

# Conservation Plan

For the campus of:  
**Middle Tennessee State University**

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## **Conservation Plan for MTSU**

### **ABAS 4370 Soil and Water Conservation**

**What is the problem?** Practices needed to control soil loss, sediment filtration, and runoff water contaminated with calcium carbonate, petroleum products, and other organic chemicals from parking lots located on the campus of Middle Tennessee State University.

#### **Goals and Objectives of Conservation Plan:**

- To stop soil loss and erosion due to high parking lot runoff water volume.
- To put practices in place to improve runoff water quality.
- Identify potential sites for locating raingardens, plunge pools, grassed waterways, and filter strips.
- To make MTSU campus more aesthetically pleasing.
- To educate MTSU students, faculty/staff, and visitors about the importance of water and soil quality and conservation.

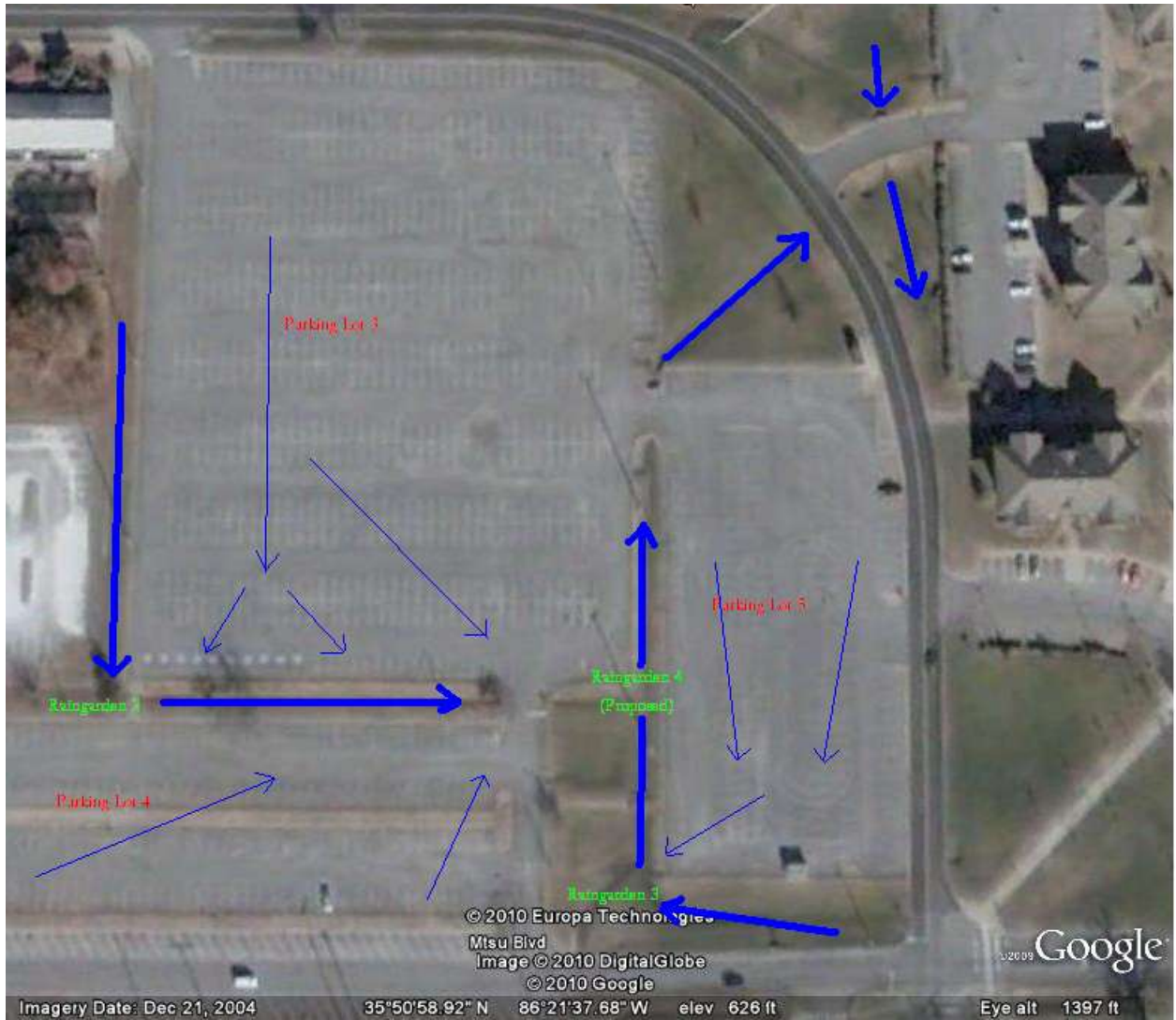
#### **Alternatives:**

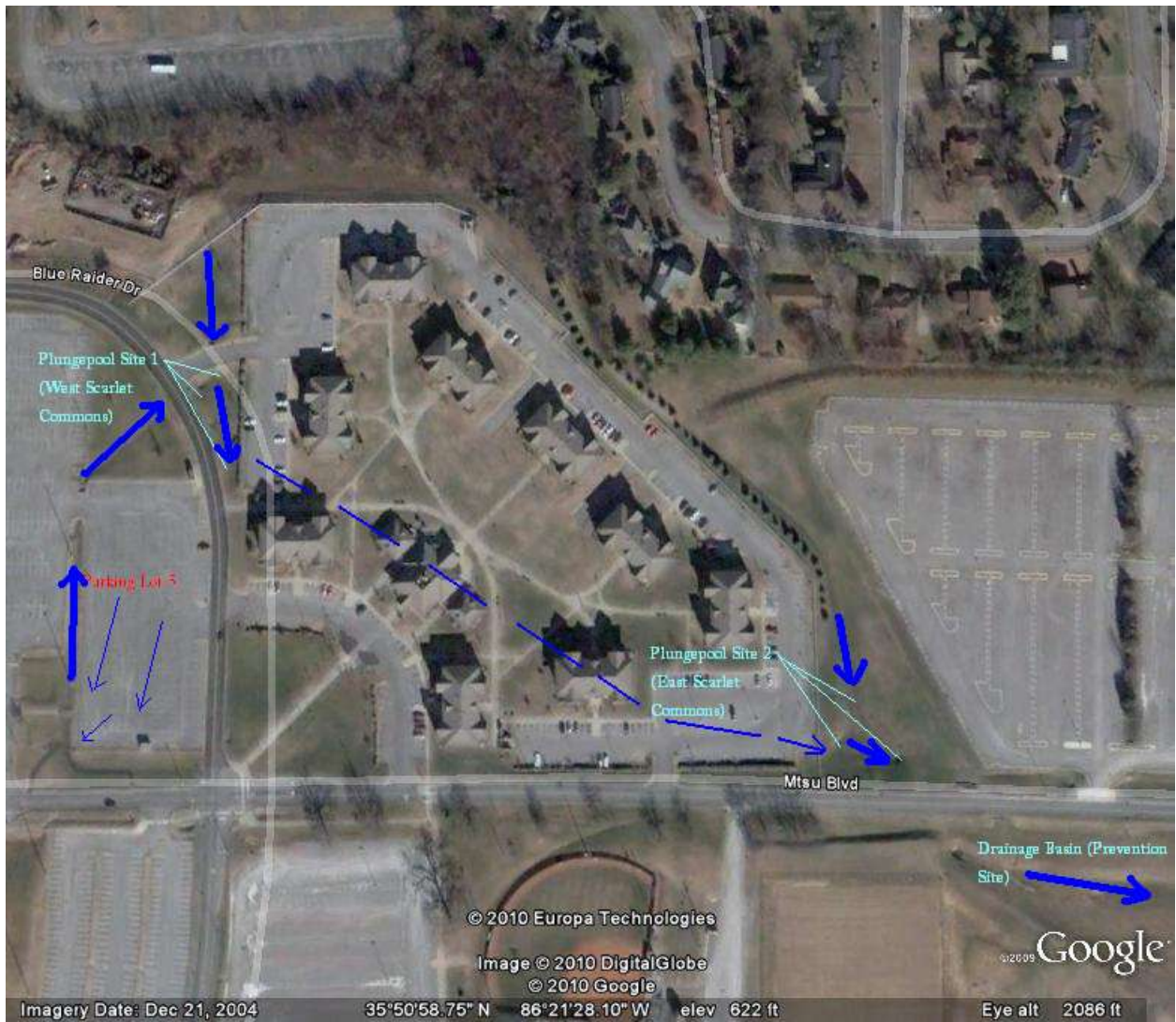
- Organic mulch alternative in the raingardes: Rock or Ground Cover
  - Rock and Groundcover have a higher initial investment but less recurring maintenance.
- Plunge pool alternative: Terraced hardscape
  - Significantly higher initial investment.

## Maps and Arial Photographs









## **Raingardens**

- Low-lying area
- Pervious soil
- Plants with high absorption capacity
- Allows contaminants to precipitate out of runoff water
- Raingarden effluence turbidity significantly lower than influent
- Groundcover could be mulch, rocks, or ivy
- The groundcover allows sediments to precipitate out of runoff water

## **Plunge Pools**

- Placed immediately after a culvert
- Intended to slow velocity of water flow
- Constructed of river rock and shot rock
- Low maintenance

## **Grassed Waterways**

- Provides a non-erosive pathway for runoff water by establishing vegetation
- Easily maintained

## **Filter Strips**

- A seed mesh that can be rolled out across eroded soils, in strips, leading to rooting of grasses to permanently control the eroded site
- Reduces dissolved contaminants, organics, and pathogen loadings in runoff
- Easily maintained but care must be taken when mowing around it

## ABAS 4370 Spring 2010 Erosion Control Progress

### Raingarden

- Performed annual maintenance: weeding, installed new organic mulch, and smoothed rock bedding



Figure 1 Raingarden Number 1 Post Annual Maintenance



The photos above were taken during the remediation of Raingarden Number 1. Work was performed by class members of ABAS 4370 during the Spring 2010 Semester with the oversight of Dr. Anderson and Mr. Larry of the MTSU Greenhouse staff. Work included: weeding, raking, redistribution of current rock bed, and the installation of new organic mulch.

*Photos above were taken by Dr. Anderson.*



The photos above are taken of the newly remediated Raingarden Number 1.

*Photos above were taken by David O'Brien.*

## Plunge Pools

- Installed four plunge pools: two on the northwest side of Scarlett Commons and two on the southeast side



Figure 2 Culvert Pre-remediation



Figure 3 Culvert Post-remediation



Figure 4 Culvert Pre-remediation



Figure 5 Culvert Post-remediation



Figure 6 Inlet From Northwest Site to Southeast Site Pre-remediation



Figure 7 Same Site as Figure 8 Post-remediation

## Photo Walkthrough of Campus Runoff from Center of Campus to Drainage Basin



**Figure 1:** This is the eastern view of the peak of elevation on campus.



**Figure 2:** This is the western view for the same site.



**Figure 3:** This is the eastern side of this site by the parking lot.

The site featured in figures 1, 2, and 3 serves as the dividing point for the flow of drainage on MTSU's campus. From this point, runoff that flows to the left drains to the east and runoff that flows to the right drains to the west.



**Figure 4:** This is Raingarden #1 after the remediations were completed.



**Figure 5:** This is a grass ditch located between the sites of Raingarden 1 and 2.



**Figure 6:** Calcium Carbonate which has precipitated onto a rock from runoff on campus.



**Figure 7:** This is an inlet from a parking lot to Raingarden #2.



**Figure 8:** This is the same inlet shown in Figure 6 that flows from the parking lot into Raingarden #2.



**Figure 9:** This is the inlet in relation to the parking lot that was mentioned in the above photos.



**Figure 10:** This is beginning of the site for Raingarden #2.



**Figure 11:** Raingarden #2



**Figure 12:** This figure is facing due west towards Raingarden #2.



**Figure 13:** This figure demonstrates the affects of runoff on the gravel in Raingarden #2.

In figures 13 and 14, the grey colors demonstrate a buildup of Calcium Carbonate, while the brown shows the original color of the river rock used in the Raingarden.



**Figure 14:** This site shows Raingarden #2 from a due east direction.



**Figure 15:** Raingarden #2.



**Figure 16:** The circle in this figure demonstrates a proposed site for “Raingarden #4”.



**Figure 17:** This is the same area as above, just as southern view of proposed Raingarden #4.



**Figure 18:** This is the western view of the proposed area for the new Raingarden.

The soil samples from the areas show in figures 16, 17, and 18 had a content of organic matter was about 20% when the state average is only about 1%.



**Figure 19:** This is a western view of proposed Raingarden #4. This view goes against the flow of runoff.



**Figure 20:** This is facing north from the proposed area of the Raingarden.



**Figure 21:** This is the inlet area from the parkinglot to the area of the proposed Raingarden.



**Figure 22:** The inlet and Raingarden #3.



**Figure 23:** The inlet of Raingarden 3#.

Figures 22, 23, and 24 demonstrate Raingarden #3 on MTSU's campus. From these photos, it is obvious that Raingarden #3 needs remediation because it is the only drainage spot for the large parking lot around it.



**Figure 24:** The inlet of Raingarden #3.



**Figure 25:** This photo is facing northward, which follows the flow of runoff towards Raingarden #3.



**Figure 26:** This photo was taken against the flow of runoff to Raingarden #3. This circle in this figure shows a proposed site for filter strips on campus.

Around this area, there is only one 300 square foot Raingarden. The filter strips would be a useful addition because this small Raingarden is not sufficient enough for the large area which it encompasses.



**Figure 27:** This photo shows the inlet to the proposed area above.



**Figure 28:** This is the inlet from the parking lot by proposed the Raingarden.



**Figure 29:** This is facing against the flow towards Raingarden #4.



**Figure 30:** This is also facing against the flow to Raingarden #4.



**Figure 31:** This shows the same area as figures as 29 and 30, yet this is on the other side of the inlet. The work done here was mostly for erosion control.

Figures 29 and 30 demonstrate the only two outlets in this area which includes about 4 acres of parking lots.



**Figure 32:** This area in the circle shows a proposed site for filter strips.



**Figure 33:** This is a close-up view of the area for the proposed filter strips.



**Figure 34:** This is the same area for the proposed filter strips, but this photo is from the other direction.

The filter strips that are mentioned in figures 32, 33, and 34 are needed because all the runoff from about 7 acres of parking lots and surrounding areas ends up here.

### **Coordinates:**

Parking lot 1: 35°51'N, 86°21'W; Elev. = 631ft

Parking lot 2: Elev. = 35°60'N, 86°21'45"W; Elev. = 630->629ft

**Rain Garden 1:** 35°51'N, 86°21'40"W; Elev. = 629ft

**Rain Garden 2:** 35°51'N, 86°21'42"W; Elev. = 629ft

Parking Lot 3: 35°51'N, 86°21'39"W; Elev. 633->630ft

Parking lot 4: 35°50'56"N, 86°21'42"W; Elev. 630ft

**Rain Garden 3:** 35°51'N, 86°21'38"; Elev. = 629ft (Remediation Req.)

Parking lot 5: 35°50'57"N, 86°21'36"W; Elev. = 633->630ft

**Rain Garden 4 (Proposed Site):** 35°50'57"N, 86°21'37"W; Elev. = 628ft

Remediation Site 1: 35°51'N, 86°21'36"W; Elev. 624ft

Plunge Pool Site 1: 35°51'N, 86°21'34"W; Elev. 623ft

Buffer Zone Site 1 (Proposed): 35°51'N, 86°21'34"W; Elev. 621ft.