

Water quality at the spring sites was evaluated by comparing the data to state drinking water standards or Maximum Contaminant Loads (MCLs) (Table 3). (Not all drinking water parameters were analyzed in this study, but of those that were analyzed the only one that exceeded the standards in any of the springs was nitrate). Spring sites were ranked in order of their average concentrations of nitrate. Water quality data from springs also were used for water typing analysis.

Water typing was performed using a variety of methods to determine the origination of water for each of these springs.

Sites were ranked based on calcium/magnesium (Ca^{+2}/Mg^{+2}) ratios, as well as concentrations of major ions, in order to group stream sites and springs by their water chemistry signatures. Additionally, a ternary plot was used to group sites with similar concentrations of major ions together. By using this information and comparing the data to previous studies done on the characteristics of groundwater in

Table 3. Pennsylvania Drinking Water Standards

PARAMETERS	LIMITS	REFERENCE CODE
Nitrate	10 mg/L	a
Chloride	250 mg/L	a
Sulfate	250 mg/L	a
pH	6.5 - 8.5	a
REFERENCE CODE & REFERENCE		
a www.depweb.state.pa.us/watersupply/lib/watersupply/pa-mcls_05.pdf		

carbonate aquifers, some conclusions were made as to which streams and springs have water from a similar origin.

Results and Discussion

Water quality, macroinvertebrate, and habitat conditions for each stream sampling site in the Morrison Cove region are depicted in Figure 4. Two sites demonstrated the best overall conditions in each category with “higher” water quality, non-impaired macroinvertebrates and excellent habitat. Four sites did not exceed water quality levels of concern and were considered as “higher” water quality sites. Thirteen sites slightly exceeded levels of concern and received a “middle” water quality designation, while four sites considerably exceeded levels of concern and were given a “lower” water quality designation. The remaining two sites were classified as “poor” water quality, as they were considerably worse than the “lower” designation. Habitat conditions throughout Morrison Cove were rated highly overall. Fifteen sites were rated as excellent (68 percent), supporting habitat was found at five sites (23 percent), one site (4.5 percent) was rated as partially supporting, and one site (4.5 percent) was non-supporting. Of all the individual samples that were collected, 80 percent of the values exceeding water quality levels of concern were of nitrate. Another 12 percent of the exceedances were of sodium, while conductivity, alkalinity, and chloride accounted for the remaining few exceeding values (Figure 5).

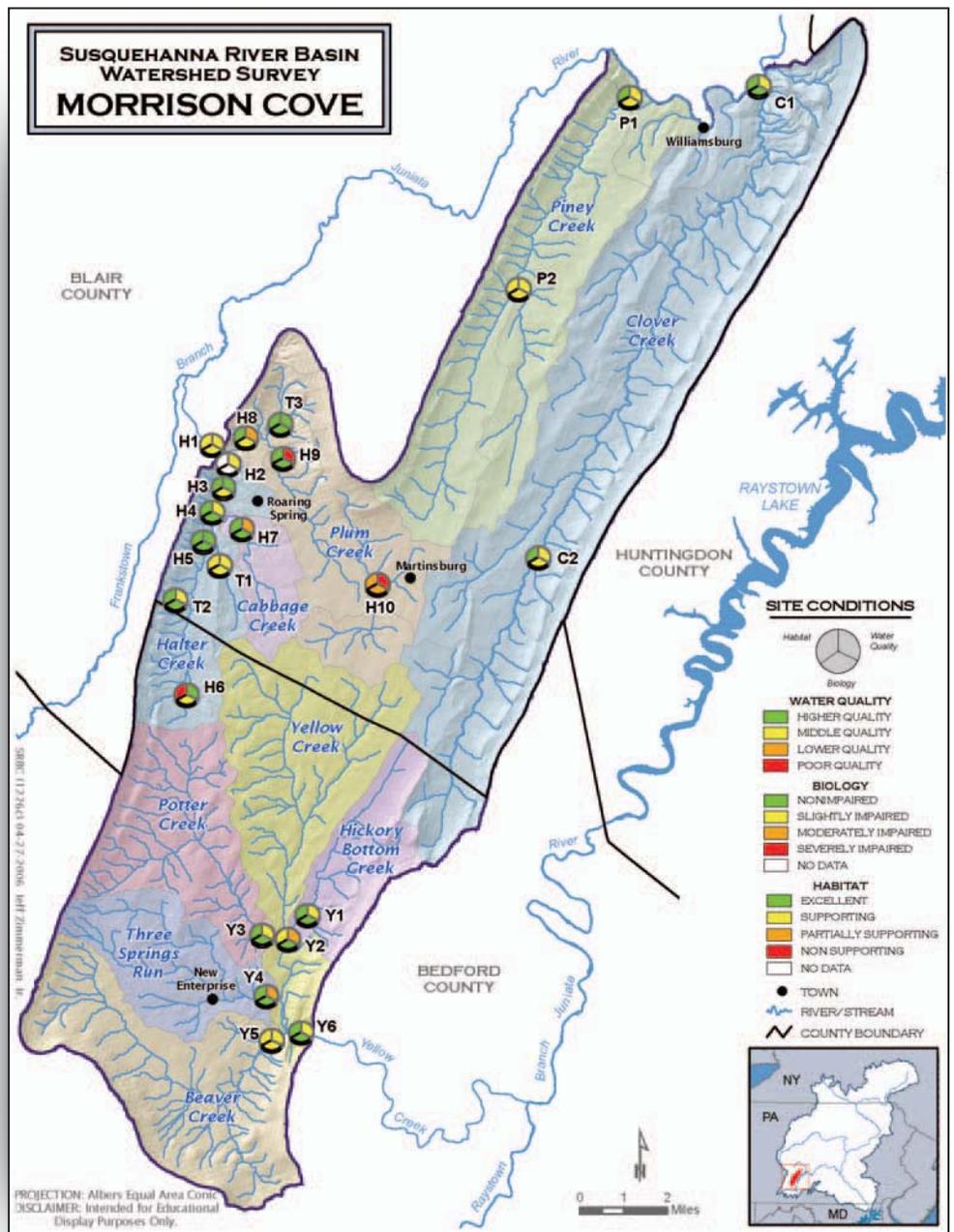


Figure 4. Subwatersheds and Site Conditions at Each Sampling Site in Morrison Cove