Shanty Creek Area - Stormwater Action Plan

Runoff Basics

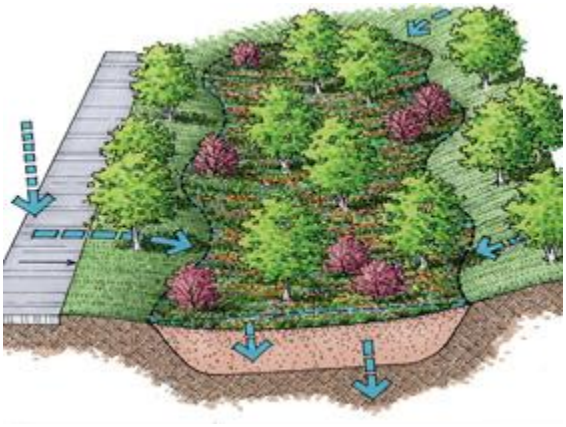
One of the major pathways by which many types of pollutants get to lakes and streams is through stormwater runoff. Stormwater runoff results when drops of rain fall to the ground, or snow melts, and the resulting water that does not infiltrate into the ground flows over the surface of the land. This runoff often dislodges and carries soil or sediment particles (causing streambank erosion in some places) to which many pollutants are attached. The runoff may also directly move the pollutant itself (i.e., garbage, oils, grease, gas, pesticides, etc.). The amount of stormwater runoff that occurs is dependent upon a variety of conditions including storm intensity and duration, topography, time of year, soil moisture levels, soil permeability, vegetative cover types, the extent of vegetated cover, and the amount of impervious surfaces.

Road and roof runoff are two sources of stormwater.

Urban locations, like Traverse City, Elk Rapids and Suttons Bay often produce greater amounts of runoff due to the increased amount of impervious surfaces in these urban areas relative to more rural settings within the watershed. Impervious surfaces are those areas on land that cannot effectively absorb or infiltrate rainfall. Areas such as these may include: roads, streets, sidewalks, parking lots, and rooftops. Runoff entering the Bay and its tributaries from storm drain outlets contributes a significant amount of pollution (there are almost 20 storm drain outlets to Grand Traverse Bay in Traverse City alone). However runoff may also enter waterways through ditches and other overland sources, as well as at road stream crossings. When added up, inputs from all these small instances of runoff can result in a massive amount of pollution entering Grand Traverse Bay and our inland lakes and waterways. Most often the pollution is at its worst during heavy rain and snowmelt events.

Dealing With Runoff

Low Impact Development is a set of small-scale runoff management practices implemented on a site that mimic and work with nature to reduce water runoff and pollutants. LID methods manage water and pollutants at the source, minimizing the impact to ground water, streams, rivers, lakes and coastal waters. The U.S. EPA has found that implementing LID practices saves substantial money for developers, property owners and entire communities, all while improving water quality.



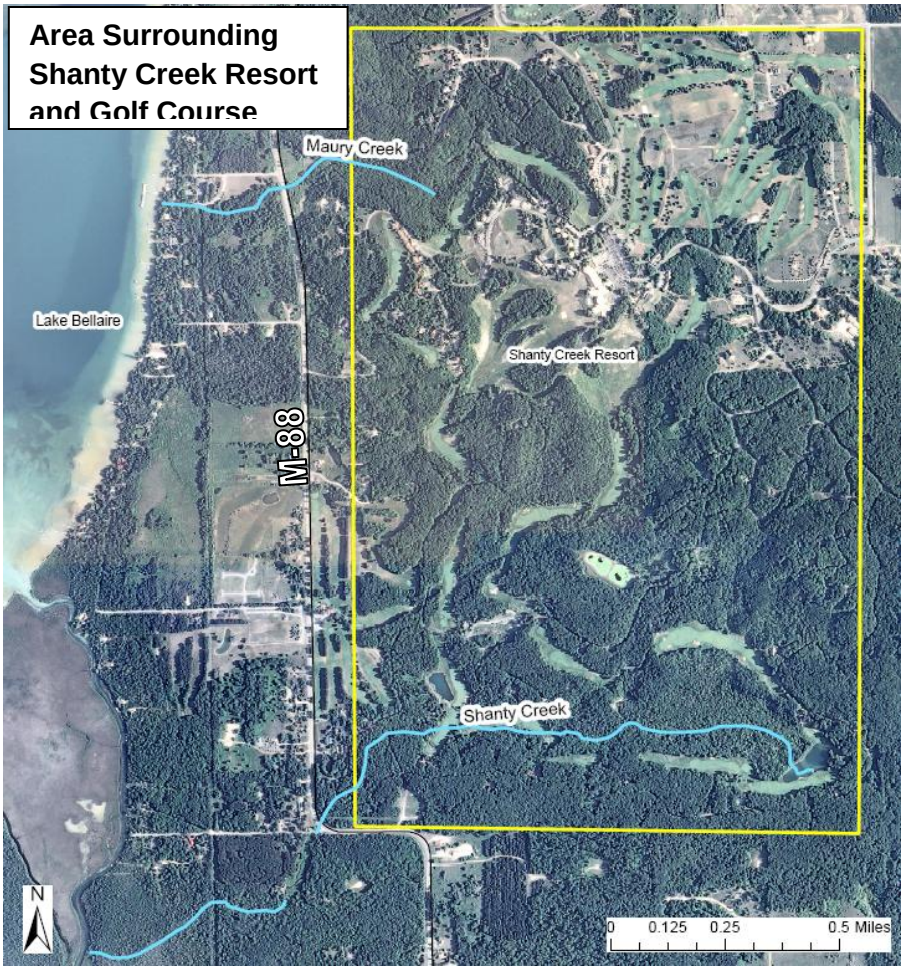
Addressing pollutants with LID runoff practices is of utmost importance in the Grand Traverse region because nutrients and sediments in runoff are the biggest threats to water quality in Grand Traverse Bay and its watershed.

Project Summary

In 2013 and 2014 staff from The Watershed Center Grand Traverse Bay and the Antrim Conservation District conducted initial stormwater runoff assessments for six communities in Antrim and Kalkaska Counties - Elk Rapids, Ellsworth, Central Lake, Bellaire, Alden and the Village of Kalkaska. The purpose was to help local governments in Antrim and Kalkaska Counties begin to address pollution stemming from stormwater runoff in their communities to protect water quality and our Up North quality of life. The area surrounding Shanty Creek Resort and Golf Course (shown below) was later added as a priority site to investigate stormwater inputs to surrounding areas. Specifically we were concerned with inputs to Shanty Creek, which empties into the Grass River, and Maury Creek, which empties into Lake Bellaire.

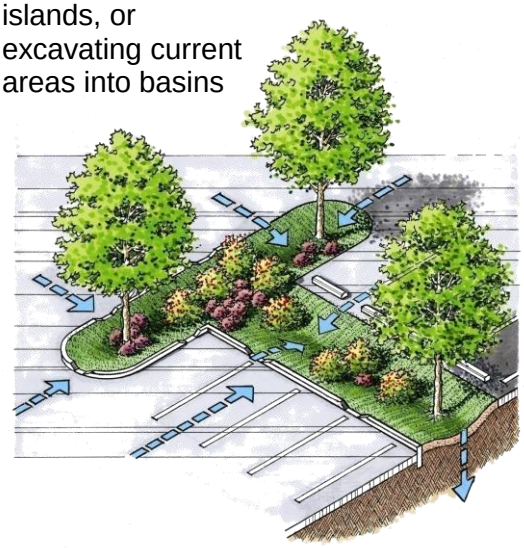
The following 'Action Plan' and accompanying pictures identify major points of runoff entry to the watershed as well priority sites for improvement. For locations with runoff concerns, LID techniques have been proposed to help maximize stormwater retention and minimize pollution resulting from impervious surfaces. In this way we can best utilize limited funds to make improvements where they would have the most effect. The plan also notes existing erosion areas on at the resort caused by stormwater runoff, but having no adverse affect on water quality. Suggestions are included on how to minimize this erosion. Additionally, streambank erosion is discussed on Shanty and Maury Creeks. This is because this erosion could be caused and/or exacerbated by stormwater runoff.

It is also noted that Shanty Creek Resort owns or controls less than 1/3 of the area noted in the map to the right. The rest is comprised of private homeowners' associations and lots, who then have responsibility for their own property. The suggestions in this report include all these areas.



Findings/Recommendations: Shanty Creek Resort and Buildings

- General management -
  - Use Phosphorus-free fertilizers on areas currently fertilized (non-golf course areas)
  - In paved areas where runoff could reach surface water or where erosion/excess water is an issue, utilize Low Impact Development techniques including:
    - Porous pavement (paver stones, porous concrete)
    - Consider, for large parking areas (such as main lodge parking shown at right), installing infiltration islands to direct runoff into by creating new islands, or excavating current areas into basins

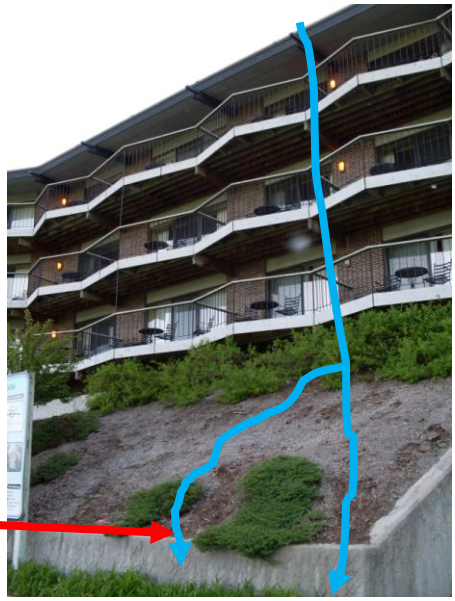


Infiltration Islands for Parking Areas

Main Resort Area and Lodge

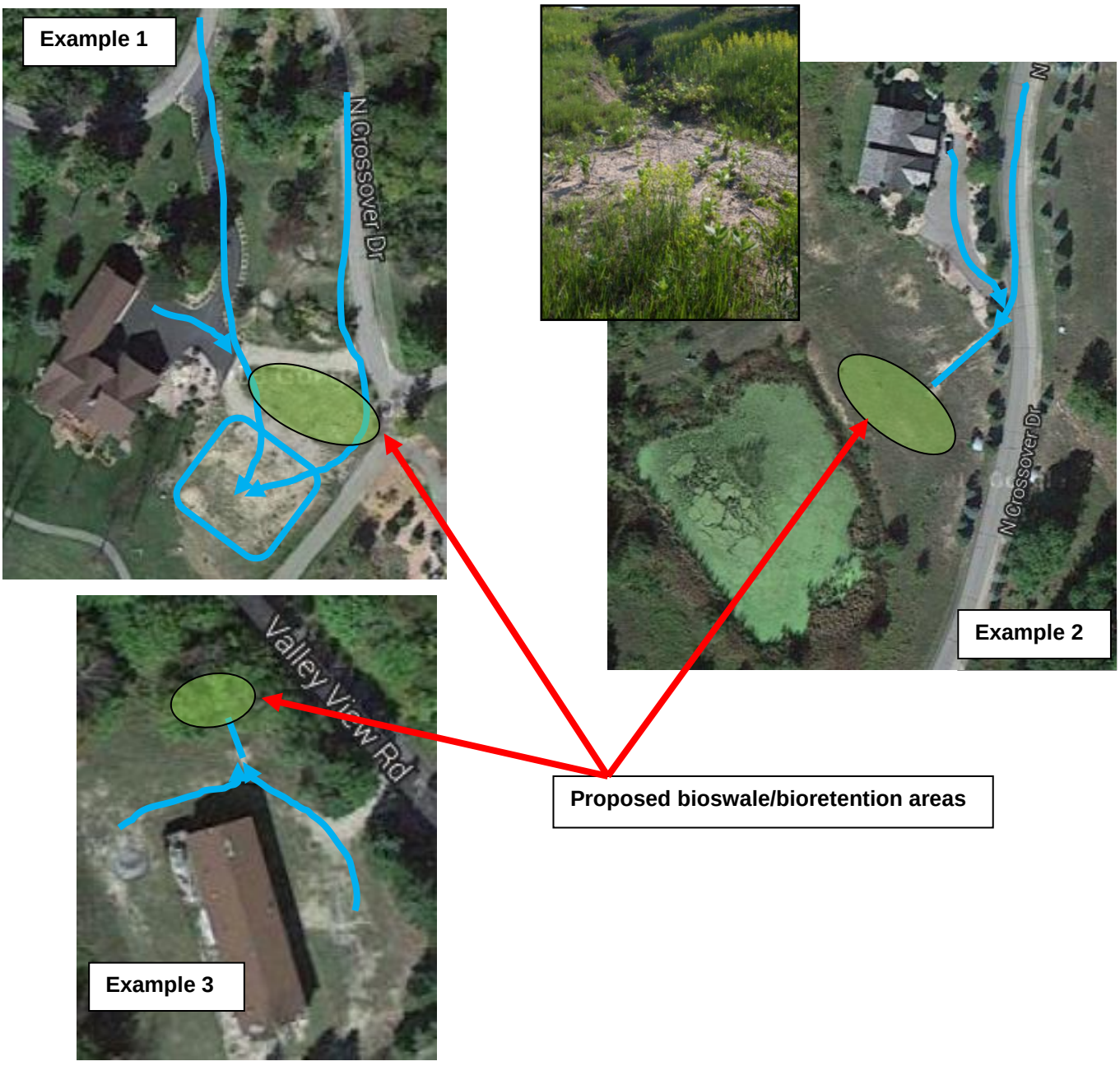
- Roof Runoff from Main Resort Building -
  - *Findings:* Runoff from the roof goes into raised bed gardens, or into a drain that goes into a dry well
  - *Recommendations:* Excavate beds and plant with native vegetation to help capture stormwater and reduce erosion

Noted erosion problems are due to stormwater runoff but have no affect on surface water quality



Current Runoff Path and Resulting Erosion

- Erosion Locations - Main Resort Area -
  - *Findings:* A few instances of erosion (caused by runoff paths shown below) throughout the development could be reduced by creating rain gardens at strategic locations
  - *Recommendations:*
    - Example 1: Erosion down steep hill resulting from runoff along North Crossover Drive - Place bioretention basin top of the slope (private property)
    - Example 2: Erosion from road drainage along North Crossover Drive near large pond - Place large rock to help disperse energy, and a bioswale/bioretention area at the bottom of the slope (private property)
    - Example 3: pipe outlet to the North of Maintenance Building: create bioretention basin at drain outlet (Resort property)



Findings/Recommendations: Shanty Creek

- <u>Lack of Buffer Along Shanty Creek -</u>
  ~Findings:
  - Creek runs through The Legend golf course green on hole #8 and has mowed lawn to the banks of the creek

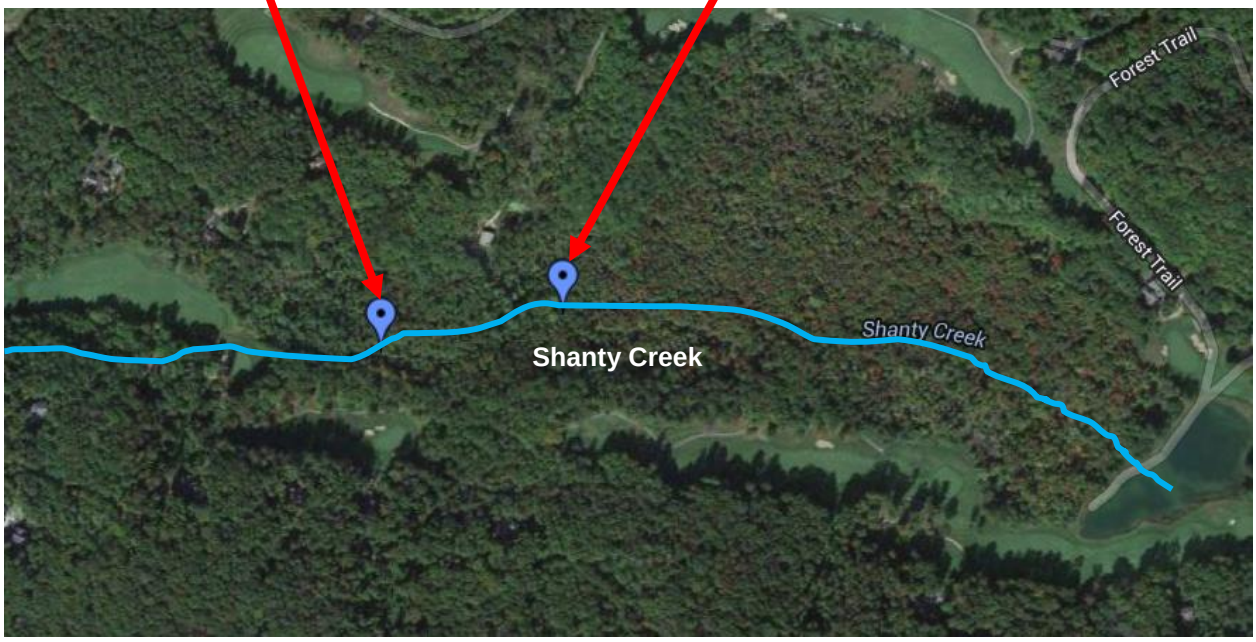
  ~Recommendations:
  - Install a greenbelt buffer along this stretch of the creek, suggested depth of 50-75 feet, or eliminate mowing

- <u>Erosion Along Shanty Creek -</u>
  ~Findings:
  - Multiple sites along Shanty Creek and its feeder creeks receive runoff from gravel roads adjacent to the creek (see photo at right)

  ~Recommendations:
  - Install bio-detention swales and speed bumps to help direct runoff into swales
  - Install large rip-rap to help reduce erosion and disperse water energy

- <u>Road-Stream Crossings - (unnamed maintenance road along Shanty Creek)</u>
  ~Findings:
  - Gravel road bridges cross Shanty Creek at two locations that constrict stream flow and have erosion around the structures (see photos below)

  ~Recommendations:
  - Remove current bridges and install open bottom bridge structures
  - Stabilize stream banks with woody debris, rip-rap and native plants
  - On either side of the bridges, install large rocks and native plants to help decrease erosion from road runoff



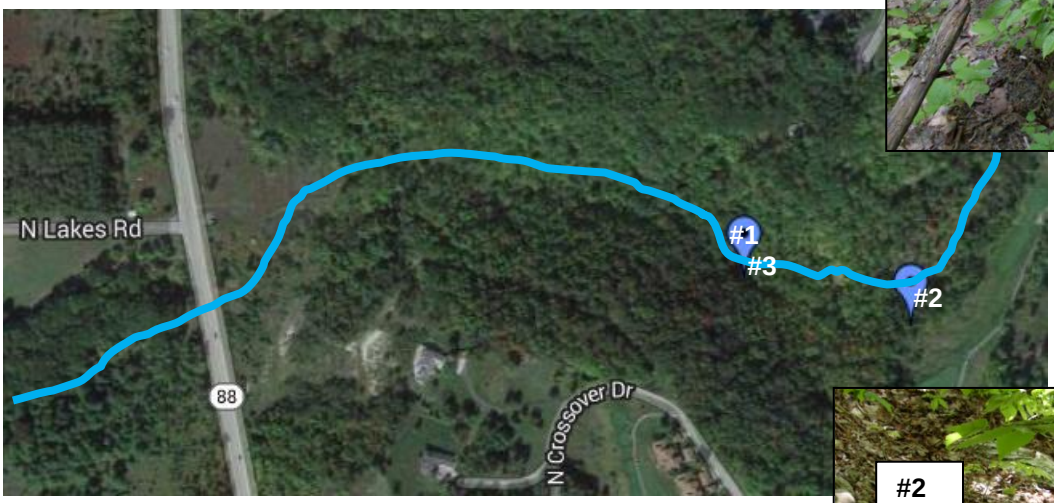
- Old Road Crossing Structure - (Forest Trail/Creekside Drive)
  ~Findings:
  - Structure with two large concrete abutments constricting flow of the creek (see photo below)

  ~Recommendations:
  - Remove structure
  - Stabilize streambank with woody debris and plantings

Findings/Recommendations: Maury Creek

- <u>Erosion Along Maury Creek -</u>
  ~Findings:
  - Multiple sites along Maury Creek have erosion most likely due to flashiness of creek and increased flow during rain events (see example at right, #1 on map)
  - GPS: 44.952165, -85.192735

  ~Recommendations:
  - Where possible install natural erosion control techniques to stabilize soil (i.e. native plants, coir logs, etc.)
  - Where necessary, install large rip-rap to help reduce erosion and disperse water energy



- <u>Tile Drain - (by The Legend golf course, Hole #2)</u>
  - Single tile drain from golf course exits approx. 100yds from Maury Creek, creating pathway of erosion (see photo at right, #2 on map above)
  - GPS: 44.952028, -85.191774

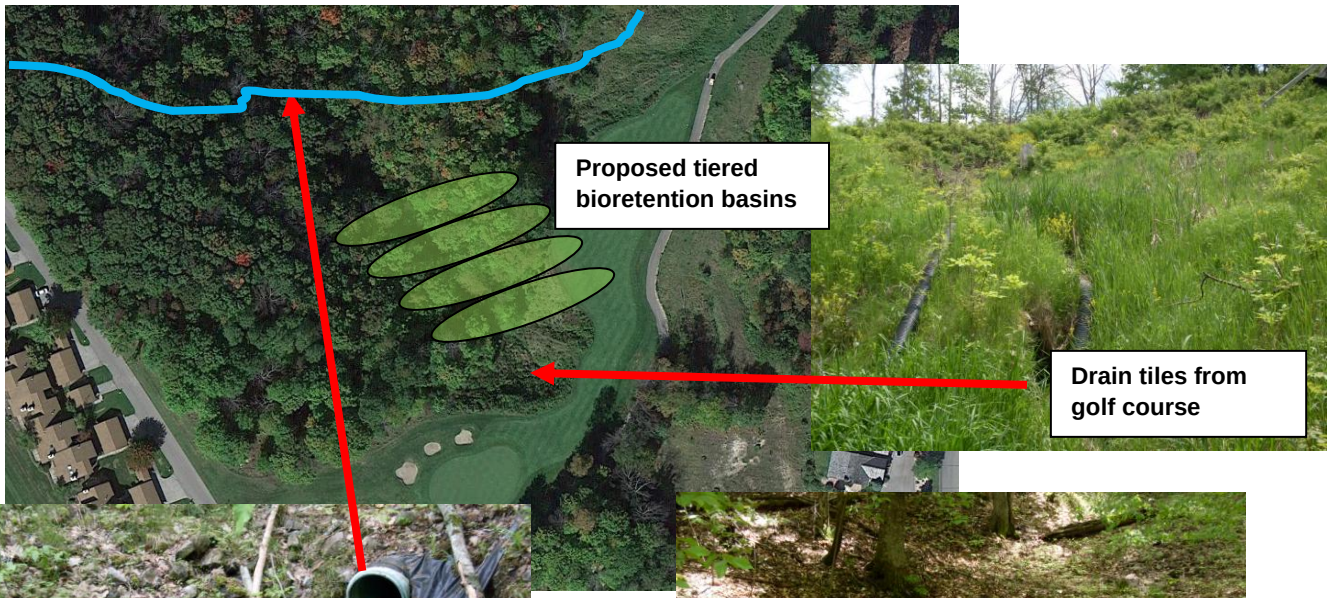
  ~Recommendations:
  - Install large rip-rap to help reduce erosion and disperse water energy
  - Work with private homeowners' associations up the slope to slow water and capture it in bioswales or rain gardens.

- <u>Road Crossing -</u>
  - Creek constricted to a pipe for access road (see photo at right, #3 on map above)
  - GPS: 44.952178, -85.192683

  ~Recommendations:
  - Remove culvert, Construct an open bottom bridge structure and place rip-rap and plantings around it to decrease erosion and stabilize soils

- <u>Terraced Runoff System -</u>
  ~Findings:
  - A series of drainage tiles and unvegetated detention basins receive runoff originating from golf course (The Legend golf course, Hole #2). This system eventually discharges runoff into Maury Creek (see photo bottom left) just downstream of road crossing noted on previous page.
  - Basins are not functioning properly, some drainage tiles go directly to creek, overflow from basins goes directly to creek via piping
  - Large amount of clay soils in the area; little infiltration, especially in unvegetated basins; exposed clay soils with springs/seeps, very wet area; significant amount of clay runoff to Maury Creek
  - Significant amount of runoff volume to creek, potential for heavy clay input
  - GPS: 44.950967, -85.192175

  ~Recommendations:
  - Reconstruct entire system:
    - Have all pipes outlet onto large rip-rap near top of hill to help dissipate energy
    - Construct series of bioretention basins down hillside to creek, connected via rip-rap channels (first basin fills up, overflows to second basin, etc.)
    - Cover with topsoil and plant with native plants to break up clay soils and increase infiltration
    - Install rip-rap where final basin enters the creek to help dissipate energy



Findings/Recommendations: Upstream of Unnamed Creek Crossing S. M-88 Highway

- <u>Erosion Created by Stormwater Runoff -</u>
  ~Findings:
  - Stormwater from drainage tiles on the golf course are piped to a location down a hillside (see photo at right) on private property. (5801 S. M88 Hwy)
  - There is heavy erosion where the pipe outlets and creates an unnamed stream in conjunction with natural groundwater seeps. Creek eventually crosses M-88.
  - Pipe outlet at GPS: 44.949084, -85.196521

  ~Recommendations:
  - Install large rip-rap at drain outlet to help reduce erosion and disperse water energy
  - Install plantings to help stabilize the soil
  - Replace existing pipes with infiltration trenched pipes allowing some of the stormwater to percolate into the soil and infiltrate naturally along the way