



ARCOLA MILLS

ADDRESS:

Stillwater, MN
55082

WATERSHED:

St. Croix River
Basin

FUNDING PARTNERS

- Bush Foundation
- MPCA
- Carolyn Foundation
- Minnesota Environment and Natural Resources Trust Fund
- Arcola Mills Historic Foundation

BEST MANAGEMENT PRACTICES IMPLEMENTED

- Raingarden
- Open Culvert
- Speed Bump Water Bar
- Tread Bump Water Bar
- Pond Planting



St. Croix Valley Healthy Waters Initiative

Stillwater, MN

Arcola Mills



“Arcola Mills, located six miles north of Stillwater, Minnesota, is one of the largest undeveloped parcels of land on the shoreline of the nationally designated wild and scenic St. Croix River.”

“The Arcola Mills Historic Foundation is a non-profit organization that was created at the bequest of Katharine Van Meier upon her death. Great care is being given to preserve the natural woodland beauty and historic building. The lumber-era Greek Revival mansion, built in 1847, is currently being restored with the future goal of restoring eight eclectic cottages.”
(www.arcola mills.org)

At Arcola Mills, the goal is to reduce erosion along drives, ravines and over grown service roads. This was accomplished with several types of trail Best Management Practices (BMPs), short term and long term trail plan, soil stabilization and creating vegetated rain gardens to hold excess stormwater.

North Drive BMPs.

There is a gravel driveway along the northern property line of Arcola Mills. During rain events this road acts as a conduit for water allowing it to pick up speed and directing it into several ravines. The goal was to implement several trail BMPs to divert water into raingardens before it gets to the ravines. A combination of open-grated culverts, speed bumps, and tread bumps were installed to accomplish this.



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Old Service Road

Off of the north drive there is an old service road that is no longer used. It was excavated down lower than the existing land and acted as a funnel for stormwater runoff. The solution was to install several log check dams across the road and plant them as rain gardens. The plan is that as one raingarden fills up it will overtop into the next one below it.

Ravine Erosion

On the west arm of the current trail loop there is an eroding ravine above a spring. Several bio-logs were staked in place to create terraces and then planted with native ferns.

Trail Plan

Assist Arcola Mills with a plan for both short term and long term trail layout. The goal is to locate the trails in areas where there will be the least disturbance and soil erosion. Using GIS software, the location was mapped into a digital format that could be followed for implementation.



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St. Croix Healthy
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- Carolyn Foundation
- Metro Corridors
- Arcola Mills Historic
Foundation

BEST MANAGEMENT PRACTICES IMPLEMENTED

- Speed Bump Water
Bar



St. Croix Valley Healthy Waters Initiative

Stillwater, MN

Arcola Mills: Speed Bump Water Bar

Purpose: Speed Bump Water Bars are used to direct water off of roads where other diversion applications such as Grated Culverts are not feasible to construct, often due to the low height of the road bed. They direct water to the side of the road into stable vegetated areas.

Material: At Arcola, they will be constructed from Class V gravel.

Installation: Each Speed Bump Water Bar at Arcola was installed across the driveway bed and direct water to a stable vegetated area. Each Speed Bump extend into the side slopes to keep water from flowing around it. The downhill side slopes (earthen “curbs”) were cut to allow water to flow into vegetated areas. Some vegetated areas had to be excavated.

The outlet needs to be armored with erosion blanket and logs to help slow water down and keep the soil at the edge from eroding. Speed Bump Water Bars won’t redirect all water coming down the drive in large storms or snowmelt, and should be thought of as one part of a larger system of water diversion.

Speed Bump Water Bars will be 4” to 6” higher than the tracks, and about 2” higher than the grassy median. They will be about 3’ wide so that vehicles with lower clearances do not have a problem driving over them.

When constructing with gravel be sure to compact the gravel in 1”-1 1/2” lifts when using a hand tamper.

The grassy median uphill of the Speed Bump Water Bar must be shaved down level to the treads for 2’ or 3’ so that backed up water will flow over the median and toward the outlet.

Maintenance: Speed Bump Water Bars should be inspected periodically and after heavy rain storms for sediment. If there is sediment it should be removed to keep the structure operating properly. Gravel Speed Bump Water Bars will need to be checked after heavy rain events for any signs of scouring from the water. If scouring is evident repair with additional gravel and compact.

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- Carolyn Foundation
- Metro Corridors
- Arcola Mills Historic Foundation

BEST MANAGEMENT PRACTICES IMPLEMENTED

- Tread Bump Water Bar



St. Croix Valley Healthy Waters Initiative

Stillwater, MN

Arcola Mills: Tread Bump Water Bar

Purpose: Tread Bump Water Bars are used to pool water behind them where diversion applications such as Grated Culverts or Speed Bump Water Bars are not feasible to construct, often due to the low height of the road bed. They slow water behind them to reduce the velocity and scouring action of the water.

Material: At Arcola, they will be constructed from Class V gravel.

Installation: Each Tread Bump Water Bar at Arcola Mills was installed across the tread bed at a low height to pool water in the tread behind them.



This practice should be thought of as one part of a larger system of water and erosion control.

Tread Bump Water Bars were 2" to 3" high, in the treads only (not the grassy median). They were constructed about 2' wide so that vehicles with lower clearances would not have a problem driving over them. When designing tread bars, remember that vehicles will have to drive through the pools behind them, so keep them relatively small.

When constructing with gravel be sure to compact the gravel in 1"-1 1/2" lifts when using a hand tamper.

Maintenance: Tread Bump Water Bars should be inspected periodically and after heavy rain storms for sediment. If there is sediment it should be removed to keep the structure operating properly. Tread Bump Water Bars will need to be checked after heavy rain events for any signs of scouring from the water. If scouring is evident repair with additional gravel and compact.

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BEST MANAGEMENT PRACTICES IMPLEMENTED

- Open Grated Culvert



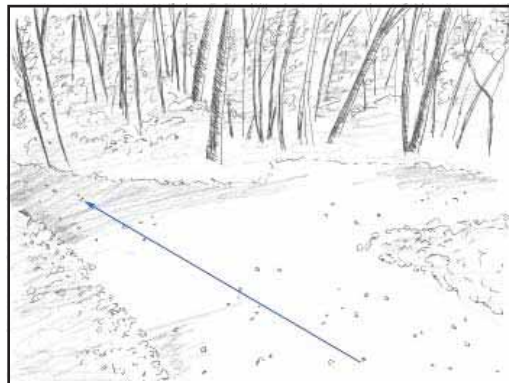
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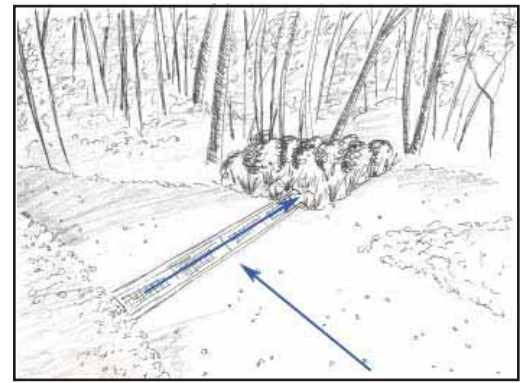
Arcola Mills: Open Grated Culvert

Purpose: Open grated culverts collect water off of service roads or trails and discharge it into a stable vegetated area. .

Open grated culverts are meant for use on camp roads or trails that receive little or no snow plowing.



Service Road before



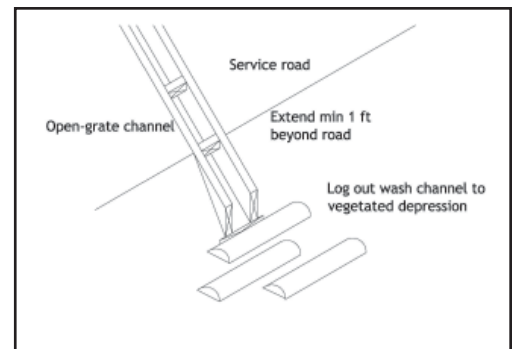
Service Road after Open grated-culvert and raingarden installation

Materials: Open grated culverts can be constructed from material found at the local hardware, lumber or building supply store.

The following is a guideline for basic materials you will need:

- 2" x 10" Pressure treated lumber for bottom
- 2" x 6" Pressure treated lumber for sides (double the length of the bottom)
- 3" galvanized nails or screws to assemble the structure
- 2" x 2" pressure treated lumber to maintain structure of the culvert
- PVC Pipe with a bolt running through it can be substituted for the 2x2's

Installation: Open grated culverts can be constructed of pressure treated lumber. Spacers are placed in the culvert to strengthen the culvert.



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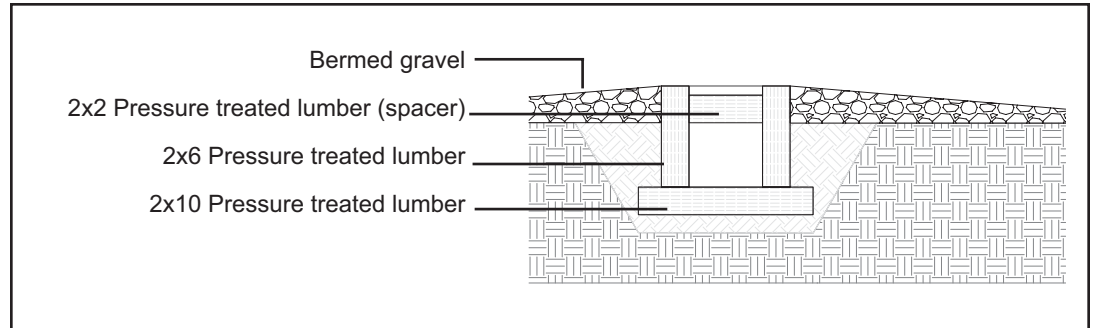
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The length of the culvert will vary depending on the width of the road. Remember that when calculating the length of the culvert that it should be installed at an approximately 30 degree angle down slope. Also the culvert should extend a minimum of 1 ft. beyond the down slope side of the road. Take these added lengths into account when calculating materials.

Install the culvert flush with the road or trail. On sloped roads or trails it may be necessary to elevate the culvert 1" - 2" above the road and then gently slope away from the top of the culvert with an aggregate rock (3/4" to 1 1/2"). This is to help slow water down before entering the culvert and allow sediment to drop out.

The culvert outlet should use some form of structure to help slow the water further and direct it to a settling area such as a raingarden. Logs maybe used to achieve this as long as they are dug into the soil and left with spacing between.

Maintenance: Routine maintenance should be done to clean sediment from the bottom of the culvert. A small garden hoe can be used to scrape the sediment out of the bottom.



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