

# Roadside Ditches

## Best Management Practices to Reduce Floods, Droughts, and Water Pollution

We all live in a watershed, and precipitation is the lifeblood of a watershed. When rainfall pounds impervious surfaces and compacted soils, it runs off rapidly instead of percolating down to the groundwater. The runoff can contribute to flooding and carries pollutants that degrade water quality.

Hundreds of miles of ditches criss-cross each watershed. While the ditches drain roads, they also efficiently intercept the runoff from adjacent hillslopes, capturing about 20 percent of the runoff in each watershed. Ditches rapidly shunt the water to streams, where it is discharged, like a high-velocity faucet. Ditches are also conduits of road salts, fertilizers, and viable pathogens from lawns and farms to streams. Unprotected ditches are a significant source of suspended sediment and gravel, turning the streams brown with each storm event. The ditch outputs disturb the natural stream flow and cause erosion along the stream banks.

The end results of these cumulative impacts are:

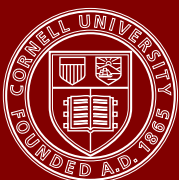
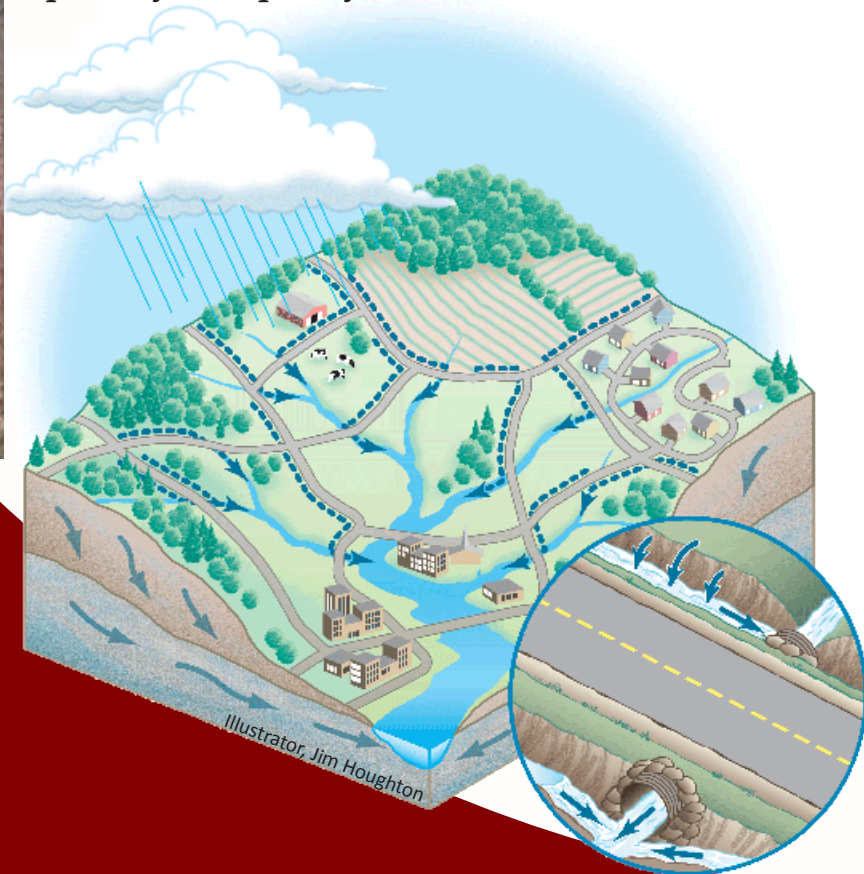
- increased flooding
- declining groundwater tables
- drier streams and empty wells
- greater streambank erosion
- increased pollution in our drinking water supplies

The management practices for roadside ditches, instituted nationwide almost a century ago, have been implemented in large part without considering the impacts on downstream water resources. Growing water scarcity and anticipated impacts from climate change, however, call for better water stewardship. We need to balance the value that ditches provide in protecting our roadways with the negative effects on our water.

**This fact sheet provides guidelines for adjusting ditch management practices to improve the quantity and quality of our water resources.**



Recent research at Cornell University indicates roadside ditches are a previously unrecognized but critical contributor to flooding and pollution of our waters.



Cornell University

# Roadside Ditches

## Cleaning Ditches

### Problem:

Soils exposed during cleaning are a significant source of sediment that washes into streams.

### Solution:

Vegetation reduces erosion of sediment, filters out contaminants, and slows down water flow.

### Actions:

- Remove as little material as possible during ditch cleaning.
- Don't scrape back and fore slopes unless necessary.
- Where scraping is necessary, leave intact vegetated strips in the downhill part of the ditch to trap sediment.
- Seed immediately after cleaning and before the next storm. Hydroseed where needed to establish vegetation quickly.
- Seed early in the growing season to allow adequate time for plants to grow.
- If needed, do follow-up watering to ensure successful growth.
- Use seed mixes with limited fertilizers to reduce nutrient loading downstream.
- Contact your local Soil and Water Conservation District for a good mixture of native grass seeds to use in your area.



## Improving Ditch Design

### Problem:

Ditches that are very deep, V-shaped, or steeply sloping all lead to higher velocities, incision, and increased sediment erosion.

### Solution:

Reshaping ditches can slow down water flow and reduce sediment movement.

### Actions:

- Reshape ditches to a shallow, trapezoidal or rounded profile that allows routine mowing.
- Avoid V-shaped ditches that concentrate flow, become incised, and erode sediment.
- Don't "overditch" — deep ditches are a hazard to pedestrians and cars, and capture more runoff.
- When building a ditch, don't ignore drainage areas upslope that contribute to greater runoff.
- Even in vegetated ditches, check dams may be needed to slow down water velocities and capture sediment.
- Avoid filling ditches with boulders, which can store summer heat and transfer it to the streams, impacting fish.



## Recharging Groundwater Reservoirs

### Problem:

Ditch capture and shunting of runoff contributes to downstream flooding and simultaneously decreases groundwater recharge, leading to drier soils and empty wells during the summer.

### Solution:

Alternative ditch designs are possible to encourage infiltration of water and prevent its rushing to the streams.

### Actions:

- Break the ditch-stream connection wherever possible.
- At frequent intervals along a ditch, redirect ditch flow downslope to fields or forests where the water can infiltrate back into the ground.
- At the downslope ditch end, disconnect the ditch from the stream and divert the flow to an infiltration basin, constructed wetland, or retention basin to help recharge groundwater.



## Thinking Outside the Ditch

### Problem:

Stormwater runoff from yards, farm fields, and parking lots transports more water as well as nutrients, pesticides, and live pathogens to drinking water sources via ditches.

### Solution:

Decrease landscape routing of stormwater to roadside ditches.

### Actions:

- Reroute runoff from rooftops and other impervious surfaces to rain gardens, rain barrels, or low-lying depressions instead of to ditches.
- Replace impervious sidewalks and parking lots with permeable materials to reduce runoff.
- In agricultural fields, route underground tiling systems to an infiltration basin and not to roadside ditches.
- Increase forested canopy cover in the watershed to capture more rainfall and also to reduce summer air temperatures.
- Replace expanses of mowed lawns with mulched gardens or trees to intercept rain and foster infiltration.



## Reducing Gravel Erosion

### Problem:

Gravel along road shoulders washes into the ditch, causing clogging and/or moving to the stream, where it creates a delta that redirects the stream's flow, eroding the banks.

### Solution:

Design road shoulders to minimize gravel erosion into ditches.

### Actions:

- Lessen the pitch of the shoulder to reduce erosion.
- Make sure that a vegetative strip exists between any gravel shoulder and the ditch.
- Compact shoulders during placement to reduce erosion.
- Consider alternatives to gravel, such as sealing road shoulders.



A properly designed and maintained ditch system is critical for protecting quantity and quality of our water resources.

## Moving Forward

It is easy to understand the need for improving roadside ditch management, but changing longstanding practices will take effort, new partnerships, and additional resources. Landowner willingness, municipal support, and funding are particularly needed at the local level, while highway personnel must be engaged in statewide water resource discussions. The resulting improvements in floods, droughts, and water quality will be worth the effort.



Photographer, Bill Hecht



### More Resources

Cornell Local Roads Program: [www.clrp.cornell.edu](http://www.clrp.cornell.edu)

Rebecca Schneider home page:

[www.dnr.cornell.edu/cals/dnr/people/faculty.cfm?netId=rls11](http://www.dnr.cornell.edu/cals/dnr/people/faculty.cfm?netId=rls11)

### Acknowledgments

Written by  
Rebecca Schneider, Department of Natural Resources, Cornell University, and  
David Orr, Cornell Local Roads Program, Cornell University

Design by Laurie Ray and Diana Bryant, Cornell University

Funding for this fact sheet provided by: NYS WRI USGS 10(4) B

9/2010 5M GPP 100237