Section 2.7
Land Use/Land Cover

Land use and land cover of a watershed have a great influence on water quality and stream stability. The watershed's land cover directly impacts stream hydrology by influencing the amount of stormwater runoff. Forests, natural meadows and wetlands naturally absorb rainwater, allowing a portion of it to percolate back into the ground. However, impervious surfaces such as pavement, parking lots, driveways, hard-packed dirt roads and rooftops increase the amount of rainfall that flows over land and reduces the amount of rainfall that percolates into the soil to recharge groundwater wells and streams.

Impervious cover is a major influence on streams and stream life due to the way it changes the amount and duration of stormwater that gets to the stream. Generally, the more impervious surface there is in a watershed, the less groundwater recharge. This, in turn, leads to a lower water supply to the summer flows, and greater storm flows, together with increased erosion in streambed). In addition to degrading streams, watersheds with a high percentage of impervious surfaces are prone to larger and more frequent floods, which cause property damage through inundation, as well as ecological harm resulting from lower base stream flows.

The literature documents deleterious effects of impervious surfaces on biota (Limburg and Schmidt, 1990; May et al., 2000; Wang et al., 2001; Roy et al., 2005), stream stability (Booth, 1990; CWP, 1998; White and Greer, 2005; Wohl, 2005) and instream water quality (Groffman et al., 2004 and Deacon et al., 2005). For example, impervious surfaces can raise the temperature of stormwater runoff, which in turn reduces the waters ability to hold dissolved oxygen and harms some game fish populations, while promoting excess algal growth. Field observation, research and hydrologic modeling suggest a threshold of 10% impervious surface in a watershed, after which there is marked transition to degraded stream conditions (CWP, 1998 and Booth, 2000).

Certain types of pollution are often associated with particular land uses, such as sedimentation from construction activities. There has been a vast array of research demonstrating that as land uses become more urbanized (built), biotic communities decline in health (Limburg and Schmidt, 1990; Schueler and Holland, 2000; May et al., 2000; Wang et al., 2001 and Potter et al. 2005). Concentrations of selected chemical constituents, including nitrate, in stream base-flow were strongly affected by the predominant land use in a large Hudson Valley study (Heisig, 2000). The decline of watershed forest cover below 65% percent marked a transition to degraded water quality (Booth, 2000). Based upon these results, land use/cover appear to be attractive attributes for long-term trend tracking. These results can be correlated with in-stream water quality data and then used to focus best management practices towards the land uses with the greatest impact on water quality.

Land use of the Upper Neversink River watershed was analyzed by a team of scientists at Frost Valley YMCA Roehm Technology Center using the LANDSAT ETM geographic information system (GIS) coverage (provided by the National Land Use Cover Data). To simplify the data, the 47 classifications assigned to the

different types of land cover have been re-classified and grouped together under more general land use categories. The table and figure below illustrates the categories and percentages of the different land use types present in the Upper Neversink River watershed.

Table 1 Land Use Classification

Land Use	Percent	Acres
Parks/Forest/Open Space	93.75	55,208.80
Non-Woody Vegetation/ Recreation	5.11	3,009.38
Rural Housing	0.31	184.008
Roads	0.25	149.898
Single Family Units	0.19	114.718
Urban (impervious/built up land)	0.16	93.11
Agriculture (livestock)	0.11	63.28
Agriculture (Crops)	0.041	23.848
Low Density Housing	0.041	24.64
General Residential Housing	0.026	15.26
Mobile Home	0.001	0.77
Industrial	0.005	2.82
Commercial Offices	0.0003	0.20
Total	100.0000	58,890.70

The overwhelming majority (94%) of land use in the Neversink watershed is forested area. A large portion of this forest land is owned by the State of New York and under current state laws will remain undeveloped. Non-woody vegetation, including recreational fields, follows in a distant second at 3,009 acres (5%). Residential property is less than 1% of the region, covering approximately 338 acres of the watershed. There is very little commercial and industrial activity in the Neversink watershed, combined they make up less than 3% of the land cover. The majority of the impervious surface in this area is made up of the network of roads which fragment the landscape.

Table 2 Land Cover Classification

Land Cover	Percent	Acres
Deciduous Forest	64.82	38,173.49
Coniferous Forest	21.68	12,768.90
Mixed Forest	7.24	4,264.62
Grass/Herbaceous	1.25	735.42
Impervious Surface	0.40	235.04
Water	3.74	2201.97

Approximately 38,173 acres of the forest in the Neversink watershed is deciduous, totaling over 64% of the total land cover in the watershed (Table 2). Over 21% of the landscape is covered by coniferous forest and over 7% by mixed forest. Livestock and crop agriculture occupy approximately 0.15% of the watershed combined. Impervious surfaces, consisting of roads, residential, urban and industrial areas total around 0.44% of the watershed. Although the total impervious surface area is low in the Neversink watershed, negative impacts on the stream are still possible. Instances where roads and homes occur directly adjacent to the stream can result in significant runoff during storm events. Proper land use planning to direct development and preserve sensitive areas can be utilized to maintain a manageable low level of impervious cover.