

Commercial Horticulture

# Turfgrass Disease Control -- Cultural

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To control turfgrass diseases, manage these three factors—they must occur together in just the right form for a disease to develop:

- 1) the host — a grass that is susceptible to the disease causing organism,
- 2) the pathogen — the disease causing organism (most turfgrass pathogens are fungi), and
- 3) the environment — such environmental conditions as temperature and moisture must be in the range for pathogens to be active and spread.

These three factors are like the sides of a triangle, as long as each is present the triangle is complete and there is potential for a disease to occur. If one of the three factors is missing then the triangle is broken and disease will not occur.

Understanding the disease triangle concept helps you properly identify and control turfgrass diseases. It can be used to identify diseases by excluding the pathogens that do not occur on the grass in question — or under the current environmental conditions that you observe when you notice disease symptoms. The triangle concept also can be used to control diseases, by removing any one of the three factors necessary for a disease to occur. For example, the pathogen's environment, especially in terms of water, can be manipulated in several ways. Effective strategies to reduce free water include (1) morning irrigation, (2) removing dew, and (3) reducing the amount and frequency of irrigation.

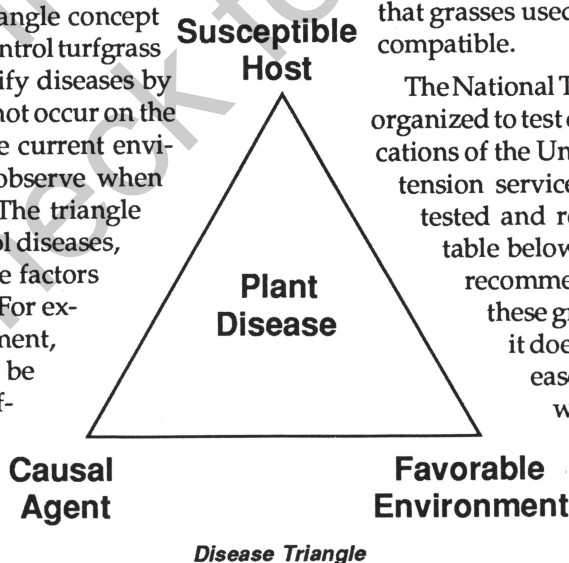
The host can be altered by choosing disease resistant cultivars and species. When manipulating the host and the environment do not provide effective disease management, then reduce the pathogens by applying appropriate chemicals that will either kill the organism or keep it from growing. You must properly identify the disease causing organisms to select the appropriate fungicide for control.

Consequently, before applying fungicides, consider controlling the host (type of grass) and the environment. Host and environmental considerations can be combined in a cultural disease control program that includes management decisions such as fertility, water, drainage, thatch removal, mowing, and resistant turfgrass species and varieties. See the Agricultural Guide on Chemical Turfgrass Disease Control for control measures using fungicides.

## Managing the Host

**Resistant Grasses:** Some diseases can be completely avoided by selecting or substituting grass species that are not susceptible to certain pathogens. For example summer patch is a severe problem on Kentucky blue grass but has little effect on perennial ryegrass and tall fescue. In this situation tall fescue could be completely substituted for Kentucky bluegrass or perennial ryegrass could be over seeded to disguise the problem. Be sure that grasses used as mixtures or over seedings are compatible.

The National Turfgrass Evaluation Program was organized to test cultivar performance in several locations of the United States. Contact your local extension service for the grasses that have been tested and recommended in your area. The table below gives disease resistant cultivars recommended for Missouri. Even though these grasses are termed disease resistant it does not mean that they are 100% disease resistant, and that no infection will occur. Instead the field evaluation process identifies cultivars that show the least amount of disease when a given trial becomes infected. Thus, many of the cultivars listed below are actually *less susceptible* to specific diseases but may not actually be *completely* disease resistant.



## Managing the Disease Environment

**Water:** Nearly all diseases require water for the development of fungal pathogens. Some disease problems such as pythium blight, brown patch, and dollar spot are accentuated by extended periods of free mois-

## Turfgrass Diseases, Resistant Varieties, and Cultural Controls

Disease Scientific Name Host	Symptoms	Cultural disease control
<p><b>Anthracnose</b> <i>Collectotrichum graminicola</i> <u>Host:</u> Annual bluegrass, fine fescue, perennial ryegrass, Kentucky bluegrass.</p>	<p>The fungus is most common on dead or senescing leaves and stems. During cool, wet periods, water soaked stem lesions later turn bleached, girdle the tiller, and cause small patches of plants or individual plants to die. During warm weather plants are stressed, lesions on individual leaves are round to elongate. Reddish brown to brown blotches appear, often surrounded by a yellow halo, that may merge to blight entire leaves. Numerous, minute, black spined fruiting bodies are often observed on the affected tissue if magnified with a 10X hand lens.</p>	<p><b>Management Practices:</b> Use adequate nitrogen, phosphorus and potassium. Avoid water stress on plants. <b>Resistant varieties</b> None</p>
<p><b>Brown patch</b> <i>Rhizoctonia solani</i> <u>Host:</u> Bermudagrasses, bluegrasses, Zoysiagrass, perennial ryegrass, fescue.</p>	<p>Brownish-purple to light brown circular area ranging from a few inches to 2 feet in diameter with close-cut turf. Under high mowing conditions, the affected area may be several feet in diameter with sunken areas of matted grass. On close-cut golf greens during periods of warm, humid weather, dark purplish smoke rings may border the area especially in early morning areas.</p>	<p><b>Management Practices:</b> Avoid summer application of nitrogen, especially soluble sources, and frequent irrigation, especially during hot humid conditions. Remove dew and guttation with a light irrigation at sunrise only when disease conditions exist. <b>Resistant varieties:</b> <i>Tall fescue:</i> Adventure, Maverick, Arid, Cimmaron, Mesa, Monarch, Rebel II, Tributt. <i>Perennial ryegrass:</i> Citation, Derby, Omega, Pennfine, Yorktown II, Manhattan II, Tara.</p>
<p><b>Dollar spot</b> <i>Lanzia</i> and <i>Mellerodiscus</i> spp. (<i>Sclerotinia homoeocarpa</i>) <u>Host:</u> All turf-grasses.</p>	<p>On closely-cut greens (3/16" to 1/4") this disease appears as dead spots about the size of a silver dollar. On home lawns, spots will be larger, about the size of a fist. Individual leaves initially have yellow-green blotches turning to a light straw color with a dark brown margin. Lesion extends across the entire leaf's width causing an hourglass, or constricted leaf appearance.</p>	<p><b>Management Practices:</b> Avoid nitrogen deficiency, drought, and night watering. If disease symptoms are present, nitrogen levels are known to be low, and water is not contributing to the problem, then a light nitrogen application (.25 to .50 lbs N/1000 sq ft) may stimulate growth and eliminate the need for fungicides. Keep thatch to a minimum. <b>Resistant varieties:</b> <i>Kentucky bluegrass:</i> Adelphi, Bonnieblue, Bristol, Eclipse, Majestic, Parade, Park, Touchdown, Vantage, Victa.</p>
<p><b>Fairy rings</b> <i>Marasmius</i> and many other mushroom fungi. <u>Host:</u> All turfgrasses.</p>	<p>Circular rings 2-10 feet in diameter. Rings may appear as semicircles on sloped areas. Rings are either yellow or darker green. They grow at a different rate than the surrounding turf. The fairy rings are caused by colonies of mushroom fungi that live in soil and thatch. Mushrooms may be seen under conditions of high soil moisture.</p>	<p><b>Management Practices:</b> Increase nitrogen fertilizer program to hide darker green ring. Core aerify and use wetting agents to increase water infiltration. Water thoroughly. More radical control measures include total removal of all the affected soil or fumigation of the affected area. <b>Resistant Varieties:</b> None</p>

## Turfgrass Diseases, Resistant Varieties, and Cultural Controls

<b>Disease</b> <i>Scientific Name</i> <u>Host</u>	<b>Symptoms</b>	<b>Cultural disease control</b>
<b>Leaf smuts</b> Stripe smut ( <i>Ustilago striiformis</i> ) Flag smut ( <i>Urocystis agropyri</i> ) <u>Host:</u> Leaf smuts - bentgrass, bluegrass, ryegrass.	Infected turfgrass plants are generally slow growing, and have a yellow or grayish cast. As the disease progresses, long yellow green streaks develop on the leaves. These become gray or black as epidermal tissue ruptures releasing black spore masses. Loss of water from the ruptured epidermal tissue results in leaf death. Scattered plants or large patches may be infected. Affected plants are systemically infected and are susceptible to other stresses.	<b>Management Practices:</b> Avoid excess nitrogen and drought. Use unfested seed or smutfree sod. If plants are infected allow grass to undergo natural dormancy periods to reduce inoculum. This practice may necessitate renovation and replanting if turf is heavily infected. <b>Resistant Varieties:</b> <i>Kentucky bluegrass:</i> Adelphi, Birka, Bonnieblue, Glade, Ram 1, Sydsport, Touchdown. Substitute ryegrasses or fescues.
<b>Leaf spots and blights</b> <i>Drechslera</i> and <i>Bipolaris</i> ( <i>Helminthosporium</i> spp.), <i>Septoria</i> , <i>Ascochyta</i> , and <i>Nigrospora</i> . <u>Host:</u> Bluegrasses, bermudagrasses, bentgrasses, fescues, ryegrasses, zoysia.	Fungi invade the leaves producing spots with definite margins. The spots may enlarge until the entire blade is affected. The leaf blight stage is not always the most important stage and plant death can occur when the crowns and roots are infected.	<b>Management Practices:</b> Avoid excess nitrogen, especially in the spring; excessive use of benomyl, thiophanates, or triadimefon; and night watering. Mild leaf spotting may not require fungicide application. Heavy spring leaf spotting should be treated in the spring since it may result in severe turf loss during the summer from crown rot. Collect and destroy clippings during periods of infection. <b>Resistant Varieties:</b> <i>Kentucky bluegrass:</i> Birka, Bonnieblue, Bristol, Enmundi, Fylking, Majestic, Parade, Ram I, Touchdown. <i>Perennial ryegrass:</i> Diplomat, Manhattan II, Omega, Player, Score, Sprinter, Yorktown II. <i>Fine fescue:</i> Atlanta, Biljart, Centurion, Checker, Jamestown, Scaldis.
<b>Powdery mildew</b> <i>Erysiphe graminis</i> <u>Host:</u> Bluegrasses, fescues, bermudagrasses.	The fungus appears as isolated tufts of gray-white growth on the upper surface of the grass blade. The mycelial growth may rapidly cover the entire blade surface giving the area a greyish-white cast. Black dots may be seen interspersed with the mycelial growth.	<b>Management Practices:</b> Powdery mildew is usually only a problem in shady locations. Several cultivars of fine fescue are better adapted for shade and are more resistant to powdery mildew than Kentucky bluegrass. Turf-type tall fescue and perennial ryegrass are also better adapted for shade than Kentucky bluegrass. Avoid excessive nitrogen. Prune trees to improve light and provide better air flow. <b>Resistant Varieties:</b> <i>Kentucky bluegrass:</i> A 34, Bristol, Eclipse, Glade, Nugget, Touchdown
<b>Pythium blight</b> (Greasy spot) <i>Pythium aphanidermatum</i> <u>Host:</u> All turfgrasses. Bentgrasses are especially susceptible.	This disease appears first as an area of water-soaked tissue which turns light brown as the leaf tissue dies. The disease pattern seen in the turf reflects the presence of poor surface drainage. Under conditions of high humidity, diseased leaves may be covered with white cob-webby mycelial strands.	<b>Management Practices:</b> Avoid excess nitrogen and water, especially in hot weather on perennial ryegrass fescue and bentgrass. Provide adequate water and air drainage. Encourage leaf surface drying on a daily basis when conditions are favorable for the disease to occur. Dew or guttation fluids can be removed from turf canopies by a light sprinkling (less than 5 minutes) shortly after day light. Removing free moisture in this manner will cause quicker canopy drying that reduces the mobility and activity of Pythium. Where dew or guttation are not present, light daily watering may favor development of the disease problem. <b>Resistant Varieties:</b> None.

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<b>Diseases</b> <i>Scientific Name</i> <u>Host</u>	<b>Symptoms</b>	<b>Cultural disease control</b>
<b>Red thread</b> <i>Laetisaria fuciformis</i> <b>Pink patch</b> <i>Limonomyces roseipellis</i> <u>Host:</u> Bentgrasses, perennial ryegrass, bermudagrasses, fine fescues, bluegrasses.	Red thread can be distinguished in the advanced stages by the presence of bright red to pink fungal structures at the tips of the affected leaves. These two diseases present similar symptoms of irregularly shaped patches of blighted grass. From a distance, the patch may have a pinkish or reddish cast. On individual leaves, the initial blighted areas can enlarge causing leaf death. During prolonged moist weather, the leaves may become covered with pink gelatinous growth.	<b>Management Practices:</b> Increase nitrogen. Collect and destroy clippings during periods of infection. <b>Resistant Varieties :</b> <i>Kentucky bluegrass:</i> A 34, Adelpia, Birka, Bonnieblue, Touchdown. <i>Perennial ryegrass:</i> Citation, NK100, NK200, Score. <i>Fine Fescue:</i> Atlantic, Biljart, Centurion, Highlight, Pennlawn, Ruby, Scaldis.
<b>Rust</b> <i>Puccinia graminis</i> <u>Host:</u> Kentucky bluegrass, perennial ryegrass, zoysia-grass.	Early infections appear as light flecking on the leaves. Epidermal tissues rupture as the disease progresses giving a rusty appearance to the leaves. A rusty orange powder can be rubbed off the leaves when the spores are mature.	<b>Management Practices:</b> Usually a problem after turf growth has been slowed by drought. Avoid nitrogen and moisture stress. Light nitrogen application at first sign of infection may help. <b>Resistant Varieties:</b> <i>Kentucky bluegrass:</i> Fylking, Park, Sydsport.
<b>Seedling blight</b> <i>Pythium , Rhizoctonia and Fusarium</i> species <u>Host:</u> All turfgrasses.	In newly seeded areas, seedlings thin or die forming irregular patches. Affected plants may become slimy and form a crust over the soil surface.	<b>Management Practices:</b> Avoid spring or summer seeding of cool season grasses. Prepare a well drained seed bed that prevents water from standing on the soil surface. <b>Resistant Varieties:</b> None.
<b>Snow molds</b> <i>Typhula:</i> rare in Missouri <i>Gerlachia miralis</i> <u>Host:</u> Bluegrass, bentgrass, fescues, ryegrass.	Typical symptoms are dead areas of grass during cool wet weather from October to April. A pink cast may be seen on the area due to accumulation of pink fungal spores. No small brown sclerotia are found associated with the dead grass.	<b>Management Practices:</b> Avoid early fall nitrogen that leads to lush growth. <b>Resistant Varieties:</b> None.
<b>Slime molds</b> <i>Myxomycetes</i> <u>Host:</u> All turfgrasses.	Small white-gray or yellowish slimy masses spread on the leaf blade. Fruiting structures develop releasing masses of powdery black spores. Essentially nonparasitic, but unsightly.	<b>Management Practices:</b> Use spray from a garden hose or a broom to remove slime mold from leaf surface. <b>Resistant Varieties:</b> None -- not needed.
<b>Spring dead spot</b> <i>Leptosphaeria korrae</i> <u>Host:</u> Bermudagrass.	<b>Bermudagrass</b> – Circular patches of bleached dead grass in spring when dormant bermudagrass resumes growth. Rough circular, bleached, dead spots appear with regrowth in the spring, varying in size from 2 inches to more than 3 feet in diameter. Sometimes the centers may survive after several years, resulting in "doughnuts." The spots often develop into rings and tend to reappear and enlarge in the same area for several years before disappearing.	<b>Management Practices:</b> Remove excess thatch when it reaches 1/2 inch. Aerify to relieve compaction and promote deep root development. Maintain balanced fertility. Promote good soil drainage. <b>Resistant Varieties:</b> Cultivars with a high level of winter hardiness are less affected by spring dead spot.



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<b>Disease</b> <i>Scientific Name</i> <u>Host</u>	<b>Symptoms</b>	<b>Cultural disease control</b>
<p><b>Summer patch</b>  <i>Magnaporthe poae</i>  <b>Necrotic Ring Spot</b>  <i>Leptosphaeria korrae</i>                      (Fusarium Blight Syndrome)  <u>Host:</u> Bluegrasses, bentgrasses, fine fescues, bermudagrasses.</p>	<p><b>Kentucky bluegrass</b> -- Dead turf patches are seen in midsummer ranging from a few inches to a foot or more across. Often an area of dead grass will have areas of green grass in the center (frog-eye). Disease usually seen in fourth or fifth year after lawn initiation and generally most severe on sunny, exposed areas that tend to dry out.</p>	<p><b>Management Practices:</b> Perennial ryegrass is not affected by this disease. Overseed Kentucky bluegrass with perennial ryegrass to reduce the noticeable damage caused by summer patch or necrotic ringspot. Avoid excess nitrogen, drought, excess water, and very close mowing. Irrigate to maintain even growth with little turf wilting. Alternate wetting and drying cycles may increase infection.  <b>Resistant Varieties:</b> <i>Kentucky bluegrass:</i> Adelphi, Enmundi, Glade, Parade, Sydsport, Touchdown, Vantage, Windsor.</p>
<p><b>Take-all patch diseases</b>  <i>Gaeumannomyces graminis</i>  <u>Host:</u> Most cool season grasses. Bentgrasses are especially susceptible.</p>	<p><b>Bentgrass</b> -- Typically appears in late spring or early summer as mahogany-brown areas of dead grass. A doughnutlike dead infection center usually occurs in pure bentgrass stands. In mixed stands, the bentgrass is killed and other grasses remain.</p>	<p><b>Management Practices:</b> Use acidifying fertilizers or sulfur to lower thatch and soil pH. Avoid applications of lime.  <b>Resistant Varieties:</b> None.</p>
<p><b>Yellow patch</b>  <i>Rhizoctonia cerealis</i>  <u>Host:</u> Kentucky bluegrass, creeping bentgrass, fescue, zoysia.</p>	<p>Light green to yellow green, yellow, tan, straw, or bronze-colored rings and crescent-shaped patches, ranging from a few inches to about 3 feet in diameter, often with green grass in the center of the circles. Smaller yellow patches usually result from infections that occur under cold, wet conditions. The patches are often sunken as a result of rapid decomposition of the thatch. The symptoms appear in cool to cold weather (optimum 40 to 60 F) in the spring, fall, and winter and resemble summer patch and necrotic ring spot.</p>	<p><b>Management Practices:</b> Nitrogen to promote recovery.  <b>Resistant Varieties:</b> None.</p>
<p><b>Zoysia patch</b>  <i>Gaeumannomyces incrustans</i>                      (suspected pathogen)  <u>Host:</u> Zoysiagrasses</p>	<p>Circular patches may be 2 to 10 feet in diameter and are usually only visible in the spring and fall but have also been observed during short periods of cool, wet and cloudy weather in the summer. In the spring symptoms will usually appear within 60 days of zoysia green-up. As zoysia greens up in the spring those areas affected by the disease will have a greater number of dead leaves, weakened roots, and a slightly sunken appearance, however, no more than 80 percent of the plants will die within the patch. Leaves at the outer edge of the patch will have a distinct yellow/orange color that results in a ring</p>	<p><b>Management Practices:</b> Not yet established.  <b>Resistant Varieties:</b> None.</p>

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Disease <i>Scientific Name</i> <u>Host</u>	Symptoms	Cultural disease control
	appearance on the periphery of the patch. As soil temperature increases the symptoms disappear and turf may sometimes fully recover in the affected areas during the summer. The patch and yellow/orange ring will usually occur in the same exact area as zoysia growth slows in the late summer and fall. The patches seem to increase one to two feet in diameter each year.	

### Missouri Turfgrass Disease Calendar

Season	Anthracnose	Brown Patch	Dollar spot	Fairy ring	Leaf smuts	Leaf spot & blight	Red thread/pink patch	Powdery mildew	Pythium blight	Rust	Seedling blight	Snow mold	Slime molds	Spring dead spot	Summer patch and necrotic ringspot	Yellow patch	Zoysia patch
Spring				X	•	•	•			X		X	X	•		X	•
Late Spring/ Early Summer	X	X	•	•		X	X		X		X		X		X		X
Summer	•	•	•	X		X	X	X	•		X		X		•		
Late Summer/ Early Fall	•	•	•	X		X	X	•	•	X	X		X		X		X
Fall			X	•	X	X		X		•		X	X				•
Winter												X		X		X	

X -- Means disease *may* occur.

• -- Means disease *most likely* to occur.

## Visual Symptoms

Lawn diseases generally show two types of visual symptoms – those affecting individual leaves and those that cause larger patches of damaged turf. Use the appropriate table to match the visual symptoms to the disease.

Leaf Symptoms	Dollar spot	Leaf spot	Ascochyta	Septoria	Nigrospora	Red thread
• Defined Lesion Margin	X	X			X	
• Pycnidia			X	X		
• Cobwebby mycelium under high humidity	X				X	
• Dies from leaf tip (sometimes)		X	X		X	X
• Straw colored or bleached	X		X			
• Yellow				X		
• Brown		X		X	X	
• Tan	X				X	X
• Purple/brown				X	X	
• Pink/tan						X

General Patch Symptoms	Pythium blight	Zoysia patch	Brown patch	Yellow patch	Summer patch and necrotic ring spot	Spring dead spot	Red thread
Cotton-like mycelium forms under high humidity							
• White	X		X				
• Pink-red							X
Patch color							
• Purple wilting at first notice	X				X		
• Pink							X
• Tan		X		X		X	
• Greasy brown/tan	X						
Ring forms							
• Yellow					X		
• Purple	X		X				
• Orange		X					
• Tan					X		
Patch type							
• Frog eye (center remains green)					X		
• Patch thinned but not entirely killed		X	X				
• Patch entirely dies	X						
• Sunken patch	X					X	

ture. Extended periods of free moisture in the turfgrass environment can be caused by dew, guttation, and frequent irrigation or rain. (*Guttation* -- water droplets that form at the tips of grass leaves.) Remove dew and guttation from grass leaves by dragging a hose across the surface, using a whipping pole, or briefly irrigating it with large droplets — only long enough to wash the dew from the surface.

The objective of all three methods is to spread the concentrated dew or guttation droplets over a larger surface area so the turf canopy will dry faster in the morning.

Improper irrigation alone may create a disease problem that normally would not exist. Avoid frequent irrigation that results in extended periods of free moisture, especially when you expect pythium, brown patch and dollar spot. In general, deep and infrequent irrigation is recommended to allow some soil and leaf drying and a gaseous exchange between soil and atmospheric air. Use drying periods to disrupt the growth cycle of some of the water loving pathogens.

However, some exception to the rule is provided by summer patch and necrotic ringspot.

Alternate wetting and drying cycles usually accentuate these diseases. Avoiding severe drying is especially important because it also may cause additional heat stress. Where summer patch and necrotic ringspot are a problem, apply water frequently enough to prevent even mild turfgrass wilt.

**Fertility:** From a disease standpoint, supply enough nitrogen so that a proper mowing is required on a weekly basis. Dollar spot, rust, red thread, and pink patch are favored when nitrogen is deficient and turfgrass leaf growth is slow. Sometimes a light application of nitrogen will produce enough active leaf growth so disease symptoms are no longer visible, and you can avoid a fungicide application. If summer patch and necrotic ringspot have caused dead turf, apply nitrogen to speed recovery of the damaged areas. Other disease problems, such as brown patch and pythium blight, can be accentuated by nitrogen application, especially from the soluble nitrogen sources applied in the summer.

Heavy spring applications of nitrogen will also encourage leafspot diseases.

Potassium has been shown to suppress disease development. Apply potassium at the same time and in the same amounts as nitrogen.

**Drainage and Air Movement:** A good exchange of air between the soil and atmosphere is necessary for vigorous turfgrass growth. Turf areas that stay constantly wet because of poor soil water drainage are prime targets for such water-loving, soil-borne diseases as pythium blight and brown patch. Surface contouring and subsurface drainage are costly but permanent solutions to wet soils.

Coring and slicing are turf management practices that can be repeated during the year to temporarily increase air exchange and soil drying. (To let in needed air, you can use a core aeration machine to punch holes into the ground and/or a slicing machine to cut grooves into it.)

You also can increase light penetration and air movement by selectively pruning your trees and shrubs. This will speed the drying of poorly drained areas and also reduce the humidity in localized turf areas on a daily basis.

**Thatch:** Essentially all turfgrass diseases are reduced by thatch control.

*Thatch* is a decayed layer of dead grass plants that is located between the soil surface and green portions of grass. It harbors active and resting stages of disease causing organisms. When environmental conditions are optimum, fungi can rapidly grow and attack living turf.

Remove excess thatch when turf is actively growing, so it will quickly recover from power-raking or verticutting — usually spring or fall on cool season grasses and mid summer on warm season grasses. Coring is a slower process of thatch removal but will cause less direct stress on the turf. Remove excess thatch when it accumulates to 1/2 inch in taller mowed turf (1.5 to 3.0 inches) and 1/8 inch in lower cut fine turf (below 0.5 inch).