

V. WATER USES/NEEDS

The uses and needs for water in the Deer Creek Watershed depend upon both land use within the watershed, and that in surrounding communities. In the following sections, the current uses and needs for water are discussed, and a water budget is developed for the watershed as a whole.

A. Land Use

Land use in the Deer Creek Watershed is largely agricultural and forested, with subsidiary amounts of developed land. The Deer Creek Watershed is the largest agricultural area in Harford County (MDE, 2006). The primary sources of quantitative information used in this analysis were:

- 1992 and 2001 Land Use Geographic Information System (GIS) coverages from the Multi-Resolution Land Characteristics Consortium (MRLC)/National Land Cover Database (NLCD);
- 2002 Harford County and Baltimore County Land Use coverage developed by the Maryland Department of Planning;
- U.S. Department of Agriculture Cropland Data Layer, 2002;
- Pennsylvania Land Use Coverage (based upon 1992 MRLC data, plus 1990s and 2002 Thematic Mapper data); and
- Deer Creek Watershed Characterization (MDE, 2006).

The percentages of land attributed to each use vary between these different sources, in part due to differing resolution of the data, and to different sources and methods. Table 11 presents an analysis of the 2001 and 2002 data sets. The data are presented graphically on Figure 22. In general, the agricultural portion of the watershed represented 58 to 63 percent of the total land area in 2001-2002. This proportion is slightly lower in Harford County than other portions of the watershed. Forested regions comprised about 34 percent of the watershed. Developed areas, primarily low density residential areas, comprised between 3 percent and 8 percent of the watershed.

Table 11. Land Use Composition

| Land Use | Deer Creek 2001 MRLC/NLCD Data | Deer Creek 2002 USDA Cropland Data | Harford County Section SSP&A Analysis (2002 data) | Harford County Section MDE Analysis (2002 data) | Baltimore County Section MDE Analysis (2002 data) | York County Section MDE Analysis (2002 data) |
|-----------------|---------------------------------------|---|--|--|--|---|
| Agricultural | 62.6% | 57.9% | 53.7% | 54.0% | 57.0% | 57.0% |
| Forested | 33.6% | 33.4% | 31.4% | 31.0% | 33.0% | 23.0% |
| Developed | 3.0% | 8.2% | 14.7% | 15.0% | 10.0% | 20.0% |
| Other | 0.8% | 0.5% | 0.2% | --- | --- | --- |

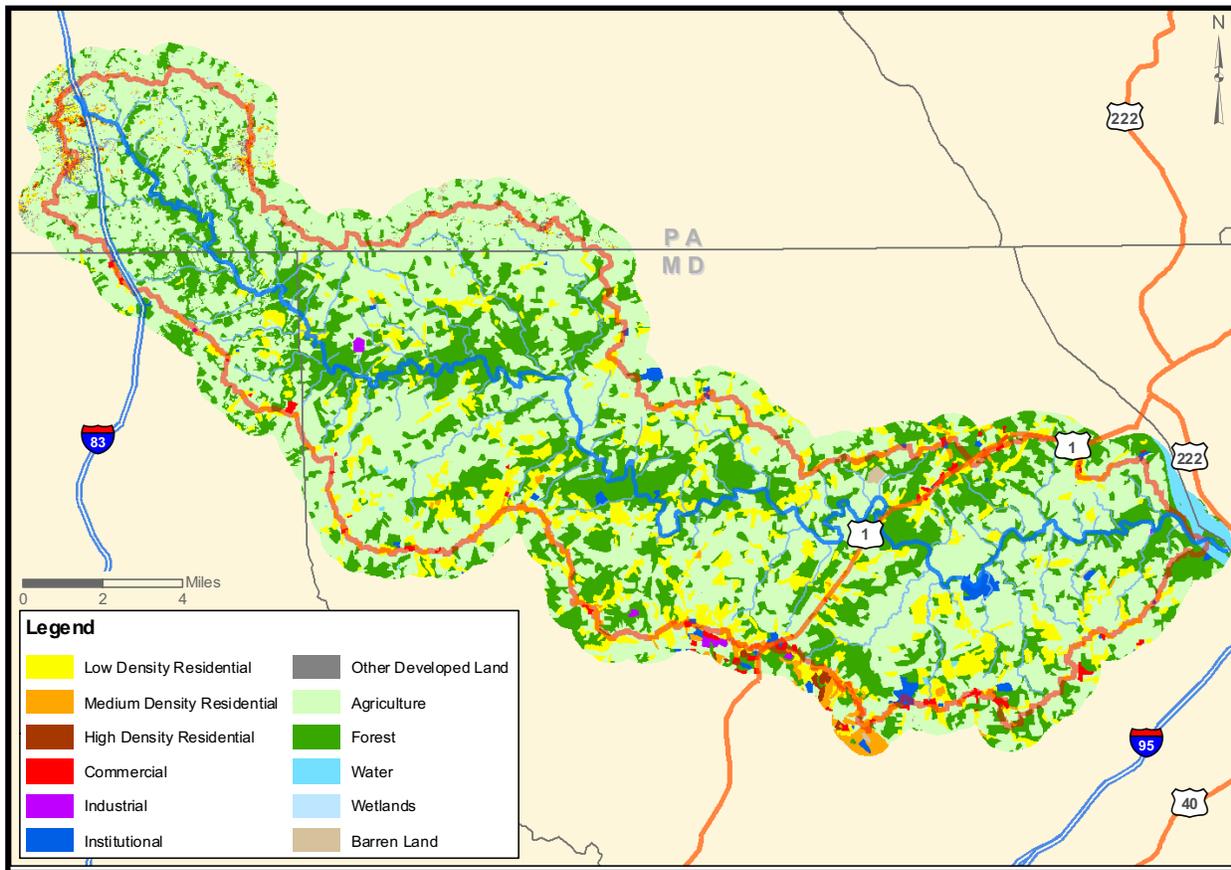


Figure 22. Land Use Map

B. Recreational Use

The water resources within the Deer Creek Watershed support a variety of recreational activities. In Harford County, the section of Deer Creek from Bond Road to the Susquehanna River is a 43.5-mile-long Class I-III section of whitewater according to American Whitewater, a boating advocacy group. The reach is typically utilized by paddlers of medium experience, as well as beginners that are accompanied by more experienced paddlers. Harford County’s Eden Mill Nature Center and Park provides canoe launching, canoe trips, and offers canoe certification courses throughout the year. The section of Deer Creek within Rocks State Park is also very popular for canoeing, kayaking, tubing, and swimming. In a typical year, Deer Creek can be canoed from March to July, after which time flows typically become too low, and then again from September to November, after which time water temperatures typically become unsafe.

Upper Deer Creek, within Rocks State Park – Hidden Valley Natural Area and Eden Mill, is stocked with hatchery trout and is a very popular put-and-take trout fishery in the spring. Rainbow trout raised at the Albert Powell State Fish Hatchery in Hagerstown are stocked within the put-and-take trout management areas. Brown trout from private hatcheries also are occasionally stocked to provide another species of trout for anglers to catch. Fall stockings of hatchery trout extend the angling season for trout from October into early June. Deer Creek

typically becomes too warm during the summer months to support year-round trout survival. Smallmouth bass are also found throughout Deer Creek in low numbers.

Historically, Deer Creek supported spawning runs of anadromous fish such as hickory shad, white perch, yellow perch, alewife, and blueback herring. A private dam built on Deer Creek at Wilson's Mill blocked approximately 25 miles of spawning habitat from these anadromous fishes. A Denil fish ladder was built and reopened historic anadromous fish spawning habitat in Deer Creek in 2000. Since the opening of the fish ladder, all of the historical species of anadromous fishes that ascended Deer Creek to spawn have been documented passing through the fish ladder. From late March through early May, the lower Deer Creek within the Susquehanna State Park is a popular fishing destination for anglers to catch and release hickory shad. Thousands of river herring and hickory shad run up Deer Creek to spawn. The Stafford Road Bridge area is a very popular destination for fly anglers. Due to the popularity of the spring shad run, the lower Deer Creek can be quite crowded and experience limited parking during the spring months.

C. Existing Water Demands

Water users in the Deer Creek Watershed include:

- Large permitted users in excess of 20,000 gallons per day (gpd) consumptive use and/or 100,000 gpd total use.
- Permitted and un-permitted users of less than 20,000 gpd, including small community and non-community water systems.

For this study, sources of data included:

- SRBC – users in excess of 20,000 gpd consumptive use and/or 100,000 gpd total use.
- MDE – permits for small community and non-community water systems, with exemptions for agricultural use.
- Pennsylvania Department of Environmental Protection (PADEP), York District Office – information on regulated water supply systems in York County.
- Population data from the U.S. Census Bureau.

Figure 23 and Table 12 show the major permitted users of water within the Deer Creek Watershed, and the permitted amounts.

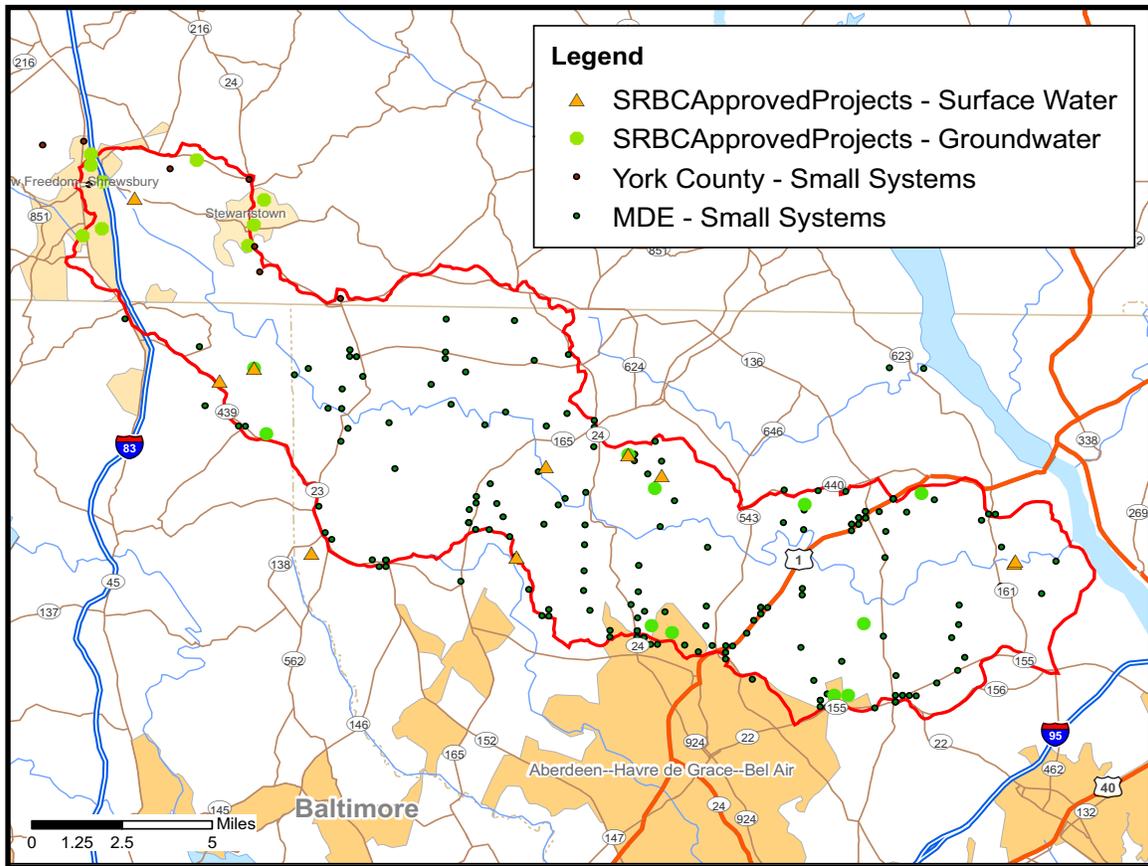


Figure 23. Major Water Users

Quantification of the water use in the basin cannot be exact with the available data. While permitted amounts are recorded by the states and SRBC, water users generally do not report detailed information on actual water use. The state of Pennsylvania recently enacted the Water Resources Planning Act of 2002 (Act 220), by which permitted users are required to report actual usage. In addition, domestic household uses are not reported or recorded by the state. Consequently, we chose to quantify the water use with the following steps:

- Assume that permitted users are withdrawing the permitted amount. Although most users typically withdraw less, it is conservative to assume they withdraw their full permitted amounts. This assumption is particularly valid considering the growth of use over time and the tendency of uses to peak during extreme conditions such as droughts.
- Assume domestic use based upon an average population density and typical volumes used in domestic settings, consistent with planning standards used in the state and local jurisdictions.
- Assume that consumptive use represents 10 percent of total use, which is consistent with the percentage demonstrated from usage records on an average annual basis.
- For farms, nurseries, and golf courses, assume consumptive use is 100 percent. Although a portion of irrigation water could potentially return to the groundwater system, it is unlikely to be significant or quantifiable, and operators are not apt to apply more water to the ground than can be uptaken by the plants.

Table 12. Summary of Major Water Users

| Water User | Annual Water Use (cfs) | | | | | Percentage from Deer Creek Watershed | Estimated Consumptive Use/Export (cfs) | Comments | Sources |
|--|---------------------------|---------------------------|---------------|---------------|--|--------------------------------------|--|--|--|
| | Reported Use 2004 (PADEP) | SRBC Reported Use (years) | SRBC Approved | MDE Permitted | | | | | |
| Shrewsbury Boro, Pa. (including Forest Lakes Water System) | 0.55 | 0.3 - 0.42 (1999 to 2004) | 1.07 | | | ~ 50% | 0.53 | consumptive use: exports to WWTP | SRBC-approved projects PADEP projects |
| Stewartstown Boro Authority, Pa. (excluding imports from York Water Co.) | 0.34 | .01 - 0.2 (2001 to 2004) | 0.43 | | | ~ 50% | 0.02 | | SRBC-approved projects PADEP projects |
| Stewartstown Boro Authority, Pa. (imports from York Water Co.) | 0.11 | --- | --- | | | 0% | -0.10 | Estimate based upon discussions with Stewartstown personnel | SRBC-approved projects |
| York County Solid Waste Authority Golf Course (Consumptive Use) | --- | --- | 0.31 | | | 100% | 0.31 | | SRBC-approved projects |
| Geneva Farm Golf Club (Consumptive Use) | --- | .02 - 0.18 (1992 to 2005) | 0.04 | | | 100% | 0.04 | Assume all use is consumptive | SRBC-approved projects MDE Files |
| City of Aberdeen Deer Creek Use Chapel Hill Intake | --- | 2.7 - 3.7 (2003 to 2005) | 4.6 | 5.1 | | 100% | 5.10 | Use max permitted amount all water exported | SRBC-approved projects MDE Files |
| Small Permitted Users of >10,000 gpd in Maryland (16 permits) | --- | --- | --- | 0.78 | | 100% | 0.53 | | SRBC-approved projects MDE Files |
| Small Permitted Users of <10,000 gpd in Maryland (179 permits) | --- | --- | --- | 0.479 | | 100% | 0.05 | | MDE Files |
| Small Permitted Users in Pa. (3 users, no use data) | --- | --- | --- | 0.24 | | 100% | 0.10 | | PADEP Files |
| Remaining Small Users - Residential (Total Use ~ 10.6 cfs) | --- | --- | --- | --- | | 100% | 1.06 | Population Density of 0.89 People/Acre (Assume 70 gpd/person) | Census Data |

D. Water Budget

The summary water budget is shown in Table 13. The budget was developed for three periods: an average rainfall year, the year 2002 (the driest year in the period of record), and a relatively wet year (2004). There are several components of this budget that were estimated using the best available data. These include the estimated quantities of consumptive use that were developed from the PADEP, MDE, and SRBC databases, as described above. Although these components are not known with great precision, it is clear that they represent only a small percentage of the total water budget. They are shown in italics in Table 13. *Because this study is assessing water availability at Darlington, the APG use is not included.*

Similarly, there is a relatively small, but still significant amount of water that is being exported from the watershed in the vicinity of Shrewsbury. Groundwater pumped from the Shrewsbury well field is distributed to homes and businesses with private disposal systems, some of which are outside of the Deer Creek Watershed boundaries. This volume of water has not been quantified. In addition, Shrewsbury's municipal wastewater is all discharged to the New Freedom wastewater treatment plant, and ultimately the Codorus Creek Watershed.

The water budget begins with the amount of water provided by precipitation as the total available water in the watershed. The stream gage records provide an estimate of the quantity of water that is drained from the watershed to the Susquehanna River. Other inputs and removals (through water purveyors and consumptive uses) are added and subtracted to adjust the total. The quantity remaining – that amount of water that does not flow into the river and is not withdrawn for use – can only leave the watershed through one remaining route. It is the quantity of water that evaporates from the surface or is transpired by vegetation during the growing season. As shown in Table 13, evapotranspiration accounts for the bulk of the water budget in normal, dry, and wet years.

Table 13. Summary Water Budget

| Parameter | | Average (cfs) | 2004 (cfs) | 2002 (cfs) |
|--|-------------------------|----------------|----------------|---------------|
| Precipitation | | 577.42 | 779.86 | 360.92 |
| Adjustments | Imports ¹ | <i>0.10</i> | <i>0.10</i> | <i>0.10</i> |
| | Exports ² | <i>-0.27</i> | <i>-0.27</i> | <i>-0.27</i> |
| | Streamflow ³ | <i>-221.3</i> | <i>-321.7</i> | <i>-87.3</i> |
| | Subtotal | <i>-221.47</i> | <i>-321.87</i> | <i>-87.47</i> |
| Percentage of Precipitation | | 38.3% | 41.2% | 24.2% |
| Water Use (estimated consumptive use Upstream of Darlington Gage) | | <i>-2.63</i> | <i>-2.63</i> | <i>-2.63</i> |
| Percentage of Precipitation | | 0.3% | 0.3% | 0.6% |
| Evapotranspiration | | <i>-354.1</i> | <i>-456.1</i> | <i>-271.6</i> |
| Percentage of Precipitation | | 61.3% | 58.5% | 75.3% |

Estimated values shown in italics.

1 Stewartstown imports from York Water Co. (estimated to be 70,000 gpd).

2 Exports from public use outside DC watershed, and exports to New Freedom wastewater treatment plant – Shrewsbury area.

3 Flows based upon Rocks, Maryland, gage, scaled to area of watershed upstream of Darlington (ratio of 1.67).