

Figure 19. Overview of UPS6.

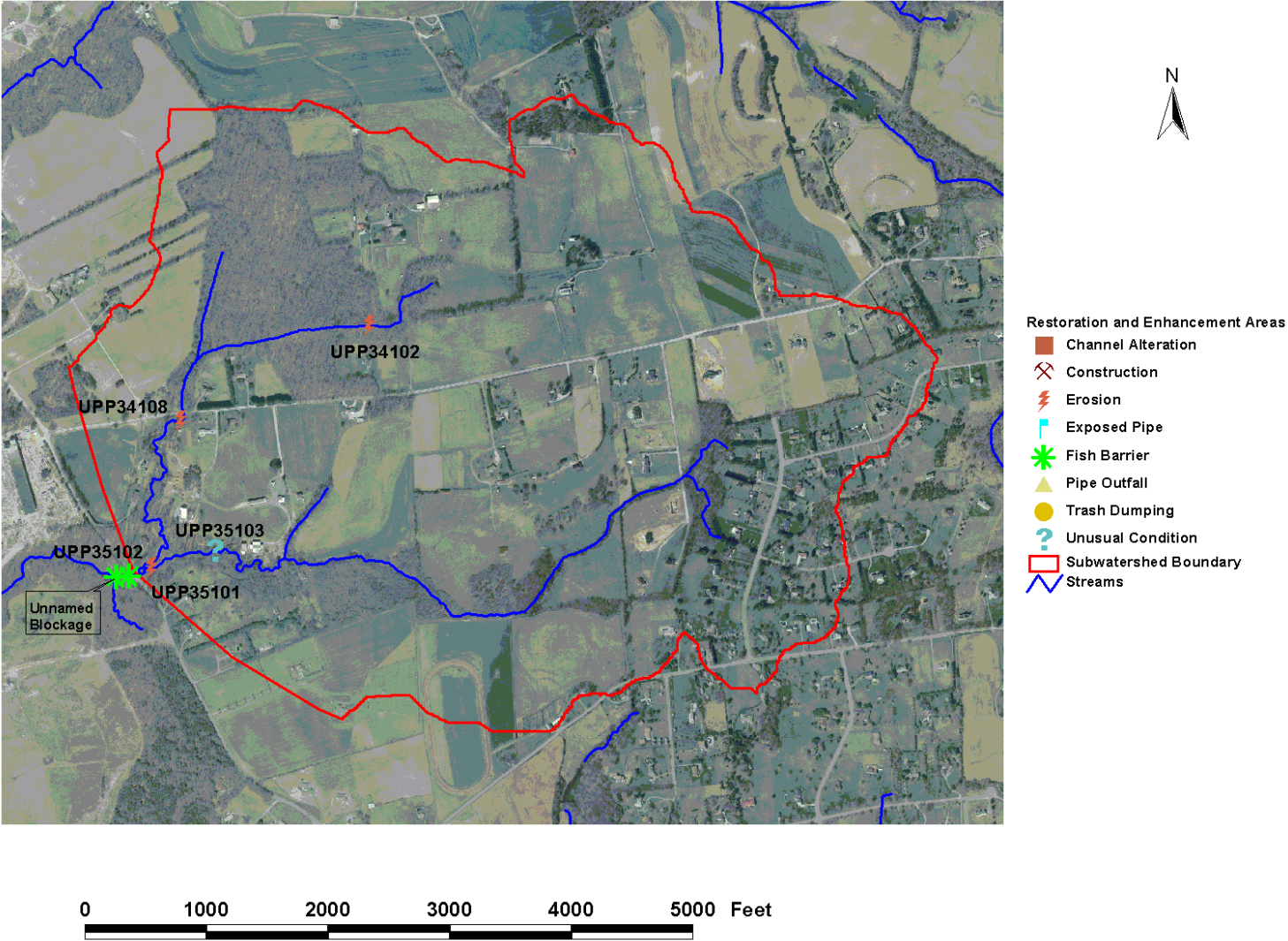


Figure 20. Location of potential priority restoration sites in UPS6.

UPS9—Stocketts Run.

The southern most subwatershed assessed in Anne Arundel County during this WRAS, Stocketts Run has a drainage area of approximately 6.4 square miles, which makes it the largest subwatershed assessed in Anne Arundel County. Ten water chemistry and ten biological monitoring stations were established in the subwatershed for this assessment. No fish sampling was performed in this subwatershed during the WRAS.

Land Use. Land use within Stocketts Run subwatershed is summarized below:

Table 30. Land Use Summary for UPS9 (Stocketts Run)

Land Use	Acres	% of Area
Agriculture	1579.5	38.5
Open Space	321.5	7.8
Single Family Residential	497.6	12.1
Retail	1.8	0.0
Utility/Roadway Right-of-Way	159.1	3.9
School	202.0	4.9
Recreational	11.5	0.3
Vacant Land	1334.7	32.5
Total Area	4107.7	100.0

As illustrated in Figure 21, this subwatershed has about equal amounts of agricultural land and vacant land. Most of the vacant land is currently in forest cover. The remainder of the subwatershed is comprised of single family residential along with lesser amounts of open space and other categories. The current level of watershed impervious surface is approximately

1.5% and is predicted to reach 5% at full build-out conditions, assuming current zoning remains unchanged.

Natural Resources. Thirty-one miles of stream channel drain UPS9 (Stocketts Run) of which approximately 28 miles were assessed. As mapped by the National Wetlands Inventory, there are 100 acres of wetlands in Stocketts Run (see Figure 21). Most of the wetlands are concentrated in a 53-acre complex spanning the lower quarter of the mainstem riparian area and in a 38-acre complex in the middle portion of the subwatershed. The balance consists of scattered ponds on agricultural land and stormwater management facilities in larger developed areas. According to the most recent soil survey, there are no hydric soils mapped in the Stocketts Run watershed.

As noted above approximately 33% of the subwatershed is in forest cover, found in somewhat contiguous blocks covering the central portions of the subwatershed. Along the mainstem, large riparian areas (>300 feet wide) exist for most of its length. Except for the riparian area, which is zoned as “open space,” the balance of this forest cover is zoned for residential agriculture. Most of this undeveloped area has been identified as potential greenway in the Anne Arundel County greenway master plan (Anne Arundel County, 2002). However, identification of areas for potential inclusion does not guarantee their protection.

Watershed Conditions. The BCS results for Stocketts Run (UPS9) are summarized below:

Table 31. BCS Summary for Stocketts Run

Metric Group	Metric Group Score	Condition Rating
Water Quality Conditions	17	Poor
Living Resource Conditions	44	Poor
Habitat Conditions	29	Good
Landscape Conditions	47	Fair
Hydrologic Conditions	15	Fair
Overall BCS	152	Fair

Stocketts Run received an overall BCS rating of fair. Although the subwatershed shows some signs of degradation, it should be noted that this evaluation is based on incomplete SCA work. Portions of the stream, located on private property were not assessed

because landowners did not grant site access to field crews. It is not known how including these reaches might have affected the overall BCS score. Biological monitoring results, from stations that bracket the areas not assessed, did not exhibit discernable differences. Both sites scored as having a fair biological community and partially supporting habitat. Thus, an assumption can be made that current land management activities within the non-assessed area are not degrading stream ecological conditions. This assumption requires confirmation with additional monitoring.

As described in Pavlik and Stribling (2003), subwatershed-wide biological conditions were judged “poor” based on aquatic invertebrate populations and habitat conditions were judged “partially supporting.” As described above, two stations, located in the lower third of the Stocketts Run mainstem had biological communities measured in fair condition with partially supporting habitat. All other mainstem and tributary stations had poor or very poor communities and degraded habitat. Overall, habitat conditions appear to match the observed biological community.

As described in DNR (2002b), the orthophosphate concentrations observed in Stocketts Run were some of the highest measured in this assessment. The reason for this is unknown. It is possible that rainfall several days before sampling commenced might have increased suspended sediment in the stream, which would cause an increase in measured phosphate levels because phosphorous compounds are typically bound to soil particles. However, additional sampling during extended dry weather conditions is necessary to determine if this assumption is correct. It is interesting to note that the highest level of PO₄ (0.157 mg/L) was located in an area with relatively high levels of residential development. However, nitrate levels were very low at this site, and low overall in this subwatershed (maximum value = 1.00 mg/L). Septic systems may have a role in the water quality conditions observed in this subwatershed, although the actual impacts are likely minimal (Novotny and Olem, 1994). Additional monitoring is needed to identify and confirm any such relationship.

Watershed Improvement Activities. Based on conditions and land use characteristics in this subwatershed, the following general recommendations are made:

- Investigate downstream of assessment area to determine if any natural or manmade fish passage impediments exist and correct as necessary;

- Work with the Soil Conservation District and the Anne Arundel County Department of Public Works to determine the distribution of best management practices in the subwatershed;
- Identify funding opportunities to facilitate property acquisition for inclusion in the County’s greenways; and
- Perform additional water quality assessments to determine the sources of sediment/elevated orthophosphate levels.

The following specific restoration or enhancement projects recommended for this subwatershed are described in Table 32 and shown in Figure 22.

Table 32. Description and Ranking of Priority Projects in Stocketts Run

SCA Site Number	Project Type	Project Description	Subwatershed Priority Ranking	Notes
UPQ43104	UC	Stream flow being diverted into pool and garden	1	Easy correctability score put this at top of list.
UPV41101	FB	Shallow box culvert prevent fish movement	2	Successful project opens up 2.7 miles of headwater stream habitat.
UPS41301	PO	Stormwater outfall discharging into stream	3	Source of discharge unknown. Requires additional investigation.
UPQ43102	ES	Eroding bank 8 feet high, 3600 feet long	3	. Requires additional investigation
UPT44101	ES	Eroding bank 5 feet high, 400 feet long	5	Easier access and moderate difficulty in correction result in higher rating than others.
UPU41301	ES	Eroding bank 4 feet high, 2000 feet long	6	Access judged difficult.
UPV41102	ES	Eroding bank 5 feet high, 2400 feet long	6	. Requires additional investigation
UPT45201	ES	Eroding bank 5 feet high, 1000 feet long	8	Project judged difficult to correct.

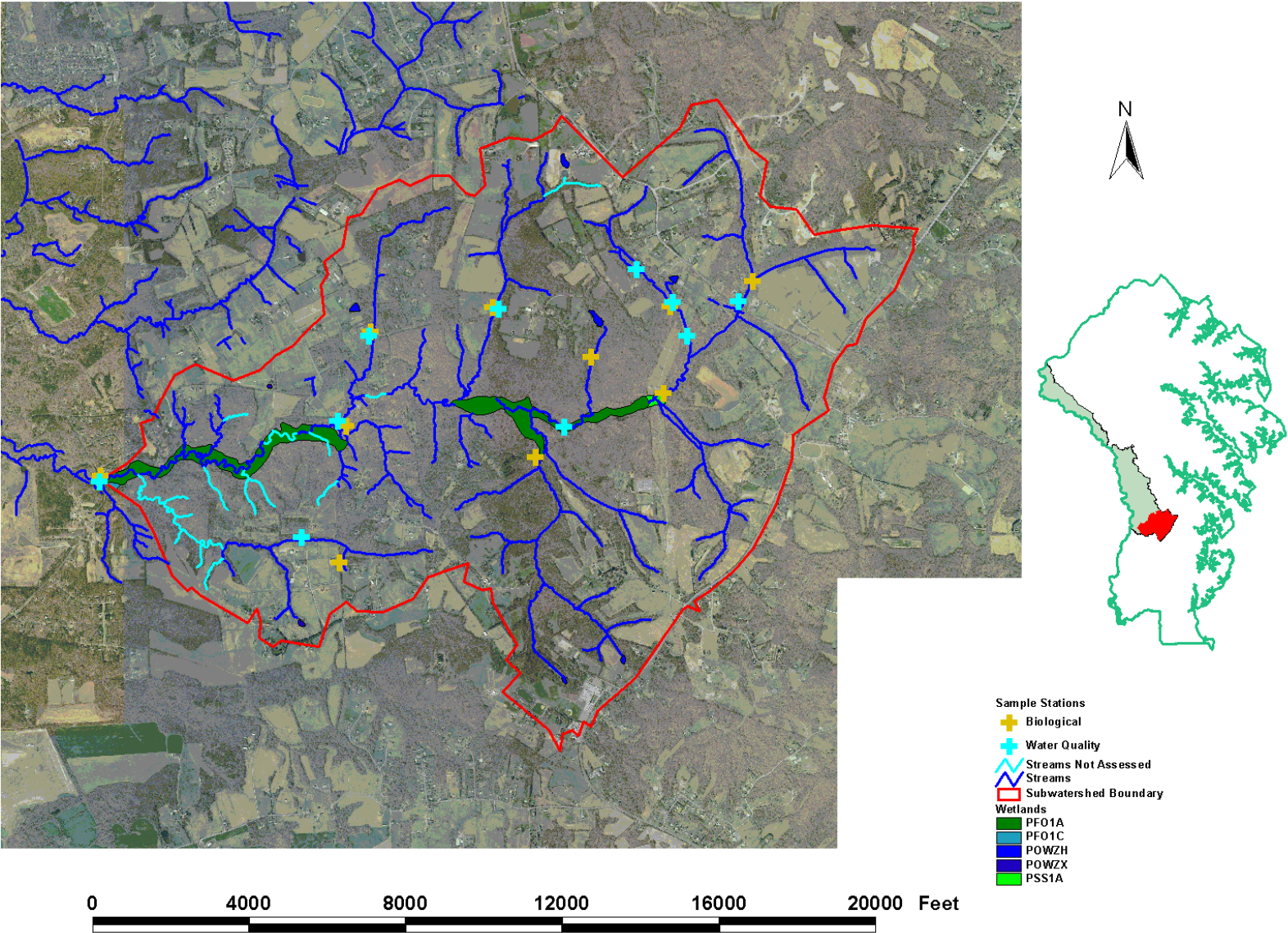


Figure 21. Overview of Stocketts Run (UPS9).

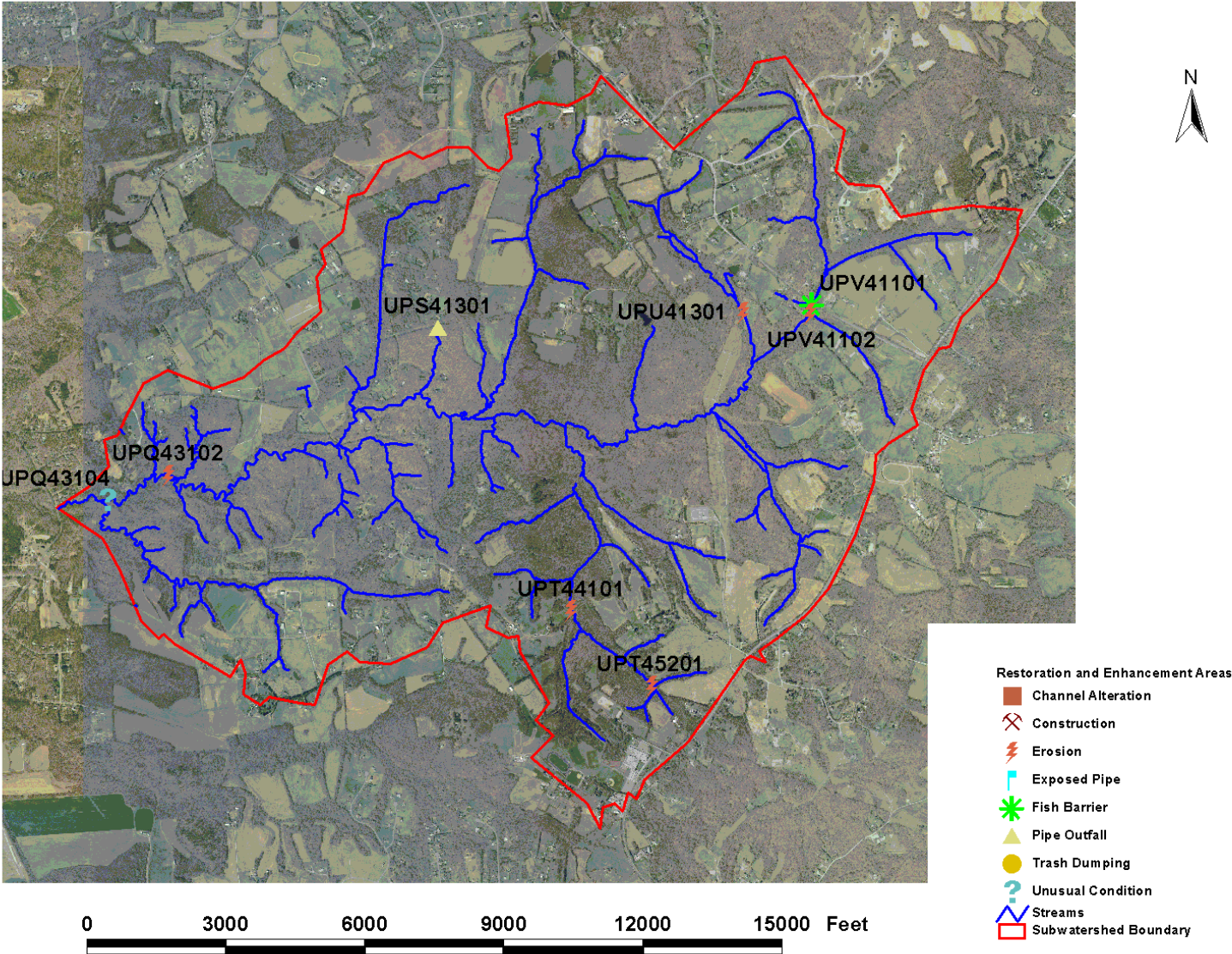


Figure 22. Location of potential restoration sites in Stocketts Run (UPS9).

UPS10—Unnamed Tributary to Patuxent River.

One of the smaller subwatersheds at approximately 0.5 square miles in size, UPS10 is also one of the more developed subwatersheds. The subwatershed is located just south of Kings Branch and is diagonally bisected by Central Avenue (MD Route 214). Three water chemistry stations, two biological monitoring stations, and one fish monitoring station were established in the subwatershed for this assessment (Figure 23).

Land Use. Land use within UPS10 is summarized below:

Table 33. Land Use Summary for UPS10

Land Use	Acres	% of Area
Agriculture	70.4	22.4
Open Space	14.8	4.7
Single Family Residential	170.7	54.3
Retail	3.3	1.1
Industrial	5.3	1.7
Powerline right-of-way	6.0	1.9
Recreational	3.2	1.0
Vacant Land	40.8	13.0
Total Area	314.4	100.0

As illustrated in Figure 23, this subwatershed is predominately residential in character with lesser amounts of agriculture and forest cover. The residential development is concentrated in the western half of the subwatershed while the undeveloped, vacant land areas are located in the eastern portion of the subwatershed. Agriculture is also concentrated mainly in the eastern

third of the subwatershed. As is true with the other subwatersheds in this assessment, most of the vacant land category in UPS10 contains the remaining forest cover in the subwatershed. Small amounts of industrial areas are intermixed with residential in the western portions of the subwatershed. Overall, current imperviousness is 13%, while future impervious cover will likely increase to 15%. This assumption is based on current watershed wide zoning not changing in the future.

Natural Resources. Approximately 2 miles of stream channel drain this subwatershed. An inspection of the National Wetlands Inventory map for this subwatershed shows no wetlands in this subwatershed. However, the recent soil survey for the County maps two small areas of hydric soils, one in a forest block in the central northern portion of subwatershed along the drainage divide, the other along the drainage divide in the eastern portion of the subwatershed. It is likely that there are small, unmapped wetlands on these parcels.

Watershed Conditions. The BCS results for UPS10 are summarized below:

Table 34. BCS Summary for UPS10

Metric Group	Metric Group Score	Condition Rating
Water Quality Conditions	14	Poor
Living Resource Conditions	42	Poor
Habitat Conditions	84	Good
Landscape Conditions	61	Fair
Hydrologic Conditions	15	Fair
Overall BCS	216	Fair

While this subwatershed was classified as fair, it was only 4 points from the cutoff for the poor category. Biological communities and habitat conditions indicate degradation. As described in

Pavlik and Stribling (2003), subwatershed-wide biological conditions were “poor” based on aquatic invertebrate populations. Habitat conditions were “non-supporting,” with large amounts of sand observed in the stream channel. Pollutant tolerant organisms dominated the samples. However, the severe drought that occurred during the sampling period likely impacted stream biological integrity.

Fish passage is a serious problem in this subwatershed. As described in DNR (2002b), only three species were collected at the fish sampling station in this subwatershed. The instream pond at the lower end of the subwatershed (UPP38111, see Table 35) is likely preventing all migration of game and non-game species from the Patuxent River. This pond is located on a sand and gravel mine located mostly to the north of UPS10.

Erosion is also a moderate problem in this subwatershed. Approximately 16% of stream reaches assessed were noted to have at least a moderately severe erosion problem. These reaches are listed in Table 35 as possible habitat restoration projects. Erosion is known to have an adverse impact on fish and aquatic insects (Waters, 1995).

As described in DNR (2002b), no water quality problems were observed in this subwatershed. However, an examination of baseflow loading rates shows higher loadings at the most upstream station than at the downstream station. For example, orthophosphate loadings exhibit a fourfold increase (0.0055 lbs/ac/yr most downstream, 0.0218 lbs/ac/yr, most upstream) in the upstream direction while nitrate loadings increase approximately 5 times (0.4654 lbs/ac/yr most downstream versus 2.3422 lbs/ac/yr most upstream), although rates were fairly low throughout the subwatershed. The reason for this is unknown. However, if this trend holds true during storm event loading, this could be indicative of a serious water quality problem depending on the pollutants observed. As in other subwatersheds, the role of septic system inputs should be investigated. In addition, livestock access to the stream should also be evaluated.

Watershed Improvement Activities. Based on conditions and land use characteristics in this subwatershed, the following general recommendations are made:

- Investigate downstream of assessment area to determine if any natural or manmade fish passage impediments exist and correct as necessary;
- Work with the Soil Conservation District and the Anne Arundel County Department of Public Works to determine the distribution of best management practices in the subwatershed; and
- Consider performing additional water quality assessments to determine if pollutant loading patterns observed at baseflow are true during stormflow conditions.

The following specific restoration or enhancement projects recommended for this subwatershed are in described in Table 35 and shown in Figure 24.

Table 35. Description and Ranking of Priority Projects in UPS10

SCA Site Number	Project Type	Project Description	Subwatershed Priority Ranking	Notes
UPP38101	FB	Twin perched 48" metal corrugated metal pipes	1	Requires further assessment to determine feasibility, need.
UPP38111	FB	Large instream pond at bottom of subwatershed	2	Large inline pond installed during development of sand and gravel mine. Requires further assessment to determine feasibility, need for project, and type if project needed.
UPQ39101	FB	Small instream impoundment constructed	2	Ease of removal accounts for high ranking.
UPP38103	ES	3 foot high, 700 feet long bank	4	Further assessment needed to determine cause of problem.
UPP38113	UC	Extreme levels of orange flocculent after passing through pipe	4	Requires further investigation to determine if problem exists. Could be natural.
UPP38106	PO	36" corrugated metal pipe discharging into stream	6	Further investigation required to determine if water quality problem exists.
UPQ38102	ES	10 foot high, 1000 foot long bank	7	Severe problem, access and correctability judged difficult
UPP38110	IC	Large construction site at bottom of subwatershed	7	2000 aerial photography sand and gravel mine operation at this location.