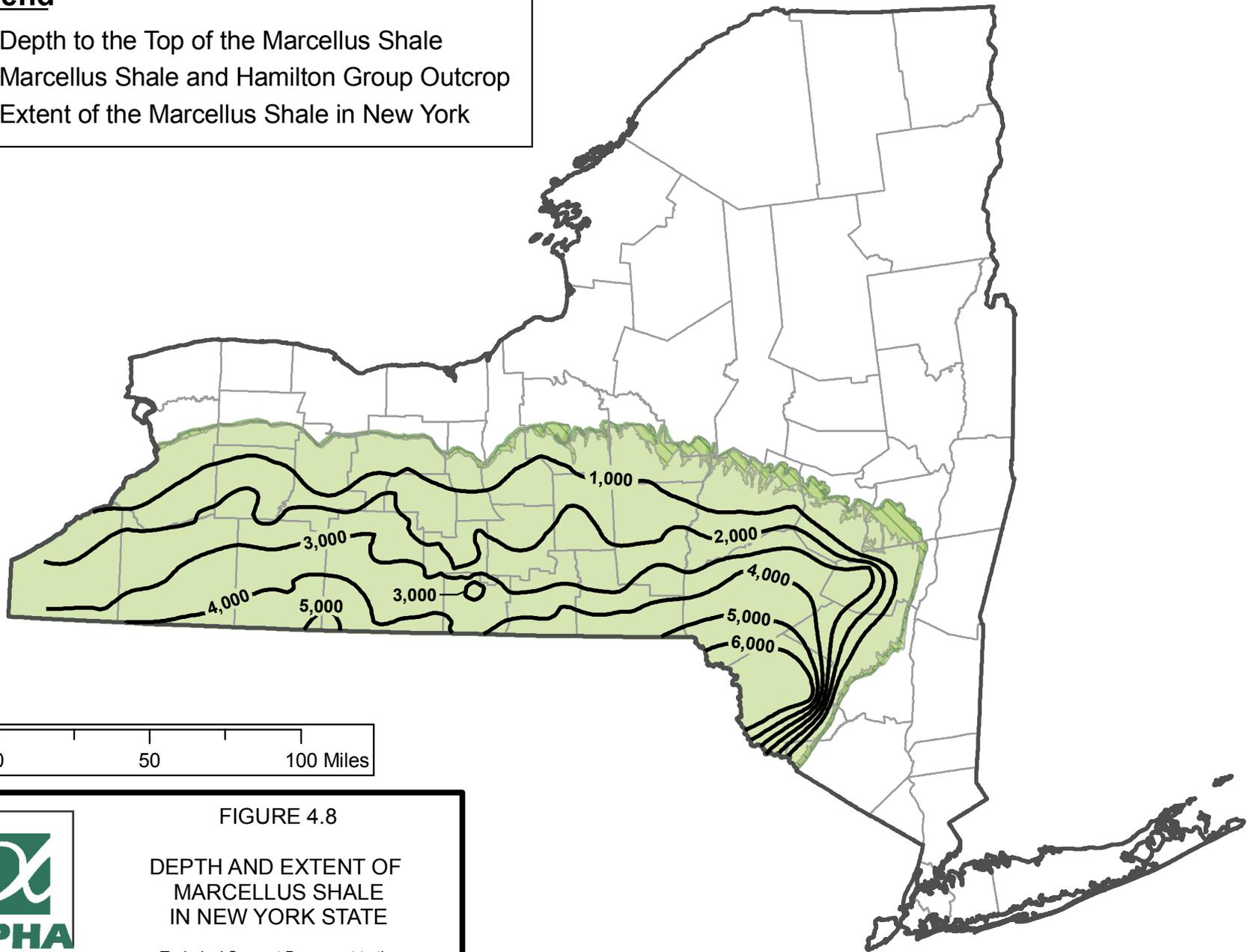


FIGURE 4.8

DEPTH AND EXTENT OF
MARCELLUS SHALE
IN NEW YORK STATE

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Source:
- New York State Museum - Reservoir Characterization Group (Leone, 2009).

Legend

- Thickness Organic-Rich Marcellus Shale (in feet)
- ▨ Marcellus Shale and Hamilton Group Outcrop
- Extent of the Marcellus Shale in New York

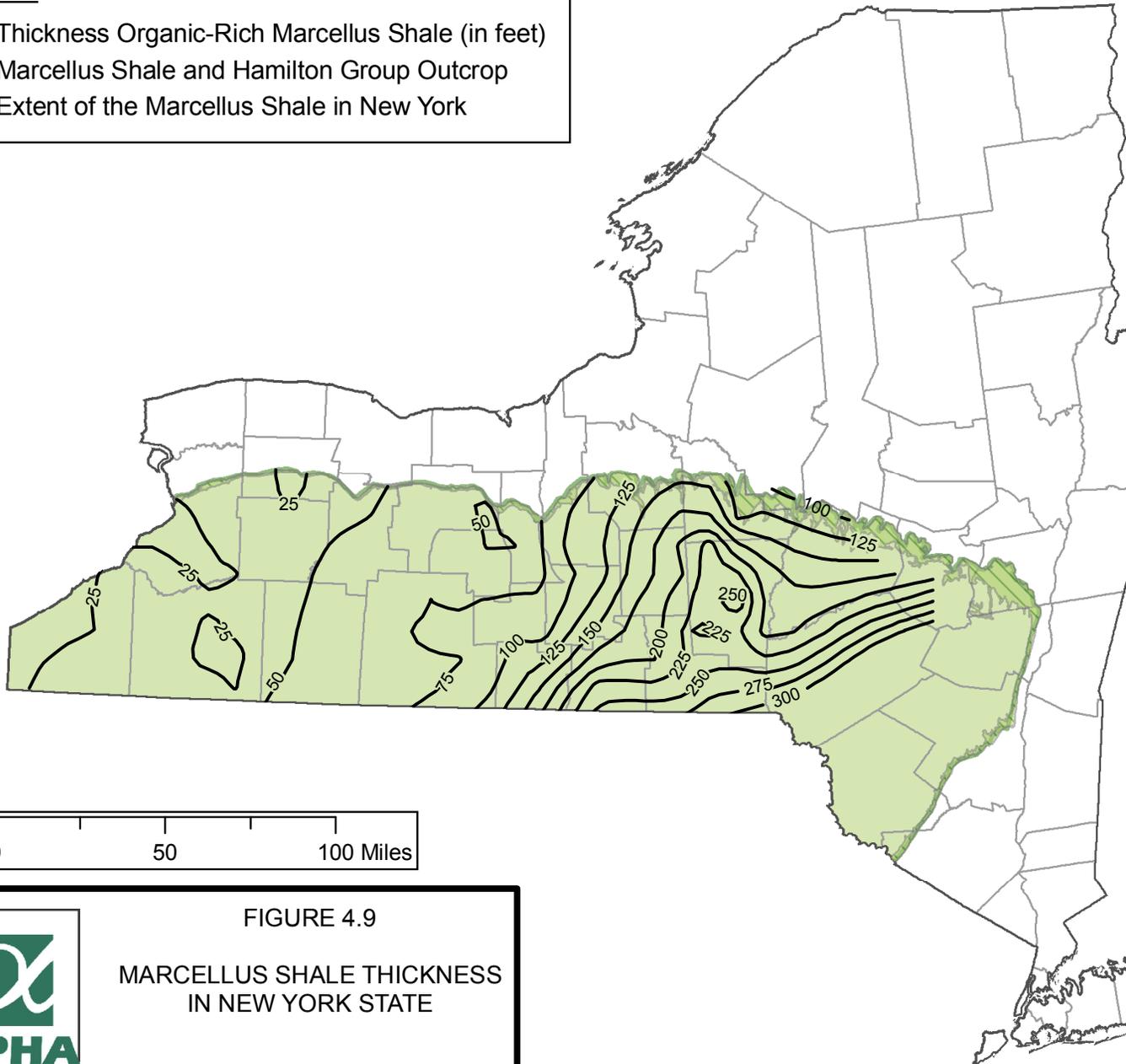


FIGURE 4.9

MARCELLUS SHALE THICKNESS
IN NEW YORK STATE



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Notes:

- Source: New York State Museum - Reservoir Characterization Group (Leone, 2009)
- Organic-rich Marcellus includes Union Springs and Oatka Creek Members and lateral equivalents.

Legend

- Total Organic Carbon (weight percent) in Organic-Rich Marcellus Shale
- ▨ Marcellus Shale and Hamilton Group Outcrop
- Extent of the Marcellus Shale in New York

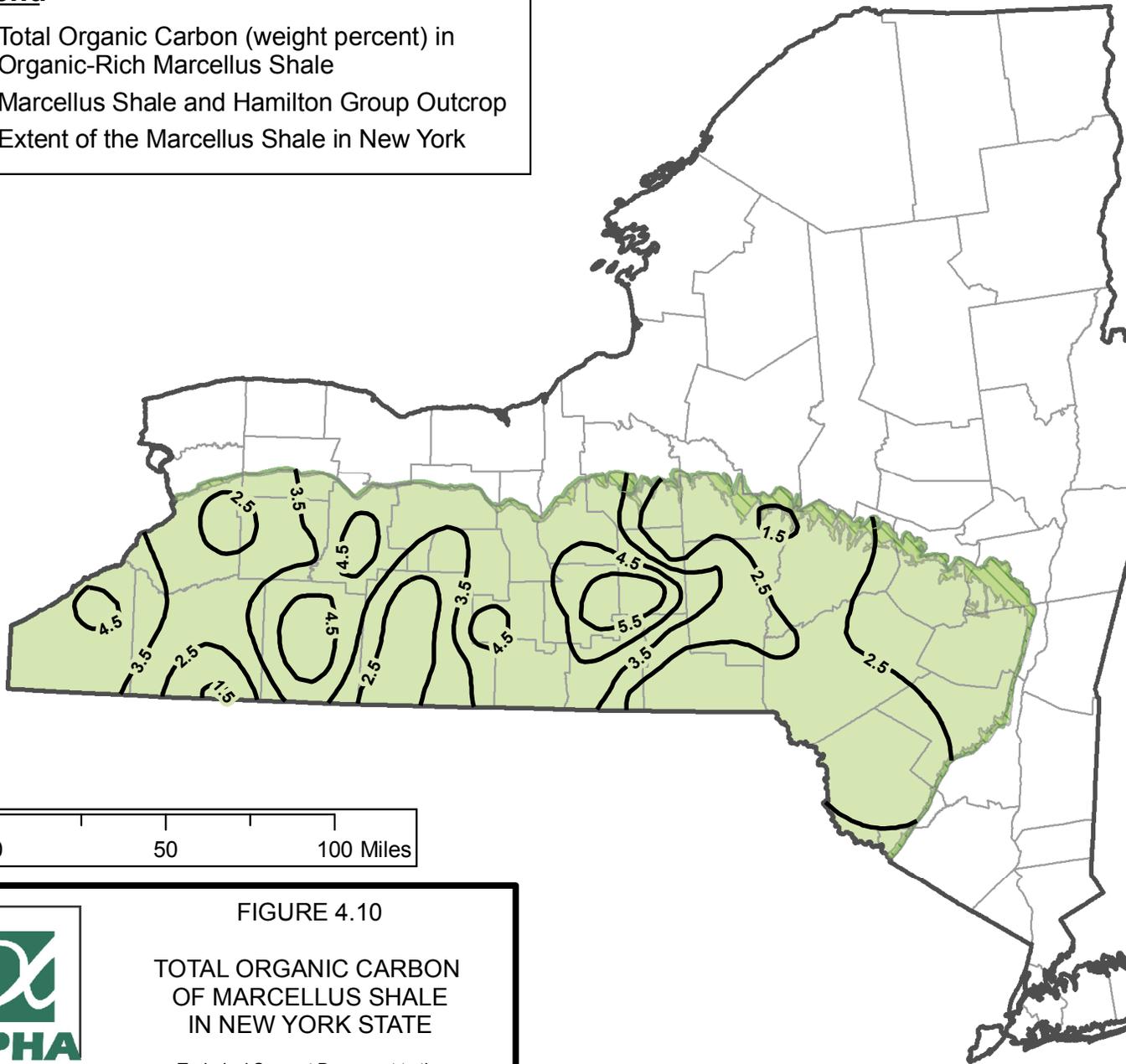


FIGURE 4.10

TOTAL ORGANIC CARBON
OF MARCELLUS SHALE
IN NEW YORK STATE

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Source:
- Modified from New York State Museum - Reservoir Characterization
Group (Leone, 2009).

Legend

Extent of the Marcellus Shale in New York

Vitrinite Reflection (%Ro)

- Less than 0.6
- 0.6 to 1.5
- 1.5 to 3.0
- Greater than 3.0

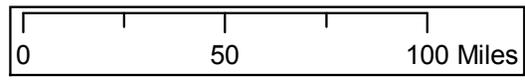
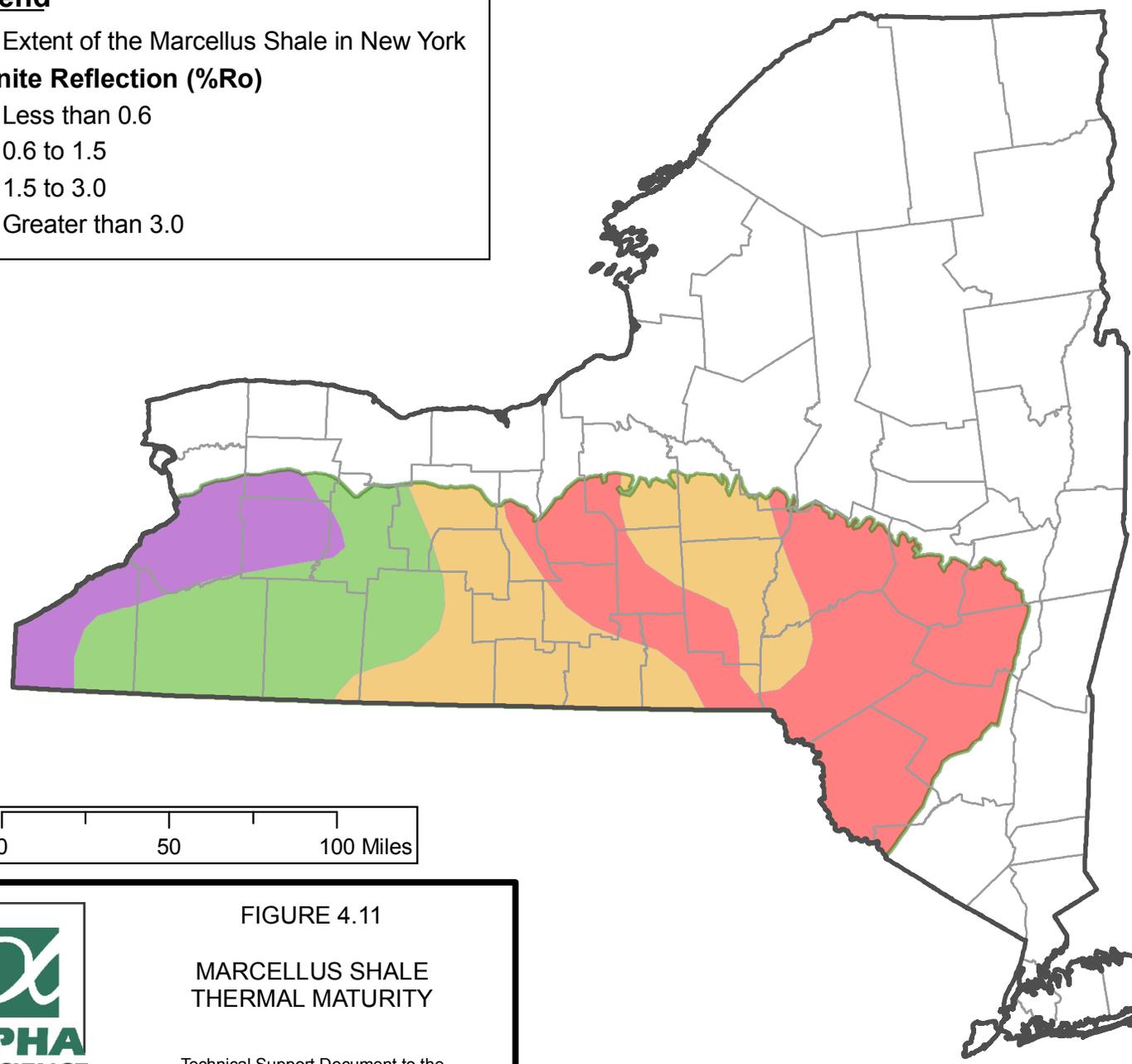


FIGURE 4.11

**MARCELLUS SHALE
THERMAL MATURITY**

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Environmental Impact Statement

Source:
- Modified from Smith & Leone (2009).

Legend

-  Marcellus Shale and Hamilton Group Outcrop
-  Marcellus Shale Fairway
-  Extent of the Marcellus Shale in New York

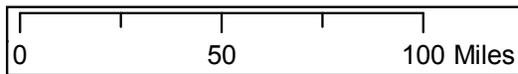
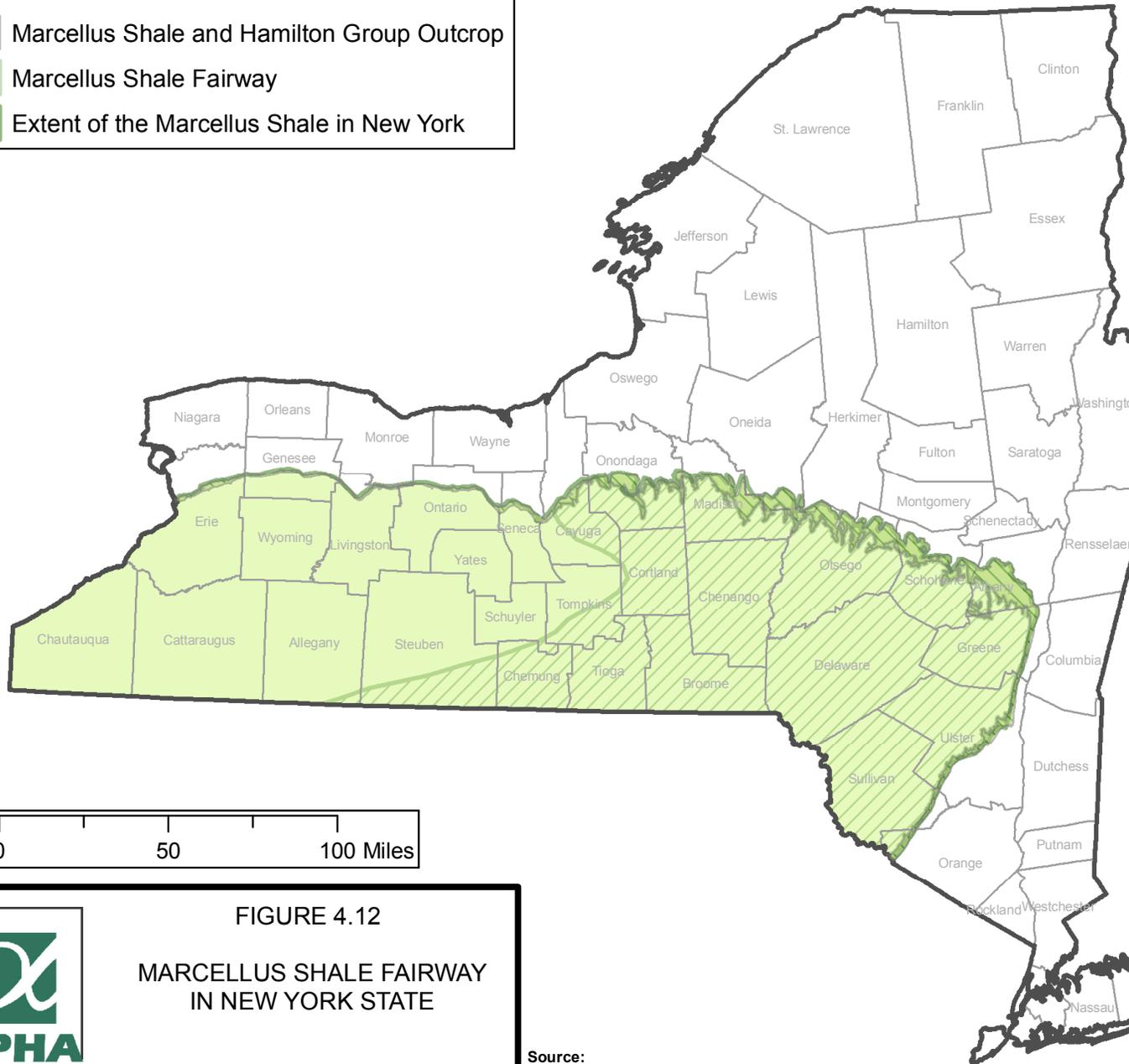


FIGURE 4.12

**MARCELLUS SHALE FAIRWAY
IN NEW YORK STATE**

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Source:
 - US Geological Survey, Central Energy Resources Team (2002)
 - New York State Museum - Reservoir Characterization Group
 - Nyahay et al. (2007)

In 2011, the USGS estimated a mean of 84.2 Tcf of technically recoverable undiscovered natural gas reserves in the Marcellus Shale in the Appalachian Basin, more than a 40-fold increase from its 2002 estimate of 1.9 Tcf. Engelder had previously estimated a 50% probability that 489 Tcf of gas would be produced basin-wide from the Marcellus after a 50-year decline, and assigned 71.9 Tcf of that total to 17 counties in New York.³⁴ Engelder's basin-wide estimate appears to include both proven and undiscovered reserves. While Engelder's methodology is based on both geology and published information about initial production rates and production decline from actual wells in Pennsylvania, the USGS describes its approach as based on recognized geologic characteristics of the formation. There is insufficient information available to determine the validity of comparing these projections, but it is common for projections of these types to vary, as a function of the prevailing technologies and knowledge base associated with a given resource.

4.5 Seismicity in New York State

4.5.1 Background

The term “earthquake” is used to describe any event that is the result of a sudden release of energy in the earth's crust that generates seismic waves. Many earthquakes are too minor to be detected without sensitive equipment. Large earthquakes result in ground shaking and sometimes displacing the ground surface. Earthquakes are caused mainly by movement along geological faults, but also may result from volcanic activity and landslides. An earthquake's point of origin is called its focus or hypocenter. The term epicenter refers to the point at the ground surface directly above the hypocenter.

Geologic faults are fractures along which rocks on opposing sides have been displaced relative to each other. The amount of displacement may be small (centimeters) or large (kilometers).

Geologic faults are prevalent and typically are active along tectonic plate boundaries. One of the most well known plate boundary faults is the San Andreas fault zone in California. Faults also occur across the rest of the U.S., including mid-continent and non-plate boundary areas, such as

³⁴ Engelder, 2009.

the New Madrid fault zone in the Mississippi Valley, or the Ramapo fault system in southeastern New York and eastern Pennsylvania.

Figure 4.13 shows the locations of faults and other structures that may indicate the presence of buried faults in New York State.³⁵ There is a high concentration of structures in eastern New York along the Taconic Mountains and the Champlain Valley that resulted from the intense thrusting and continental collisions during the Taconic and Allegheny orogenies that occurred 350 to 500 million years ago.³⁶ There is also a high concentration of faults along the Hudson River Valley. More recent faults in northern New York were formed as a result of the uplift of the Adirondack Mountains approximately 5 to 50 million years ago.

4.5.2 *Seismic Risk Zones*

The USGS Earthquake Hazard Program has produced the National Hazard Maps showing the distribution of earthquake shaking levels that have a certain probability of occurring in the United States. The maps were created by incorporating geologic, geodetic and historic seismic data, and information on earthquake rates and associated ground shaking. These maps are used by others to develop and update building codes and to establish construction requirements for public safety.

New York State is not associated with a major fault along a tectonic boundary like the San Andreas, but seismic events are common in New York. Figure 4.14 shows the seismic hazard map for New York State.³⁷ The map shows levels of horizontal shaking, in terms of percent of the gravitational acceleration constant (%g) that is associated with a 2 in 100 (2%) probability of occurring during a 50-year period.³⁸ Much of the Marcellus and Utica Shales underlie portions of the state with the lowest seismic hazard class rating in New York (2% probability of exceeding 4 to 8 %g in a 50-year period). The areas around New York City, Buffalo, and northern-most New York have a moderate to high seismic hazard class ratings (2% probability of exceeding 12 to 40 %g in a 50-year period).

³⁵ Alpha, 2009, p. 138.

³⁶ Alpha, 2009, p. 138.

³⁷ Alpha, 2009, p. 139.

³⁸ Alpha, 2009, p. 139.

Legend

- Geologic Fault
- Combined Utica and Marcellus Shales in New York State

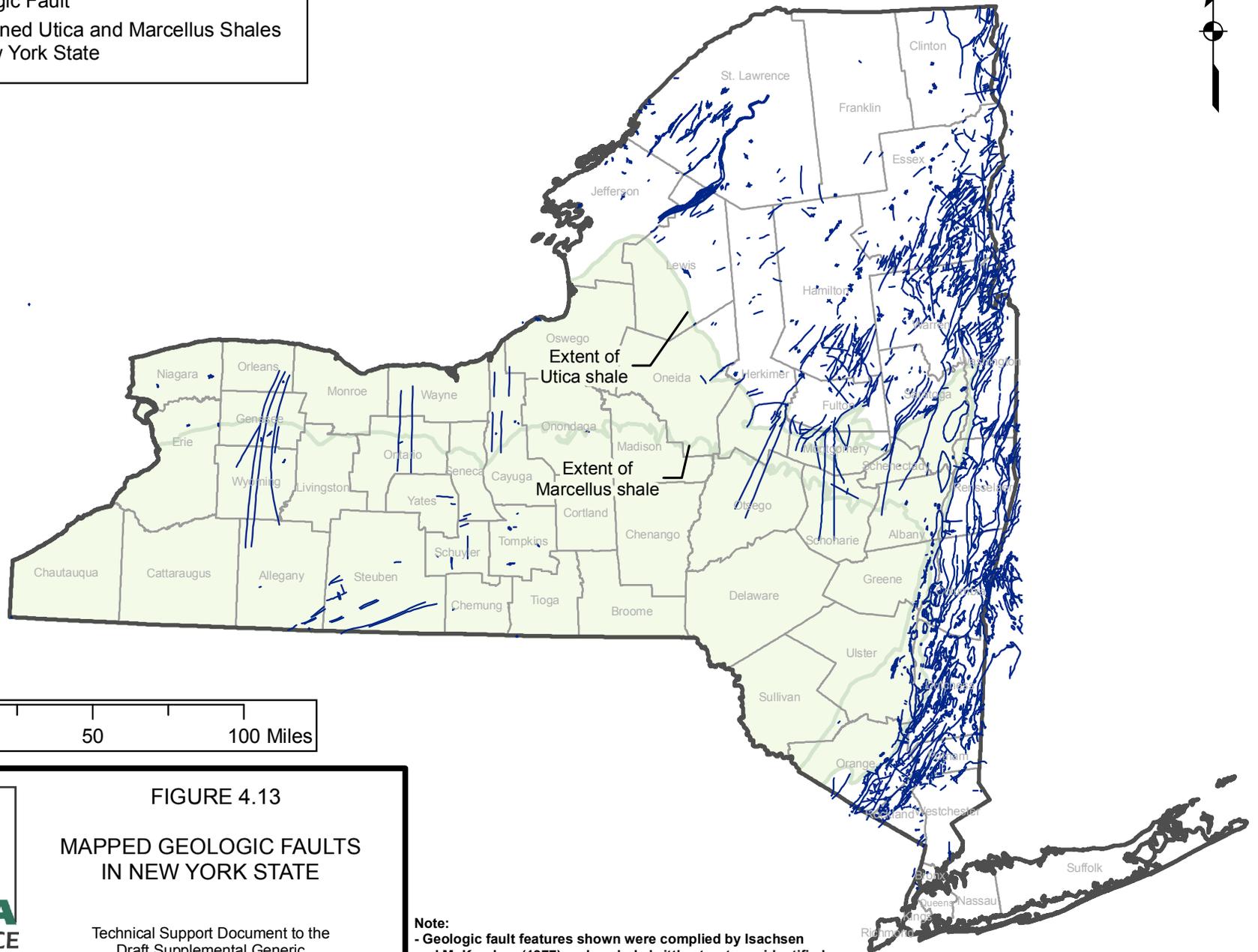


FIGURE 4.13

MAPPED GEOLOGIC FAULTS
IN NEW YORK STATE

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Note:
- Geologic fault features shown were compiled by Isachsen and McKendree (1977) and exclude brittle structures identified as drillholes, topographic, and tonal linear features.

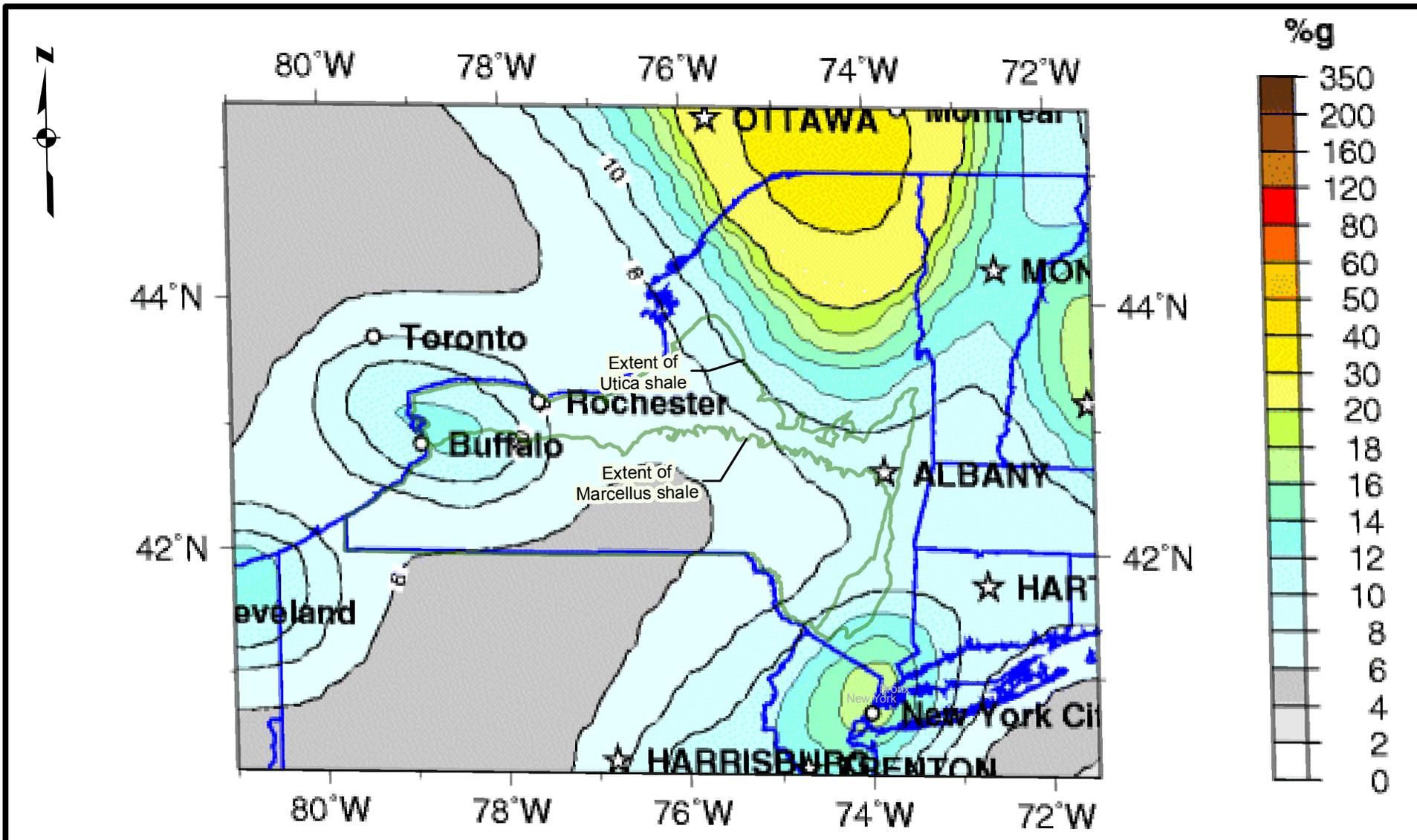


FIGURE 4.14

NEW YORK STATE
SEISMIC HAZARD MAP

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- Notes:
- Map shows peak acceleration (%g) with 2% probability of exceedence in 50 years.
 - Source - USGS National Seismic Hazard Maps (2008).

4.5.3 Seismic Damage – Modified Mercalli Intensity Scale

There are several scales by which the magnitude and the intensity of a seismic event are reported. The Richter magnitude scale was developed in 1935 to measure of the amount of energy released during an earthquake. The moment magnitude scale (MMS) was developed in the 1970s to address shortcomings of the Richter scale, which does not accurately calculate the magnitude of earthquakes that are large (greater than 7) or distant (measured at a distance greater than 250 miles away). Both scales report approximately the same magnitude for earthquakes with a magnitude less than 7 and both scales are logarithmic; an increase of two units of magnitude on the Richter scale corresponds to a 1,000-fold increase in the amount of energy released.

The MMS measures the size of a seismic event based on the amount of energy released. Moment is a representative measure of seismic strength for all sizes of events and is independent of recording instrumentation or location. Unlike the Richter scale, the MMS has no limits to the possible measurable magnitudes, and the MMS relates the moments to the Richter scale for continuity. The MMS also can represent microseisms (very small seismicity) with negative numbers.

The Modified Mercalli (MM) Intensity Scale was developed in 1931 to report the intensity of an earthquake. The Mercalli scale is an arbitrary ranking based on observed effects and not on a mathematical formula. This scale uses a series of 12 increasing levels of intensity that range from imperceptible shaking to catastrophic destruction, as summarized in Table 4.1. Table 4.1 compares the MM intensity scale to magnitudes of the MMS, based on typical events as measured near the epicenter of a seismic event. There is no direct conversion between the intensity and magnitude scales because earthquakes of similar magnitudes can cause varying levels of observed intensities depending on factors such location, rock type, and depth.

4.5.4 Seismic Events

Table 4.2 summarizes the recorded seismic events in New York State by county between December 1970 and July 2009.³⁹ There were a total of 813 seismic events recorded in New York

³⁹ Alpha, 2009, p. 140.

State during that period. The magnitudes of 24 of the 813 events were equal to or greater than 3.0. Magnitude 3 or lower earthquakes are mostly imperceptible and are usually detectable only with sensitive equipment. The largest seismic event during the period 1970 through 2009 is a 5.3 magnitude earthquake that occurred on April 20, 2002, near Plattsburgh, Clinton County.⁴⁰

Damaging earthquakes have been recorded since Europeans settled New York in the 1600s. The largest earthquake ever measured and recorded in New York State was a magnitude 5.8 event that occurred on September 5, 1944, near Massena, New York.⁴¹

⁴⁰ Alpha, 2009, p. 140.

⁴¹ Alpha, 2009, p. 140.

**Table 4.1
Modified Mercalli Intensity Scale**

Modified Mercalli Intensity	Description	Effects	Typical Maximum Moment Magnitude
I	Instrumental	Not felt except by a very few under especially favorable conditions.	1.0 to 3.0
II	Feeble	Felt only by a few persons at rest, especially on upper floors of buildings.	3.0 to 3.9
III	Slight	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.	
IV	Moderate	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.	4.0 to 4.9
V	Rather Strong	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.	
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.	5.0 to 5.9
VII	Very Strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.	
VIII	Destructive	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.	6.0 to 6.9
IX	Ruinous	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.	
X	Disastrous	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.	7.0 and higher
XI	Very Disastrous	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.	
XII	Catastrophic	Damage total. Lines of sight and level are distorted. Objects thrown into the air.	

The above table compares the Modified Mercalli intensity scale and moment magnitude scales that typically observed near the epicenter of a seismic event.

Source: USGS Earthquake Hazard Program (http://earthquake.usgs.gov/learning/topics/mag_vs_int.php)

Table 4.2
Summary of Seismic Events in New York State
December 1970 through July 2009

County	Magnitude					Total
	< 2.0	2.0 to 2.9	3.0 to 3.9	4.0 to 4.9	5.0 to 5.3	
<i>Counties Overlying Utica and Marcellus Shales</i>						
Albany	27	20	3	0	0	50
Allegany	0	0	0	0	0	0
Broome	0	0	0	0	0	0
Cattaraugus	0	0	0	0	0	0
Cayuga	0	0	0	0	0	0
Chautauqua	0	0	0	0	0	0
Chemung	0	0	0	0	0	0
Chenango	0	0	0	0	0	0
Cortland	0	0	0	0	0	0
Delaware	1	2	0	0	0	3
Erie	7	5	0	0	0	12
Genesee	3	5	0	0	0	8
Greene	2	1	0	0	0	3
Livingston	1	5	1	0	0	7
Madison	0	0	0	0	0	0
Montgomery	1	2	0	0	0	3
Niagara	7	3	0	0	0	10
Onondaga	0	0	0	0	0	0
Ontario	1	1	0	0	0	2
Otsego	0	0	0	0	0	0
Schoharie	2	4	0	1	0	7
Schuyler	0	0	0	0	0	0
Seneca	0	0	0	0	0	0
Steuben	2	0	1	0	0	3
Sullivan	0	0	0	0	0	0
Tioga	0	0	0	0	0	0
Tompkins	0	0	0	0	0	0
Wyoming	8	5	0	0	0	13
Yates	1	0	0	0	0	1
<i>Subtotal</i>	<i>63</i>	<i>53</i>	<i>5</i>	<i>1</i>	<i>0</i>	<i>122</i>
<i>Counties Overlying Utica Shale</i>						
Fulton	1	2	1	0	0	4
Herkimer	4	3	0	0	0	7
Jefferson	5	3	0	0	0	8
Lewis	3	0	2	0	0	5
Monroe	1	0	0	0	0	1
Oneida	3	4	0	0	0	7
Orange	14	5	0	0	0	19
Orleans	0	0	0	0	0	0
Oswego	2	0	0	0	0	2
Saratoga	1	2	0	0	0	3
Schenectady	1	1	0	0	0	2
Wayne	0	0	0	0	0	0
<i>Subtotal</i>	<i>35</i>	<i>20</i>	<i>3</i>	<i>0</i>	<i>0</i>	<i>58</i>

Table 4.2
Summary of Seismic Events in New York State
December 1970 through July 2009

County	Magnitude					Total
	< 2.0	2.0 to 2.9	3.0 to 3.9	4.0 to 4.9	5.0 to 5.3	
<i>Counties Not Overlying Utica or Marcellus Shales</i>						
Bronx	0	0	0	0	0	0
Clinton	60	30	5	0	1	96
Columbia	0	0	0	0	0	0
Dutchess	6	4	2	0	0	12
Essex	88	64	4	1	1	158
Franklin	40	19	3	0	0	62
Hamilton	53	10	0	0	0	63
Kings	0	0	0	0	0	0
Nassau	1	0	0	0	0	1
New York	3	2	0	0	0	5
Putnam	4	2	0	0	0	6
Queens	0	0	0	0	0	0
Rensselaer	1	0	0	0	0	1
Richmond	0	0	0	0	0	0
Rockland	15	3	0	0	0	18
St. Lawrence	84	29	0	0	0	113
Suffolk	0	0	0	0	0	0
Ulster	3	0	0	0	0	3
Warren	11	5	1	0	0	17
Washington	1	3	0	0	0	4
Westchester	61	11	1	1	0	74
<i>Subtotal</i>	<i>431</i>	<i>182</i>	<i>16</i>	<i>2</i>	<i>2</i>	<i>633</i>
<i>New York State Total</i>	<i>529</i>	<i>255</i>	<i>24</i>	<i>3</i>	<i>2</i>	<i>813</i>

Notes:

- Seismic events recorded December 13, 1970 through July 28, 2009.
- Lamont-Doherty Cooperative Seismographic Network, 2009

Figure 4.15 shows the distribution of recorded seismic events in New York State. The majority of the events occur in the Adirondack Mountains and along the New York-Quebec border. A total of 180 of the 813 seismic events shown on Table 4.2 and Figure 4.15 during a period of 39 years (1970–2009) occurred in the area of New York that is underlain by the Marcellus and/or the Utica Shales. The magnitude of 171 of the 180 events was less than 3.0. The distribution of seismic events on Figure 4.15 is consistent with the distribution of fault structures (Figure 4.13) and the seismic hazard risk map (Figure 4.14).

Induced seismicity refers to seismic events triggered by human activity such as mine blasts, nuclear experiments, and fluid injection, including hydraulic fracturing.⁴² Induced seismic waves (seismic refraction and seismic reflection) also are a common tool used in geophysical surveys for geologic exploration. The surveys are used to investigate the subsurface for a wide range of purposes including landfill siting; foundations for roads, bridges, dams and buildings; oil and gas exploration; mineral prospecting; and building foundations. Methods of inducing seismic waves range from manually striking the ground with weight to setting off controlled blasts.

Hydraulic fracturing releases energy during the fracturing process at a level substantially below that of small, naturally occurring, earthquakes. However, some of the seismic events shown on Figure 4.15 are known or suspected to be triggered by other types of human activity. The 3.5 magnitude event recorded on March 12, 1994, in Livingston County is suspected to be the result of the collapse associated with the Retsof salt mine failure in Cuylerville, New York.⁴³ The 3.2 magnitude event recorded on February 3, 2001, was coincident with, and is suspected to have been triggered by, test injections for brine disposal at the New Avoca Natural Gas Storage (NANGS) facility in Steuben County. The cause of the event likely was the result of an extended period of fluid injection near an existing fault⁴⁴ for the purposes of siting a deep injection well. The injection for the NANGS project occurred numerous times with injection periods lasting 6 to 28 days and is substantially different than the short-duration, controlled injection used for hydraulic fracturing.

⁴² Alpha, 2009, p. 138.

⁴³ Alpha, 2009, p. 141.

⁴⁴ Alpha, 2009, p. 141.

One additional incident suspected to be related to human activity occurred in late 1971 at Texas Brine Corporation's system of wells used for solution mining of brine near Dale, Wyoming County, New York (i.e., the Dale Brine Field). The well system consisted of a central, high pressure injection well (No. 11) and four peripheral brine recovery wells. The central injection well was hydraulically fractured in July 1971 without incident.

The well system was located in the immediate vicinity of the known, mapped, Clarendon-Linden fault zone which is oriented north-south, and extends south of Lake Ontario in Orleans, Genesee, Wyoming, and the northern end of Allegany Counties, New York. The Clarendon-Linden fault zone is not of the same magnitude, scale, or character as the plate boundary fault systems, but nonetheless has been the source of relatively small to moderate quakes in western New York (MCEER, 2009; and Fletcher and Sykes, 1977).

Fluids were injected at well No. 11 from August 3 through October 8, and from October 16 through November 9, 1971. Injections were ceased on November 9, 1971 due to an increase in seismic activity in the area of the injection wells. A decrease in seismic activity occurred when the injections ceased. The tremors attributed to the injections reportedly were felt by residents in the immediate area.

Evaluation of the seismic activity associated with the Dale Brine Field was performed and published by researchers from the Lamont-Doherty Geological Observatory (Fletcher and Sykes, 1977). The evaluation concluded that fluids injected during solution mining activity were able to reach the Clarendon-Linden fault and that the increase of pore fluid pressure along the fault caused an increase in seismic activity. The research states that "the largest earthquake ... that appears to be associated with the brine field..." was 1.4 in magnitude. In comparison, the magnitude of the largest natural quake along the Clarendon-Linden fault system through 1977 was magnitude 2.7, measured in 1973. Similar solution mining well operations in later years located further from the fault system than the Dale Brine Field wells did not create an increase in seismic activity.

Legend

**Recorded Seismic Events
Magnitude (Richter Scale)**

- Less than 3.0
Minor - not felt
- 3.0 to 3.9
Minor - often felt, no damage
- 4.0 to 4.9
Minor - shaking observed
- 5.0 to 5.3
Moderate - Some damage
- Combined Utica and Marcellus Shales
in New York State

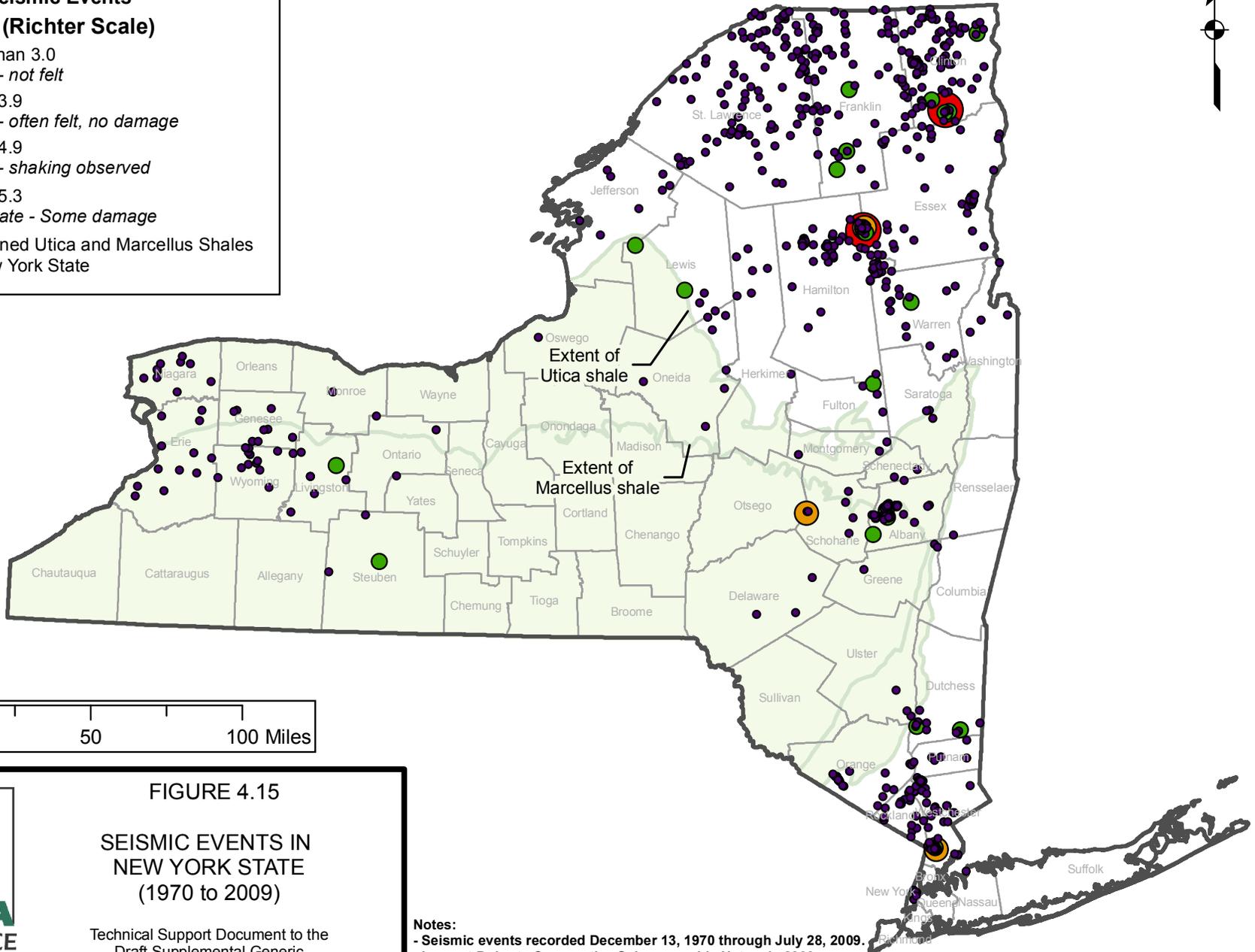


FIGURE 4.15

**SEISMIC EVENTS IN
NEW YORK STATE
(1970 to 2009)**

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Notes:

- Seismic events recorded December 13, 1970 through July 28, 2009.
- Lamont-Doherty Cooperative Seismographic Network, 2009
(<http://almaty.ldeo.columbia.edu:8080/data.search.html>)

4.5.5 *Monitoring Systems in New York*

Seismicity in New York is monitored by both the US Geological Survey (USGS) and the Lamont-Doherty Cooperative Seismographic Network (LCSN). The LCSN is part of the USGS's Advanced National Seismic System (ANSS) which provides current information on seismic events across the country. Other ANSS stations are located in Binghamton and Lake Ozonia, New York. The New York State Museum also operates a seismic monitoring station in the Cultural Education Center in Albany, New York.

As part of the ANSS, the LCSN monitors earthquakes that occur primarily in the northeastern United States and coordinates and manages data from 40 seismographic stations in seven states, including Connecticut, Delaware, Maryland, New Jersey, New York, Pennsylvania, and Vermont.⁴⁵ Member organizations that operate LCSN stations include two secondary schools, two environmental research and education centers, three state geological surveys, a museum dedicated to Earth system history, two public places (Central Park, NYC, and Howe Caverns, Cobleskill), three two-year colleges, and 15 four-year universities.⁴⁶

4.6 Naturally Occurring Radioactive Materials (NORM) in Marcellus Shale

NORM is present to varying degrees in virtually all environmental media, including rocks and soils. As mentioned above, black shale typically contains trace levels of uranium and gamma ray logs indicate that this is true of the Marcellus Shale. The Marcellus is known to contain concentrations of NORM such as uranium-238 and radium-226 at higher levels than surrounding rock formations. Normal disturbance of NORM-bearing rock formations by activities such as mining or drilling do not generally pose a threat to workers, the general public or the environment. However, activities having the potential to concentrate NORM need to come under regulatory oversight to ensure adequate protection of workers, the general public and the environment.

Chapter 5 includes radiological information (sampling results) from environmental media at various locations in the Appalachian Basin. Radiological data for the Marcellus in New York were derived from: a) drill cuttings and core samples from wells drilled through or completed in

⁴⁵ Alpha, 2009, p. 142.

⁴⁶ Alpha, 2009, p. 143.

the Marcellus; and b) production brine from vertical wells completed in the Marcellus.

Radiological data for the Marcellus in Pennsylvania and West Virginia were derived from: a) drill cuttings from wells completed in the Marcellus in Pennsylvania; and b) flowback water analyses provided by operators of wells in Pennsylvania and West Virginia. Chapter 6 includes a discussion of potential impacts associated with radioactivity in the Marcellus Shale. Chapter 7 details mitigation measures, including existing regulatory programs, proposed well permit conditions, and proposed future data collection and analysis.

4.7 Naturally-Occurring Methane in New York State

The presence of naturally-occurring methane in ground seeps and water wells is well documented throughout New York State. Naturally-occurring methane can be attributed to swampy areas or where bedrock and unconsolidated aquifers overlie Devonian-age shales or other gas-bearing formations. The highly fractured Devonian shale formations found throughout western New York are particularly well known for shallow methane accumulations. In his 1966 report on the Jamestown Aquifer, Crain explained that natural gas could occur in any water well in the area "which ends in bedrock or in unconsolidated deposits overlain by fine-grained confining material. Depth is not of primary importance because pockets of gas may occur in the bedrock at nearly any depth."⁴⁷ Upper Devonian gas bearing rocks at or near the surface extend across the southern tier of New York from Chautauqua and Erie Counties, east to Delaware and Sullivan counties (Figure 4.16).

As noted below, early explorers and water well drillers in New York reported naturally occurring methane in regions not then associated with natural gas well drilling activity. "Methane can occur naturally in water wells and when it does, it presents unique problems for water well drilling contractors. The major concern relates to flammable and explosive hazards associated with methane."⁴⁸ Gas that occurs naturally in shallow bedrock and unconsolidated sediments has been known to seep to the surface and/or contaminate water supplies including water wells. Often landowners are not aware of the presence of methane in their well. Methane is a colorless,

⁴⁷ NYSDEC, 1992, GEIS, p. 10-6.

⁴⁸ Keech, D. et al, 1982, pp. 33-36.

odorless gas, and is generally considered non-toxic but there could be an explosive hazard if gas is present in significant volumes and the water well is not properly vented.

The existence of naturally occurring methane seeps in New York has been known since the mid 1600s. In August 1669 Rene Robert Cavelier de la Salle and Rene de Brehant de Galinee, while on their way to explore the Mississippi Valley, arrived in the Bristol Hills area of Ontario County, New York. It was here where the explorers observed natural gas flowing from joint planes in the Penn Yan Shale (Upper Devonian) at the foot of a falls over the Genundewa Limestone.⁴⁹ More recent studies and investigations have provided other evidence of naturally occurring methane in eastern New York. A private well in Schenectady County was gaged at 158 MMcf/d of natural gas by the Department in 1965. The well provided natural gas for the owner's domestic use for 30 years.⁵⁰ In 1987 the Times Union reported that contaminants, including methane, were found in well water in the Orchard Park subdivision near New Scotland, Albany County. Engineers from the Department reported the methane as "natural occurrences found in shale bedrock deposits beneath the development."⁵¹ Ten years later, in 1997, a Saratoga Lake couple disclosed to a news reporter the presence of methane gas in their water well. The concentration of gas in the well water was concentrated enough for the owners to ignite the gas from the bathtub faucet.⁵² According to a September 22, 2010 article in the Daily Gazette, water wells in the Brown Road subdivision, Saratoga County became contaminated with methane gas when water wells were "blasted" (fractured) to reach a greater supply of water.⁵³

Methane contamination of groundwater is often mistakenly attributed to or blamed on natural gas well drilling and hydraulic fracturing. There are a number of other, more common, reasons that well water can display sudden changes in quality and quantity. Seasonal variations in recharge, stress on the aquifer from usage demand, and mechanical failures are some factors that could lead to degradation of well water.

⁴⁹ Wells, J. 1963.

⁵⁰ Kucewicz, J. 1997.

⁵¹ Thurman, K. 1987.

⁵² Kruse, M. 1997.

⁵³ Bowen, K. 2010.

Recently, as part of two separate complaint investigations in the towns of Elmira and Collins, New York, the Department documented that methane gas existed in the shallow aquifers at the two sites long before and prior to the exploration and development for natural gas^{54, 55}. The comprehensive investigations included the following:

- Analysis of drilling and completion records of natural gas wells drilled near the water wells;
- Evaluation of well logs to ascertain cement integrity;
- Collection of gas samples for compositional analysis;
- Inspections of the water and natural gas wells; and
- Interviews with landowners and water well drillers.

Both investigations provided clear evidence that methane contamination was present in the area's water wells prior to the commencement of natural gas drilling operations.

Drilling and construction activities may have an adverse impact on groundwater resources. The migration of methane can contaminate well water supplies if well construction practices designed to prevent gas migration are not adhered to. Chapter 6 discusses these potential impacts with mitigation measures addressed in Chapter 7.

In April 2011 researchers from Duke University (Duke) released a report on the occurrence of methane contamination of drinking water associated with Marcellus and Utica Shale gas development.⁵⁶ As part of their study, the authors analyzed groundwater from nine drinking water wells completed in the Genesee Group in Otsego County, New York for the presence of methane. Of the nine wells, Duke classified one well as being in an active gas extraction area (i.e., a gas well within 1 kilometer (km) of the water well), and the remaining eight in a non-active gas extraction area. The analysis showed minimal amounts of methane in this sample group, with concentrations significantly below the minimum methane action level (10 mg/L) to

⁵⁴ NYSDEC, 2011.

⁵⁵ NYSDEC, 2011.

⁵⁶ Osborne, S. et al, 2011.