Objective/Background:
The objective of this project was to evaluate an erosion concern at a residential property. The property is located at 1820 Arrowhead Drive, West Lafayette. Homeowner Lynn Hiser approached the capstone personnel looking for assistance with gully erosion on the property. Over the course of the last two years, the above-average precipitation has destabilized the gully, causing large sections to slide down the slope. The increased erosion and destabilization has caused the residents to become concerned about loss of property and damage to homes. The gully itself merges with Goose Creek and is a waterway to the Indian Creek system. The project final design approach is to break up the multiple aspects causing the erosion into two or three heritage capstone projects.

Residential:
The channel will need to be lined first with a series of check dams (Figure 6).
- Installation of check dam at base of slope (Figure 6)
- Use V-shaped Riprap
- Channel to control future erosion (Figure 7)
- Revegetation of banks (Figure 8)

Culvert:
- Suggest installing a 24" culvert instead of 12"
- Place Riprap baskets at the entrance and exit (Figure 7)
- Line the channel of the grass waterway with Riprap (Figure 7)
- Place a check dam (Figure 6) at the base of the waterway to reduce water flow rate

Methodology:

Design Assumptions:
- Design Storm
  - 2-year, 24-hour event 3 in
  - 5-year, 24-hour event 3.5 in
  - 10-year, 24-hour event 4 in
- Watershed Areas
  - Bent Tree to culvert - 14 Acres
  - Total area to Goose Creek - 29 Acres

Constraints:
- Residential
  - Budget
  - Access/ seasons
  - Waterway restrictions
- Culvert
  - Co-op project with county
  - Bent Tree Trail
  - Seasonal availability of staff

Impact/ Sustainability:
- Improved water quality
- Habitat creation
- Buffer zones for toxins before entering water ways
- Stabilization of property along the gully
- Improved aesthetics
- Low maintains

Alternative Solutions:
- Bioengineering/ Bio-tech: The use of plants and inert plant objects to stabilize banks.
- Polypropylene or polyethylene geo-grid fabric to stabilize slopes.
- Brush Mattress
- Use vegetation to “armor” slope

Design Concept:

Bent Tree Trail:
- Installation of check dam at base of slope (Figure 6)
- Use V-shaped Riprap
- Channel to control future erosion (Figure 7)
- Revegetation of banks (Figure 8)

Design Components:

- Riprap
- Check Dams
- Revegetation

Budget:
- Arrow head Sub. Division 75,000
- Culvert 15,000
- Bent Tree Trail 20,000

Time Line:
- Surveying of Water Shed
- Consulting Forester
- Erosion Technique Selection
- Vegetation Selection
- Rain Fall Calculations

Author:
Daniel Madson, ASM

Technical Advisor:
Robert Stwalley Ph.D., PE
Sam Noel

Instructors:
Bernard Engel, Ph.D, PE
Robert Stwalley, Ph.D, PE

Acknowledgements:
I would like to thank Mr. and Mrs. Hiser for the providing me with this opportunity. Sam Noel for his help with Arc GIS, the use of his watershed App and all his help. Dr. R. Stwalley for all his help and guidance. The judges of my term spring presentation for their advice and direction on how to improve this project. My wife Brandy Madson and sons for their belief in me and encouragement.