IV-E: Water Resources

The waters resources in the Batavia Kill watershed are diverse and they are the central focus of this stream corridor management plan. From the Batavia Kill to the groundwater, water resources in the Batavia Kill are important for commercial, residential, and recreational uses. For the purpose of this SCMP, the GCSWCD relied heavily on previous work completed by the USGS and NYCDEP to characterize the water resources in the watershed. Between 1990 and 1993, Paul Hesig of the USGS completed a very through analysis of the water resources in the central portion of the watershed, and many of his findings have been summarized in this description (Hesig 1999).

1. PRECIPITATION

The annual mean precipitation in the Batavia Kill watershed is evenly distributed over the course of the entire year, with spatial variation related to elevation evident in the watershed (Hesig 1999). There is limited long term data on precipitation in the watershed. However, a U.S. Weather Service station located in the watershed above Hensonville has recorded an annual mean precipitation rate of 41.09 inches during the period from 1961-1990. Using data from this weather gage, as well as previous work done on rainfall distribution in mountainous areas, Hesig reported that variation in annual precipitation may range from over 51 inches at the highest elevations in the eastern portion of the watershed to 41 inches at the lowest elevation in the watershed. Using an area weighted averaging to account for these spatial differences, Hesig calculated a mean annual precipitation for the watershed of 42.5 inches.

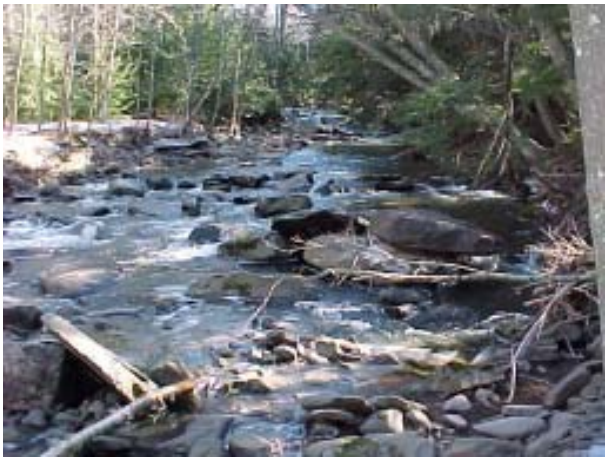


Figure IV-17: Batavia Kill stream in Big Hollow.

In his studies, Hesig did not report on the characteristics of snowfall in the watershed which must be recognized as having a potential impact on its hydrology. In 1965, studies conducted by the Soil Conservation Service in

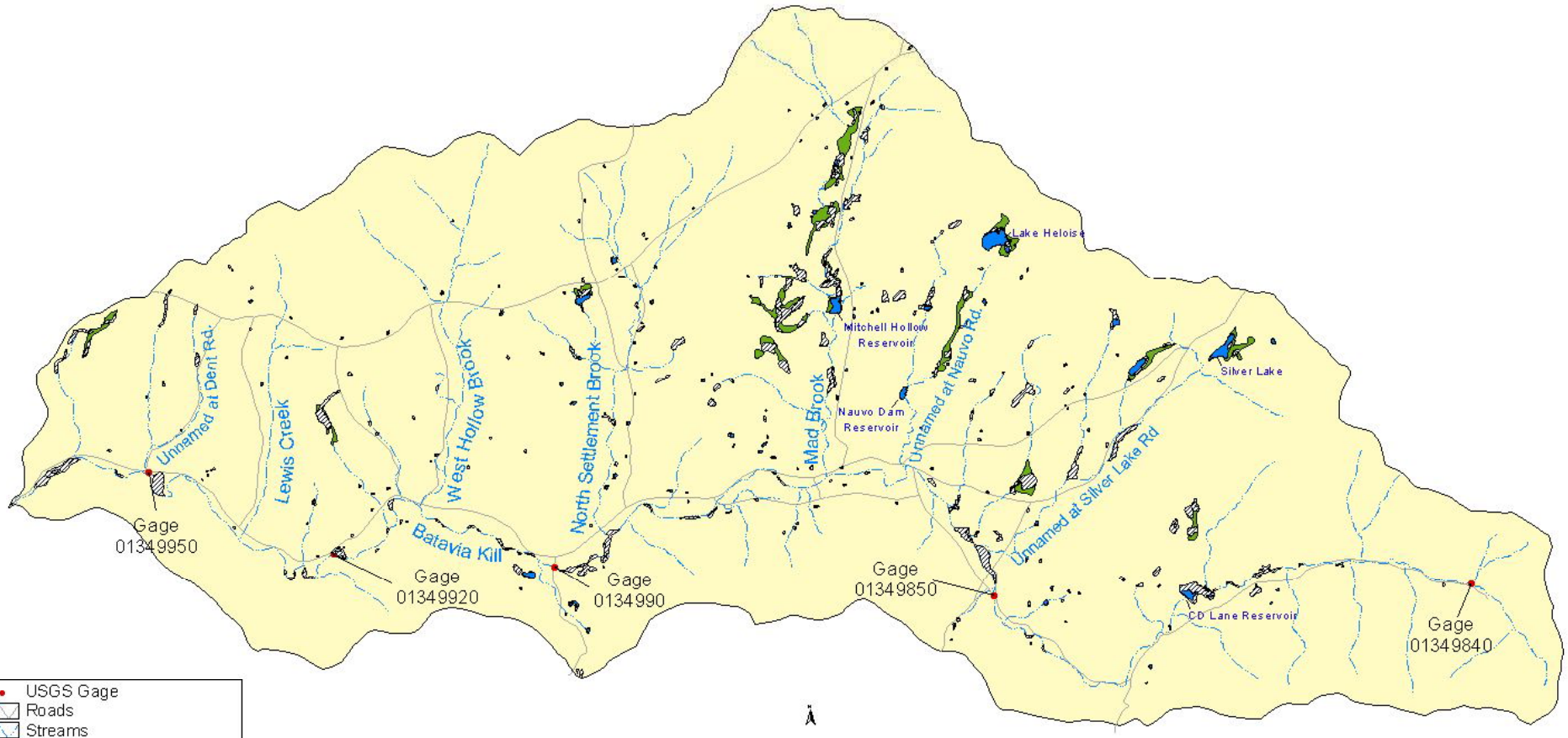
preparation for the flood control project reported that the watershed has an average annual snowfall of 51 inches (soil Conservation Service 1993). While the dominant flow regime of the watershed is based on precipitation, under some conditions snow pack in the watershed can contribute significantly, to the runoff characteristics of the Batavia Kill. The impact of snow pack on the flow of the Batavia Kill was most recently noted during the January 1996 flood event, when a rain on snow event occurred in the watershed during a period when snowfall accumulations were above average. While the frequency of mid-winter rainfall events is very low, early spring rain storms when the snow pack is still melting are a fairly common occurrence and these events often result in elevated stream flows and flooding conditions.

A final consideration which must be noted in relation to precipitation characteristics involves the types of storm events which are typical in the Batavia Kill watershed. While the annual mean precipitation rate is fairly moderate, the watershed is significantly impacted by the way in which rainfall events occur in the Catskills. The USDA Natural Resources Conservation Service (NRCS) has developed maps based on the distribution of the rainfall during a 24-hour period (USDS-NRCS Engineering Field Manual). Many rainfall events in the watershed have been mapped by the NRCS as being Type III storms, in which rainfall distribution indicates very high intensity, short duration storms. Typical rainfall events in the watershed may be very heavy, but occur over a short period of time. Combined with the low permeability of soil features discussed previously, high intensity storms produce increased amounts of runoff in a much shorter period of time than those storms where rainfall is steady, but distributed more uniformly over an extended period.

2. BATAVIA KILL STREAM

The primary surface water resources of the watershed is the Batavia Kill and its tributaries **(Map IV-7)**. The Batavia Kill main stem is approximately 21 miles in length, and based on calculations conducted by NYSDEC, consists of 128 acres of surface area [11] (NYSDEC, 0000). The entire main stem of the Batavia Kill is a perennial stream, with the exception of a few degraded reaches above the C.D.Lane flood control structure, where over widening of the channel and an abundance of loose, aggraded gravels causes the stream to lose its surface flow to infiltration during periods of low flow.

Under NYS Public Health Law, all waters of the state are given a classification by NYSDEC based on the best usage of the waters. These classifications range from AA which is suitable for drinking, culinary, or food processing purposes, to Class D streams which is suitable for fishing (NYSDEC 2000). Streams with a use classification of C or higher may carry a sub-classification of (t) or (ts) to indicate the waters sustaining trout populations (t) and those which support trout spawning (ts). The



- USGS Gage
- Roads
- Streams
- Water
- Federal Regulated Wetlands
- NYS Regulated Wetlands
- Batavia Kill Watershed

Scale 1:72000

6000 0 6000 12000 18000 Feet

Note: NYS Wetlands, Federal Wetlands, and Open Water cover approximately 902 acres (1.9%) of the Batavia Kill Watershed

Data Sources:
Hydrography- digitized by NYCDEP from USGS Quad and SCS Maps 1993.
Watershed Boundary- NYCDEP derived from USGS topography 1965.
Roads: US Department of Commerce, Bureau of the Census 1998, from 1995 Tiger/line files
NYS Regulated Freshwater Wetlands (12.4 acres or greater)-NYS Department of Environmental Conservation from official NYS Freshwater Wetland Maps, 1:24000
Federal Regulated Wetlands-NYC DEP from National Wetlands Inventory as delineated on USGS topographic base maps from stereoscopic analysis of high altitude aerial photographs, 1:24000
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.

Batavia Kill Watershed Water Resources

Map IV-7
Greene County Soil & Water Conservation District
Batavia Kill Stream Corridor Management Plan

Batavia Kill main stem carries classifications ranging from A(ts) to C(t) and are located as shown in the **Table IV-1**. Of 71.2 miles of Batavia Kill tributaries which have been classified, 22.3 miles carry a standard of C(ts) or higher, 9.0 miles have a classification of C(t) with the remaining 39.9 miles classified as C. Under NYS Environmental Conservation Law, streams with a classification of C(t) or greater are protected, and any activities in relation to the stream must be permitted. (NYSDEC 2000)

Table IV-1 Water Use Classifications on the Batavia Kill

Stream Reach Description	Waters Classification	Approximate Length
Schoharie Creek to below Ski Windham intake	C(t)	10.1 miles
Ski Windham intake to Navu Road	A(t)	2.4 miles
Navu Road to 1st tributary above C.D. Lane	A(ts)	5.7 miles
Remainder of the stream	C(ts)	3.6 miles

3. LAKES & PONDS

In addition to the Batavia Kill, the watershed also includes numerous small lakes and ponds which are important as recreational and habitat resources. The principal uses of these surface waters include fishing, snow making, and private recreation such as swimming. These surface waters also are a water supply for NYC. The permanent pool at the C.D.Lane flood control structure is a 26 acre impoundment managed by the Town of Windham for recreational activities. The facility has a public beach. This lake is also managed by NYSDEC as a trout fishery with rainbow and brook trout stocked annually, and with a boat launch site maintained at the facility. At the Mitchell Hollow flood structure (Mad Brook), a smaller, shallower permanent pool behind the dam is characterized by excellent wetland habitat conditions.

Figure IV-18: Local water resources such as Lake Heloise at the White Birch Campground are important to the economy in the watershed

At several places in the watershed, there are small lakes associated with private camps and pubic campsites. In the headwater area of East Windham, Silver Lake is a sizable impoundment located at the site of Camp Oh-Ne-Tah (a girls summer camp). This structure recently underwent extensive rehabilitation and represents an impoundment of approximately 15 acres, with a sizable wetland at the head of the lake. On the

northern slope of the watershed, Lake Heloise is a sizable impoundment which is the site of White Birches Campground. In both cases, these lakes are used for fishing, swimming and boating. The Batavia Kill watershed is also characterized by numerous private ponds of various sizes.

At the present time, the only identified water quality problems with any of these impoundments is turbidity at the C.D.Lane Park facility. No known problems with degradation of the water chemistry in these impoundments have been reported to the GCSWCD or state agencies.

4. GROUNDWATER

Groundwater is the sole source of water for domestic use in the Batavia Kill watershed. Municipal water is limited to the hamlets of Windham and Hensonville, while Ashland is currently exploring the possibility of developing a water system for the hamlet. The Windham water system uses groundwater sources from municipal wells on the valley floor. Individual homes and businesses outside these water districts have water provided by on-site, private wells.

The best potential for groundwater resources is within and adjacent to the Batavia Kill Valley [8]. The major tributaries with fractured bedrock are the primary source of groundwater, while lesser amounts coming from glacial deposits. The less productive areas for groundwater are the valley areas adjacent to ice-contact deposits and where there are thin ice-contact deposits below lacustrine deposits.[8] Both the ice -contact deposits (lodgement tills) and the lacustrine deposits have very low permeability and generally impede the movement of groundwater water supply for NYC, as well . While the gravels and sands found in the valley bottoms are permeable, they have a limited saturation thickness and are located too close to the surface to be a good source of groundwater.

In his study of the groundwater relationships in the Batavia Kill, Hesig reported that many of the tributaries exhibit infiltration losses as they reach the stratified, permeable materials found at the fringe of the Batavia Kill against the valley walls (1999). This infiltration is an important recharge source for the valley aquifer, but many of these tributaries may go dry for significant stretches during

Figure IV-19: Water used for snow making at Ski Windham accounts for 55% of total average water use in the watershed.

periods of low flow as a result.

5. WATER USAGE

The USGS report, "Water Resources of the Batavia Kill Basin at Windham, Greene County, New York" [8] provides the best, most up-to-date data on the status of water usage within the Batavia Kill watershed. Water withdrawals are approximately 286 million gallons per year in the watershed. This includes water taken from both ground and surface water sources. Municipal use in the Windham water system accounts for approximately 34% of the total water withdrawal, with water withdrawals by Ski Windham accounting for approximately 55% of the total water withdrawal. Rural, private wells account for approximately 12% of the water withdrawals. Water consumption, or that fraction of the total water withdrawal which is not eventually returned to the watershed, accounts for 5.1 million gallons of water on an annual basis, or 2.2% of the total withdrawal.

While there are limited withdrawals from surface waters for commercial or private use, the snow-making operation at Ski Windham is the single largest user of water in the Batavia Kill watershed. Regulated under a permit with NYSDEC, Ski Windham is limited to taking a maximum of 7 cubic feet per minute (3,142 gpm) from the Batavia Kill and the ski area must monitor withdrawals on 15 minute intervals during the period between November and February. Investigations by Heisig found average daily withdrawal of 2.2 million gallons per day while Ski Windham reported an average seasonal pumpage of 139 million gallons (1999). Ski Windham is consistently within the limits set forth in their permits.

6. STREAM GAGE NETWORK

One of the primary tools of watershed managers, a good stream gaging network, is essential to the planning and implementation of stream restoration projects as well as assessments of changes in hydrological conditions in a watershed. In the Batavia Kill main stem, there are a total of four USGS sites with continuous-reading gages with telemetry capabilities, allowing for "real-time" measurements of stream flows; and there is one peak flow gage in the Hensonville area.

At the present time, the gaging network on the Batavia Kill has some limitations to its use, primarily associated with the lack of a suitable period of record to perform flow analysis. While a gage in the Ashland area at County Route 17 will have 10 years of record at the end of the 2000-01 water year, newer gages in the headwaters (Big Hollow) and at Red Falls have just over a 2 year period of record which is not long enough to perform useful flow analysis. These new gages do have the added benefit of being linked by phone lines to the USGS computer network, and real-time stage readings can be viewed on the Internet with updates approximately every 4 hours. The gages are maintained by the USGS in partnership with NYCDEP. The GCSWCD has

conducted detailed surveys of the stream cross section at the staff plate on each of these gages, and can use USGS real-time gage data with the program AutoCAD to monitor the rise in stream flow from the office. This allows us to target our inspection trips to the watershed to observe stream flows.

Table IV-2 Batavia Stream Gage Network

Gage No	Drainage Area	Gage Location & Type	Period of Record	Maximum recorded Flow	Minimum Recorded Flow
01349840	2.03 mi^2	Big Hollow headwaters continuous with telemetry	10/97 to present	6.12 cfs 9/16/99	0.30 cfs 8/20/99
01349850	13.5 mi^2	Hensonville Crest gage	1955 to present	>5,000 cfs*	Not Applicable
01349900	51.2 mi^2	Ashland @CRT 17 continuous no telemetry	1991 to present	15,300 cfs ** 9/16/99	
01349950	68.6 mi^2	Red Falls continuous with telemetry	10/97 to present	16,800 cfs 9/17/99	1.9 cfs 8/22/99

* Peak flow during both 1955 and 1960 flood events exceeded the gage limits, stopped recording at 5000 cfs
** Provisional Data

7. PRIORITIES WATERS LIST (PWL)

To monitor the conditions of the state's surface waters, the NYSDEC maintains, and routinely updates, a list of waterbodies which are affected by known or suspected impacts on water quality, recreational uses, or fisheries. Based on information provided by NYSDEC staff, other agencies, and problems reported by citizens, the Priority Waters List (PWL) provides a broad assessment of water quality based on any known or suspected impacts to the best use classifications of state waters (NYSDEC 2000). In recent years, the significance of the PWL has increased as NYSDEC uses the list as guidance when evaluating grant requests for water quality projects. While a waterbody not on the PWL may be successful in obtaining state or federal funding, the project success is significantly improved if the project addresses a problem on the PWL. [12] (NYSDEC, 1996)

At the time of this report, the Batavia Kill is on the PWL. The stream was listed on the original PWL developed in 1991, and has remained during recent updates. The source for the following information is the Batavia Kill PWL summary sheet provided by NYSDEC [12].

PWL Segment No: 1202-0001
Size of listed waterbody: Entire 20 mile length
Use Impairment: Fish propagation
Severity of Impact: Impaired
Type of Pollutant: Sediment

Sources of Pollutants:	Streambanks (roadways/construction)
Resolvability:	Issue needs study and management plan

The PWL is consistent with NYCDEP and GCSWCD observations regarding the turbidity problems on the Batavia Kill. The PWL narrative summary notes problems with sedimentation of trout spawning areas and siltation of eggs and benthic organisms. The PWL also notes the transport of Batavia Kill watershed sediments to the Schoharie Reservoir.