CHAPTER 5:

WATER QUALITY AND NATURAL RESOURCES

INTRODUCTION

The Extended LAP is intended to provide long-term benefits to the water quality of the City's water supply system through the preservation of sensitive lands proximate to water resources. Land acquisition is an anti-degradation strategy, which can preclude adverse water quality impacts associated with development and other land uses.

This section will provide a description of existing water quality in the watershed and a discussion of the anticipated beneficial effects of land acquisition on water quality, water resources, and natural resources. It will also examine the water quality and natural resource impacts of avoiding land acquisition in and around hamlet areas where centralized services already exist, while focusing acquisition efforts in other areas, consistent with "smart growth" principles.

The Extended LAP would result in a beneficial effect on water quality and natural resources, and there would be no potential for significant adverse impacts to occur. Therefore, the analysis provided in this chapter is qualitative and relies on the extensive documentation in the literature that demonstrates beneficial impacts on water quality and natural resources of land preservation and smart growth principles.

EXISTING CONDITIONS

LAP is a key component of the City's efforts to increase watershed protection and avoid filtration of the Cat-Del system, which provides water to over nine million residents of the City and nearby communities in New York State. Since the program started in the 1990s, LAP has protected, through acquisition, over 96,000 acres of land in the one million-acre Cat-Del System. Together with lands previously protected by the State and other entities, these acquisitions have raised the level of permanently protected land in the Cat-Del System from 24 percent in 1997 to 34 percent today.

The NYC reservoirs and water supply system are subject to the federal Surface Water Treatment Rule (SWTR) standards, NYS ambient water quality standards, and NYCDEP's own target criteria for water quality. A summary of the latest reservoir-wide statistics for a variety of physical, biological, and chemical analytes are shown in Figures 5-1a through 5-1d[1] for individual reservoirs throughout the Cat-Del system.

Median turbidity levels in all terminal reservoirs are well below the standard of 5.0 NTU. Median total phosphorus was lower than the water quality guidance value of 15 µg/L for each source water reservoir in 2008. Nitrate was uniformly low in all reservoirs with no samples

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[1] "2008 Watershed Water Quality Annual Report," New York City Department of Environmental Protection, Bureau of Water Supply, July 2009

approaching the standard of 10 mg/ L. Ammonia was very low for WOH terminal reservoirs and no excursions above the standard were evident.

Table 5-1a: Reservoir-wide summary statistics for a variety of physical, biological, and chemical analytes, 2008.

		West Ashokan Basin			East Ashokan Basin			Schoharie		
Analyte	WQS	N	Range	Median	N	Range	Median	N	Range	Median
PHYSICAL										
Temperature (°C)		143	4.0 - 22.8	9.5	92	3.8 - 23.7	10.5	119	4.2 - 22.1	9.7
pH (units)	6.5-8.5 [1]	143	5.9 - 7.5	6.7	92	5.9 - 8.2	7.1	119	6.3 - 7.7	6.9
Alkalinity (mg/L)		12	6.6 - 13.9	10.1	9	9.2 - 12.1	9.9	9	9.7 - 18.8	12.9
Conductivity		105	42 - 70	55	86	50 - 64	56	108	58 - 92	73
Hardness (mg/L) [2]		9	12.7 - 20.0	18.1	8	15.9 - 18.2	16.3	6	16.4 - 19.8	18.6
Color (Pt-Co units)	(15)	141	6 - 18	12	89	5 - 15	9	91	5 - 24	16
Turbidity (NTU)	(5) [3]	144	1.3 - 9.3	3.6	91	0.8 - 6.6	1.6	120	1.2 - 11.0	4.3
Secchi Disk Depth (m)		39	1.4 - 4.5	3.1	25	2.1 - 5.8	4.2	41	1.1 - 4.0	2.2
BIOLOGICAL										
Chlorophyll a (µg/L)	7 [4]	28	1.04 - 4.71	2.18	20	0.96 - 3.78	1.88	35	0.16 - 5.67	1.63
Total Phytoplankton (SAU)	2000 [4]	75	<5 - 610	180	59	5 - 870	170	52	<5 - 1100	56
CHEMICAL										
Dissolved Organic Carbon (mg/L)		85	1.0 - 2.1	1.3	57	1.3 - 1.8	1.5	73	1.4 - 2.8	1.7
Total Phosphorus (µg/L)	15 [4]	105	<5 - 14	8	65	<5 - 13	8	104	6 - 19	10
Total Nitrogen (mg/L)		75	0.15 - 0.39	0.30	48	0.11 - 0.40	0.29	73	0.14 - 0.45	0.32
Nitrate+Nitrite-N (mg/L)	10 [1]	59	<0.050 - 0.301	0.222	42	<0.050 - 0.276	0.181	37	<0.050 - 0.350	0.180
Total Ammonia-N (mg/L)	2 [1]	85	<0.02 - 0.03	<0.02	57	<0.02 - 0.05	0.02	64	<0.02 - 0.04	0.02
Iron (mg/L)	0.3 [1]	8	0.02 - 0.50	0.05	8	0.02 - 0.06	0.03	4	0.11 - 0.33	0.15
Manganese (mg/L)	(0.05)	8	na	na	8	na	na	4	na	na
Lead (µg/L)	50 [1]	8	<1 - 1	<1	8	<1 - <1	<1	4	<1 - <1	<1
Copper (µg/l)	200 [1]	8	<3 - 14	<3	8	<3 - 27	<3	4	<3 - <3	<3
Calcium (mg/L)		9	3.8 - 6.2	5.5	8	4.8 - 5.2	5.0	6	5.1 - 6.0	5.8
Sodium (mg/L)		9	3.32 - 4.41	3.79	8	3.59 - 4.09	3.75	6	4.57 - 5.32	5.04
Chloride (mg/L)	250 [1]	36	5.9 - 7.6	6.6	27	6.3 - 7.1	6.7	28	6.8 - 11.1	9.6

Table 5-1b: Reservoir-wide summary statistics for a variety of physical, biological, and chemical analytes, 2008.

Analyte	WQS	Cannonsville N	Cannonsville Range	Cannonsville Median	Pepacton N	Pepacton Range	Pepacton Median
PHYSICAL							
Temperature (°C)		183	3.7 - 23.2	11.8	203	2.7 - 23.3	7.3
pH (units)	6.5-8.5 [1]	166	6.5 - 9.1	7.0	157	6.6 - 9.2	7.1
Alkalinity (mg/L)		18	10.9 - 20.4	15.8	21	9.2 - 13.5	10.5
Conductivity		183	73 - 103	83	190	54 - 67	58
Hardness (mg/L) [2]		18	20.0 - 26.6	24.7	19	16.3 - 20.3	18.2
Color (Pt-Co units)	(15)	165	8 - 23	14	197	6 - 17	12
Turbidity (NTU)	(5) [3]	165	0.8 - 11.0	2.4	197	0.4 - 9.0	1.6
Secchi Disk Depth (m)		59	1.7 - 5.3	2.9	66	0.6 - 5.1	3.9
BIOLOGICAL							
Chlorophyll a (µg/L)	7 [4]	48	1.44 - 13.27	5.07	43	0.03 - 8.03	4.33
Total Phytoplankton (SAU)	2000 [4]	76	5 - 4400	295	61	<5 - 880	230
CHEMICAL							
Dissolved Organic Carbon (mg/L)		147	1.3 - 2.2	1.6	145	1.2 - 2.0	1.4
Total Phosphorus (µg/L)	15 [4]	163	5 - 19	14	192	<5 - 22	8
Total Nitrogen (mg/L)		120	0.20 - 0.79	0.54	130	0.14 - 0.59	0.47
Nitrate+Nitrite-N (mg/L)	10 [1]	60	<0.050 - 0.721	0.402	64	<0.050 - 0.480	0.381
Total Ammonia-N (mg/L)	2 [1]	132	<0.02 - 0.05	0.02	142	<0.02 - 0.04	<0.02
Iron (mg/L)	0.3 [1]	8	0.04 - 0.11	0.07	8	0.02 - 0.04	0.03
Manganese (mg/L)	(0.05)	8	na	na	8	na	na
Lead (µg/L)	50 [1]	8	<1 - <1	<1	8	<1 - <1	<1
Copper (µg/l)	200 [1]	8	<3 - 5	<3	8	<3 - 3	<3
Calcium (mg/L)		18	5.6 - 7.6	7.1	19	4.8 - 6.1	5.3
Sodium (mg/L)		18	5.94 - 7.56	6.40	19	3.62 - 3.90	3.74
Chloride (mg/L)	250 [1]	32	10.3 - 12.7	11.1	40	6.2 - 7	6.8

Table 5-1c: Reservoir-wide summary statistics for a variety of physical, biological, and chemical analytes, 2008.

		Neversink			Rondout		
Analyte	WQS	N	Range	Median	N	Range	Median
PHYSICAL							
Temperature (°C)		136	3.3 - 22.4	8.1	179	2.9 - 22.3	10.4
pH (units)	6.5-8.5 [1]	136	5.6 - 7.3	6.3	149	6.0 - 8.5	7.0
Alkalinity (mg/L)		9	1.7 - 6.5	3.0	9	5.3 - 9.9	6.5
Conductivity		136	25 - 31	29	179	44 - 61	53
Hardness (mg/L) [2]		9	7.3 - 8.2	8.0	9	12.1 - 16.9	14.3
Color (Pt-Co units)	(15)	136	7 - 18	12	180	7 - 16	12
Turbidity (NTU)	(5) [3]	136	0.3 - 1.6	0.8	180	0.4 - 1.7	0.9
Secchi Disk Depth (m)		39	4.4 - 9.8	5.8	51	3.7 - 6.9	5.3
BIOLOGICAL							
Chlorophyll a (µg/L)	7 [4]	32	0.47 - 6.00	2.65	24	0.22 - 5.13	2.28
Total Phytoplankton (SAU)	2000 [4]	62	<5 - 220	41	106	<5 - 650	155
CHEMICAL							
Dissolved Organic Carbon (mg/L)		97	1.4 - 2.1	1.6	80	1.3 - 1.9	1.5
Total Phosphorus (µg/L)	15 [4]	135	<5 - 8	5	100	<5 - 9	7
Total Nitrogen (mg/L)		97	0.10 - 0.35	0.28	80	0.25 - 0.47	0.34
Nitrate+Nitrite-N (mg/L)	10 [1]	46	<0.050 - 0.250	0.180	29	0.120 - 0.411	0.257
Total Ammonia-N (mg/L)	2 [1]	96	<0.02 - 0.08	<0.02	70	<0.02 - 0.03	<0.02
Iron (mg/L)	0.3 [1]	7	0.04 - 0.10	0.06	8	0.02 - 0.04	0.02
Manganese (mg/L)	(0.05)	7	na	na	8	na	na
Lead (µg/L)	50 [1]	7	<1 - 1	<1	8	<1 - <1	<1
Copper (µg/l)	200 [1]	7	<3 - <3	<3	8	<3 - <3	<3
Calcium (mg/L)		9	2.1 - 2.3	2.3	9	3.5 - 4.9	4.1
Sodium (mg/L)		9	1.69 - 1.85	1.80	9	3.42 - 4.17	3.64
Chloride (mg/L)	250 [1]	21	3.1 - 3.7	3.5	25	6.4 - 8.1	6.9

Table 5-1d: Reservoir-wide summary statistics for a variety of physical, biological, and chemical analytes, 2008.

		West Branch			Kensico			Boyd Corners		
Analyte	WQS	N	Range	Median	N	Range	Median	N	Range	Median
PHYSICAL										
Temperature (°C)		147	3.6 - 23.6	13.8	427	2.6 - 21.9	11.4	44	6.9 - 26.0	17.5
pH (units)	6.5-8.5 [1]	133	6.4 - 8.1	7.2	362	6.3 - 7.5	7.0	44	6.8 - 8.1	7.4
Alkalinity (mg/L)		14	9.4 - 50.5	17.9	20	8.7 - 13.3	10.6	5	23.9 - 37.1	34.5
Conductivity		139	59 - 165	95	401	50 - 88	67	44	193 - 224	209
Hardness (mg/L) [2]		5	19.2 - 30.2	22.1	20	16.12 - 20.5	19.0	5	40.4 - 51.2	48.3
Color (Pt-Co units)	(15)	147	8 - 30	15	371	5 - 15	10	39	15 - 30	25
Turbidity (NTU)	(5) [3]	147	0.7 - 3.5	1.4	427	0.2 - 2.5	1.1	40	0.7 - 3.1	1.7
Secchi Disk Depth (m)		60	0.2 - 5.0	3.6	117	2.3 - 6.1	4.8	17	2.6 - 4.3	3.6
BIOLOGICAL										
Chlorophyll a (µg/L)	7 [4]	28	<0.40 - 16.60	4.45	61	<0.40 - 9.30	4.30	18	<0.40 - 14.10	6.90
Total Phytoplankton (SAU)	2000 [4]	76	21 - 2500	440	159	30 - 1300	260	13	30 - 3300	400
CHEMICAL										
Dissolved Organic Carbon (mg/L)		62	1.5 - 3.3	2.0	193	1.1 - 1.9	1.5	40	2.2 - 4.4	3.9
Total Phosphorus (µg/L)	15 [4]	74	5 - 19	9	195	3 - 10	6	40	6 - 15	12
Total Nitrogen (mg/L)		75	0.15 - 0.39	0.26	177	0.15 - 0.44	0.29	37	0.15 - 0.67	0.24
Nitrate+Nitrite-N (mg/L)	10 [1]	76	<0.010 - 0.264	0.131	170	0.042 - 0.336	0.190	38	<0.010 - 0.133	0.005
Total Ammonia-N (mg/L)	2 [1]	76	<0.010 - 0.101	<0.010	136	<0.010 - 0.035	<0.010	38	<0.010 - 0.033	<0.010
Iron (mg/L)	0.3 [1]	5	0.03 - 0.96	0.06	6	0.02 - 0.04	0.02	4	0.07 - 0.49	0.10
Manganese (mg/L)	(0.05)	5	na	na	6	na	na	4	na	na
Lead (µg/L)	50 [1]	5	<1 - <1	<1	6	<1 - <1	<1	4	<1 - <1	<1
Copper (µg/l)	200 [1]	5	<3 - <3	<3	6	<3 - <3	<3	4	<3 - <3	<3
Calcium (mg/L)		5	5.1 - 7.9	5.8	20	4.7 - 5.8	5.4	5	10.1 - 12.6	12.0
Sodium (mg/L)		5	7.85 - 10.5	8.80	20	4.06 - 5.95	5.41	5	20.6 - 22.5	22.10
Chloride (mg/L)	250 [1]	14	9.6 - 34.3	19.0	20	7.3 - 10.9	9.0	5	38 - 41.3	40.4

The SWTR (40 CFR § 141.71(a)(1)) requires that water at a point just prior to disinfection not exceed specified thresholds for fecal coliform bacteria and turbidity. To ensure compliance with this requirement, NYCDEP monitors water quality for each of the water supply systems at "keypoints" (entry points from the reservoirs to the aqueducts) just prior to disinfection. As stated in the latest Annual Water Quality Report (2008), the fecal coliform counts at all the keypoints consistently met the SWTR standard that no more than 10% of daily samples may contain > 20 CFU 100mL-1. The 2008 calculated percentages for effluent waters at Croton Gate House, Catksill Lower Effluent Chamber and Shaft 18 on the Delaware Aqueduct were far below this limit. Median fecal coliform counts (CFU 100mL-1) in raw water samples taken at these sites were the same, at 1 CFU 100mL-1, while maxima were 7, 45, and 74, respectively. The SWTR limit for turbidity is 5 NTU. All three effluent waters, measured at 4-hour intervals, were consistently well below this limit in 2008.

Since 1993, the City has been granted a series of Filtration Avoidance Determinations for the Cat-Del system by the U.S. Environmental Protection Agency (EPA). This designation recognizes the high quality of New York City's West of Hudson water supply.[2]

Through the City's overall Watershed Protection Program, which includes many water quality improvement as well as anti-degradation programs, the high water quality of the system's reservoirs has been maintained and, in certain cases, improved. At the Cannonsville Reservoir, upgrades to wastewater treatment plants and Best Management Practices (BMPs) implemented at farms have resulted in lower algae levels and Total Phosphorus in the Reservoir. At a number of reservoirs, the City's waterfowl management program has dramatically reduced coliform levels.

FUTURE WITHOUT THE PROPOSED ACTION

One of the planning elements of LAP is that it seeks to acquire more ecologically-sensitive lands, thereby encouraging development in areas where it is already occurring, or where it will have less impact of water quality. Without the Extended LAP, development can be expected to occur in a more diffuse manner, also known as sprawl, in areas where the adverse impacts on water quality could be greater. Without the Extended LAP, new development could occur in areas that are less suitable from an ecological standpoint and could be more damaging to water quality. Greater parcel fragmentation could also occur, with adverse impacts on natural resources and habitats.

In addition, the Extended LAP is a requirement of the Filtration Avoidance Determination. Without the Extended LAP, NYCDEP would risk losing filtration avoidance. See also, Chapter 11, *Alternatives, No Action Alternative.*

FUTURE WITH THE PROPOSED ACTION

As expressed in the 2007 FAD, "Land acquisition is one of the most effective, and therefore, important mechanisms to permanently protect the City's Catskill/Delaware watershed. The Land Acquisition and Stewardship Program [now LAP], which is described in detail in the New York City Watershed MOA, seeks to prevent future degradation of water quality by acquiring sensitive lands and by managing the uses on these lands."

Land Acquisition is an anti-degradation strategy that ensures protection by precluding land use changes on undeveloped land. Development, including the associated land disturbances and impervious surfaces, has the potential to introduce increased levels of pollutants, including pathogens, nutrients and turbidity, into watercourses. This is particularly important during storm events when pollutant levels are elevated and the rapid movement of water reduces the effectiveness of natural cleansing processes. Once the landscape is disturbed for development, the probability that pollutants could reach the drinking water supply is directly related to several factors including proximity to surface water features and topography. The water quality effects of the City's

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[2] New York City Filtration Avoidance Determination, Surface Water Treatment Rule Determination for New York City's Catskill/Delaware Water Supply System, USEPA in consultation with NYSDOH, July 2007.

acquisitions of sensitive lands accrue over time, as future development would occur at locations with less potential to adversely impact water quality rather than on the land protected by LAP.

The Extended LAP has a number of elements targeted at maximizing these water quality benefits as discussed below.

PRIORITIZATION

The LAP first prioritizes property for solicitation on the basis of its location within the water supply system, followed by site-specific characteristics so as to maximize the water quality benefit of lands acquired. The proposed Extended LAP seeks to increase the percentage of protected lands in the Cat-Del System as a whole, with a particular emphasis on:

- Non-terminal reservoir basins with less than 30 percent protected lands;
- Specific sub-basins with a relatively low percentage of protected lands; and
- Reservoir basins that are expected to provide larger contributions to future water supply.

Ensuring protection of lands with water quality sensitive features is proposed to be accomplished through the targeted purchase of lands based on Natural Features Criteria, including wetlands, floodplains, and lands within 300 feet of streams, ponds or lakes or within 1,000 feet of reservoirs and lands with moderate to steep slopes.

NATURAL FEATURES

The Natural Features Criteria for the Extended LAP were modified to include numeric thresholds. As described in Chapter 1, *Project Description*, Table 1-4, the criteria would remove certain lands from future solicitation. This potential change would focus acquisitions on those lands more connected and sensitive to water quality. Further, by avoiding certain properties which would fall beneath the thresholds for acquisition, future development would be more likely to occur on properties deemed to have a lower potential impact on water quality. As discussed in Chapter 1, the criteria could reduce the amount of land available for solicitation. from 363,394 acres under current criteria to about 352,441 acres.

Even though some land may be eliminated from potential future solicitation, the land that is purchased will, under Natural Features thresholds, be land that is more water quality sensitive and therefore provides more protection of water resources. Nor would this revision be expected to decrease the number of acres eventually acquired; rather, a similar number of acres would be acquired from a slightly smaller pool of solicited land.

STREAM BUFFERS

In addition, through a Riparian Buffer Program, as discussed in Chapter 1, the City would further protect the watershed by purchasing land within riparian buffers that may not be eligible for, or where the owners may not be interested in, LAP's existing fee simple or conservation easement programs. The proposed City-funded Riparian Buffer Program would be implemented in conjunction with one or more Stream Management Plans developed under the City's Stream Management Program, and would be carried out in partnership with one or more local land trusts.

The next two sections provide a review of the literature on land acquisition and smart growth principles as water quality and natural resources protection measures. These sections are followed by an assessment and conclusions based on the literature review.

LITERATURE REVIEW OF LAND ACQUISITION AS A WATER QUALITY AND NATURAL RESOURCES PROTECTION MEASURE

The importance of preserving undeveloped lands for water quality and ecosystem health is well-documented in the literature. This section reviews a number of these sources.

In a study[3] conducted by the National Research Council (NRC) in 2000, it was concluded that:

> *Purchasing private land is one of the most important nonstructural tools used to protect a watershed…A land acquisition program is potentially one of the most successful strategies for source water protection.*

In their report, "Protecting Water Resources with Smart Growth," EPA notes:

> *Preserving open space is critical to maintaining water quality at the regional level. Large, continuous areas of open space reduce and slow runoff, absorb sediments, serve as flood control, and help maintain aquatic communities. In most regions, open space comprises significant portions of a watershed, filtering out trash, debris, and chemical pollutants before they enter a community's water system. Open space provides a number of other benefits, including habitat for plants and animals, recreational opportunities, forest and ranch land, places of natural beauty, and important community space*: [4].

The Extended LAP would limit the potential future amount of impervious surface cover in water quality sensitive areas, leaving less sensitive lands and areas that have already been extensively disturbed available for future growth. The Center for Watershed Protection[5] has extensively researched imperviousness and how it relates to habitat structure, water quality and biodiversity of aquatic systems:

> *Impervious surfaces collect and accumulate pollutants deposited from the atmosphere, leaked from vehicles or derived from other sources. During storms, accumulated pollutants are quickly*

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[3] National Research Council. 2000. Watershed Management for Potable Water Supply: Assessing the New York City Strategy. Washington, DC: National Academy Press.

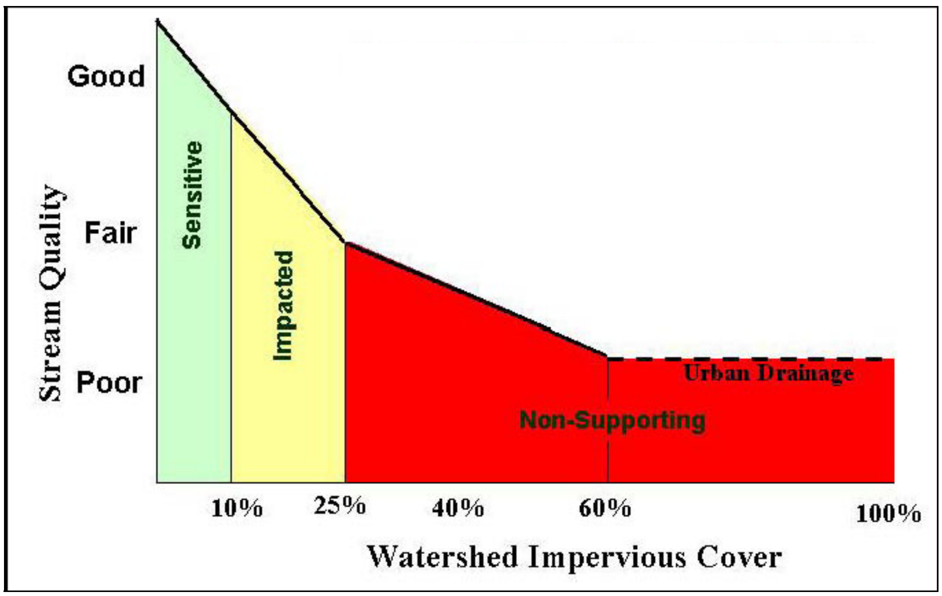
[4] "Protecting Water Resources with Smart Growth," U.S. EPA, www.epa.gov/smartgrowth.

[5] "Impacts of Impervious Cover on Aquatic Systems," Center for Watershed Protection, March 2003

washed off and rapidly delivered to aquatic systems. Monitoring and modeling studies have consistently indicated that urban pollutant loads are directly related to watershed imperviousness. Indeed, imperviousness is the key predictive variable in most simulation and empirical models used to estimate pollutant loads.

As shown in Figure 5-1, the ecological health of streams is greatly impacted by impervious cover. Biological and physical indicators of stream quality tend to show observable negative impacts at levels of imperviousness as low as 5 percent,[6] and with impervious cover greater than 25 percent, a stream may be unable to support ecological habitat. The Cat-Del watershed has a low percentage of impervious cover, and the Extended LAP would help to increase that protection.

Figure 5-1: Impacts of Imperviousness on Ecological Health



Source: Center for Watershed Protection

In the SUNY College of Environmental Science and Forestry/Yale School of Forestry and Environmental Studies joint study, *Predicting Future Water Quality from Land Use Change Projections in the Catskill-Delaware Watersheds,*[7] the authors state that:

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[6] "Impacts of Impervious Cover on Aquatic Systems," Center for Watershed Protection, March 2003

[7] Myrna Hall, Rene Germain, Mary Tyrrell and Neil Sarpor, Predicting Future Water Quality from Land Use Change Projections in the Catskill-Delaware Watersheds, SUNY College of Environmental Science and Forestry/Yale School of Forestry and Environmental Studies, December 2008.

> *Land use and water quality are inextricably linked," and have shown that forest cover provides more optimal land cover for protecting water quality than many of the potential uses to which that land may be converted..*

In regard to the City's watershed in particular, they further note that:

> *Although the forest cover appears to be stable, both through remotely sensed data and 'windshield survey,' fragmentation and parcelization have been increasingly altering the natural landscape by breaking large forest areas into smaller parcels and large land holdings into smaller ones… Fragmentation and parcelization (Sampson and DeCoster 2000) are two agents of change in forest cover, and are often an unnoticed threat.*

As noted in the joint study referenced above:

> *[T]hese current trends of parcelization in the Cat/Del watershed may ultimately threaten water quality. The Croton watershed in the east of Hudson section of the city's water supply system serves as an example of the impacts of development on water quality. In the Croton watershed, widespread development patterns have resulted in the extensive urban infrastructure increasing peak flows of stormwater runoff, leading to erosion, streambank instabilities, and higher concentrations of pollutants (NYC DEP 2003).*

LITERATURE REVIEW OF SMART GROWTH AS A WATER QUALITY PROTECTION MEAURE

Smart growth principles are important tools for protecting water quality and ecosystem health. This section reviews a number of literature sources.

As noted in EPA's "2003 Draft Report on the Environment":

> *When such* [growth and preservation] *areas are clearly defined, development is encouraged on land with less ecological value, such as previously developed areas (e.g., brownfields, greyfields) and vacant properties. Land with higher ecological value, such as wetlands, marshes, and riparian corridors, is then preserved or otherwise removed from the pool of "developable land.*

The Center for Watershed Protection promotes concentration of new development in areas of existing development.

> *The best way to minimize the creation of additional impervious area at the regional scale is to concentrate it in high density clusters or centers.*[8]

ASSESSMENT AND CONCLUSIONS

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[8] "The Importance of Imperviousness," feature article from Watershed Protection Techniques. 1(3): 100-111, Center for Watershed Protection.

LAP was established for the sole purpose of protecting the City's drinking water quality. As shown in the tables in Existing Conditions section above, water quality in the NYC reservoirs is very high and the Extended LAP would support maintaining that quality in the future. The goals of LAP are consistent with the federal Surface Water Treatment Rule (SWTR, 1989), New York State Department of Health regulations (10 NYCRR Part 5-1.30(c)(7)(I), and the Filtration Avoidance Criteria under the SWTR. The LAP provides for water quality protection through anti-degradation and smart growth principles.

The Extended LAP is expected to result in the protection of a substantial amount of land rich in natural features such as water resources, wildlife habitat, natural vegetation, wetlands and forested land. The preservation of these lands and water resources, particularly given that many of these areas would continue to provide substantial contiguous natural corridors, would provide a direct benefit to water quality and natural resources by keeping these lands protected from the impacts of development. The LAP places a high priority on acquiring wetlands and lands adjacent to watercourses, and its efforts are expected to result in the protection of many regulated and non-regulated freshwater wetlands, floodplains, riparian areas, and other environmentally sensitive water resources. LAP would protect lands in their natural state, thus preserving potential habitat of species that may utilize those lands, and ensure water quality, thereby protecting aquatic systems.

Most lands purchased under LAP are forested and that would be expected to continue under the Extended LAP. The Extended LAP could help reduce fragmentation, the breaking up of large parcels of forest into smaller pieces, by protecting more continuous adjoining parcels of forested land. Increasing parcelization and conversion to non-forest land has been documented in the Cat-Del watershed. The Extended LAP is likely to protect lands adjacent to existing protected areas such as State Forest Preserve lands. Because forests act as filters, the removal of forested land near watercourses could impact water quality. Fragmentation further reduces the beneficial effects of forests on water quality. The Extended LAP would seek to preserve the forest cover in lands it acquires, which would help to protect water quality and natural habitats.

Protecting forested lands provides ancillary benefits. As stated in the NYS Open Space Plan,[9] forested areas remove carbon dioxide from the atmosphere, thereby mitigating the threat of global warming; and reduce the consumption of nonrenewable fossil fuels for residential and commercial cooling and heating, and trap pollutants in the atmosphere. The current and Extended LAP programs are expected to support, rather than reduce, the removal of carbon dioxide from the air.

The Extended LAP would limit the potential future amount of impervious surface cover in water quality sensitive areas, leaving less sensitive lands and areas that have already been disturbed available for future growth. The Natural Features Criteria, Riparian Buffer Program, and expanded hamlet areas under the Extended LAP (See Chapter 1) would further support these development patterns. Concentrating future development around hamlet areas where much of it historically and currently occurs is consistent with the principles of smart growth and associated benefits on water quality and the environment. While development in hamlet areas could result

[9] New York State Open Space Plan. 2009

in some localized water quality impacts, these impacts would be combined with greater protection of natural areas with high ecological value and by ensuring that development occurs in a sustainable manner in these higher density areas, under the Watershed Rules and Regulations. Smart growth promotes coordination between development and conservation plans. The proposed Extended LAP is consistent with these outlined principles, with numerous Comprehensive Plans prepared by towns, and should have a net benefit to water quality while minimizing impacts to future growth.

Based on the literature review and assessment above, the proposed Extended LAP is anticipated to have beneficial impacts to water quality and natural resources and no potential for significant, adverse impacts are expected to occur.