

# Mill Creek

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## Methods

### Study Area Analysis

The watershed containing the stream being assessed was analyzed using ESRI ArcGIS 10.2. Using this software with 2011 Hillsborough County aerial, Land Use/ Land Cover (LULC) and Watershed boundary layers courtesy of the Southwest Florida Water Management District, Landscape Development Intensity (LDI) Index values were calculated for each watershed following the procedures of Reiss & Brown 2012 (Reiss & Brown. 2012. Landscape Development Intensity (LDI) Index User's Manual. H.T. Odum Center for Wetlands, University of Florida. March 2012). According to Reiss and Brown "The LDI represents a human disturbance gradient for wetland systems. The LDI is an integrated measure of human activity, combining the effects from air and water pollutants, physical damage, changes in the suite of environmental conditions ... on the structure and processes of landscapes and ecosystems... Natural, undeveloped LU/LC classes have a LDI index value of zero. In the Florida framework, the maximum LDI index score is approximately 42."

### Habitat/Vegetation Assessment

For small streams that are not easily navigated by Jonboat for bathymetric mapping and vegetation analysis, Hillsborough County requested the implementation of the Florida Department of Environmental Protection methods for Stream and River Habitat Assessment (FT 3100) (<http://www.dep.state.fl.us/water/sas/sop/sops.htm>) using forms FD 9000-3, FD 9000-4 and FD 9000-5, Rapid Periphyton Survey (FS 7230) using form FD 9000-25 and Linear Stream Vegetation Survey (FS 7320) using form FD 9000-32. These methods were utilized on two sampling locations on each stream, typically near access points along roadways.

Stream and River Habitat Assessment per FT3100 receives a score calculated in Form FD 9000-5. This score results from the ranking of the primary habitat components (substrate diversity, substrate availability, water velocity and habitat smothering) and secondary habitat components (Artificial channelization, bank stability, riparian buffer zone width and riparian zone vegetation quality). The maximum score possible in this method is a 160.

Two metrics are utilized in the Linear Vegetation Survey. The Mean Coefficient of Conservatism (CoC) applies a score of 0-10 to each species based on its ecological tolerances and fidelity to pre-settlement conditions. Species with higher scores show a high fidelity to native, undisturbed habitats and are typically sensitive to alterations. Available CoC scores can be obtained from LT 7000 from the Florida Department of Environmental Protection at: <http://www.dep.state.fl.us/water/sas/sop/sops.htm>. The Percent Florida Exotic Pest Plant Council (% FLEPPC) metric calculates the percent invasive exotics as the number of occurrences of FLEPPC Category I or II in the 100 m reach divided by the total number of taxa occurrences in the 100 m reach. The FLEPPC list can be found at: <http://www.fleppc.org/list/11list.html>

## Water Quality Assessment

Physical water quality samples were taken using a Eureka Manta Sub-2 multiprobe pre and post calibrated daily. Measurements taken with this device include: depth, conductivity, pH, Dissolved Oxygen (mg/l and % Saturation) and salinity. Chemical water parameters were collected and preserved on ice by USF Water Institute staff and analyzed at the Environmental Protection Commission of Hillsborough County Laboratory. Analysis include; Chlorophyll (a, b, c, t and corrected), Alkalinity, Color, Fecal Coliform, Enterococci, Ammonia, Nitrates/Nitrites, Total Phosphorous, Kjeldahl Nitrogen and Total Nitrogen.

## Study Area

Mill Creek located in Hillsborough County Florida was sampled at two localities on separate dates. The first sampling locality was sampled on 8/25/2014 and is located near Victoria Avenue in Plant City at: 28.0207595 N and 82.1370225 W. The second sampling locality was sampled on 9/22/2014 and is located slightly south of the first locality at W Risk St in Plant City at: 28.0183086 N and 82.1369997 W. Mill Creek discharges into Pemberton Creek. The watershed surrounding Mill Creek is dominated by Natural Land/Open Water (23.7%), Residential (18.12%), Pasture/Livestock (10.64%), and Industrial/Commercial (9.73%) land uses. The Landscape Development Intensity Index of the watershed is 28.47.

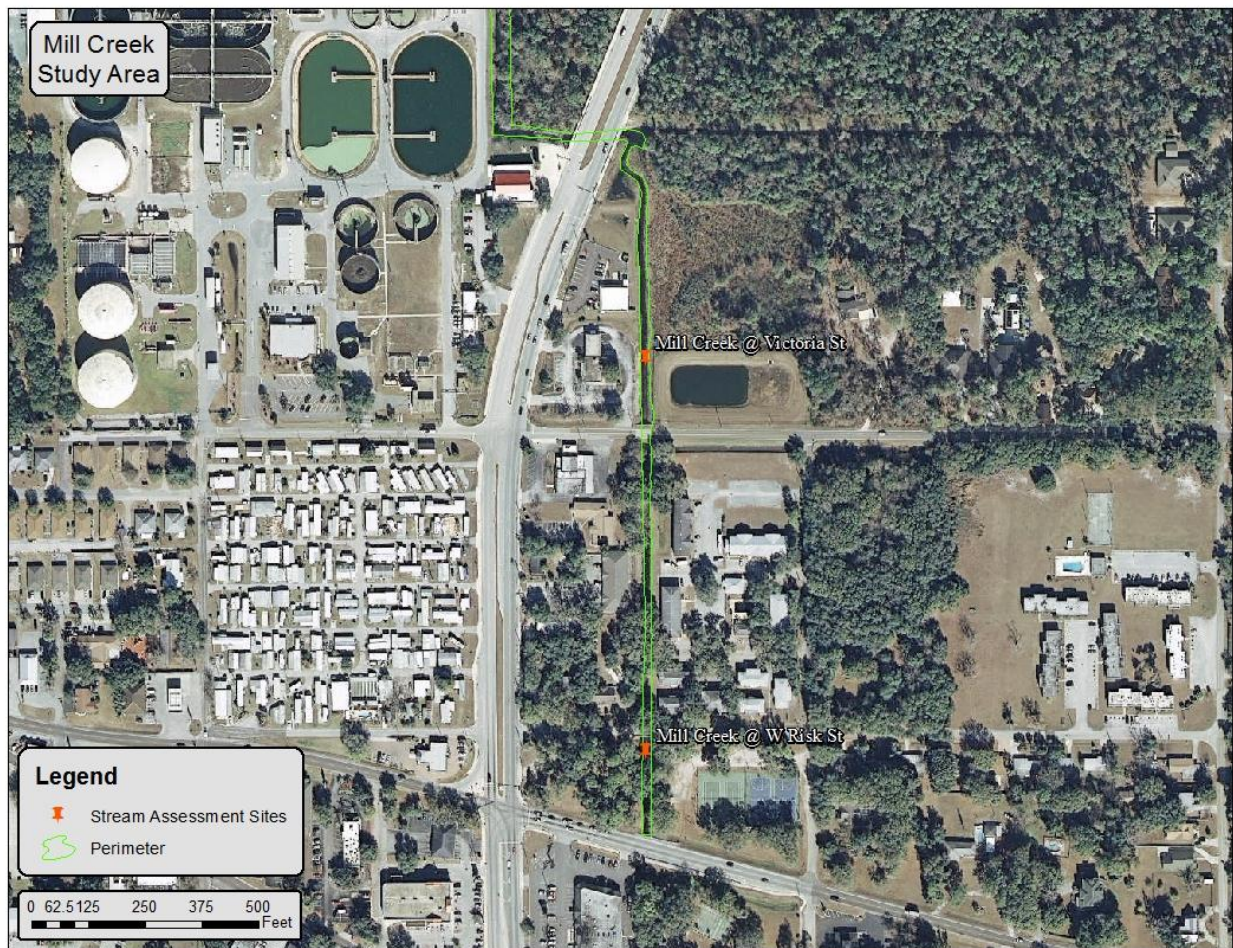


Figure 1 2014 Mill Creek Assessment Study Area Map



## Habitat Assessment

### Mill Creek at Victoria Avenue



Figure 2 Overview photograph of Mill Creek at Victoria Ave Sample site

Mill Creek near Victoria Avenue received a habitat assessment score of 57 due to low substrate diversity/availability, habitat smothering by sand, and related habitat problems that stem from artificial straightening of stream channels. The channel observed was very straight lacking any sinuosity that would be expected in a Coastal Plain flow regime. The right bank showed far more signs of instability from channelization than the left and most vegetation was invasive. The left bank, however, had a slope angle  $<60^\circ$  with bankfull  $>60\%$ . Water in the creek flowed clear at time of assessment and fish were commonly observed in the habitat, however, Mill Creek has been prior observed at a separate locality than was sampled, to flash and become tannic after times of heavy rainfall (see Figure 3). Two stable pools were observed but based on the average width of the creek of 4.9 m, three pools would have been ideal. A minor erosional slump surface was also noted on the right bank at the 80 m mark. Average flow velocity measured over three locations was suboptimal at 0.17 m/sec at the time of assessment at the 20 meter mark. The riparian buffer zone was completely absent on the right bank (see Figure 2) due to a maintenance easement and vegetation removal was obvious. The riparian buffer zone was  $>18$  m on the left bank.

During the Rapid Periphyton Survey, periphyton was not observed in the 99 individual grab samples performed. The average canopy cover in the 100 meter region was 0%. The Secchi Disk Depth

was measured at 1.5' and visible on the bottom at the 50 meter mark. The average water depth at the time of the assessment was 2'.



**Figure 3 Left, Mill Creek flowing clearly on a normal day (7/2/2014), Right, Mill Creek flashing tannic after heavy rainfall (7/16/2014).**

The Linear Vegetation Survey identified 25 species rooted in the water at the time of the assessment. The majority of these species (18) are native species. The remaining 7 species are non-native and invasive to this region. The vegetation community along this sample location are frequently disturbed by mowing resulting in the dominance by pioneering species. There were a total of 121 species observations in the 100 meter study area. The mean Coefficient of Conservatism (CoC) metric for the study area was 1.61 and the % FLEPPC metric for the study area was 38.02%.

### Table 1 Linear Vegetation Survey Results - Mill Creek @ Victoria Avenue

| Plant Species                      | Sample Site  |         |         |         |         |         |         |         |         |          | Observations /Species | CoC  |
|------------------------------------|--------------|---------|---------|---------|---------|---------|---------|---------|---------|----------|-----------------------|------|
|                                    | 0-10 m       | 10-20 m | 20-30 m | 30-40 m | 40-50 m | 50-60 m | 60-70 m | 70-80 m | 80-90 m | 90-100 m |                       |      |
| <i>Alternanthera philoxeroides</i> | 1            | 1       | 1       | 1       | 1       | 1       | 1       | 1       | 1       | 1        | 10                    | 0    |
| <i>Colocasia esculenta</i>         | 1            | 1       | 1       | 1       | 1       | 1       | 1       | 1       | 1       | 1        | 10                    | 0    |
| <i>Panicum repens</i>              | 1            | 1       | 1       | 1       | 1       | 1       | 1       | 1       | 1       | 1        | 10                    | 0    |
| <i>Commelina diffusa</i>           |              | 1       | 1       | 1       | 1       | 1       | 1       | 1       | 1       | 1        | 9                     | 2.02 |
| <i>Hydrilla verticillata</i>       | 1            |         | 1       | 1       | 1       | 1       | 1       | 1       | 1       | 1        | 9                     | 0    |
| <i>Boehmeria cylindrica</i>        | 1            | 1       | 1       | 1       |         | 1       | 1       | 1       | 1       |          | 8                     | 5    |
| <i>Mikania scandens</i>            | 1            | 1       |         | 1       | 1       | 1       | 1       | 1       | 1       |          | 8                     | 1.95 |
| <i>Hydrocotyl umbellata</i>        | 1            | 1       | 1       | 1       | 1       | 1       |         | 1       | 1       |          | 8                     | 1.92 |
| <i>Ludwigia leptocarpa</i>         | 1            | 1       | 1       | 1       | 1       |         | 1       | 1       |         |          | 7                     | 3    |
| <i>Ludwigia repens</i>             |              | 1       |         |         | 1       | 1       | 1       | 1       | 1       | 1        | 7                     | 3.2  |
| <i>Ludwigia peruviana</i>          | 1            | 1       |         |         | 1       |         | 1       | 1       | 1       |          | 6                     | 0    |
| <i>Paspalum urvillei</i>           |              | 1       | 1       | 1       |         |         |         |         |         | 1        | 4                     | 0    |
| <i>Sambucus canadensis</i>         |              |         | 1       |         |         |         | 1       |         | 1       | 1        | 4                     | 1.48 |
| <i>Bacopa monnieri</i>             | 1            |         |         |         |         | 1       |         |         |         | 1        | 3                     | 3.5  |
| <i>Bidens alba</i>                 | 1            |         |         |         | 1       |         |         | 1       |         |          | 3                     | 1    |
| <i>Typha</i> spp.                  | 1            |         |         |         |         |         | 1       | 1       |         |          | 3                     | 1    |
| <i>Cicuta maculata</i>             |              |         |         | 1       |         | 1       |         |         |         |          | 2                     | 4.54 |
| <i>Micromeria brownei</i>          |              |         |         |         |         |         |         | 1       | 1       |          | 2                     | 6.34 |
| <i>Phyla nodiflora</i>             | 1            |         |         |         |         |         |         | 1       |         |          | 2                     | 1.92 |
| <i>Cyperus odoratus</i>            | 1            |         |         |         |         |         |         |         |         |          | 1                     | 3    |
| <i>Diodia virginiana</i>           |              |         |         |         |         |         |         |         | 1       |          | 1                     | 3    |
| <i>Eupatorium capillifolium</i>    |              |         |         | 1       |         |         |         |         |         |          | 1                     | 0.83 |
| <i>Ludwigia octovalvis</i>         |              |         |         |         |         |         |         |         |         | 1        | 1                     | 2    |
| <i>Panicum hemitomon</i>           |              |         |         |         |         |         |         |         |         | 1        | 1                     | 5.82 |
| <i>Urochloa mutica</i>             |              |         |         |         |         | 1       |         |         |         |          | 1                     | 0    |
| Observations/Station               | 14           | 11      | 10      | 12      | 11      | 12      | 12      | 15      | 13      | 11       | 121                   |      |
| <b>Total Observations</b>          | <b>121</b>   |         |         |         |         |         |         |         |         |          |                       |      |
| <b>Mean CoC</b>                    | <b>1.61</b>  |         |         |         |         |         |         |         |         |          |                       |      |
| <b>% FLEPPC</b>                    | <b>38.02</b> |         |         |         |         |         |         |         |         |          |                       |      |



## Mill Creek at West Risk St



Figure 4 Overview photograph of Mill Creek at West Risk St Sample Site

Mill Creek at West Risk Street received a Habitat Assessment score of 99. While the channel was most definitely artificially straightened lacking any sinuosity that would be expected in a Coastal Plain flow regime, there were a number of positives observed. Along most of the left bank and some of the right, each 10 m section typically contained 2 m<sup>2</sup> of fine root habitat. We also observed a total of 6 productive pools in the creek within our 100 m section which is greater than what would be expected in optimal conditions. There were also plenty of snags observed along both banks as well as exposed rocky habitat. Overall, we observed a decent amount of habitat available for macroinvertebrates along this section (see Figure 5). The primary factors holding this section of creek from a good habitat score were the over steepened banks at >60%, a lack of good armoring along most of the creek on both sides, a very narrow, almost absent riparian buffer zone along both banks due to intense human activity and due to evidence of bank undercutting.





Figure 5: Left, photo of Mill Creek along Aexandria/Victoria sampling locality, note presence of fine roots along left bank, Right, snag crossing over half of creek with presence of pool and leaf packs.



Figure 6 Photo showing exposed roots of vegetation indicating bank undercutting.



The Linear Vegetation Survey identified 14 species rooted in the water at the time of the assessment. Half of these species (7) are non-native, invasive species. The remaining 7 species are native to this region. The vegetation community along this sample location showed evidence of frequent disturbance resulting in success of pioneering species. There were a total of 58 species observations in the 100 meter study area. The mean Coefficient of Conservatism (CoC) metric for the study area was 0.79 and the % FLEPPC metric for the study area was 72.41%. The distribution of native vegetation was sparse and there were no clear dominant specimens in any of the sections.

| Plant Species                            | Sample Site  |         |         |         |         |         |         |         |         |          | Observations /Species | CoC  |
|--|--------------|---------|---------|---------|---------|---------|---------|---------|---------|----------|-----------------------|------|
|  | 0-10 m       | 10-20 m | 20-30 m | 30-40 m | 40-50 m | 50-60 m | 60-70 m | 70-80 m | 80-90 m | 90-100 m |                       |      |
| <i>Hydrilla verticillata</i>             | 1            | 1       | 1       | 1       | 1       | 1       | 1       | 1       | 1       | 1        | 10                    | 0    |
| <i>Hygrophila polysperma</i>             | 1            | 1       |         | 1       | 1       | 1       | 1       | 1       | 1       | 1        | 9                     | 0    |
| <i>Alternanthera philoxeroides</i>       | 1            | 1       |         | 1       |         | 1       |         | 1       | 1       | 1        | 7                     | 0    |
| <i>Colocasia esculenta</i>               | 1            |         |         |         | 1       | 1       | 1       | 1       | 1       |          | 6                     | 0    |
| <i>Ruellia simplex</i>                   | 1            | 1       | 1       |         |         |         |         | 1       |         | 1        | 5                     | 0    |
| <i>Boehmeria cylindrica</i>              |              |         |         |         |         |         | 1       | 1       | 1       | 1        | 4                     | 5    |
| <i>Mikania scandens</i>                  |              |         |         |         | 1       | 1       |         | 1       |         |          | 3                     | 1.95 |
| <i>Syngonium podophyllum</i>             |              | 1       | 1       | 1       |         |         |         |         |         |          | 3                     | 0    |
| <i>Hydrocotyl umbellata</i>              |              |         |         |         |         | 1       |         | 1       |         | 1        | 3                     | 2    |
| <i>Bidens alba</i>                       |              |         |         |         |         |         |         | 1       | 1       |          | 2                     | 1    |
| <i>Ludwigia repens</i>                   |              |         |         |         |         | 1       |         | 1       |         |          | 2                     | 3.2  |
| <i>Sphagneticola (Wedelia) trilobata</i> |              |         |         |         |         |         |         | 1       | 1       |          | 2                     | 0    |
| <i>Asclepias prennis</i>                 |              |         |         |         |         |         |         |         |         | 1        | 1                     | 0    |
| <i>Panicum hemitomon</i>                 |              |         |         |         |         |         |         |         | 1       |          | 1                     | 5.82 |
| Observations/Station                     | 5            | 5       | 3       | 4       | 4       | 7       | 4       | 11      | 8       | 7        | 58                    |      |
| <b>Total Observations</b>                | <b>58</b>    |         |         |         |         |         |         |         |         |          |                       |      |
| <b>Mean CoC</b>                          | <b>0.79</b>  |         |         |         |         |         |         |         |         |          |                       |      |
| <b>% FLEPPC</b>                          | <b>72.41</b> |         |         |         |         |         |         |         |         |          |                       |      |

## Water Quality Assessment

Long-term water quality data is available for Mill Creek spanning the present to the past three years. The available data was collected by the Hillsborough County Environmental Protection Commission during routine sampling. Values for the 2014 USF Water Institute Assessment fall within the range of the previous data collections with the exception of Nitrates/Nitrites, Total Phosphorous, and Enterococci at the West Risk Street sampling locality only. Table 3 provides a summary of the Physical/Chemical conditions recorded at both sites.

**Table 3 Mill Creek Water Quality (Field)**

| <b>Mill Creek @ Victoria Ave</b> |               |           |                |                 |                        |                       |                          |
|----------------------------------|---------------|-----------|----------------|-----------------|------------------------|-----------------------|--------------------------|
| <b>Depth (m)</b>                 | <b>T (°C)</b> | <b>pH</b> | <b>DO mg/L</b> | <b>DO Sat %</b> | <b>Cond. (UMHO/cm)</b> | <b>Salinity (ppt)</b> | <b>Secchi Depth (ft)</b> |
| 0.05                             | 28.57         | 7.47      | 6.84           | 84.7            | 403.7                  | 0.19                  | 1.5' (vob)               |
| 0.07                             | 28.57         | 7.47      | 6.84           | 84.6            | 408.7                  | 0.19                  |                          |
|                                  |               |           |                |                 |                        |                       |                          |
| <b>Mill Creek @ W Risk St</b>    |               |           |                |                 |                        |                       |                          |
| <b>Depth (m)</b>                 | <b>T (°C)</b> | <b>pH</b> | <b>DO mg/L</b> | <b>DO Sat %</b> | <b>Cond. (UMHO/cm)</b> | <b>Salinity (ppt)</b> | <b>Secchi Depth (ft)</b> |
| 0.04                             | 29.76         | 8.51      | 7              | 88.4            | 368.7                  | 0.17                  | 0.82' (vob)              |
| 0.06                             | 29.77         | 8.2       | 6.98           | 88.2            | 369.5                  | 0.17                  |                          |

The chemical water quality analysis for Mill Creek is shown in Table 4 along with geometric mean values for the past three years for available parameters. Total Phosphorous values were below the nutrient region threshold developed by FDEP of 0.49 mg/l. Total Nitrogen values were also below the nutrient region threshold developed by FDEP of 1.65 mg/l. Chlorophyll-a values fall within the site specific evaluation range of 3.2 µg/l to 20 µg/l. For sites with Chlorophyll-a values in this range, the assessment is inconclusive of conditions reflecting an imbalance in flora.



Table 4 Mill Creek Water Quality (Laboratory)

| Mill Creek                |                 |              |                                |                                |                                |
|---------------------------|-----------------|--------------|--------------------------------|--------------------------------|--------------------------------|
| Parameter                 | Victoria Ave    | W Risk St    | Mill Creek<br>2012<br>Geomeans | Mill Creek<br>2013<br>Geomeans | Mill Creek<br>2014<br>Geomeans |
| Ammonia                   | 0.030 mg/L      | 0.127 mg/L   | 0.076                          | 0.087                          | 0.067                          |
| Nitrates/Nitrites         | 0.399 mg/L      | 0.679 mg/L   | 0.134                          | 0.372                          | 0.137                          |
| Kjeldahl Nitrogen         | 0.289 mg/L      | 0.337 mg/L   | 0.311                          | 0.391                          | 0.287                          |
| Total Nitrogen            | 0.688 mg/L      | 1.016 mg/L   | 0.453                          | 0.783                          | 0.435                          |
| Total Phosphorous         | 0.136 mg/L      | 0.311 mg/L   | 0.126                          | 0.170                          | 0.171                          |
| Alkalinity                | 167.0 mg/LCaCO3 | No Data      | No Data                        | No Data                        | No Data                        |
| Chlorophyll - a           | 3.1 ug/L        | 3.7 ug/L     | 3.896                          | 3.100                          | 3.100                          |
| Chlorophyll - a Corrected | 3 ug/L          | 3.0 ug/L     | 3.386                          | 3.000                          | 3.000                          |
| Color                     | 8.9 Pt/Co       | 15.5 Pt/Co   | 10.856                         | 12.844                         | 11.594                         |
| Fecal Coliform            | 180 #/100 ml    | 100 #/100 ml | 73.227                         | No Data                        | 197.990                        |
| Enterococci               | 320 #/100 ml    | 780 #/100 ml | 212.842                        | No Data                        | 248.193                        |

## Conclusion

The results of the assessment of Mill Creek does not show impairment based on water quality alone. The system does show impairment in the vegetation communities linear vegetation survey results with a high percentage (>25%) of non-native invasive species. The habitat assessment performed on the two sample sites shows habitat degradation at the Victoria Avenue site with a Habitat Assessment score of 57. The West Risk Street sample site showed a good diversity and amount of habitat for aquatic macroinvertebrates with a habitat assessment score of 99.