



# Cornell Waste Management Institute

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## Using Manure-Based Composts in Turf Maintenance

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This Fact Sheet summarizes the results of a study conducted by Cornell Waste Management Institute and the Cornell Department of Horticulture. This research was completed on four sites in western and southeast NYS over several years to assess compost use in turf maintenance. Dairy and poultry manure-based composts were topdressed at 2 rates (1/4 inch and 1/2 inch) on replicated plots along with control plots once in Year 1 and twice in Years 2 and 3. The impact on soils and turf quality was analyzed and is summarized here. (See <http://cwmi.css.cornell.edu/turf.htm> for further information on the study.)

### Why Use Compost?

Composts can be topdressed on turf to promote improved soil structure, add organic matter and nutrients, and possibly suppress plant pathogens. Since composts vary, it is wise to consider what characteristics are needed and obtain information from the supplier before selecting a compost.

### Compost Qualities

For ease of application, **moisture content** is important. If too wet, it will clump and if too dry it may be dusty. **Particle size** is also important with large

pieces such as wood chips presenting a challenge to application and also remaining on the lawn surface and possibly smothering the turf. Screened compost may be

desirable if the compost has irregular particle size. A maximum particle size of 3/8 inch is recommended because larger particles do not filter easily between blades of grass in existing turf plantings. Composts with larger particle size can be used if incorporated into the soil prior to establishment of new turf.

### High conductivity or soluble salts

can indicate that the compost is not fully mature and may “burn” the grass leaving voids that allow weed encroachment and exacerbate weed problems. Immature composts may also have an ammonia odor.

The **phosphorus (P) and nitrogen (N)** content vary with the type of feedstocks used to create the compost. Manure-based composts are higher in nutrients than composts based on yard trimmings and may result in excess nutrient additions, especially of P, if applied at high rates or with multiple applications. Since the nutrients are mainly associated with organic matter, they are less available and are more slowly released than those applied in inorganic fertilizers.

### How Much Compost?

Top dressing 1/4 to 1/2 inch is recommended. Use this equation to calculate how much compost you need:  
Volume Required (cubic yards) = area (sq. ft.) x depth (inches) x 0.0031.

### How to Apply?

Spreading the compost can be a challenge since appropriate equipment may not be available. Core aerating before and after the compost is applied will help to incorporate the compost into the soil.

**Weed seeds** can be a concern in poorly managed compost. If properly composted, weed seeds are destroyed by high temperatures, but can be reintroduced if composts are stored uncovered outdoors. Unfortunately, composts are rarely tested for weed seeds so data may not be available.



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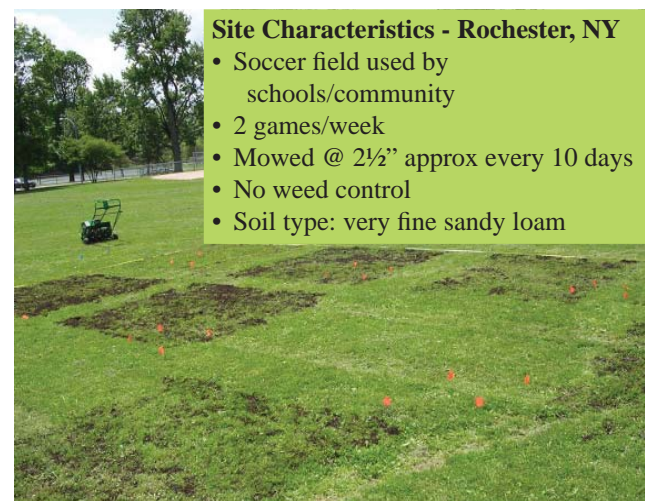
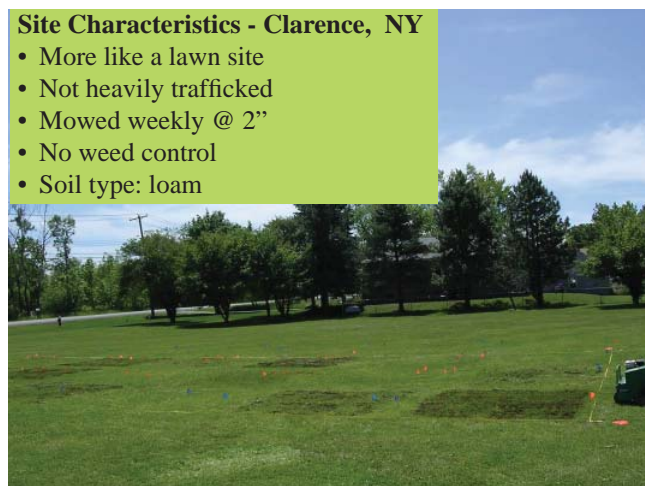


The **organic matter (OM)** content of composts varies and depends in part on whether the composting takes place on an improved surface or directly on soil that may then become mixed into the compost. Since increasing OM is often a motivation for using compost, a high OM content (>40%) is desirable.

## Findings From This Research

### Impact of Composts

The use of manure-based composts on turfgrass can improve soil organic matter content, increase the pH of acidic soils to closer to neutral, and decrease bulk density, thus reducing compaction. Over the long-term, on some sites, it can improve turfgrass quality, reduce weeds and increase grass cover. In addition, many of the managers at the sites reported earlier spring green-up on the compost-treated plots. However, high salt levels and immature composts can have detrimental effects such as burning of the grass and exacerbation of



weed problems. Application of manure-based composts increases soil P levels that may cause concern about runoff or leaching losses of P.

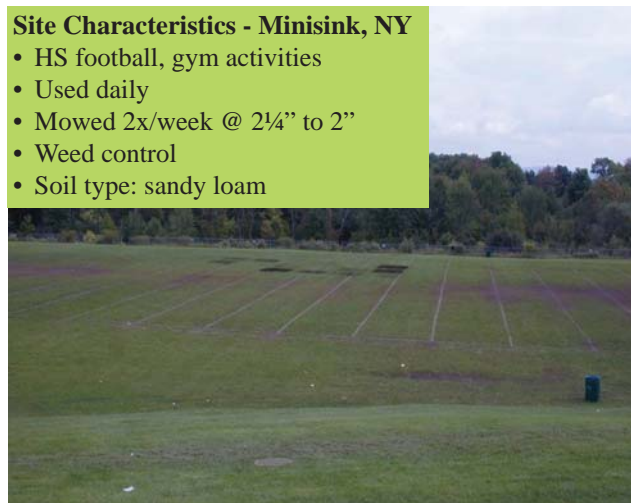
On sites where fields were poorly constructed and where field-use is very high, compost additions could not overcome these limitations and did not result in significant improvements in turf quality.

**Turf quality (TQ)** is a measure of aesthetics (i.e. density, uniformity, texture, smoothness, growth and color), and functional use. The most common way of assessing turfgrass quality is a visual rating system with 9 being best and 1 being poorest (6 or above is generally considered acceptable). The turf quality impacts of compost additions varied with the different sites. In general, compost addition and fertilizer addition had similar beneficial impacts. At one site (Rochester), where field use was moderate, the compost treated plots had significantly more grass and fewer weeds than both the fertilized and unfertilized control plots. Improvements due to compost additions may take time. At the end of this 3-year study, there was an upward trend in the compost-treated plots at all but the site that had extreme use.

### Soil Chemical Properties

Soil **pH** has an effect on the availability of soil nutrients. Most minerals and nutrients are more soluble or available in acid soils than in neutral or slightly alkaline soils. A pH range of approximately 6 to 7 promotes the most readily available plant nutrients for turfgrasses. Many mature composts have a basic pH (>7). Compost additions raised the pH at the sites where initial pH was <7. It did not change the pH of sites where soil was already alkaline.

Both **manganese (Mn)** and **iron (Fe)** are micronutrients whose availability is affected by pH. In both cases, the higher the pH, the less available are Mn and Fe. Iron is essential for chlorophyll synthesis and can thus help with turfgrass color. Compost application did not have much affect on soil iron levels at any of the sites, though it is possible that the earlier spring green-up observed at some sites may be related to iron in the composts. Manganese plays a role in photosynthesis and helps to suppress both leaf and root diseases. The soil manganese level was not affected by dairy manure compost, but increased to the high range with the use of poultry-manure compost at all sites.



**Phosphorus (P)** in the soil is important for plant establishment and growth. Levels of 4.5 mg/kg (mg/kg = parts per million) P is considered high and levels approaching 50 mg/kg may become an environmental issue due to potential leaching or runoff. Soil phosphorus increased significantly over time to levels above 50 mg/kg on all plots receiving multiple compost additions.

**Organic matter** serves as a reservoir of nutrients and water in the soil, aids in reducing compaction and surface crusting, and increases water infiltration into the soil. For turf, values between 7 and 10% are considered good levels of organic matter. Soil organic matter levels increased significantly over time with all compost types at all sites.

#### Soil Physical Properties

**Bulk density** of the soils at all sites decreased over the course of the study on all plots due to the core aeration performed as part of the experiment. In addition, compost resulted in lower bulk density at 2 of the 4 sites (Rochester and Clarence).

**Aggregate stability** refers to the ability of soil aggregates to resist disruption when outside forces are applied. Since aggregation affects erosion, infiltration of water, and plant root growth, it is desirable to have aggregates that are stable. At all sites aggregate stability fell within acceptable range throughout the research. Despite the fact that OM increased at all sites and is supposed to increase aggregate stability, only at one site (Rochester) was aggregate stability significantly improved with compost additions over the 3-year project.

**Water infiltration** rate is the rate at which water soaks into the ground and is measured as millimeters (mm) of water soaking in per hour. If the infiltration rate is very low, (< 5mm/hr) even very gentle rain falling on moist soil will cause surface ponding or runoff and the fields will remain mushy for days, allowing play to cause damage to the turf. Initial infiltration rates at all sites were acceptable and compost additions had little effect.

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## Special Thanks to Contributors and Supporters

**Local cooperators:** *Rose Baglia*, CCE Orange County; *Kermit Bossard*, CCE Chemung (retired); *Brian Eshenaur*, CCE Monroe County; *Walt Nelson*, CCE Monroe County; *Sharon Webber*, CCE Erie County

**Cornell:** *Jeff Barlow*, Horticulture; *Zachary Easton*, Horticulture; *Doug Soldat*, Horticulture

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**Green industry and site managers:** *Bill Blosser*, Minisink Schol District; *Nick Boffemmyer*, Minisink School District; *Leonard DeBuck*, DeBuck's Sod Farm; *Al Festaiuti*, Organic Lawn & Garden Company; *Bob Ottley*, One Step Tree & Lawn Care

## For Further Information

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Compost Use Guidelines and Specifications. 2003. Cornell Waste Management Institute. <http://compost.css.cornell.edu/market-label/guidelines/formula.htm>. A compost calculator to estimate the amount of compost needed for a project.

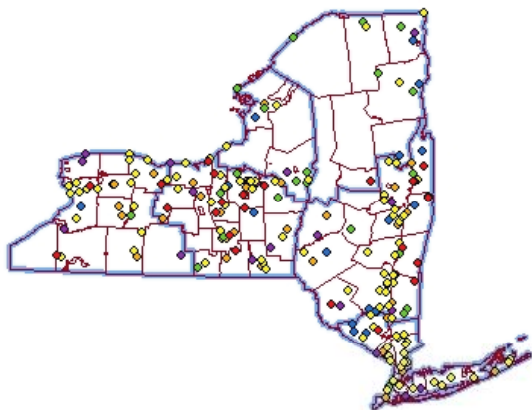
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Guidelines for Using Compost in the Green Industries. 1998. Compiled and edited by Ronald F. Kujawski and Heather Cupo, in cooperation with University of Mass Extension and The Center for Ecological Technology. Available from the Center for Ecological Technology, 26 Market St., Northhampton, MA 01060.

Landscape Architect Specifications for Compost Utilization. 1997. E&A Consultants for the Clean Washington Center and US Composting Council. Updated 2003. [http://www.compostingcouncil.org/pdf/LASpecs\\_MOEA211.pdf](http://www.compostingcouncil.org/pdf/LASpecs_MOEA211.pdf). A book describing compost and compost use and including model specifications for compost to be used in landscape amendment.

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Maps and database of NYS Compost Facilities can be accessed at: <http://compost.css.cornell.edu/maps/simple-search.asp>. This can be used to identify sources of compost.



### Select a Map to View Facilities:

- All Compost Facilities
- Yardwaste Compost Facilities
- Manure Compost Facilities
- Foodscrap Compost Facilities
- Biosolids Compost Facilities
- Compost Research Farms
- Small Scale Compost Demo Sites

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