
IV-I: Land Use/Land Cover

In any stream system, the land use pattern in the watershed is likely the greatest influence on water quality and stream stabilization. The watershed's land cover directly impacts stream hydrology by influencing the stormwater runoff. Forested and grassland areas produce significantly less runoff for a storm event than impervious surfaces. Land use associated with significant impervious areas (roads, parking lots, buildings, etc.) also promotes quicker peaks in stream flows as the landscape has lost or reduced its function to delay the travel of rainfall to the drainage system.



In addition to causing changes in watershed hydrology, land use patterns also have the potential to directly impact stream stability due to human activities and management practices. For example, increased development is often characterized by the need to develop new road systems with associated culverts, bridges, and fills along the stream corridor. In an agricultural land use situation, farm operators often maximize their utilization of the prime farmlands on the floodplains by developing berms, reducing riparian buffers, and conducting bank stabilization and stream “maintenance” activities. A stream and its watershed are directly linked and as land use changes occur, it can be expected that the stream system will respond, usually in ways which are less than favorable to the residents of the watershed.

1. HISTORIC LAND USE

In the relatively short span of 200 years, the Batavia Kill watershed has experienced significant changes in land use and land cover. From the tanning industry's deforestation of the mountain slopes to the rise and decline in agriculture, the Batavia Kill has been a watershed in flux for many years. When first settled in 1784, the watershed was a vast wilderness with forests dominated by hemlock, and man had yet to put his signature on the landscape.

By the early 1800s the tanning industry had stripped the mountains of hemlock, and much of the remaining hardwoods and other trees had also been removed for

**Batavia Kill Watershed
Estimated Land Use 1965**

10% Cropland
10% Pasture
6% Idle Land
4% Roads/Hamlets
70% Forest

Figure IV-36: Estimated land use in the Batavia Kill Watershed in 1965, USDA

fuel and lumber. This newly opened land was soon converted to agricultural land. A study of old photographs and drawings of the area indicate that much of the watershed was at one time converted from forest cover to crop-land and pasture. These changes likely had a major impact on the watershed's hydrology, and subsequently its stream systems, but these impacts are difficult to quantify with any certainty. The only past land use inventory was completed in with the development of the Batavia Kill flood control project in the early 1960s.



Figure IV-37: View of Windham area in 1920's, note the presence of extensive open fields on the lower slopes of the mountains and the valley floor. Photo Source Town of Windham Website

2. TRENDS IN LAND USE & LAND COVER

During the course of the Batavia Kill Stream Corridor Management Pilot Project, the GCSWCD has spent significant time reviewing aerial photographs for the period from 1958 to the present. The dramatic replacement of fields and open spaces by young forests is a standout feature of the aerial record. An example of this change is demonstrated in the series of aerial photographs of the Red Falls area shown below.

In **Figure IV-38**, the photo on the left shows that as late as 1959, there were still fairly large areas of land in open fields and used for agricultural purposes. At this time, the Conine Farm was active, and the fields were maintained for hay and pasture. By 1995 (center), the Conine Farm had been inactive for a number of years and the encroachment of woody vegetation on the fields is clearly visible in many areas of the photo. In the fall of 2000, new aerials (right) of the Batavia Kill valley showed that this trend has continued, with as much as 50% of the open fields present in 1959 now forested.

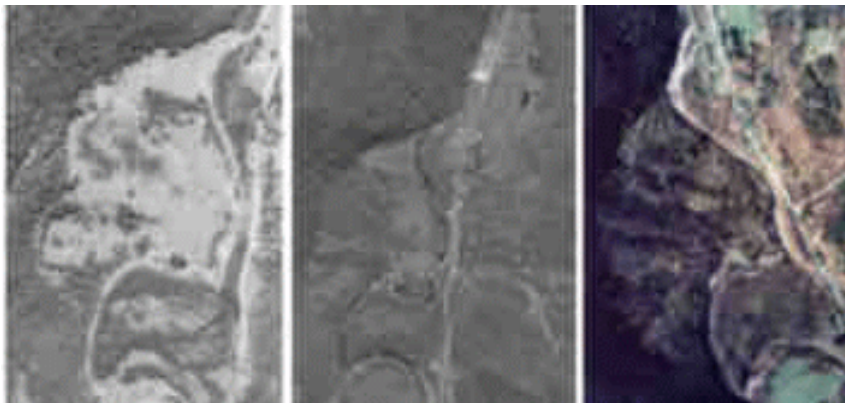


Figure IV-38: Time progression of vegetative cover change in the Red Falls area. Photos left to right are from 1959, 1995, and 2000. Note the open field in 1959 (left) have mostly disappeared by 2000 (right)

This loss of open fields has occurred as many family farms in the watershed

have gone out of production. These changes in land use have the potential to significantly impact watershed hydrology. As land cover changes from open hay fields to forest, the runoff characteristics of the land also change. While grasslands are typically considered good land covers which do not produce significant runoff, forests are considered even better. As these lands revert to forest, the amount of rainfall which runs off the land as sheet flow is reduced even further.

For example, using current hydrological models, a pasture in fair hydrologic would have rainfall runoff about 36% than a mature forest in good hydrologic condition, given that an equal amount of rainfall per unit area was applied to the land (USDA). Rainfall runoff from the forested area would be approximately 36% less than the pasture area. As the Batavia Kill watershed reverts from old farm fields to mature forests, total rainfall runoff continues to decrease and the impact on the stream system of flashy, high runoff conditions also decreases.

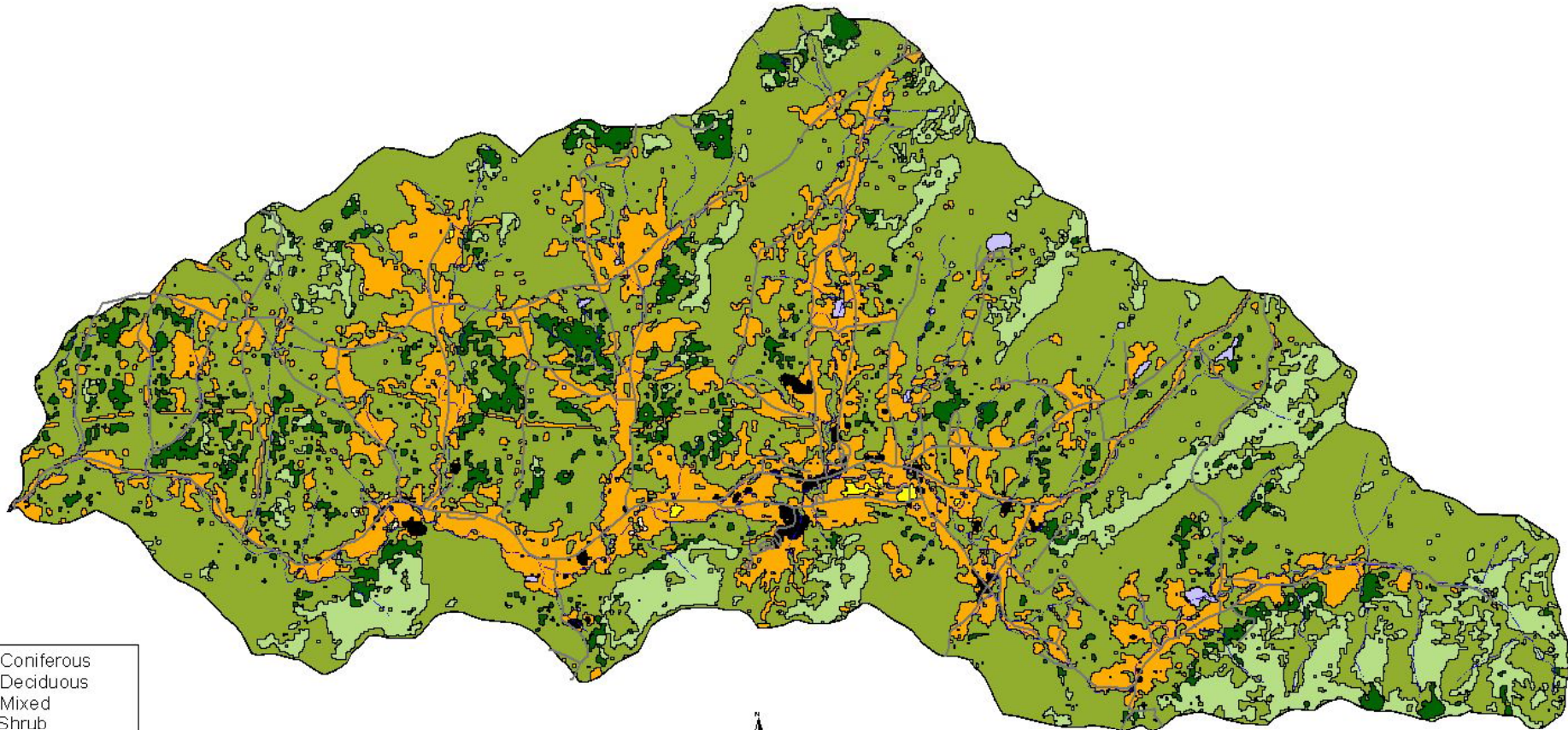
3. CURRENT LAND USE - LAND COVER

For the purpose of this SCMP, the GCSWCD utilized an existing GIS coverage of Land Use & Land Cover previously mapped by NYCDEP. Based on LANDSAT TM data (1992), Land Cover maps with 25 meter resolution were completed for the entire state. The data for the Batavia Kill watershed from this mapping effort is summarized in **Table IV-4** below and **Map IV-8**.

As the data shows, the Batavia Kill watershed is dominated by forest cover with approximately 80% covered by deciduous, coniferous, or mixed forest. Mixed grass/shrub cover and straight grassland are the second most common types of land cover, with agricultural uses, impervious surfaces and waterbodies combined comprising just over 1% of the watershed land cover.

Table IV-4: 1992 Land Cover of the Batavia Kill Watershed

Land Cover	Acres	Sq. Miles	% of Cover
Forest Deciduous	29,921.71	46.75	64%
Forest Coniferous	2,378.15	3.72	5%
Forest Mixed	5,148.22	8.04	11%
Grass/Shrub Mixture	12.85	0.02	<.01%
Grasslands	8,836.71	13.81	19 %
Row Crops (corn)	26.97	0.04	.25 %
Permanent Cover Crops (Alfalfa)	61.45	0.10	<.02%
Impervious Surfaces	285.72	0.45	<.66%
Water Surfaces	128.71	.20	<.03%
Totals	46,800.49	73.13	



- Forest Coniferous
- Forest Deciduous
- Forest Mixed
- Grass/Shrub
- Grass
- Corn
- Alfalfa
- Impervious Surface
- Water
- Streams
- Roads
- Batavia Kill Watershed

Scale 1:72000



Land Use	Acres	Square Miles	% Land Use
Forest Deciduous	28,921.71	46.75	64%
Forest Coniferous	2,378.16	3.72	5%
Forest Mixed	5,148.22	8.04	11%
Grass/Shrub	12.88	0.02	0%
Grass	8,838.71	13.81	19%
Corn	26.97	0.04	0%
Alfalfa	61.46	0.10	0%
Impervious Surface	285.72	0.45	1%
Water	128.71	0.20	0%

**Batavia Kill Watershed
Land Use/Land Cover**
Map IV-8
Greene County Soil & Water Conservation District
Batavia Kill Stream Corridor Management Plan

Data Sources: Hydrography- digitized by NYCDEP from USGS Quad and SCS Soil Survey Maps 1993, edited by GCSWCD to show only streams found on USGS topo quads.
 Watershed Boundary- NYCDEP derived from USGS topography 1985.
 Land Use/Land Cover- 25 meter, classified in 1998 by NYCDEP mapping & modeling from 1992 LANDSAT TM data.
 Roads-US Department of Commerce, Bureau of the Census 1998, from 1995 TIGER/Line files.
 Map produced by Greene County Soil & Water Conservation District, January 2001.
 Note: GIS data are approximate according to their scale and resolution.
 They may be subject to error and are not a substitute for on-site inspection or survey.

Note: NYS and County roads totaling 62 miles length by an assumed 24ft width, or approximately 180 acres (0.28 square miles) were added to impervious surface on the above map but not included in area calculations shown in the table.

Based on the observations of the GCSWCD in the period between 1992 and the present, these breakdowns of land use are thought to still provide a fairly accurate characterization of the watershed. While the watershed has experienced some increases in impervious surfaces since 1992, the GCSWCD finds it probable that impervious land use is still less than 1% of the total watershed area.



This is supported by data reported by the Town of Windham Comprehensive Plan (July 2000). Based on a review of building permits, Chazen reported that in the three years between 1996 and 1998, of 186 building permits issued, only 30 were for new homes with the balance issued for renovations or accessory structures.

Figure IV-39: The Enclave at Windham Mountain is typical of the building trend in the 1980's and early 1990's.

4. PROPERTY USE CLASSIFICATION

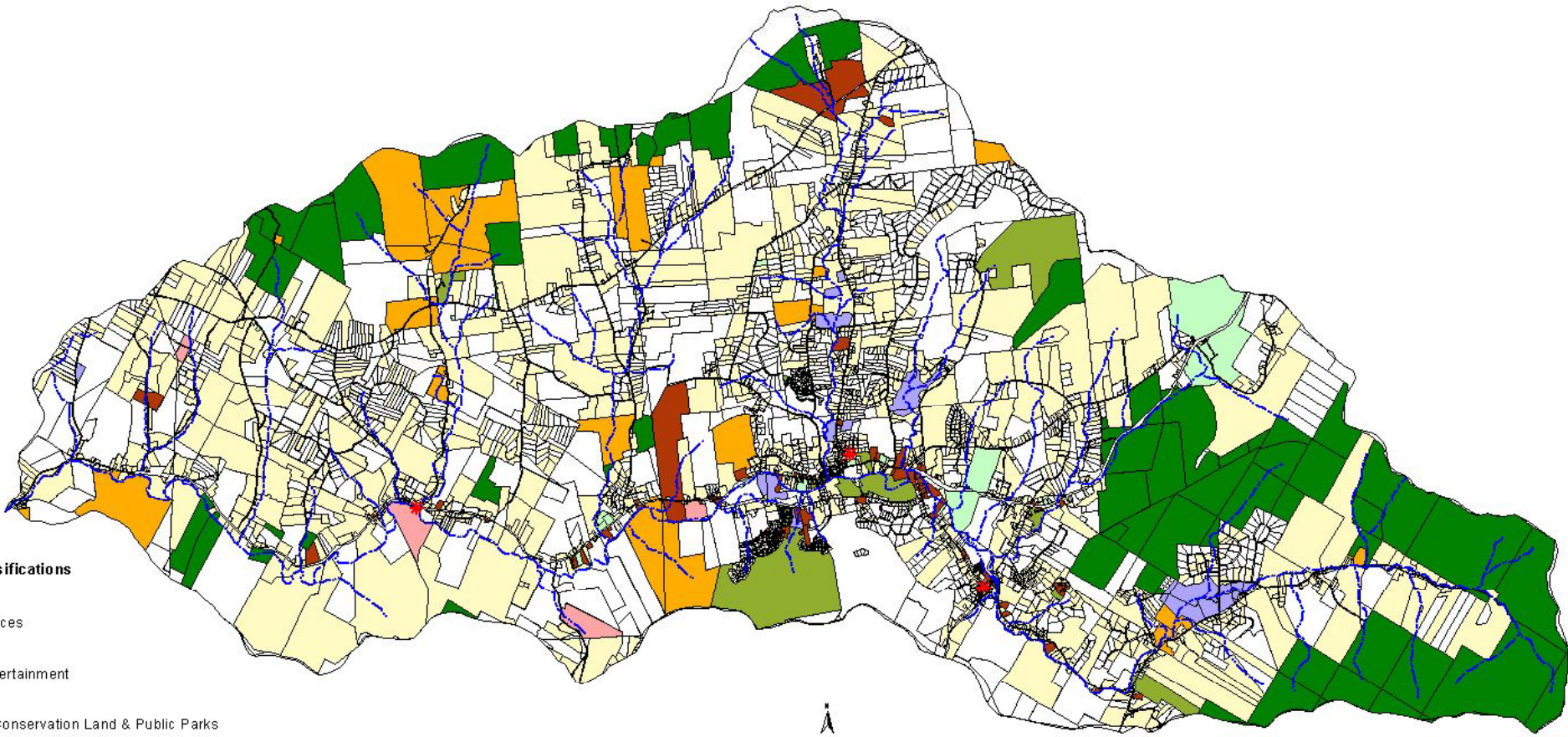
Since none of the municipalities in the watershed have zoning regulations in place, the GCSWCD examined the Property Type Classifications as shown on the records of the Greene County Real Property Tax Service Department. For each tax parcel in the watershed, Greene County Real Property maintains a coding system based on the present use of the property. In the Batavia Kill watershed, the Property Type Classifications are broken down as shown in **Table IV-5** and **Map IV-9**.

While residential properties and vacant land account for approximately 71% of the watershed area, residential development in the watershed to date has been primarily comprised of single homes on large lots, with some higher density construction concentrated in several condominium complexes. In recent years, development or expansion of condominium units has been minimal and build-out of existing subdivisions has been slow.



The Batavia Kill watershed also contains a number of properties which are in public ownership **Map IV-10** and therefore are protected from development. At the time of this SCMP, 10.52 % of the watershed is owned by the State of New York (6,732 acres) with

Figure IV-40: Golf is a significant recreational activity in the watershed, with two large courses present. Recreational landuses comprise approximately 3% of the watershed area.



- Property Type Classifications**
- Agricultural
 - Commercial
 - Community Services
 - Industrial
 - Public Services
 - Recreation & Entertainment
 - Residential
 - Vacant Land
 - Wild, Forested, Conservation Land & Public Parks
 - Streams
 - Tax Parcels

Scale 1:72000

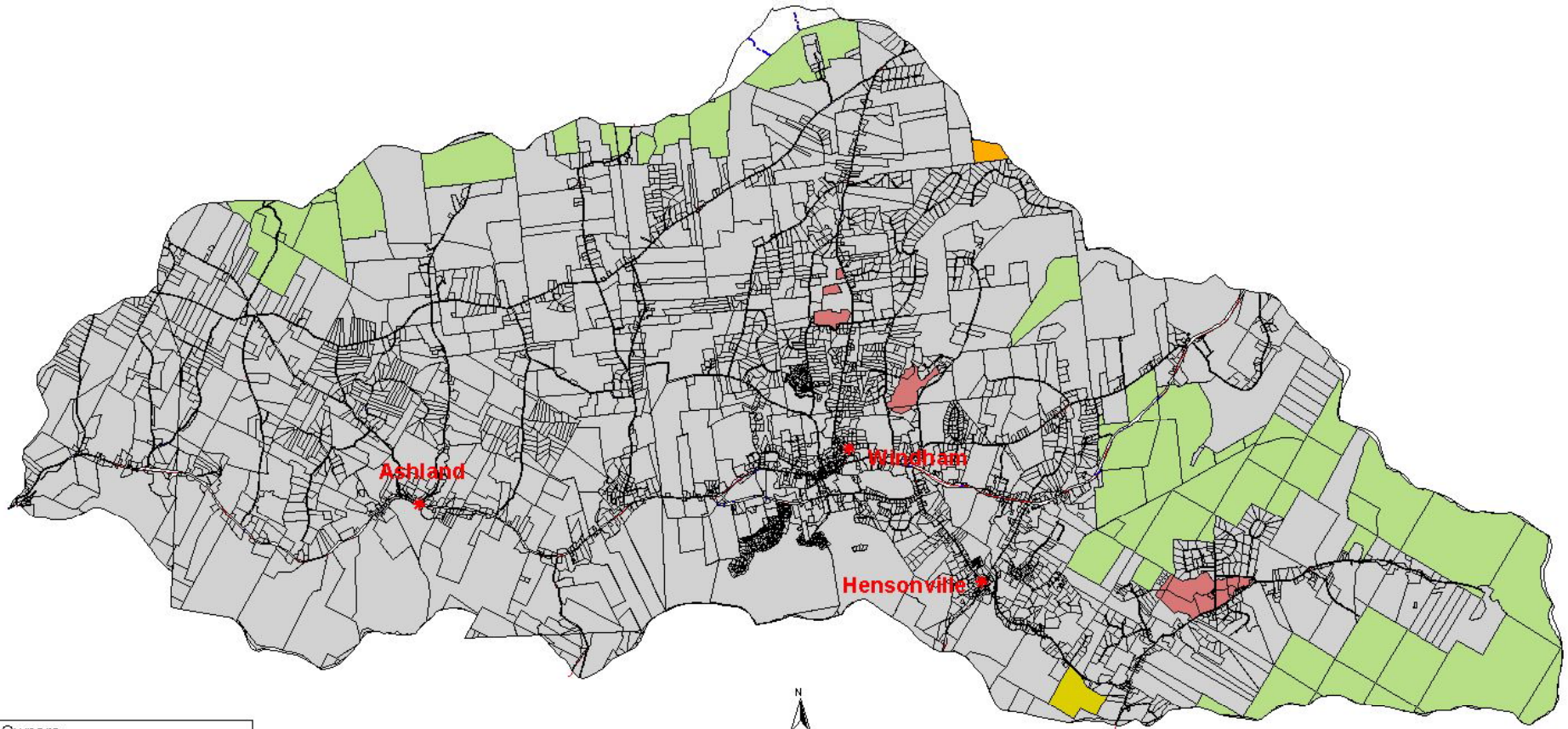


Note: The New York State property type classification system consists of nine categories:
 Agricultural-property used for the production of crops or livestock
 Residential-property used for human habitation. Living accommodations such as hotels, motels, and apartments are in the commercial category
 Vacant Land-property that is not in use, is in temporary use, or lacks permanent improvement
 Commercial-property used for the sale of goods and/or services
 Recreation & Entertainment-property used by groups for recreation, amusement, or entertainment
 Community Services-property used for the well being of the community
 Industrial-property used for the production and fabrication of durable and nondurable man-made goods.
 Public Services-property used to provide services to the general public
 Wild, Forested, Conservation Lands & Public Parks-reforested lands, preserves, and private hunting and fishing clubs

Data Sources: Hydrography- digitized by NYCDEP from USGS Quad and SCS Maps 1993.
 Tax Parcels-Greene County Real Property
 Roads-US Department of Commerce, Bureau of the Census 1998, from 1995 TIGER/Line files.
 Map produced by Greene County Soil & Water Conservation District, January 2001.
 Note: GIS data are approximate according to their scale and resolution.
 They may be subject to error and are not a substitute for on-site inspection or survey.

Property Type	Area (Ac)	Area (Sq Mi)	% Area
Agricultural	2,236.25	3.49	5%
Commercial	732.81	1.15	2%
Community Services	643.82	1.01	1%
Industrial	267.72	0.52	0%
Public Services	391.74	0.61	1%
Recreation & Entertainment	1,156.56	1.81	3%
Residential	16,578.65	25.50	36%
Vacant Land	15,363.14	24.54	34%
Wild, Forested, Conservation Lands & Public Parks	7,167.34	11.20	16%

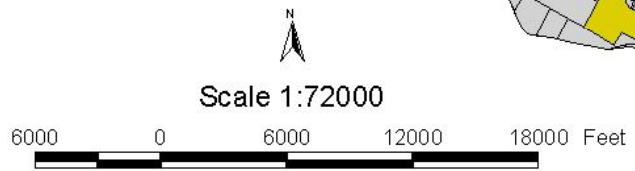
**Batavia Kill Watershed
 Property Type Classification**
 Map IV-9
 Greene County Soil & Water Conservation District
 Batavia Kill Stream Corridor Management Plan



Public Land Owners

- Batavia Kill Watershed District
- New York-New Jersey Trail Conference
- NYC DEP
- State of New York
- Tax Parcels
- Roads
- Batavia Kill Watershed

Data Sources:
Streams-NYC DEP from USGS Quad & SCS Soil Survey Maps 1993,
edited by GC SW CD to show only streams found on USGS quads
Public Lands-NYC DEP
Tax Parcels-GC Department of Real Property
Roads-US Department of Commerce, Bureau of the Census 1998 from 1995 Tiger/line files
Map Produced by Greene County Soil & Water Conservation District, January 2001
Note: GIS data are approximate according to their scale and resolution.
They may be subject to error and are not a substitute for on site inspection or survey.



Owner	Area (Ac)	Area (Sq M)
Batavia Kill Watershed	311	0.49
NYC DEP	115	0.18
NY/NJ Trail	53	0.08
State of New York	6,732	10.52
Total	7,211	11.27

Note: Approximately 15% of the Batavia Kill Watershed is publicly owned land.

**Batavia Kill Watershed
Public Land**

Map IV-10
Greene County Soil & Water Conservation District
Batavia Kill Stream Corridor Management Plan

the Batavia Kill Watershed District (311 acres), NYCDEP (115 acres) and NY/NJ Trail Conference (53 acres) owning less than 0.5% of the watershed each. It is expected that NYCDEP will continue to make acquisitions in the watershed to provide protection to additional properties.

Table IV-5: Property Use Classification in the Batavia Kill Watershed

Property Type	Acres	Sq. Miles	% Area
Agriculture	2,236.29	3.49	5 %
Commercial	732.81	1.15	2 %
Community Service	643.82	1.01	1 %
Industrial	207.72	0.32	< 0.5 %
Public Services	391.74	0.61	< 1 %
Recreation & Entertainment	1,156.56	1.81	3 %
Residential	16,578.65	25.90	36 %
Vacant land	15,963.14	24.94	35 %
Wild, Forested, Conservation, Parks	7,167.34	11.20	16%

In recent publications, it has been reported that current research suggests that the threshold for adverse effects of stormwater runoff on stream system stability begins at a point when approximately 10% of the watershed area is comprised of impervious surfaces (Fischenich 2000). In the case of the Batavia Kill, it would take a 10 fold increase in impervious surfaces to reach this threshold.



Figure IV-41: The Thompson House in Windham is typical of the resort & tourism industry which is important in the watershed.

5. LAND USE REGULATION

Since the Batavia Kill watershed is located in and contributes to the New York City watershed, changes in land use and general development activities are not only governed by a wide range of local, state, and federal rules and regulations, but also by those outlined in the 1997 NYC Watershed Memorandum of Agreement. In each case, these regulations provide a number of diverse mechanisms which provide protection to the watershed's water resources. The Towns of Ashland, Windham and Prattsville do not have local laws relating to zoning. Only Windham has a local Site Plan Review Law. Thus, at the local level, NYC Watershed Rules and Regulations provide significant protection to watershed resources.

The absence of zoning rules does not eliminate all local control over land use changes in the watershed. Each town has a number of other local ordinances which can be used to guide not only the location and type of development in the watershed, but also potential impacts on the watershed's resources. **Table IV-6** summarizes the current status of local ordinances in the Batavia Kill watershed ^[14] (Greene County Planning, 1992).

Table IV-6: Local Laws & Ordinances for Land Use in the Batavia Kill Watershed

Rule/Regulation	Ashland	Windham	Prattsville
Comprehensive Plan	1976 (m)	2000 (d)	2000 (d)
Zoning Law	No	No (s)	No
Subdivision Regulations	1985 (r)	1990	1987
Site Plan Review	No	1989	No
Mobile Home Law	1988 (r)	1970	Yes
Highway Standards	1883	1984	Yes
Floodplain Regulations	1998 (r)	1988	1983
(d) draft (r) revised date (s) setback ordinance (m) Mountaintop Study Commission Gen. Dev. Plan			

6. NYC WATERSHED REGULATIONS

On May 1, 1997, the revised NYC Watershed Rules and Regulations became effective in the watershed. As adopted, the rules & regulations provide additional controls on land use in the watershed. Rules on septic systems, impervious surfaces and stormwater management are the most directly applicable to potential impacts on the stream system. The septic system rules will reduce or eliminate development on some of the steeper, poorer sites, while regulations on impervious surfaces and stormwater will insure not only water quality, but also minimization of future impacts due to increased runoff and erosion from development sites. In addition to the rules and regulations as revised in 1997, the NYC Department of Environmental Protection has a large professional staff responsible for reviewing development activities in the watershed.

In many watershed or stream corridor management planning efforts, future changes in the watershed's character is often recognized as a major factor influencing the success of the planning process. In the case of the NYC watershed, the rules and regulations coupled with professional oversight provide arguably one of the strongest protection tools of any watershed in the country. While the rules and regulations do not affect every potential impact on the watershed, they can be used effectively to reduce future impacts.