Best Management Practices Project (Urban): Nutrient and Irrigation Management to Reduce Nonpoint Source Pollution of Surface and Ground Waters in Colorado Urban Landscapes

Conducted by: Northern Colorado Water Conservancy District (NCWCD)
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The Northern Colorado Water Conservancy District (NCWCD) effort, supported by NPS grants, created a set of best management practices (BMPs) for the maintenance of turfgrass lawns in northern Colorado.

Healthy turfgrass lawns benefit the environment by reducing nonpoint source pollution. The thatch layer and the dense root system of healthy turfgrass attract and hold chemicals and fertilizers, minimizing how much is leached into the ground water or run-off into surface waters.

To document the benefits of healthy turfgrass, NCWCD focused on tracking the leaching of nitrates, which can be pollutants that are highly soluble and mobile, in the soil profile. Nitrates, key nutrients in keeping a lawn healthy, come primarily from added fertilizers.

From 1993 to 1995, bucket lysimeters were used to create a baseline measurement of how much nitrate was being leached through the soil of an established, healthy, fertilized lawn. The demonstration site, located in Loveland, Colorado, featured a heavy silty clay loam soil and Kentucky bluegrass. The lysimeters measured an average of .43 pounds of nitrate being leached through the soil per acre.

During the 1996 growing season, no fertilizer was applied to the lawn, and its health subsequently declined. Along with this decline in appearance and plant vigor, the lysimeters measured an increase in the leaching of nitrates in the soil profile. These nitrates had been present in the turfgrass but were released into the soil by deteriorating plants at the rate of 4.2 pounds per acre – a drastic increase over the healthy, fertilized, baseline lawn.

In 1997 NCWCD created a new turfgrass study utilizing additional and more sensitive lysimeters. In an exercise similar to what a farmer goes through to plant a new crop, the established lawn was removed, and the demonstration area was prepared for a new seeding. Disturbing the soil through tillage caused more than 27 pounds per acre of nitrate to be leached through the profile. However, as the lawn became established during 1998 and 1999, nitrate leaching was reduced to about one pound per acre.

The study also looked at the effect of watering levels on nitrate leaching. When over-watering occurred, as might occur with a typical homeowner, the amount of nitrate leaching increased only slightly.

A similar test site was installed on very sandy soils in Greeley, Colorado, and the amount of nitrate leaching was only slightly more than that which occurred on the heavy clay soil site.

While the data show the benefits of a healthy turfgrass lawn in reducing nitrate leaching, it became clear that the single largest cause of pollution to the water supply from lawn care came from allowing fertilizers, chemicals and grass clippings to contact hard surfaces such as roadways, parking lots and sidewalks that border the lawn. The fertilizer, other chemicals and clippings are pulverized by vehicles and then washed into surface waters by rainfall or irrigation.

In most years, the challenge in the urban setting is not so much helping homeowners and professional landscapers with watering practices to reduce pollution, but understanding that the method of applying fertilizers and chemicals is critical to protecting water sources.

Better methods and more care in applying fertilizers and chemicals can greatly reduce or prevent pollution.

Recommended Best Management Practices for Urban Turfgrass in Colorado

Water quality hazards associated with proper turfgrass management are significantly less than with other land uses. The high organic matter in the thatch and fibrous root system in the soils gives the grass the ability to attract and hold onto fertilizers and other chemicals so they do not move as easily through the soil profile as happens with bare or cultivated soils. Turfgrass managers can avoid negative environmental impacts and demonstrate a progressive response to public concerns by implementing best management practices.

- Select grass species that best meet the requirements and purposes of the lawn area.
  - Areas that receive wear and tear will require a more aggressive sod–forming grass such as Kentucky bluegrass.
  - Areas that are difficult to mow or are for visual appeal only should use other grass varieties that require less fertilizing, mowing, and watering. Such grasses include buffalo grass, blue grama and other slower growing species.
- Use turfgrass in areas that are large and relatively flat. This will minimize the potential for the runoff of water, fertilizers and chemicals.
- Mulch mow grass to a height of 2.5 to 3.0 inches to help turfgrass develop healthier, deeper root systems. Mulched grass clippings can return approximately 25-30 percent of the needed nitrogen to the lawn. Over the course of the growing season this translates to a reduction in required nitrogen of more than one pound per thousand square feet. Mulch mowing also reduces the amount of trash that is put into the landfill. If grass clippings are caught, recycle them by making compost that can be returned as a soil conditioner. Avoid throwing grass clippings onto hard surfaces such as streets and sidewalks. They are a source of pollution.
- Apply fertilizer at no more than the rate recommended by the manufacturer. Check with Cooperative Extension for the most current information (www.cerc.colostate.edu/titles/Guide3.html). Use a drop spreader to apply fertilizers and other chemicals and avoid spreading them on hard surfaces such as walks and driveways. With mulch mowing, an additional three pounds of nitrogen fertilizer per thousand square feet should be sufficient for the growing season. This means one less application of fertilizer in most situations. Reducing inputs lowers the runoff and leaching potential. The best fertilizers are slow-release, controlled-release, slowly soluble nitrogen or naturally organic based. If the fertilizers release slowly, there is less potential for them to leach or move because of runoff. This protects both surface and ground water resources.

"We have been able to do demonstrations and studies and gather enough information that we can now educate the public on how to protect water resources."

— Brent Mecham, Landscape Water Management & Conservation Specialist, NCWCD

- Apply fertilizer when the grass needs it. In general, cool season grasses need to be fertilized in early April, late May, early September and mid October. Apply no more than 1 pound of nitrogen per thousand square feet at each application. Warm season grasses need less fertilizer and are best fertilized about mid June and again in the beginning of August. Correct application of fertilizer and other chemicals is one of the best and easiest ways to protect our water resources.
- Proper irrigation can minimize how much fertilizer and other chemicals are leached past the root zone or washed away by runoff. The amount of runoff is affected by the slope of the terrain, the precipitation rate and precipitation duration.
- Fix broken sprinkler heads and pipes immediately. Care should also be given to make sure sprinklers are properly targeted. Conserving water is one of the best ways to maintain high water quality.