

# **Pest Control for Professional Turfgrass Managers 2009**

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# ***Pest Control for Professional Turfgrass Managers***

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Recommendations of specific chemicals are based upon information on the manufacturer's label and performance in a limited number of trials. Because environmental conditions and methods of application by growers may vary widely, performance of the chemical will not always conform to the safety and pest control standards indicated by experimental data.

Recommendations for the use of agricultural chemicals are included in this publication as a convenience to the reader. The use of brand names and any mention or listing of commercial products or services does not imply endorsement by North Carolina State University or discrimination against similar products or services not mentioned. Individuals who use agricultural chemicals are responsible for ensuring that the intended use complies with current regulations and conforms to the product label. Be sure to obtain current information about usage regulations and examine a current product label before applying any chemical. The county's Cooperative Extension agent may also be of assistance.

# ***Pest Control for Professional Turfgrass Managers***

## **Introduction**

*Pest Control for Professional Turfgrass Managers* supplies up-to-date information on pesticides used to control pests in turfgrasses. The tables in this book supplement information available in other NC State Extension publications. The *Turfgrass Pest Management Manual, AG-348*, provides information that will help the reader to identify major turfgrasses and turfgrass pests, and better understand their lifecycles, symptoms, and biology. And while pollution of surface and groundwater supplies from turfgrass pesticide application is uncommon, the turf manager can use *Pesticide Selection and Water Quality for the Professional Turfgrass Manager, AG-629*, when selecting the best pesticide for a site.

Because of the risks involved, many of the very hazardous pesticides are labeled “RESTRICTED USE PESTICIDE.” Apply such products only by or under the direct supervision of certain or licensed individuals. Certain pesticides may be used only by commercial or professional and landscape personnel. “GENERAL USE” pesticides can be purchased and applied by anyone; however, anyone applying any pesticide for pay or to public property (including golf courses) must have a license or be supervised by someone with a license.

Use pesticides safely to protect people and the environment. Begin by properly diagnosing your pest problem. If a pesticide is needed, select the proper one. Always follow all label directions and obey all federal, state, and local laws and regulations concerning pesticides.

Recommendations of specific chemicals are based upon information on the manufacturer’s label and performance in a limited number of trials. Because environmental conditions and methods of application by growers may vary widely, performance of the chemical will not always conform to the safety and pest control standards indicated by experimental data.

Recommendations for the use of agricultural chemicals are included in this publication as a convenience to the reader. The use of brand names and any mention or listing of commercial products or services does not imply endorsement by North Carolina State University or discrimination against similar products or services not mentioned. Individuals who use agricultural chemicals are responsible for ensuring that the intended use complies with current regulations and conforms to the product label. Be sure to obtain current information about usage regulations and examine a current product label before applying any chemical. The county’s Cooperative Extension agent may also be of assistance.

See the following Extension publications at [www.TurfFiles.ncsu.edu](http://www.TurfFiles.ncsu.edu) for more information on turfgrass management:

- *Turfgrass Pest Management Manual, AG-348*  
Crop Science Extension, Box 7620, N.C. State University, Raleigh, NC 27695-7620
- *Pesticide Selection and Water Quality for the Professional Turfgrass Manager, AG-629*  
Publications, CALS Communication Services, Box 7603, N.C. State University, Raleigh, NC 27695-7603
- *2009 North Carolina Agricultural Chemicals Manual*  
Publications, CALS Communication Services, Box 7603, N.C. State University, Raleigh, NC 27695-7603  
<http://ipm.ncsu.edu/agchem/agchem.html>

**COMMERCIAL TURF INSECT CONTROL**  
**R. L. BRANDENBURG, Entomology Extension**

**INSECT CONTROL IN COMMERCIAL TURF**

<b>Pest</b>	<b>Insecticide and Formulation</b>	<b>Amount Per 1,000 Sq Ft</b>	<b>Precautions and Remarks</b>
<b>ANT (Also see IMPORTED FIRE ANT)</b>	bifenthrin* (Menace, Talstar, others) F, GC; G form also available	0.5 to 1 fl oz	Use GC formulation for golf courses.
	carbaryl* (Sevin) 80 WSP	1 to 1.5 oz	
	chlorpyrifos* (Dursban) 2E, 4E, 2G, 50 WP, Pro	See label	For use on golf courses. See new label.
	chlothianidin + bifenthrin (Aloft)	See label	
	cyfluthrin (Tempo 2)	0.143 fl oz	Home lawns only.
	cypermethrin* (Demon) TC	See label	
	deltamethrin (Deltagard) G	2 to 3 lb/1,000 ft	
	fipronil (bait)	See label	
	hydramethylnon* (Maxforce G, Amdro)	See label	
	lambda-cyhalothrin* (Battle, Scimitar WP, CS, GC)	See label	Do not make applications within 20 feet of any body of water. No reentry until spray has dried.
<b>BEE and WASP (Burrowing)</b>	carbaryl* (Sevin) 80 WSP	1.5 oz	
	pyrethroids* (Advanced Garden, Battle, Deltagard, Menace, Scimitar, Talstar, Tempo)	See label	
<b>BILLBUG</b>	bifenthrin* (Menace, Talstar, others) F, GC; G form also available	0.25 to 0.5 fl oz	Use GC formulation for golf courses.
	chlorantraniliprole (Acelepryn)	0.184 to 0.46 fl oz	
	chlorpyrifos* (Dursban) 50 WSP, Pro	See label	For use on golf courses; check new label.
	clothianidin (Arena) .5G 50 WDG	14 to 22 oz 0.15 to 0.22 oz	
	chlothianidin + bifenthrin (Aloft)	See label	
	deltamethrin (Deltagard) G	2 to 3 lb/1,000 ft	
	imidacloprid* (Merit) 75 WSP	3 to 4 level tsp	Make application prior to egg hatch.
	imidacloprid + bifenthrin (Allectus, Atera)	See label	Rate varies with pest. Different formulations for different sites.
	lambda-cyhalothrin* (Battle, Scimitar WP, CS, GC)	See label	Observe restrictions near water.
	propoxur (Baygon) 1.5 fl oz	1 pt	Treat area thoroughly. Use at least 15 gal water per 1,000 sq ft. Do not allow spray mixture to stand overnight. Mow grass before treatment.
	thiamethoxam (Meridian) 0.33 G 25 WG	60 to 80 lb/acre 12.7 to 17 oz/acre	Optimum control when applied from peak flight of adults to peak of egg hatch. Also suppresses mole crickets and chinch bugs.

**INSECT CONTROL IN COMMERCIAL TURF**

Pest	Insecticide and Formulation	Amount Per 1,000 Sq Ft	Precautions and Remarks
CHINCH BUG	acephate* (Orthene T, T&O) 75 S	1.2 to 2.4 oz	
	<i>Beauveria bassiana</i> (Botanigard, Naturalis-T)	See label	
	bifenthrin* (Menace, Talstar, others) F, GC; G form also available	0.25 to 0.5 fl oz	Use GC formulation for golf courses.
	carbaryl* (Sevin) 80 WSP	2.5 to 3 oz	
	chlorantraniprole (Acelepryn)	0.0184 to 0.46 fl oz	Suppression
	chlothianidin (Arena) .5G 50 WDG	1.4 to 1.8 lb 0.2 to 0.3 oz	
	chlothianidin + bifenthrin (Aloft)	See label	
	cypermethrin (Demon) TC	0.33 to 0.65 fl oz	
	chlorpyrifos* (Dursban), 2E, 4E, 50 WP, Pro	See label	For use on golf courses; check new label.
	cyfluthrin (Tempo 2)	0.2 fl oz	Home lawns only.
	deltamethrin (Deltagard) G	2 to 3 lb/1,000 ft	
	imidacloprid + bifenthrin (Allectus, Atera)	See label	Rate varies with pest. Different formulations for different sites.
	lambda-cyhalothrin* (Battle, Scimitar WP, CS, GC)	See label	Do not make applications within 20 feet of any body of water. No reentry until spray has dried.
permethrin* (Astro)	0.4 to 0.8 fl oz		
CUTWORM, ARMYWORM	acephate* (Orthene T, T&O)	1.2 to 2.4 oz	Commercial and residential turf only.
	azadirachtin* (Neemix, Turplex)	See label	
	bifenthrin* (Menace, Talstar, others) F, GC; G form also available	0.18 to 0.25 fl oz	Use GC formulation for golf courses.
	<i>Bt</i> products, various labels	See label	
	carbaryl* (Sevin) 80 WSP and baits	0.75 to 1.5 oz	Treat in late afternoon. Apply in adequate water for good coverage but do not flood or water in. Do not cut grass for 1 to 3 days after treatment.
	chlorantraniliprole (Acelepryn)	0.046 to 0.092 fl oz	
	chlorpyrifos* (Dursban) 4 E, 2 ES, 50 WP, Pro	See label	For use on golf courses; check new label.
	chlothianidin (Arena) .5G 50 WDG	1.4 to 1.8 lb 0.2 to 0.3 oz	Cutworms only.
	chlothianidin + bifenthrin (Aloft)	See label	
	cyfluthrin* (Tempo 2)	0.143 fl oz	Home lawns only.
deltamethrin (Deltagard) G	2 to 3 lb/1,000 ft		

**INSECT CONTROL IN COMMERCIAL TURF**

<b>Pest</b>	<b>Insecticide and Formulation</b>	<b>Amount Per 1,000 Sq Ft</b>	<b>Precautions and Remarks</b>
<b>CUTWORM, ARMYWORM</b> (continued)	entomogenous nematodes*	See label	Read and follow special application instructions. Effective only against small cutworms.
	halofenozide* (Mach 2) 2 SC 1.5 G	1.5 fl oz 1 lb	Can be used two times per season at these rates.
	imidacloprid + bifenthrin (Allectus, Atera)	See label	Rate varies with pest. Different formulations for different sites.
	indoxacarb (Provaunt) SC	0.0625 to 0.25 fl oz	Not labeled for use on sod farms.
	lambda-cyhalothrin* (Battle, Scimitar WP, CS, GC)	See label	Do not make applications within 20 feet of any body of water. No reentry until spray has dried.
	spinosad A or D (Conserve) SC	0.25 to 1.25 fl oz	Rate varies with size and species.
	trichlorfon (Dylox, Proxol) 80 SP	1.5 to 3 oz	
<b>EARTHWORM</b>			Usually not a problem. No effective controls available.
<b>FALL ARMYWORM</b>	acephate* (Orthene, T, T&O)	0.5 to 1.2 oz	Water in immediately after application.
	chlorantraniliprole (Acelepryn)	0.046 to 0.092 fl oz	
	chlorpyrifos* (Dursban) 4 E, 2 E, 50WP, Pro	See label	For use on golf courses; check new label.
	halofenozide* (Mach 2) 2 SC 1.5 G	1.5 fl oz 1 lb	Can be used two times per season at these rates.
	indoxacarb (Provaunt) SC	0.0625 to 0.25 fl oz	Not labeled for use on sod farms.
	pyrethroids* (Advanced Garden, Battle, Deltagard, Menace, Scimitar, Talstar, Tempo)	See label	
<b>GRASSHOPPER</b>	acephate* (Orthene T, T&O)	0.5 oz	Do not mow turfgrass for at least 24 hr after application.
	deltamethrin (Deltagard) G	2 to 3 lb/1,000 ft	
	lambda-cyhalothrin* (Battle, Scimitar WP, CS, GC)	See label	Do not make applications within 20 ft of any body of water. No reentry until spray has dried.
<b>GROUND PEARL</b>			No effective control—practice good management.
<b>GRUB (white, May beetle, chafers, green June beetle, and others)</b>	carbaryl* (Sevin) 80 WS	3 oz	
	chlorantraniliprole (Acelepryn)	0.184 to 0.367 fl oz	Optimum when applied at egg hatch. Use higher rates later in summer.
	clothianidin (Arena) .5G 50 WDG	14 to 22 oz 0.15 to 0.22 oz	Mole cricket suppression.
	clothianidin + bifenthrin (Aloft)	See label	
	halofenozide* (Grubex, Mach 2) 2 SC 1.5 G	2.9 fl oz 3 lb	Apply during egg hatch or early instar grub development.
	imidacloprid* (Merit) 75 WP	3 to 4 level tsp	Make application prior to egg hatch. (Offers some suppression of caterpillars.)
	imidacloprid + bifenthrin (Allectus, Atera)	See label	Rate varies with pest. Different formulations for different sites.
	thiamethoxam (Meridian) 0.33 G 25 WG	60 to 80 lb/acre 12.7 to 17 oz/acre	Optimum control when applied from peak flight of adults to peak of egg hatch. Also suppresses mole crickets and chinch bugs.
	trichlorfon (Dylox, Proxol) 80 SP	3.75 oz	

**INSECT CONTROL IN COMMERCIAL TURF**

Pest	Insecticide and Formulation	Amount Per 1,000 Sq Ft	Precautions and Remarks
<b>GRUB, GREEN JUNE BEETLE (only)</b>	carbaryl* (Sevin) 80 WSP	1 to 1.5 oz	
	chlorantraniliprole (Acelepryn)	0.184 to 0.367 fl oz	Optimum when applied at egg hatch. Use higher rates later in summer.
	chlorpyrifos* (Dursban) 50 WSP, Pro	See label	For use on golf courses; see new label.
	clothianidin (Arena) .5G 50 WDG	14 to 22 oz 0.15 to 0.22 oz	Mole cricket suppression.
	chlothianidin + bifenthrin (Aloft)	See label	
	halofenozide* (Grubex, Mach 2) 2 SC 1.5 G	2.9 fl oz 3 lb	Apply during egg hatch or early instar grub development.
	imidacloprid* (Merit) 75 WP	3 to 4 level tsp	Make application prior to egg hatch. Do not use on sod farms. (Offers some suppression of caterpillars.)
	imidacloprid + bifenthrin (Allectus, Atera)	See label	Rate varies with pest. Different formulations for different sites.
	thiamethoxam (Meridian) 0.33 G 25 WG	60 to 80 lb/acre 12.7 to 17 oz/acre	Optimum control when applied from peak flight of adults to peak of egg hatch. Also suppresses mole crickets and chinch bugs.
<b>GRUB (Japanese beetle)</b>	<i>Bt</i> , various products	See label	
	carbaryl* (Sevin) 80 WSP	3 oz	
	chlorantraniliprole (Acelepryn)	0.184 to 0.367 fl oz	Optimum when applied at egg hatch. Use higher rates later in summer.
	chlothianidin + bifenthrin (Aloft)	See label	
	clothianidin (Arena) .5G 50 WDG	14 to 22 oz 0.15 to 0.22 oz	Mole cricket suppression.
	halofenozide* (Grubex, Mach 2) 2 SC 1.5 G	2.9 fl oz 3 lb	Apply during egg hatch or early instar grub development.
	imidacloprid* (Merit) 75 WP	3 to 4 level tsp	Make application prior to egg hatch. (Offers some suppression of caterpillars.)
	imidacloprid + bifenthrin (Allectus, Atera)	See label	Rate varies with pest. Different formulations for different sites.
	milky disease spore*	See label	
	thiamethoxam (Meridian) 0.33 G 25 WG	60 to 80 lb/acre 12.7 to 17 oz/acre	Optimum control when applied from peak flight of adults to peak of egg hatch. Also suppresses mole crickets and chinch bugs.
<b>IMPORTED FIRE ANT</b> (See <a href="http://www.agr.nc.us/plantind/plant/entomol/ifamap.htm">www.agr.nc.us/plantind/plant/entomol/ifamap.htm</a> for latest quarantine areas.)	acephate* (Lescro-Fate) (Orthene, T, T&O) 75 S (Precise 4G)	See label 1 to 2 tsp/mound 4 oz/mound	Distribute uniformly over mound. For best results apply in early morning or late afternoon.
	hydramethylnon* (Amdro) 0.88% bait  (Maxforce G)	—  See label	Uniformly broadcast 1 to 1.5 lb of bait per acre with ground equipment on pastures, range grasses, lawns, and nonagricultural lands. Or distribute uniformly 5 level tbsp of bait 3 to 4 ft around base of each mound. Do not exceed 1.5 lb per acre.
	avermectin/B1 (Affirm) 0.011% bait	5 to 7 tbsp/mound	Distribute uniformly 5 to 7 level tbsp of bait 3 to 4 ft around base of each mound.
	bifenthrin* (Menace, Talstar, others) F G form also available	—	Follow label directions.
	chlorpyrifos* (Dursban) 4 E	See label	
	chlothianidin + bifenthrin (Aloft)	See label	
	deltamethrin (Deltagard) G	2 to 3 lb/	

**INSECT CONTROL IN COMMERCIAL TURF**

<b>Pest</b>	<b>Insecticide and Formulation</b>	<b>Amount Per 1,000 Sq Ft</b>	<b>Precautions and Remarks</b>
<b>IMPORTED FIRE ANT</b> (continued)	fenoxycarb (Award) 1 B	1 to 3 level tbsp 1 to 1.5 lb/acre	Single mound treatment. Apply uniformly with ground equipment.
	spinosad (Justice bait)	See label	
	fipronil (Maxforce) .00015  (Topchoice) 0.0143	0.5 to 5.5 oz 5 tbs/mound 2 lb	Apply as a broadcast. May treat mounds up to four times per year.  Apply as a broadcast.
	imidacloprid + bifenthrin (Allectus, Atera)	See label	Rate varies with pest. Different formulations for different sites.
	indoxacarb (Advion) bait	1.5 lb/acre	Bait formulation.
	lambda-cyhalothrin* (Battle, Scimitar, GC, CS)	See label	
	methoprene (Extinguish) 0.5 % bait	1.5 lb/acre	Mound or broadcast.
	methoprene + hydromethylnon (Extinguish Plus)	1.5 lb/acre	
	pyriproxyfen (Distance Fire Ant Bait)	See label	Mound or broadcast.
<b>LEAFHOPPER, SPITTLEBUG</b>	acephate* (Orthene, T, T&O) 75 S	1 oz	
	bifenthrin* (Menace, Talstar, others) F, GC; G form also available	0.25 to 0.5 fl oz	Use GC formulation for golf courses.
	carbaryl* (Sevin) 80 WSP	0.75 to 1.5 oz	
	chlorpyrifos* (Dursban) 4 E, 50 WSP, Pro	See label	For use on golf courses; check new label.
	deltamethrin (Deltagard) G	2 to 3 lb	
<b>MILLIPEDE</b>	bifenthrin* (Menace, Talstar, others) F, GC; G form also available	0.25 to 0.5 fl oz	Use GC formulation for golf courses.
	carbaryl* (Sevimol) (Sevin) 80 WSP	1.5 to 3 oz 0.75 to 1.5 oz	
	chlorpyrifos* (Dursban) 2 E, Pro	See label	For use on golf courses; check new label.
	cypermethrin (Demon) TC	See label	
	lambda-cyhalothrin* (Battle, Scimitar WP, CS, GC)	See label	Do not make applications within 20 ft of any body of water. No reentry until spray has dried.
<b>MOLE CRICKET</b>	acephate* (Orthene T, T&O, Lesco-Fate) (Precise 4G)	1 to 1.9 oz 2.8 lb	Water soil before application. Do not water in. Apply within 2 weeks of egg hatch for prevention. Irrigate immediately.
	bifenthrin* (Menace, Talstar, others) F, GC; G form also available	0.5 to 1 fl oz	Use GC formulation for golf course.
	carbaryl* (Sevin) baits	See label	
	chlorpyrifos* (Dursban) B		
	cyfluthrin* (Tempo 2, Tempo Ultra)	0.2 fl oz	Home lawn use only.
	deltamethrin (Deltagard) G	2 to 3 lb	
	entomogenous nematodes*	See label	Various formulations now available. Adequate soil moisture critical for good control.
	fipronil (Chipco Choice) 0.1 G (Top Choice) 0.0143	2 lb	Use slit placement equipment. Apply as a broadcast.
	imidacloprid (Merit) 75 WP 0.5G	4 level tsp 1.8 lb	Apply while crickets are less than ½ inch long (June, early July).
	imidacloprid + bifenthrin (Allectus, Atera)	See label	Rate varies with pest. Different formulations for different sites.
	indoxacarb (Advion) bait	50 to 200 lb/acre	Not for use on sod farms.
	indoxacarb (Provaunt)	0.275 oz	Must be in possession of a supplemental label for this use at the time of application.

**INSECT CONTROL IN COMMERCIAL TURF**

<b>Pest</b>	<b>Insecticide and Formulation</b>	<b>Amount Per 1,000 Sq Ft</b>	<b>Precautions and Remarks</b>
<b>MOLE CRICKET</b> (continued)	lambda-cyhalothrin* (Battle, Scimitar WP, CS, GC)	See label	Do not make applications within 20 feet of any body of water. No reentry until spray has dried.
	propoxur (Baygon)	See label	
<b>SLUG, SNAIL</b>	Mesurool 2 B	1 lb	Apply late in afternoon.
	metaldehyde	See label	
<b>SOD WEBWORM</b>	acephate* (Lesco-Fate, Orthene T, T&O) (Precise 4G)	0.5 to 1 oz 2.8 lb	Home lawns only. Irrigate immediately.
	azadirachtin* (Azatrol, Neemix, Turplex)	0.5 fl oz	
	<i>Bacillus thuringiensis</i> , various brands	1 to 2 lb/acre	
	bifenthrin* (Menace, Talstar, others) F, GC; G form also available	0.18 to 0.25 fl oz	Use GC formulation for golf courses.
	carbaryl* (Sevin) 80 WSP	2.5 to 3 oz	
	chlorantraniprole (Acelepryn)	0.046 to 0.092 fl oz	
	chlorpyrifos* (Dursban) 4 E, 2 E, 5 G, Pro	See label	For use on golf courses; check new label.
	clothianidin (Arena) .5G 50 WDG	14 to 22 oz 0.15 to 0.22 oz	
	chlothianidin + bifenthrin (Aloft)	See label	
	cyfluthrin* (Tempo 2, Tempo Ultra)	0.143 fl oz	Irrigate immediately after application. Do not apply to newly seeded stands or bentgrass.
	deltamethrin (Deltagard) G	2 to 3 lb	
	halofenozide (Mach 2) 2 SC 1.5 G	1.5 fl oz 1 lb	Can be used two times per season at these rates.
	imidaclopid + bifenthrin (Allectus, Atera)	See label	Rate varies with pest. Different formulations for different sites.
	indoxacarb (Provaunt) SC	0.0625 to 0.25 fl oz	Not labeled for use on sod farms.
	lambda-cyhalothrin* (Scimitar WP, CS, GC) (Battle)	See label	Do not make applications within 20 feet of any body of water. No reentry until spray has dried.
	methomyl (Lannate) 90 SP	0.4 to 0.8 oz	
	permethrin* (Astro)	0.4 to 0.8 fl oz	
spinosad A and D (Conserve) SC	0.25 to 1.25 fl oz	Rate varies with size and species.	
trichlorfon* (Dylox, Proxol) 80 SP	1.5 to 3 oz		
<b>SOWBUG, PILLBUG</b>	bifenthrin* (Talstar) F, GC G form also available	0.25 to 0.5 fl oz	Use GC formulation for golf courses.
	carbaryl* (Sevin) 80 WSP	0.75 to 1.5 oz	
	cypermethrin* (Demon) TC	See label	
	deltamethrin (Deltagard) G	2 to 3 lb	
	lambda-cyhalothrin* (Battle, Scimitar WP, CS, GC)	See label	Do not make applications within 20 feet of any body of water. No reentry until spray has dried.

\* Several tradenames available. Check label for active ingredient. Always follow label instructions.

## CHEMICAL WEED CONTROL IN LAWNS AND TURF

F. H. YELVERTON, L. S. WARREN JR., and T. W. GANNON, Crop Science Department

Several of the preemergence herbicides are available on fertilizer carriers for homeowner application.

### CHEMICAL WEED CONTROL IN LAWNS AND TURF

Weed	Herbicide and Formulation	Amount of Formulation Per 1,000 sq ft	Amount of Formulation Per Acre	Pounds Active Ingredient Per Acre	Precautions and Remarks
<b>Preemergence Control SMOOTH and LARGE CRABGRASS, FOXTAILS, other annual grasses</b>	benefin (Balan 2.5 G) 2.5 G	2.75 lb	120 lb	3	Safe to apply to all established turfgrass except bentgrass. Do not apply in the spring to lawns seeded the previous fall or to golf course greens. Do not use on newly sprigged turfgrasses.
	benefin + trifluralin (Team 2 G) 2 G (Team Pro 0.86%) 0.86 G	3.5 lb 8 lb	150 lb 349 lb	3	Use on lawns and golf course fairways of bahiagrass, bentgrass, bermudagrass, centipedegrass, fescue, perennial ryegrass, St. Augustinegrass, and zoysiagrass.
	bensulide (Bensumec or Betasan) 4 EC (PreSan) 12.5 G (PreSan) 7 G		varies because several concentrations available	10	May be applied to all established turfgrass and dichondra. Do not use on newly sprigged turfgrasses.
	bensulide + oxadiazon (Goosegrass/Crabgrass Control) 6.56 G	2.6 lb	116 lb	6 + 1.5	Controls crabgrass and goosegrass. Use on established bermudagrass, zoysiagrass, tall fescue, bentgrass, perennial bluegrass, or perennial ryegrass fairways and tees. Use also on bermudagrass and bentgrass greens.
	dithiopyr (Dimension) 1 EC (Dimension 2 EW) 2 EW (Dimension Ultra WSP or Dithiopyr 40 WSB) 40 WP	1.5 fl oz 0.75 fl oz 0.46 oz	2 qt 1 qt 20 oz	0.5	May be applied to all cool-season and warm-season turfgrasses except colonial bentgrass. See label for injury precautions regarding certain varieties. Also controls pre-tillered crabgrass. Split applications recommended in southern and coastal regions of the state. Timely irrigation or rainfall is critical for activation.
	metolachlor (Pennant Liquid) 8 EC (Pennant) 5 G	1.5 fl oz 1.8 lb	4 pt 80 lb	4	Apply to established bermudagrass, centipedegrass, St. Augustinegrass, bahiagrass, and zoysiagrass.
	napropamide (Devrinol) 50 WDG (Devrinol) 5 G	1.5 to 2.2 oz 0.9 to 1.4 lb	4 to 6 lb 40 to 60 lb	2 to 3	Use in established bahiagrass, bermudagrass, centipedegrass, St. Augustinegrass, and tall fescue.
	oryzalin (Oryzalin 4 Pro or Surflan A.S.) 4 AS	1.5 fl oz	2 qt	2	Use on established bahiagrass, centipedegrass, tall fescue, St. Augustinegrass, zoysiagrass, and bermudagrass except greens and tees. A total of 3 qt per acre may be used if application is split by applying 1.5 qt per acre followed by 1.5 qt per acre 8 to 10 weeks later. Follow label directions. Do not apply in the spring or summer to tall fescue reseeded the previous fall.
	oxadiazon (Oxadiazon 2G) 2 G (Ronstar G or Regal Ronstar A.C.) 2 G	2.3 to 4.6 lb 2.3 to 3.4 lb	100 to 200 lb 100 to 150 lb	2 to 4 2 to 3	Use in established perennial bluegrass, perennial ryegrass, bentgrass, bermudagrass, tall fescue, zoysiagrass, and St. Augustinegrass. Red fescue is not tolerant. Do not apply to dichondra, centipedegrass, putting greens or tees, or to newly seeded areas. Do not apply to bentgrass mowed at less than 3/8 in. Do not apply to wet turf. Rainfall or irrigation after application will improve weed control activity. May be applied when sprigging bermudagrass and zoysiagrass. Do not apply to home lawns.
	(Oxadiazon 50 WSB or Ronstar 50 WSB) 50 WP	1.5 to 2.2 oz	4 to 6 lb	2 to 3	Use in dormant, established bermudagrass, St. Augustinegrass, and zoysiagrass in fairways and parks. Should be applied at least 2 to 3 weeks before greenup of turf. May be applied when sprigging bermudagrass and zoysiagrass. Do not use on home lawns.
(Ronstar Flo) 3.17 F	1.85 fl oz	2.52 qt	2	Use in dormant, established bermudagrass, St. Augustinegrass, and zoysiagrass in fairways and parks. May apply when sprigging bermudagrass. Make application at least 2 to 3 weeks before greenup of turf. Do not use on home lawns.	

**CHEMICAL WEED CONTROL IN LAWNS AND TURF**

<b>Weed</b>	<b>Herbicide and Formulation</b>	<b>Amount of Formulation Per 1,000 sq ft</b>	<b>Amount of Formulation Per Acre</b>	<b>Pounds Active Ingredient Per Acre</b>	<b>Precautions and Remarks</b>
<b>Preemergence Control SMOOTH and LARGE CRABGRASS, FOXTAILS, other annual grasses</b> (continued)	oxadiazon + benefin (Regalstar) 1.5 G	4.5 lb	200 lb	2 + 1	Use on turf and golf courses of bermudagrass, centipede-grass, St. Augustinegrass, zoysiagrass, bentgrass (fairways only), bluegrass, ryegrass, and tall fescue. Do not use on home lawns. Product contains 38% N. Apply to dry foliage.
	oxadiazon + prodiamine (Regalstar II) 1.2 G	4.5 lb	200 lb	2 + 0.4	Use on turf and golf courses (excluding putting greens) of established bermudagrass, zoysiagrass, St. Augustinegrass, ryegrass, centipede-grass, bentgrass, bluegrass, and tall fescue. Product contains 38% N. Apply to dry foliage.
	pendimethalin (Pre-M or Weedgrass Control) 60 WP (Pre-M 3.3 EC) 3.3 EC	1.8 oz 2.7 fl oz	5 lb 7.3 pt	3	Use on established bahiagrass, bermudagrass, centipede-grass, fine fescue, Kentucky bluegrass, perennial ryegrass, St. Augustinegrass, tall fescue, and zoysiagrass. Do not use on winter-overseeded grasses.
	pendimethalin (Pendulum AquaCap) 3.8 CS	1.15 to 2.3 fl oz	3.1 to 6.3 pt	1.5 to 3	Use on noncropland as well as established nonresidential and residential turf areas mowed at least 4 times consisting of bahiagrass, bermudagrass, buffalograss, centipede-grass, St. Augustinegrass, zoysiagrass, Kentucky bluegrass, perennial ryegrass, bentgrass, established <i>Poa annua</i> (0.5 inch height or taller), fine fescue, and tall fescue. Do not use on bentgrass or <i>Poa annua</i> greens and tees. If lower rate is applied initially, repeat in 6 to 8 weeks for extended control. Do not reseed or overseed into treated turfgrass for 3 months, or sprig turfgrass for 5 months following application. Do not exceed 4.2 pt per acre on residential and sod farm turfgrass.
	prodiamine (Barricade 65 WG) 65 WG (Barricade 4 FL) 4 FL	0.28 to 0.4 oz 0.23 to 1.1 fl oz	0.75 to 1.5 lb 0.625 to 3 pt	0.5 to 1 0.3125 to 1.5	May be used on established bahiagrass, bermudagrass, centipede-grass, St. Augustinegrass, zoysia, tall fescue, creeping red fescue, perennial bluegrass and ryegrass, and creeping bentgrass. Do not apply to greens. May apply when sprigging or plugging bermudagrass.
	(Prodiamine 65 WDG or RegalKade 65 WDG) 65 WG	0.185 to 0.83 oz	0.5 to 2.3 lb	0.325 to 1.5	
	(RegalKade) 0.5 G	1.5 to 6.9 lb	64 to 300 lb	0.32 to 1.5	See precautions for Barricade except may be used on established turf only. Do not apply more than 150 lb per acre per application. Do not make more than two applications per calendar year. Wait at least 60 days after initial application before making a second application. Prodiamine is coated on a 32-3-12 dry fertilizer carrier.
siduron (Tupersan) 50 WP	7.3 oz	20 lb	10	Use only on bluegrass, fescue, perennial ryegrass, and certain bentgrasses (check label). Can be used at the rate of 8 lb of formulation when seeding bentgrass, bluegrass, fescue, and ryegrass. Can also be used in newly sprigged or established zoysia. Do not use on bermudagrass, carpetgrass, or centipede-grass.	
<b>Preemergence Control ANNUAL BLUEGRASS (<i>Poa annua</i>)</b>	benefin + trifluralin (Team 2 G) 2 G	2.27 lb	100 lb	2	Apply during late summer before <i>Poa annua</i> germinates. Do not apply to turf areas that are to be overseeded. See section on preemergence control of crabgrass or product labels for turfgrass tolerance.
	bensulide (Betasan or Bensumec) 4 EC (PreSan) 12.5 G (PreSan) 7 G		several concentrations available	12.5	
	dithiopyr (Dimension) 1 EC (Dimension 2 EW) 2 EW (Dimension Ultra WSP or Dithiopyr 40 WSB) 40 WP	1.5 fl oz 0.75 fl oz 0.46 oz	2 qt 1 qt 20 oz	0.5	Timely irrigation or rainfall is critical for activation.
	metolachlor (Pennant Liquid) 8 EC (Pennant) 5 G	0.7 to 1.5 fl oz 0.9 to 1.8 lb	2 to 4 pt 40 to 80 lb	2 to 4	

**CHEMICAL WEED CONTROL IN LAWNS AND TURF**

<b>Weed</b>	<b>Herbicide and Formulation</b>	<b>Amount of Formulation Per 1,000 sq ft</b>	<b>Amount of Formulation Per Acre</b>	<b>Pounds Active Ingredient Per Acre</b>	<b>Precautions and Remarks</b>
<b>Preemergence Control ANNUAL BLUEGRASS (<i>Poa annua</i>) (continued)</b>	napropamide (Devrinol) 50 WDG (Devrinol) 5 G	1.5 to 2.25 oz 0.9 to 1.4 lb	4 to 6 lb 40 to 60 lb	2 to 3	
	oryzalin (Oryzalin 4 Pro or Surflan A.S.) 4 AS	1.1 fl oz	1.5 qt	1.5	
	oxadiazon (Ronstar G or Regal Ronstar A.C.) 2 G	2.3 lb	100 lb	2	
	(Oxadiazon 2G) 2 G	2.3 to 4.6 lb	100 to 200 lb	2 to 4	
	pendimethalin (Pre-M or Weedgrass Control) 60 WP (Pre-M 3.3 EC) 3.3 EC (Pendulum AquaCap) 3.8 CS	1.2 oz 1.8 fl oz 1.15 to 1.55 fl oz	3.34 lb 4.9 pt 3.1 to 4.2 pt	2 1.5 to 2	
	prodiamine (Barricade 65 WG) 65 WG (Barricade 4 FL) 4 FL	0.28 to 0.4 oz 0.23 to 1.1 fl oz	0.75 to 1.5 lb 0.625 to 3 pt	0.5 to 1 0.3125 to 1.5	
	(Prodiamine 65 WDG or RegalKade 65 WDG) 65 WG	0.185 to 0.83 oz	0.5 to 2.3 lb	0.325 to 1.5	
pronamide (Kerb WSP) 50 WP	0.75 to 1 oz	2 to 3 lb	1 to 1.5	Gives preemergence and postemergence control. Apply September 15 to February 1. Can also be used for removal of overseeded grasses; therefore, do not overseed grass if it is desired to maintain a stand. Do not overseed treated area within 90 days of treatment. Injury symptoms from postemergence applications are slow to develop. Use on bermudagrass, zoysiagrass, St. Augustinegrass, and centipedegrass.	
<b>Preemergence Control ANNUAL BLUEGRASS in OVERSEEDED BERMUDAGRASS</b>	benefin (Balan) 2.5 G	2.75 lb	120 lb	3	Apply in late summer before <i>Poa annua</i> germinates. Perennial ryegrass can be overseeded 6 weeks after Balan 2.5 G is applied.
	dithiopyr (Dimension 2 EW) 2 EW (Dimension Ultra WSP or Dithiopyr 40 WSB) 40 WP	0.75 fl oz 0.46 oz	1 qt 20 oz	0.5	Apply in late summer before <i>Poa annua</i> germinates. Perennial ryegrass can be overseeded 6 to 8 weeks after application. Apply only on well-established bermudagrass. Do not reapply in fall or winter after overseeding unless injury can be tolerated.
	prodiamine (Barricade 65 WG) 65 WG	0.213 to 0.367 oz	0.58 to 1 lb	0.89 to 1.54	Use on golf courses (excluding putting greens) when overseeding with perennial ryegrass at a minimum seeding rate of 350 lb per acre. Apply 8 to 10 weeks before overseeding and expect 70 percent or greater control. For best potential control, use higher rate and shorter time interval before overseeding. However, this could increase ryegrass seedling mortality or temporarily reduce root growth.
<b>Preemergence Control ANNUAL BLUEGRASS in OVERSEEDED BERMUDAGRASS GREENS AND TEES</b>	fenarimol (Rubigan) 50 WSP (Rubigan A.S.) 1 AS	1 to 1.5 oz 4 to 6 fl oz	44 to 65 oz 1.375 to 2.11 gal	1.4 to 2	Use as a preemergence program in bermudagrass greens and tees to be overseeded. Use two or three applications to reach a total of 3 oz per 1000 sq ft for the 50 WSP or 12 oz per 1000 sq ft for the 1 AS. Rubigan should be applied before the germination of <i>Poa annua</i> and the last application 14 days before overseeding with perennial ryegrass or 30 days prior to overseeding with <i>Poa trivialis</i> or bentgrass. In North Carolina <i>Poa annua</i> germination can occur from late August to mid-September under irrigated conditions. See label for timing of applications and other precautions.

**CHEMICAL WEED CONTROL IN LAWNS AND TURF**

Weed	Herbicide and Formulation	Amount of Formulation Per 1,000 sq ft	Amount of Formulation Per Acre	Pounds Active Ingredient Per Acre	Precautions and Remarks
<b>Preemergence and Postemergence Control ANNUAL BLUEGRASS</b>	ethofumesate (Prograss) 1.5 EC	2 fl oz	2.67 qt	1	For control of annual bluegrass in dormant bermudagrass overseeded with perennial ryegrass or in established perennial ryegrass turf. Rates are per application. The first application should be 30 to 45 days after overseeding with perennial ryegrass. The second application should be 21 to 28 days later. Do not apply Prograss to overseeded bermudagrass after January 1 in North Carolina.
	(PoaConstrictor) 4 SC	0.55 to 1.47 fl oz	1.5 to 4 pt	0.75 to 2	Must be professionally applied to residential and nonresidential turf including golf courses and sod farms. May be applied to established perennial ryegrass, Kentucky bluegrass, creeping bentgrass, tall fescue, St. Augustinegrass, and dormant bermudagrass. Do not apply to putting greens. Delay application at least 8 weeks after a pgr application. Fall annual bluegrass control best during period of maximum germination. Spring applications most effective following fall applications. For overseeded bermudagrass, apply 1 to 2 weeks after perennial ryegrass emergence and repeat at 21- to 28-day intervals. Do not apply to bermudagrass 4 weeks prior to breaking winter dormancy.
<b>Postemergence Control and Seedhead Suppression ANNUAL BLUEGRASS in OVERSEEDED BERMUDAGRASS FAIRWAYS, TEES</b>	bispyribac-sodium (Velocity) 80 SP	0.03 to 0.06 oz	1.33 to 2.66 oz	0.0665 to 0.133	Do not apply to putting greens, ryegrass mowed to less than 0.375 in., or non-overseeded bermudagrass. Apply between Feb. 1 and March 15. Make first application when annual bluegrass begins flowering. If actively flowering, use the low rate and re-treat in 28 to 35 days. If not actively flowering, use the low rate and re-treat in 14 to 21 days with the low rate. Do not apply if air temperature is less than 50°F within 3 days after application. Check label for further special instructions.
<b>Postemergence Control ANNUAL BLUEGRASS, OVERSEEDED PERENNIAL RYEGRASS, TALL FESCUE, <i>Poa trivialis</i></b>	foramsulfuron (Revolver) 0.19 SC	0.2 to 0.6 fl oz	8.8 to 26.2 fl oz	0.013 to 0.039	For use on bermudagrass and zoysiagrass grown on golf courses and sod farms. Do not use on warm season turfgrass collars surrounding bentgrass greens. May be applied up to 1 week prior to overseeding. Do not apply within 2 weeks of bermudagrass sprigging. Apply in 25 to 60 gal water per acre. Rainfast after 2 hours. Surfactant not required.
	rimsulfuron (TranXit GTA) 25 DF	0.046 to 0.092 oz	2 to 4 oz	0.03125 to 0.0625	May be applied to bermudagrass on professionally managed sports facilities at professional and collegiate levels, golf courses, sod farms, industrial and commercial lawns. For annual bluegrass control, apply November through December and again February through March at 2 oz per acre. May be applied 10 to 14 days prior to overseeding. For overseeded removal, apply 2 oz per acre 3 to 4 weeks before desired removal date, and repeat 3 weeks later. For all grass control, apply 4 oz per acre if single application only. A nonionic surfactant at 0.25% by volume is required. Do not apply to cool-season turfgrasses, residential lawns, bermudagrass putting greens, or newly sprigged/sodded bermudagrass.
	sulfosulfuron (Certainty) 75 DG	0.017 to 0.046 oz	0.75 to 2 oz	0.035 to 0.09375	May be applied to certain ornamental native grasses and also bermudagrass species, zoysiagrass, centipedegrass, St. Augustinegrass, and kikuyugrass grown on sod farms, golf courses (excluding greens), commercial and residential turf that is highly managed, and other noncrop areas. Use 1.5 to 2 oz per acre for fall annual bluegrass control 7 to 10 days before overseeding. Use 0.75 to 1.25 oz per acre for fall or winter control in nonoverseeded bermudagrass, and reapply if needed but not before 21 days after initial application. For tall fescue control, two applications may be required at 4- to 10-wk intervals. Perennial ryegrass control not as complete as with Revolver, TranXit GTA, or Monument 75 WG. Use a nonionic surfactant at 0.25% by volume. Do not exceed 2.66 oz per acre per year.

**CHEMICAL WEED CONTROL IN LAWNS AND TURF**

<b>Weed</b>	<b>Herbicide and Formulation</b>	<b>Amount of Formulation Per 1,000 sq ft</b>	<b>Amount of Formulation Per Acre</b>	<b>Pounds Active Ingredient Per Acre</b>	<b>Precautions and Remarks</b>
<b>Postemergence Control ANNUAL BLUEGRASS, OVERSEEDED PERENNIAL RYEGRASS, TALL FESCUE, <i>Poa trivialis</i></b> (continued)	trifloxysulfuron (Monument 75 WG) 75 WG	0.0023 to 0.0129 oz	0.1 to 0.56 oz	0.0047 to 0.0263	May be applied to bermudagrass and zoysiagrass on golf courses, sod farms, and other nonresidential turf areas. A nonionic surfactant at 0.25 to 0.5% by volume is recommended. Temporary discoloration may occur if used with MSO or COC. May be applied 3 weeks prior to overseeding. Use rates of 0.1 to 0.3 oz per acre to remove overseeded perennial ryegrass and <i>Poa trivialis</i> to aid bermudagrass spring transition. Labeled turf species can be seeded or sprigged into treated areas 4 weeks after application.
<b>Preemergence and Postemergence Control ANNUAL BLUEGRASS and certain winter annual broadleaf weeds</b>	atrazine (Purge) 2 F (AAtrex 4 L) 4 L	3 fl oz 0.75 to 1.5 fl oz	4 qt 1 to 2 qt	2 1 to 2	Use on centipedegrass, St. Augustinegrass, and dormant bermudagrass. Apply November 15 to December 31. Follow label directions.
	simazine (Princep DF) 90 WDG (Princep Liquid) 4 L	0.4 to 0.8 oz 0.75 to 1.5 fl oz	1.1 to 2.2 lb 1 to 2 qt	1 to 2	Use on bermudagrass, centipedegrass, St. Augustinegrass, and zoysiagrass. See label for instructions on newly sprigged turfgrass or on hybrid bermudagrass. Apply November 15 to December 15. Follow label directions.
	(Regal Wynstar) 90 WDG	0.4 to 0.8 oz	1.1 to 2.2 lb		
<b>Preemergence Control Certain Broadleaf Weeds</b>	isoxaben (Gallery 75 Dry Flowable) 75 DF	0.25 to 0.5 oz	0.66 to 1.33 lb	0.5 to 1	All established turfgrasses are tolerant. Check label for specific weeds controlled.
	pendimethalin (Pendulum AquaCap) 3.8 CS	1.15 to 1.55 fl oz	3.1 to 4.2 pt	1.5 to 2	See section on preemergence control of crabgrass or product label for turfgrass tolerance. Provides preemergence control of summer broadleaf weeds, such as prostrate spurge, prostrate knotweed, and purslane species, as well as winter broadleaf weeds, such as yellow woodsorrel, hop clover, cudweed species, common chickweed, lawn burweed, henbit, and corn speedwell when applied before expected germination.
<b>Preemergence and Postemergence Control CRABGRASS, GOOSEGRASS, OTHER ANNUAL GRASSES, BROADLEAF WEEDS, SEDGES</b>	mesotrione (Tenacity) 4 SC	0.092 to 0.183 fl oz	4 to 8 fl oz	0.125 to 0.25	Use on golf courses (not greens) and sod farms for pre- and postemergence weed control. Tolerant turfgrasses include St. Augustinegrass, centipedegrass, tall fescue, fine fescue, Kentucky bluegrass, and perennial ryegrass. Add a nonionic surfactant and repeat application after 2 to 3 weeks for improved postemergence control. Tank mix with Barricade 65 WG for extended preemergence grassy weed control. Can be applied at seeding to all tolerant grasses except fine fescue. After turf germination, wait 4 weeks or until turf has been mowed twice before making a postemergence application. Also controls henbit, chickweed, dandelion, white clover, Florida betony, Florida pusley, ground ivy, oxalis, wild violet, creeping bentgrass, and yellow nutsedge.
	sulfentrazone + prodiamine (Echelon 4 SC) 4 SC	0.184 to 0.826 fl oz	0.5 to 2.25 pt	0.25 to 1.125	For use in residential and institutional lawns, athletic fields, sod farms, golf course fairways and roughs, roadsides, utility right-of-ways, railways, and industrial areas. Apply to turf following a second mowing, if a good root system has been established. Apply up to 12 fl oz per acre to bentgrass at 0.5 inches or higher, fine fescue, and perennial ryegrass. Apply 18 to 24 fl oz per acre to perennial bluegrass, tall fescue, and all warm season grasses except St. Augustinegrass (do not apply) and bermudagrass (apply 18 to 36 fl oz per acre). For sod production, apply 6 months after establishment, and do not harvest within 3 months. Do not apply with adjuvants or surfactants.

**CHEMICAL WEED CONTROL IN LAWNS AND TURF**

<b>Weed</b>	<b>Herbicide and Formulation</b>	<b>Amount of Formulation Per 1,000 sq ft</b>	<b>Amount of Formulation Per Acre</b>	<b>Pounds Active Ingredient Per Acre</b>	<b>Precautions and Remarks</b>
<b>Postemergence Control CRABGRASS, GOOSEGRASS</b>	fenoxaprop (Acclaim Extra) 0.57 EC	0.3 to 0.9 fl oz	0.8 to 2.4 pt	0.057 to 0.174	Use only on perennial ryegrass, fine fescue, tall fescue, Kentucky bluegrass, and zoysiagrass. Reduced vigor or discoloration can occur. Rate depends upon leaf number or tillers of grass weeds and turf tolerance. Check label. A second application may be applied after 14 days.
		0.08 fl oz	3.5 fl oz	0.016	Apply only to established Pennncross bentgrass maintained at a minimum cutting height of at least 0.25 in. Bentgrass should be established for one growing season. Do not apply to greens. Applications should be made at a minimum of 21-day intervals, beginning in the spring when grassy weeds first emerge and are not larger than two- leaf. Repeat applications throughout the summer as new infestations of one- to two-leaf grassy weeds occur. See label for other restrictions.
	metribuzin (Sencor 75 Turf) 75 WDF	0.12 to 0.24 oz	0.33 to 0.67 lb	0.25 to 0.5	Recommended for application by commercial applicators only on established bermudagrass turf (such as parks, athletic fields, golf course fairways, cemeteries, and sod farms) that has a mowing height of 0.5 in. or greater. Apply when turf is vigorously growing and not under stress. Repeat if necessary in 7 to 10 days. Do not make more than two applications per season. Do not apply to greens, tees, or aprons.
	sethoxydim (Vantage) 1 EC	0.8 fl oz	2.25 pt	0.28	Use in seedling and established centipedegrass and fine fescues. Does not control yellow and purple nutsedge, annual bluegrass or broadleaf weeds. Apply no sooner than 3 weeks after spring greenup of centipedegrass. Apply before crabgrass becomes extensively tillered. Delay all treatments with Vantage until newly planted centipedegrass has 3 in. of new stolon growth. Do not mow within 7 days before or after application. Two applications 3 weeks apart will suppress bahiagrass.
<b>Postemergence Control SMOOTH and LARGE CRABGRASS, BARNYARDGRASS, WHITE AND HOP CLOVER, COMMON DANDELION, DOLLARWEED, FOXTAILS</b>	quinclorac (Drive 75 DF) 75 DF (Drive XLR8) 1.5 SL	0.367 oz 1.45 fl oz	1 lb 2 qt	0.75 0.75	For use in residential and nonresidential turf that is established, or newly seeded, overseeded, or sprigged. Refer to label for specific varieties. Apply to common and hybrid bermudagrass, Kentucky bluegrass, annual bluegrass, buffalograss, tall fescue, annual and perennial ryegrass, creeping bentgrass, and zoysiagrass. Can also be applied to fine fescue but must be in a blend. Some discoloration of hybrid bermudagrass, creeping bentgrass or fine fescue may occur. Do not apply to bahiagrass, centipedegrass, St. Augustinegrass, or dichondra. Do not use on golf course greens or collars. The addition of methylated seed oil (1.5 pt per acre or 0.55 oz per 1,000 sq ft) or a crop oil concentrate (2 pt per acre or 0.73 oz per 1,000 sq ft) is required for control. Application to weeds under stress will result in poor control. Irrigation 24 hours prior to application is recommended if drought conditions exist. Some ornamental plants are sensitive to Drive. See label for further precautions.
<b>Postemergence Control SMOOTH and LARGE CRABGRASS, BARNYARDGRASS, FOXTAILS, and many broadleaf weeds</b>	quinclorac + sulfentrazone + 2,4-D amine + dicamba (Q4) 1.54 L	2.57 to 2.94 fl oz	7 to 8 pt	1.35 to 1.54	For use in cool-season turf including annual bluegrass and ryegrass, perennial bluegrass and ryegrass, and fescue species. Do not apply to bahiagrass, bentgrass (creeping, 'Seaside,' 'Colonial'), centipedegrass, St. Augustinegrass, carpetgrass, and golf course greens, tees, and collars. May be applied to home lawns. Apply to seedling grasses after second or third mowing, or 28 days after emergence. Wait 3 to 4 weeks after sodding, sprigging, or plugging operations to apply. Wait 4 weeks after application to seed.
	quinclorac + 2,4-D amine + dicamba (Quincept) 1.875 SL	2.57 to 2.94 fl oz	7 to 8 pt	1.64 to 1.875	For use in residential and nonresidential cool season turf, including athletic fields, golf courses, and sod farms. Do not use on centipedegrass, St. Augustinegrass, bahiagrass, zoysiagrass, bermudagrass, bentgrass, or dichondra. Can apply to tolerant turfgrass seedlings after third mowing, and to newly sodded, sprigged, or plugged grasses 3 to 4 weeks after operations.

**CHEMICAL WEED CONTROL IN LAWNS AND TURF**

<b>Weed</b>	<b>Herbicide and Formulation</b>	<b>Amount of Formulation Per 1,000 sq ft</b>	<b>Amount of Formulation Per Acre</b>	<b>Pounds Active Ingredient Per Acre</b>	<b>Precautions and Remarks</b>
<b>Postemergence Control GOOSEGRASS</b>	diclofop-methyl (Illoxan) 3 EC	0.75 to 1 fl oz	32 to 43 fl oz	0.75 to 1	Apply in established bermudagrass. Rate depends upon number of goosegrass leaves from one to four leaves. Check label for specific rates.
<b>Postemergence Control BAHIAGRASS, CRABGRASS, DALLISGRASS, GOOSEGRASS, NUTSEDGE, ANNUAL SEDGES, SANDBUR</b>	DSMA (various brands)		several concentrations	3 to 5	Bermudagrass is tolerant. Bentgrass, bluegrass, zoysia and fescues are slightly sensitive. Do not use on carpetgrass, centipedegrass, or St. Augustinegrass. Begin treatment when weedy grasses are young (three to four leaf stage). Use two applications 7 to 10 days apart. More mature plants may require additional applications. Three to four applications may be necessary for nutsedge and sandbur control. Spray when soil moisture is good and air temperature is 80° F or above. On new turf, do not treat until after three mowings. Grasses may show temporary discoloration.
	MSMA (various brands)		several concentrations	2 to 3	Bermudagrass is tolerant. Bluegrass, fescue, and zoysia are slightly sensitive. Do not use on bentgrass, carpetgrass, centipedegrass, or St. Augustinegrass. Apply as described for DSMA. Note same remarks.
<b>Postemergence Control CRABGRASS, GOOSEGRASS, SANDBUR, DALLISGRASS</b>	MSMA (various brands) + metribuzin (Sencor 75 Turf) 75 WDF		several concentrations + 0.17 to 0.33 lb	1.5 to 2 + 0.125 to 0.25	See remarks for MSMA and metribuzin. The combination improves goosegrass control. Should be applied to bermudagrass only.
<b>Postemergence Control CRABGRASS, GOOSEGRASS, SANDBUR, DALLISGRASS and many broadleaf weeds</b>	MSMA + 2,4-D + MCP + dicamba (Trimec Plus) 2.88 F	3 to 5 fl oz	1 to 1.67 gal	1.8 + 0.48 + 0.48 + 0.12	Use on bermudagrass, perennial bluegrass, fescues, perennial ryegrass, and zoysiagrass. A second application will enhance control of dallisgrass or goosegrass.
	MSMA + 2,4-D + clopyralid + dicamba (Millennium Ultra Plus) 2.42 L	3 to 5 fl oz	1 to 1.67 gal	2.42 to 4.04	Do not use on residential turf. Apply to bermudagrass, zoysiagrass, tall fescue, perennial bluegrass, and perennial ryegrass. Apply to seeded grasses after third mowing. Wait 3 to 4 weeks after application to seed. Do not exceed 1 gallon per acre on cool-season grasses and 1.67 gallons per acre on warm-season grasses.
<b>Postemergence Control CRABGRASS, GOOSEGRASS, SANDBUR</b>	asulam (Asulox) 3.34 SL	1.8 fl oz	5 pt	2	Use only on St. Augustinegrass and Tifway 419 turf. On golf courses, use only on fairways and roughs.
<b>Postemergence Control YELLOW NUTSEDGE, ANNUAL SEDGE</b>	bentazon (Basagran T/O or Lescogran) 4 SL	0.75 to 1.5 fl oz	1 to 2 qt	1 to 2	For control of yellow nutsedge in established bluegrass, fescues, bentgrass, ryegrass, bermudagrass, bahiagrass, St. Augustinegrass, centipedegrass, and zoysiagrass. Apply to yellow nutsedge when actively growing under good soil moisture conditions. Additional applications may be made at intervals of 10 to 14 days until nutsedge is controlled.
<b>Postemergence Control PURPLE and YELLOW NUTSEDGE, KYLLINGA SPECIES</b>	imazaquin (Image 70 DG) 70 DG	0.128 to 0.256 oz	0.357 to 0.714 lb	0.25 to 0.5	Use on bermudagrass, centipedegrass, St. Augustinegrass, and zoysiagrass. Do not apply during spring greenup. Temporary yellowing may occur. Add a nonionic surfactant at 2 pt per 100 gal of spray solution. Addition of MSMA at 1.5 lb active per acre will improve sedge control in MSMA tolerant turfgrasses.
	halosulfuron (Sedgehammer) 75 WDG	0.9 g	0.67 to 1.33 oz	0.031 to 0.062	May be applied to bermudagrass, bahiagrass, zoysiagrass, centipedegrass, St. Augustinegrass, creeping bentgrass, Kentucky bluegrass, perennial ryegrass, tall fescue, and fine fescue. Apply broadcast when sedges have reached the three- to eight-leaf stage. Use lower rate for light infestations and higher rate for heavy infestations. A second treatment will usually be required 6 to 10 weeks after the initial treatment. Use an 80% active nonionic surfactant at 2 qt per 100 gal of spray solution (0.5% by volume). Do not exceed 1 to 2 pt of surfactant per acre. Do not apply to putting greens. Sedgehammer only suppresses green kyllinga.

**CHEMICAL WEED CONTROL IN LAWNS AND TURF**

<b>Weed</b>	<b>Herbicide and Formulation</b>	<b>Amount of Formulation Per 1,000 sq ft</b>	<b>Amount of Formulation Per Acre</b>	<b>Pounds Active Ingredient Per Acre</b>	<b>Precautions and Remarks</b>
<b>Postemergence Control PURPLE and YELLOW NUTSEDGE, KYLLINGA SPECIES (continued)</b>	MSMA (various brands)		several concentrations	2 to 3	See remarks for MSMA above. Will require at least two applications 7 to 10 days apart.
	sulfosulfuron (Certainty) 75 DG	0.017 to 0.029 oz	0.75 to 1.25 oz	0.035 to 0.059	May be applied to certain ornamental native grasses and also bermudagrass species, zoysiagrass, centipedegrass, St. Augustinegrass, and kikuyugrass grown on sod farms, golf courses (excluding greens), commercial and residential turf that is highly managed, and other noncrop areas. Use 0.75 to 1.25 oz per acre, and repeat in 4 to 10 weeks if needed. Use a nonionic surfactant at 0.25% by volume.
	trifloxysulfuron (Monument 75 WG) 75 WG	0.0023 to 0.0129 oz	0.1 to 0.56 oz	0.0047 to 0.0263	May be applied to bermudagrass and zoysiagrass on golf courses, sod farms, and other nonresidential turf areas. A nonionic surfactant at 0.25 to 0.5% by volume is recommended. Temporary discoloration may occur if used with MSO or COC. Use rates of 0.33 to 0.56 oz per acre for sedge and kyllinga species control. Labeled turf species can be seeded or sprigged into treated areas 4 weeks after application. Repeat application may be needed in 4 to 6 weeks.
<b>Postemergence Control PURPLE and YELLOW NUTSEDGE, KYLLINGA SPECIES, and various broadleaf weeds</b>	sulfentrazone (Dismiss) 4 SC	0.092 to 0.275 fl oz	0.25 to 0.75 pt	0.125 to 0.375	May be applied to home lawns. For use on creeping bentgrass, tall and fine fescue, perennial ryegrass, Kentucky bluegrass, and all warm-season turf species except St. Augustinegrass. Wait 3 months to seed, overseed, or sprig unless overseeding bermudagrass with perennial ryegrass, which only requires a 4- to 6-week waiting period after application. Apply to seedling grasses after second mowing and to new sod 6 months after establishment.
<b>Postemergence Control BAHIAGRASS, CRABGRASS, YELLOW and PURPLE NUTSEDGE, ANNUAL SEDGE, KYLLINGA SPECIES</b>	imazapic (Plateau DG) 70 DG	0.032 to 0.066 oz	1.43 to 2.86 oz (1 to 2 water soluble packs)	0.063 to 0.125	For use on centipedegrass only when grown as fine turf in nonresidential areas such as commercial and industrial turf, golf courses, and other recreational areas. Not for use in home lawns. Do not use on other turfgrass species. See label for mixing instructions of water soluble packs. A repeat application may be needed on tough to control perennial weeds such as bahiagrass. The highest labeled rate may discolor centipedegrass by causing a red color.
<b>Postemergence Control DANDELION, CARPETWEED, CAROLINA CRANESBILL, CURLY DOCK, PLANTAIN, DICHONDRA, SHEPHERDS-PURSE, YELLOW ROCKET</b>	2,4-D amine (various brands) 4 SL	3 to 4 tsp	1.5 to 2 pt	0.75 to 1	Cut rate one-half for bentgrass, carpetgrass, centipedegrass, and St. Augustinegrass. Spray when weeds are young and actively growing. To reduce danger of injury to flowers and ornamentals by spray drift, use low pressure and do not spray on windy days.
<b>Postemergence Control COMMON CHICKWEED, MOUSEEAR CHICKWEED, CREEPING CHARLIE or GROUND IVY, DANDELION, LESPEDEZA, BLACK MEDIC, SPOTTED SPURGE, HOP or WHITE CLOVER</b>	(MCPP 4 K) 4 L	1 to 1.5 fl oz	2.5 to 4 pt	1.25 to 2	Observe same precaution as for 2,4-D. May be used on bentgrass, carpetgrass, centipedegrass, St. Augustinegrass, and other turf grasses.

**CHEMICAL WEED CONTROL IN LAWNS AND TURF**

<b>Weed</b>	<b>Herbicide and Formulation</b>	<b>Amount of Formulation Per 1,000 sq ft</b>	<b>Amount of Formulation Per Acre</b>	<b>Pounds Active Ingredient Per Acre</b>	<b>Precautions and Remarks</b>
<b>Postemergence Control</b> <b>CHICKWEED, WHITE CLOVER, DANDELION, CURLY DOCK, HAWKWEED, HENBIT, KNOTWEED, RED SORREL, KNAWEL, SPURWEED, SPOTTED SPURGE, WILD STRAWBERRY, YARROW</b>	dicamba (Banvel) 4 SL	1 to 2 tsp	0.5 to 1 pt	0.25 to 0.5	Apply as foliar spray to growing weeds. Prevent injury to ornamentals. Avoid rooting zone of shallow-rooted trees and shrubs.
	diglycolamine (Vanquish) 4 SL	1 to 4.5 tsp	0.5 to 2 pt	0.25 to 1	Do not exceed 1 pt per acre on bentgrass, carpetgrass, buffalograss, and St. Augustinegrass. Apply to newly seeded grasses after the second mowing. Do not exceed 0.25 pt per acre on extended sensitive plant roots on sandy soils and 0.5 pt per acre on clay soils.
<b>Postemergence Control</b> <b>ALL WEEDS LISTED UNDER 2,4-D AMINE, MCPP, DICAMBA, and DIGLYCOLAMINE SECTIONS</b>	2,4-D amine + MCPP + dicamba (Trimec) various formulations (Triplet SF) 3.23 L or (Three-Way Selective Herbicide) 3.23 L	See label 0.75 to 1.5 fl oz	See label 2 to 4 pt	See label 0.8075 to 1.615	Check individual labels for specific instructions and precautions. Generally, 1) apply to grass seedlings after second mowing; 2) apply to sodded, sprigged, or plugged turf 3 to 4 weeks after operations; and 3) wait 3 to 4 weeks after application to seed. Many products labeled for tall fescue, perennial ryegrass, perennial bluegrass, bermudagrass, and St. Augustinegrass. Some products labeled for bentgrass putting greens, bahiagrass, zoysiagrass, and centipedegrass. Some products labeled for home use when applied by a commercial applicator.
	MCPA + MCPP + dicamba (Tri-Power) 4 L	0.7 to 1.5 fl oz	2.5 to 4.1 pt	1.25 to 2.05	
<b>Postemergence Control</b> <b>CURLY DOCK, BROADLEAF DOCK, GALINSOGA, NIGHTSHADE, CLOVER (RED, HOP, WHITE, SWEET) GOLDENROD, MUSK THISTLE, SPEEDWELLS, COMMON VETCH, HAIRY BUTTERCUP, BROADLEAF PLANTAIN</b>	clopyralid (Lontrel) 3 EC	0.1 to 0.5 fl oz	0.25 to 1.33 pt	0.09 to 0.5	Do not apply to home lawns. May be used on bentgrass, Kentucky bluegrass, creeping, red, chewings, sheep and tall fescue, perennial ryegrass, bermudagrass, bahiagrass, buffalograss, centipedegrass, zoysiagrass, and St. Augustinegrass. Do not apply to putting greens and tees. Should be applied in a minimum of 20 gal of water per acre. Surfactants are not necessary. Do not apply to exposed roots of certain trees and shrubs (legumes such as acacia, locust, mimosa, redbud, or mesquite) or <i>Tilia</i> spp. Do not use treated clippings for mulching and compost during the growing season of application.
<b>ALL WEEDS LISTED UNDER 2,4-D AMINE, CLOPYRALID, DICAMBA, and DIGLYCOLAMINE SECTIONS</b>	2,4-D amine + clopyralid + dicamba (Millennium Ultra) 3.75 L	0.36 to 1.1 fl oz	1 to 3 pt	0.47 to 1.41	Do not apply to home lawns. Use on perennial bluegrass, ryegrass, and fescue species, bentgrass (excluding greens and tees), bermudagrass, zoysiagrass, and bahiagrass. Do not apply to seedling grasses until well established. Wait 3 to 4 weeks after application to seed.
	(Millennium Ultra 2) 3.56 L	0.55 to 1.1 fl oz	1.5 to 3 pt	0.67 to 1.34	
<b>Postemergence Control</b> <b>VIRGINIA BUTTONWEED, CHICKWEED SPECIES, WHITE CLOVER, DANDELION, HENBIT, GROUND IVY, PROSTRATE KNOTWEED, MATCHWEED, BLACK MEDIC, PLANTAIN SPECIES, COMMON WOODSORREL</b>	fluroxypyr (Spotlight) 1.5 EC	0.25 to 0.9 fl oz	0.67 to 2.5 pt	0.126 to 0.47	Use on bentgrass, Kentucky bluegrass, tall and fine fescue, perennial ryegrass, bahiagrass, bermudagrass, centipedegrass, zoysiagrass, and St. Augustinegrass in established turf, such as residential lawns, golf courses, athletic fields, sod farms, and commercial turf areas. Do not use on putting greens or tees. Apply only 0.67 pt per acre to bentgrass, bermudagrass, and St. Augustinegrass if some injury can be tolerated. Prevent injury to ornamentals. Avoid rooting zone of shallowly rooted trees and shrubs.
	2,4-D amine + fluroxypyr + dicamba (Escalade) 4.4 SL or (Escalade Low Odor) 4.4 SL (Escalade 2) 4 SL	0.46 to 1.84 fl oz 0.36 to 1.1 fl oz	1.25 to 5 pt 1 to 3 pt	0.69 to 2.75 0.5 to 1.5	Use on perennial bluegrass and ryegrass, tall fescue, creeping bentgrass (excluding greens and tees), bermudagrass species, bahiagrass, zoysiagrass, and St. Augustinegrass in residential, industrial, and institutional lawns, parks, cemeteries, athletic fields, golf courses, and sod farms. Use on St. Augustinegrass sod farms only. Apply 1 to 2 pt per acre on creeping bentgrass and 1.5 to 1.8 pt per acre on warm season turf grown for sod. Apply 2 to 3 pt per acre to all other turf areas. For non-turf areas, rate can be increased to 2 to 5 pt per acre. Application can be made to grass seedlings after second mowing and to newly sodded, sprigged, or plugged grasses 3 to 4 weeks after operations.

**CHEMICAL WEED CONTROL IN LAWNS AND TURF**

<b>Weed</b>	<b>Herbicide and Formulation</b>	<b>Amount of Formulation Per 1,000 sq ft</b>	<b>Amount of Formulation Per Acre</b>	<b>Pounds Active Ingredient Per Acre</b>	<b>Precautions and Remarks</b>
<b>Postemergence Control Winter and Summer Annual Broadleaf Weeds</b>	bentazon + atrazine (Prompt) 3.32 F (Prompt 5 L) 5 SL	0.9 to 1.3 fl oz 0.66 to 0.88 fl oz	2.5 to 3.5 pt 1.8 to 2.4 pt	0.5 to 0.75 + 0.5 to 0.75	Apply to bermudagrass, centipedegrass, St. Augustinegrass, and zoysiagrass. Check label for weeds controlled and weed size for proper application.
<b>Postemergence Control BLACK MEDIC, WHITE, HOP CLOVER, BUCKHORN PLANTAIN, COMMON CHICKWEED, MOUSEEAR CHICKWEED, HENBIT, SPURWEED (LAWN BURWEED), BROADLEAF PLANTAIN, DANDELION, FALSE DANDELION, LESPEDEZA, PROSTRATE SPURGE*, WILD VIOLET*</b>	triclopyr + clopyralid (Confront) 3 SL	0.37 to 0.74 fl oz	1 to 2 pt	0.28 to 0.56 + 0.09 to 0.19	Do not apply to home lawns. May be used on centipedegrass, bermudagrass, zoysiagrass, tall fescue, creeping red fescue, chewing fescue, Kentucky bluegrass, perennial ryegrass. *Repeat treatment may be necessary.
	MCPA ester + triclopyr ester + dicamba (Cool Power) 3.6 EC	0.91 to 1.29 fl oz	2.5 to 3.5 pt	1.125 to 1.575	May be applied to home lawns by a commercial applicator. Not for use on turf grown for resale or other commercial use as sod or seed production. Use on perennial bluegrass, ryegrass, and fescue species, bentgrass (excluding greens and tees), bermudagrass, zoysiagrass, and bahiagrass. Do not apply to seedling grasses until well established. Wait 3 to 4 weeks after application to seed.
	MCPA amine + triclopyr amine + dicamba (Horsepower) 4.56 L	0.73 to 1.1 fl oz	2 to 3 pt	1.14 to 1.71	
<b>Postemergence Control PLANTAIN, CHICKWEED, DANDELION, PURSLANE, and THISTLE SPECIES, GROUND IVY, LAWN BURWEED, HENBIT, CORN SPEEDWELL, SPOTTED SPURGE</b>	carfentrazone-ethyl (QuickSilver) 1.9 EW	0.0126 to 0.048 fl oz	0.55 to 2.1 fl oz	0.008 to 0.031	May be applied to bahiagrass, bermudagrass, buffalograss, centipedegrass, St. Augustinegrass, zoysiagrass, Kentucky bluegrass, tall fescue, fine fescue, perennial ryegrass, and bentgrass. To expand the weed spectrum and extend control of the weeds listed here and on the label, carfentrazone-ethyl can be tank mixed with the entire range of phenoxy products—amines, esters, and other salts—and is also compatible with dicamba, atrazine, glyphosate, glufosinate, clopyralid, triclopyr, and MSMA. When applied alone, add 0.12 to 0.25% nonionic surfactant.
<b>Postemergence Control WHITE CLOVER, DANDELION, GROUND IVY, SPURGES, PLANTAINS, CHICKWEEDS, HENBIT, LAWN BURWEED, WOODSORRELS, DOLLARWEED, POISON IVY, POISON OAK, CORN SPEEDWELL, WILD STRAWBERRY, WILD VIOLET, VIRGINIA PEPPERWEED, SHEPHERD'S-PURSE</b>	carfentrazone + 2,4-D ester + MCPP + dicamba (Speed Zone) 2.2 EC	0.75 to 1.8 fl oz	2 to 5 pt	0.55 to 1.375	May be used on annual and perennial bluegrass, annual and perennial ryegrass, tall and fine fescue, creeping and colonial bentgrass, common and hybrid bermudagrass, and zoysiagrass. For use in ornamental turf, golf courses, lawns, sod farms, cemeteries, and parks. Optimum results when applied when temperatures are between 45 and 75°F but may be applied up to 90°F. Lower rates may be used in cooler weather. Rainfast within 3 hr and may reseed after 2 wk. May apply 3 to 4 wk after sodding, sprigging, or plugging.
	carfentrazone + 2,4-D ester + MCPP + dicamba (Speed Zone Southern) 0.81 EC	0.55 to 2.2 fl oz	1.5 to 6 pt	0.1519 to 0.6075	Also may be used on bahiagrass, buffalograss, St. Augustinegrass, centipedegrass, seashore paspalum, and kikuyugrass. May reseed after 1 wk.
	carfentrazone + MCPA ester + MCPP + dicamba (Power Zone) 2.91 EC	0.75 to 2.2 fl oz	2 to 6 pt	0.7275 to 2.1825	Same precautions and turf uses as Speed Zone 2.2 EC except cannot be applied to creeping and colonial bentgrass.

**CHEMICAL WEED CONTROL IN LAWNS AND TURF**

<b>Weed</b>	<b>Herbicide and Formulation</b>	<b>Amount of Formulation Per 1,000 sq ft</b>	<b>Amount of Formulation Per Acre</b>	<b>Pounds Active Ingredient Per Acre</b>	<b>Precautions and Remarks</b>
<b>Postemergence Control</b> <b>WHITE CLOVER, DANDELION, GROUND IVY, SPURGES, PLANTAINS, CHICKWEEDS, HENBIT, LAWN BURWEED, WOODSORRELS, DOLLARWEED, POISON IVY, POISON OAK, CORN SPEEDWELL, WILD STRAWBERRY, WILD VIOLET, VIRGINIA PEPPERWEED, SHEPHERD'S-PURSE</b> (continued)	sulfentrazone + 2,4-D amine + MCPP + dicamba (Surge) 2.18 SL	0.92 to 1.84 fl oz	2.5 to 5 pt	0.68 to 1.36	Apply 2.5 to 3.25 pt per acre on warm season turf including bermudagrass species, zoysiagrass, bahiagrass, and buffalograss. Apply 3.25 to 4 pt per acre on cool season turf including species of bluegrass, ryegrass, fescue, and bentgrass (excluding greens and tees). Four to 5 pt per acre needed to control corn speedwell and wild violet. Turf areas include residential, ornamental, institutional, and sod farms. Apply to grass seedlings after second mowing. Apply to sodded, sprigged, or plugged areas 3 to 4 weeks after operations. Treated areas may be reseeded 3 weeks after application.
<b>CARPETWEED, CHICKWEED, DANDELION, CURLY DOCK, CUTLEAF EVENINGPRIMROSE, HENBIT, KNOTWEED, COMMON MALLOW, POISON IVY, AND ANNUAL SOWTHISTLE</b>	pyraflufen ethyl (Octane 2% SC) 0.177 SC	0.016 to 0.092 fl oz	0.7 to 4 fl oz	0.000938 to 0.0055	Used in established sod farm and ornamental turf by commercial applicators and professional landscapers only. Turf can be newly seeded, sodded, or sprigged as long as it is established and not under stress. Tolerant turfgrasses include bermudagrass, centipedegrass, St. Augustinegrass, zoysiagrass, tall fescue, perennial ryegrass, perennial bluegrass, and creeping bentgrass (not greens or tees). Apply 1 to 4 fl oz alone to 3- to 6-inch tall weeds. For larger weeds and broader spectrum control, apply 0.75 to 1.5 fl oz and tank mix with 2,4-D, mecoprop, dicamba, chloroprop, MCPA, triclopyr, or fluroxypyr.
<b>Postemergence Control</b> <b>BAHIAGRASS, PERENNIAL RYEGRASS, WILD GARLIC, SPURWEED, HENBIT, miscellaneous other broadleaf weeds</b>	metsulfuron (Blade, Manor, or MSM Turf) 60 WDG	0.003 to 0.02 oz	0.125 to 1 oz	0.005 to 0.038	May be applied to established bermudagrass, zoysiagrass (Meyer or Emerald), St. Augustinegrass, Kentucky bluegrass or fine fescue. Do not apply to turf less than 1 year old. Do not exceed 0.5 oz per acre on centipedegrass, fine fescue, or Kentucky bluegrass. See label for a complete list of weeds controlled. The addition of 0.25% nonionic surfactant will enhance control. May be used for removal of perennial ryegrass from overseeded warm-season turf species. For bahiagrass control, use 0.25 to 0.75 oz per acre after spring greenup but before seedhead development. A repeat treatment may be necessary in 4 to 6 weeks.
	(Patriot) 60 WDG	0.007 to 0.046 oz	0.33 to 2 oz	0.012 to 0.075	Apply to unimproved industrial turf only. Use maximum of 0.5 oz per acre for fescue and bluegrass and 2 oz per acre for bermudagrass.
<b>Postemergence Control</b> <b>TALL FESCUE, WILD GARLIC, HENBIT, and miscellaneous other broadleaf weeds</b>	chlorsulfuron (Corsair) 75 WDG	0.02 to 0.122 oz	1 to 5.33 oz	0.05 to 0.25	May be applied to all established turfgrass species except tall fescue, buffalograss, ryegrass, and dichondra. Some discoloration or delayed greenup may occur on St. Augustinegrass, centipedegrass, zoysiagrass, or bahiagrass if applied while turf is under stress. See label for a complete list of weeds controlled. The addition of 0.25% nonionic surfactant will enhance control.
<b>Postemergence Control</b> <b>WILD GARLIC, WILD ONION</b>	imazaquin (Image 70 DG) 70 DG	0.128 to 0.256 oz	0.357 to 0.714 lb	0.25 to 0.5	Use on bermudagrass, centipedegrass, St. Augustinegrass, and zoysiagrass. Do not apply during spring greenup. Temporary yellowing may occur. Add a nonionic surfactant at 2 pt per 100 gal of spray solution.
	2,4-D amine (various brands) 4 SL	2.2 fl oz	3 qt	3	Apply in fall when garlic is young and actively growing. Add a wetting agent to keep spray from bouncing off garlic leaves. Repeat treatment for 2 years. Avoid spray drift which can injure susceptible plants. Use on bluegrass, fescue, bermudagrass, or zoysia. For more susceptible grasses, uses spot treatment below.
	Spot treatment				One tbs of 1% 2,4-D solution per garlic clump or use pressurized applicator. Apply December to April. Use as spot treatment for widely scattered clumps in small areas. Avoid excessive spraying as turfgrass injury may result.

**CHEMICAL WEED CONTROL IN LAWNS AND TURF**

<b>Weed</b>	<b>Herbicide and Formulation</b>	<b>Amount of Formulation Per 1,000 sq ft</b>	<b>Amount of Formulation Per Acre</b>	<b>Pounds Active Ingredient Per Acre</b>	<b>Precautions and Remarks</b>
<b>Postemergence Control of Various Grass and Broadleaf Weeds in Unimproved Turf and Other Noncrop Areas</b>	glyphosate (Glyphro) 5.4 SL (Glyphosate T&O, Razor, or Razor Pro) 4 SL	0.14 to 1.1 fl oz 0.75 to 2.94 fl oz	0.375 to 3 pt 1 to 4 qt	0.25 to 2 0.5 to 4	Apply to dormant or actively growing well established bermudagrass and bahiagrass. Bahiagrass growth will be suppressed if treated after spring greenup and before seedhead formation. Treat winter annual weeds when less than 6 in. tall. Higher rates are needed for more mature plants. Apply in 10 to 25 gal of water per acre and use an NIS at 2 qt per 100 gal of spray solution.
	glyphosate + 2,4-D amine (Campaign) 1.2 + 1.9 lb/gal SL	0.55 to 1.47 fl oz	1.5 to 4 pt	0.58 to 1.55	Apply in 15 to 30 gal of water per acre. May be applied to highly maintained dormant bermudagrass at 2 to 4 pt per acre. In low maintenance bermudagrass, Oust can be added at 0.25 to 1 oz per acre when dormant or actively growing. Apply 2 to 4 pt per acre on dormant bahiagrass and 1.5 to 2 pt per acre on actively growing bahiagrass. Tank mix with Oust if needed. Check label for Oust rates. Tall fescue applications can be made in the spring or summer at 2 to 3 pt per acre with or without Oust. Spray tall fescue at 4 to 6 in. tall and before seedhead emergence to minimize injury.
	sulfosulfuron (Outrider) 75 WG	0.017 to 0.046 oz	0.75 to 2 oz	0.035 to 0.094	May be used in well established dormant and actively growing bermudagrass and bahiagrass. Wait 30 days to re-treat if needed, and do not exceed 2.66 oz per acre per year. If treating weeds postemergence, use an NIS at 2 qt per 100 gal spray solution unless tank mixed with Roundup Pro. Outrider can also be tank mixed with Campaign, Escort, Oust, and Telar, but check label for proper turf species and timing. Expect temporary injury or discoloration with tank mix partners. For well-established tall fescue, do not exceed 1 oz per acre per year, and do not tank mix. Outrider is effective on johnsongrass.
<b>Postemergence Control in Dormant Warm Season Turf ANNUAL BLUEGRASS, various other winter annual weeds</b>	diquat (Reward LS) 2 SL	0.4 to 0.75 fl oz	1 to 2 pt	0.25 to 0.5	Apply in 20 to 100 gal spray mix as a broadcast application. Add 1 to 2 pt of a nonionic surfactant per 100 gal of solution. Bermudagrass must be dormant. More than one application may be needed.
	glyphosate (Glyphosate T&O, Razor Pro, or Roundup Pro) 4 SL	0.37 fl oz	1 pt	0.5	Apply in 5 to 20 gal water per acre with 0.5% by volume of a nonionic surfactant. Application to actively growing annual bluegrass must be made before initiation of bermudagrass greenup in the spring.
	glyphosate (Touchdown Pro) 3 LC	0.18 to 1.47 fl oz	0.5 to 4 pt	0.1875 to 1.5	Apply to dormant bermudagrass and bahiagrass before spring greenup. Apply in 10 to 40 gal water per acre. Will control winter annual weeds up to 6 in. tall and four- to six-leaf tall fescue. Use a 75% active ingredient nonionic surfactant at 0.25% by volume or dry ammonium sulfate at 0.5% by weight.
	glyphosate + diquat (QuikPRO) 76 WG (Razor Burn) 4.21 SL	0.11 to 0.37 oz 0.18 to 0.62 fl oz	5 to 16 oz 8 to 27 fl oz	0.24 to 0.76 0.26 to 0.89	Apply to dormant bermudagrass and bahiagrass not grown for research, sale, or other commercial uses, such as sod, seed production. Apply in 10 to 80 gal water per acre. Rates greater than 9 oz per acre QuikPro or 15 fl oz per acre Razor Burn may cause injury or delay greenup in highly maintained areas. Controls tall fescue.
	metribuzin (Sencor 75 Turf) 75 WDF	0.25 oz	0.67 lb	0.5	For application by commercial applicators to dormant bermudagrass turf. Broadcast spray before greenup of turf. Do not apply to greens, tees, or aprons. Controls common chickweed, corn speedwell, henbit, parsley-piert, and spurweed.
<b>Suppression/Control BERMUDAGRASS</b>	fenoxaprop (Acclaim Extra) 0.57 EC	0.46 fl oz	1.25 pt	0.089	Use on Kentucky bluegrass, perennial ryegrass, fine and tall fescue, and zoysiagrass. Apply June 1, July 1, August 1, and September 1, and repeat for 2 years. Can be tankmixed with 1 pt per acre Turflon Ester following the same schedule as above. Apply June 1 and Aug 1 for 2 years if tankmixed with 1 qt per acre Turflon Ester. Zoysia may show discoloration but should recover in 10 to 14 days following tankmix applications.

**CHEMICAL WEED CONTROL IN LAWNS AND TURF**

<b>Weed</b>	<b>Herbicide and Formulation</b>	<b>Amount of Formulation Per 1,000 sq ft</b>	<b>Amount of Formulation Per Acre</b>	<b>Pounds Active Ingredient Per Acre</b>	<b>Precautions and Remarks</b>
<b>Suppression/Control BERMUDAGRASS</b> (continued)	fluazifop (Fusilade II) 2 EC	0.05 to 0.14 fl oz	2 to 6 fl oz	0.03 to 0.09	Use on tall fescue or zoysia. For fescue, apply 5 to 6 oz per acre during warm weather in early spring when bermudagrass is breaking dormancy and repeated in fall when bermudagrass is preparing for dormancy. For zoysia, apply 4 oz per acre on June 1 and August 1 and repeat for 2 years. Can be tank-mixed with 1 qt per acre Turflon Ester following same schedule as above. Zoysia or tall fescue may show slight discoloration but should recover in 10 to 14 days. Add a nonionic surfactant at 0.25% v/v. Apply in a minimum of 30 gal of water per acre.
	siduron (Tupersan) 50 WP	0.5 to 1 lb	21.78 to 43.56 lb	10.88 to 21.78	Apply as an 8- to 12-inch band treatment with a single nozzle sprayer along putting green perimeter to suppress bermudagrass stolon encroachment. Initiate in March or April, and continue subsequent applications at 4- to 5-wk intervals.
	triclopyr (Turflon Ester) 4 EC	0.73 fl oz	1 qt	1.0	Use on perennial bluegrass, perennial ryegrass, and tall fescue. Do not apply to zoysia unless injury can be tolerated. Apply June 1, July 1, August 1, and September 1, and repeat for 2 years. Can be tank-mixed with Acclaim Extra or Fusilade II at rates and timings listed above.
<b>Postemergence Control BERMUDAGRASS</b>	clethodim (Envoy) 0.94 EC	0.4 to 0.8 fl oz	17 to 34 fl oz	0.125 to 0.25	For use on sod farms only. Do not apply to centipedegrass being grown for seed. Do not apply until 3 weeks after full greenup of centipedegrass in spring. Do not mow for 1 week before and after application. The addition of a nonionic surfactant at 0.25 % solution (1 pt per 50 gal water) or a crop oil concentrate at 1% solution (2 qt per 50 gal water) is necessary for control. A repeat application usually 3 to 4 weeks after the first application will be required for bermudagrass control. Use higher rates for more established bermudagrass. Do not apply more than 68 oz of Envoy per acre per year. Some discoloration of centipedegrass will occur at higher rates.
<b>Preplant Control or Lawn Renovation—emerged annual and perennial grass and broadleaf weeds</b>	glyphosate (Glyphosate T&O, Razor Pro, or Roundup Pro) 4 SL	0.75 to 3 fl oz	1 to 4 qt	1 to 4	Where existing vegetation is growing in a field or unmowed situation, apply to actively growing weeds at the stages according to label. Where existing vegetation is growing under mowed turfgrass management, apply after omitting at least one regular mowing to allow sufficient growth for good interception of the spray. Tillage or renovation techniques such as vertical mowing, coring, or slicing should be delayed for 7 days after application. Desirable turfgrass may be established following treatment.
	glyphosate (Touchdown Pro) 3 LC	0.18 to 1.47 fl oz	0.5 to 4 pt	0.1875 to 1.5	Same remarks as Roundup Pro, above. In addition, use a 75% active ingredient nonionic surfactant at 0.25% by volume or dry ammonium sulfate at 0.5% by weight.
	glyphosate + diquat (QuikPRO) 76 WG (Razor Burn) 4.21 SL	1.65 to 4.5 oz 2.75 to 5.5 fl oz	4.5 to 12.25 lb 3.75 to 7.5 qt	3.4 to 9.3 3.95 to 7.89	Generally use QuikPro at 4.5 lb per acre on annuals, 9 lb per acre on perennials, and 12.25 lb per acre on dusty or stressed plants, dense stands, or difficult-to-control perennials. Generally use Razor Burn at 3.75 qt per acre on annuals and 7.5 qt per acre on perennials. Do not use on turf grown for research, for sale, or for commercial uses, such as sod or seed production. Do not use if renovating bermudagrass or kikuyugrass sods. Delay tillage for 7 days after application.
<b>Trimming and Edging and Control of Emerged Weeds</b>	diquat (Reward LS) 2 SL	0.4 to 0.75 fl oz	1 to 2 pt	0.25 to 0.5	Add nonionic surfactant at 0.25 oz per gallon of water. Water volumes above 15 gal per acre should be used. For spot sprays, use 0.3 to 0.75 fl oz per gallon.
	glufosinate (Finale) 1 SL	2.2 to 4.4 fl oz	3 to 6 qt	0.75 to 1.5	Rate depends upon the weed to be controlled and stage of growth. Consult label. For spot or directed spray use 1.5 to 4 fl oz per gallon of water.

**CHEMICAL WEED CONTROL IN LAWNS AND TURF**

Weed	Herbicide and Formulation	Amount of Formulation Per 1,000 sq ft	Amount of Formulation Per Acre	Pounds Active Ingredient Per Acre	Precautions and Remarks
<b>Trimming and Edging and Control of Emerged Weeds</b> (continued)	glyphosate + diquat (QuikPRO) 76 WG (Razor Burn) 4.21 SL	1.65 to 4.5 oz 2.75 to 5.5 fl oz	4.5 to 12.25 lb 3.75 to 7.5 qt	3.4 to 9.3 3.95 to 7.89	May be used in general noncrop areas. Do not use on plants grown for sale or other commercial uses, such as seed production. See rate comments in lawn renovation section. For spray to wet treatments, apply QuikPro at 1.2 oz per gal of water for annuals and 1.5 oz per gal of water for perennials. Apply Razor Burn at 2 fl oz per gal of water for annuals and 2.5 fl oz per gal water for perennials. For directed spot treatment of perennials using hand-held low volume equipment, apply 4 to 8 oz per gal of water.

**TOLERANCE OF ESTABLISHED COOL-SEASON TURFGRASSES TO PREEMERGENCE HERBICIDES FOR CONTROL OF ANNUAL WEEDY GRASSES**

Herbicide	Kentucky Bluegrass	Tall Fescue	Fine Fescue	Perennial Ryegrass	Bentgrass Golf Greens
	KEY: T = tolerant when used properly according to the label; M = marginally tolerant, may cause injury or thinning of the turf; NR = not registered for use on this turfgrass. Apply only to established grasses.				
Benefin*	T	T	M	T	NR
Benefin + oryzalin	NR	T	NR	NR	NR
Benefin + trifluralin	T	T	M	T	NR
Bensulide*	T	T	T	T	T
Bensulide + oxadiazon	T	T	NR	T	T
DCPA*	T	T	M	T	NR
Dithiopyr**	T	T	T	T	T
Napropamide	NR	T	T	NR	NR
Oryzalin	NR	T	NR	NR	NR
Oxadiazon*	T	T	NR	T	NR
Pendimethalin	T	T	T	T	NR
Prodiamine	T	T	T	T	NR
Siduron***	T	T	T	T	M

\*Only benefin, bensulide, DCPA, and oxadiazon may be applied in the spring to grasses seeded the previous fall.

\*\*Do not use dithiopyr on Chewings fescue, colonial bentgrass, or unamended golf greens.

\*\*\*Siduron may be applied when seeding tolerant grasses.

**TOLERANCE OF ESTABLISHED WARM-SEASON TURFGRASSES TO PREEMERGENCE HERBICIDES FOR CONTROL OF ANNUAL WEEDY GRASSES**

Herbicide	Bahiagrass	Bermudagrass	Bermudagrass Putting Greens	Centipedegrass	St. Augustinegrass	Zoysiagrass
	KEY: T = tolerant when used properly according to the label; NR = not registered for use on this turfgrass.					
Benefin	T	T	NR	T	T	T
Benefin + oryzalin	T	T	NR	T	T	T
Benefin + trifluralin	T	T	NR	T	T	T
Bensulide'	T	T	T	T	T	T
Bensulide + oxadiazon	NR	T	T	NR	NR	T
DCPA	T	T	NR	T	T	T
Dithiopyr*	T	T	T	T	T	T
Metolachlor	T	T	NR	T	T	T
Napropamide	T	T	NR	T	T	NR
Oryzalin	T	T	NR	T	T	T
Oxadiazon	NR	T	NR	NR	T	T
Pendimethalin	T	T	T	T	T	T
Prodiamine	NR	T	NR	T	T	T
Siduron	NR	NR	NR	NR	NR	T
Simazine and atrazine	NR	T	NR	T	T	T

\*Do not use dithiopyr on unamended golf greens.

**TOLERANCE OF TURFGRASSES TO POSTEMERGENCE HERBICIDES FOR BROADLEAF WEED CONTROL**

	2,4-D	Mecoprop	Dicamba	Bentazon + Atrazine	2,4-D + Dichlorprop	2,4-D + Mecoprop	2,4-D + Triclopyr	Triclopyr + Clopyralid	2,4-D + Clopyralid + Dicamba	2,4-D + Mecoprop + Dicamba	2,4-D + Mecoprop + Dichlorprop	MCPA + Mecoprop + Dichlorprop
<b>Turfgrass</b>	<b>KEY:</b> I = intermediate tolerance, use with caution, use at reduced label rates or minimum label rates; S = sensitive, DO NOT USE THIS HERBICIDE; T = tolerant. Since tolerance frequently depends upon rate used and formulation selected, CAREFULLY CHECK THE LABEL.											
<b>COOL SEASON</b>												
Bentgrass	S-I	T	S-I	S	S-I	I	S-I	S	T*	I	I	I
Kentucky bluegrass	T	T	T	S	T	T	T	T	T	T	T	T
Tall fescue	T	T	T	S	T	T	T	T	T	T	T	T
Fine fescue	T	T	T	S	T	T	I	S	T	T	T	T
Perennial ryegrass	T	T	T	S	T	T	T	T	T	T	T	T
<b>WARM SEASON</b>												
Bahiagrass	S-I	T	T	S	I	T	S	S	T	I-T	T	T
Bermudagrass	T	T	T	T	T	T	S	T	T	I-T	T	T
Centipedegrass	S-I	T	I	T	S-I	S-I	S	T	S	S-I	I	I
St. Augustinegrass	S-I	S-I	S-I	T	S-I	S-I	S	S	S	S-I	I	I
Zoysiagrass	T	T	T	T	S-I	S-I	S	T	T	T	T	T

\* Do not use on golf course greens and trees.

**TOLERANCE OF TURFGRASSES TO POSTEMERGENCE HERBICIDES FOR CONTROL OF GRASS OR BROADLEAF WEEDS**

	CMA, DSMA, MSMA	Asulam	Atrazine	Bentazon	Chlorsulfuron	Diclofop	Dithiopyr	Ethofumesate	Fenoxaprop	Glyphosate	Imazapic	Imazaquin	Metsulfuron	Metribuzin	Pronamide	Quinclorac	Sethoxydim
<b>Turfgrass</b>	<b>KEY:</b> D = apply only during dormant season; I = intermediately tolerant; use with caution, use at reduced label rates or minimum label rates; S = sensitive—DO NOT USE THIS HERBICIDE; T = tolerant.																
<b>COOL SEASON</b>																	
Bentgrass	I	S	S	T	T	S	T	I	S-I	S	S	S	S-I	S	S	I	S
Kentucky bluegrass	I	S	S	T	T	S	T	T	T	S	S	S	I	S	S	T	S
Tall fescue	I	S	S	T	S	S	T	T	T	S	S-I	S	S-I	S	S	T	S
Fine fescue	I	S	S	T	T	S	T	S	T	S	S-I	S	I	S	S	I	T
Perennial ryegrass	T	S	S	I	S	S	T	T	T	S	S	S	S	S	S	T	S
<b>WARM SEASON</b>																	
Bahiagrass	S	S	S	T	I	S	T	S	S	D	S-I	S	S	S	S	S	S
Bermudagrass	T	T*	T	T	T	T	T	D	S	D	I	T	T	T	T	T**	S
Centipedegrass	S	S	T	T	I	S	T	S	S	S	T	T	I	S	S	S	T
St. Augustinegrass	S	T	T	T	I	S	T	T	S	S	S	T	T	S	S	S	S
Zoysiagrass	I	S	T	T	I	S	T	S	T	S	I	T	T	S	S	T	S

\*Use only on Tifway 419 bermudagrass.

\*\*Hybrid bermudagrass is intermediately tolerant to quinclorac.

**SUSCEPTIBILITY OF BROADLEAF WEEDS TO POSTEMERGENCE TURF HERBICIDES**

Weed	Classification of Weed	Response of Weeds to Herbicides							
		2,4-D	Mecoprop	Dicamba	Triclopyr + Clopyralid	2,4-D + Triclopyr	2,4-D + Mecoprop	2,4-D + Dichterprop	2,4-D + Mecoprop + Dicamba
Bittercress, hairy	WA	S	I	S	Unknown	Unknown	S	S	S
Buttercups	WA, B, P	S-I	I	I-R	S	Unknown	S	S	S
Buttonweed, Virginia	P	I	I-R	I-R	I	I	I	I	I
Carpetweed	SA	S	I	S	Unknown	S	S	S	S
Chickweed, common	WA	R	S-I	Unknown	S	S	S	S	S
Chickweed, mouseear	WA, P	I-R	S-I	S	S	S	S	S	S
Chickory	P	S	S	S	Unknown	Unknown	S	S	S
Clover, hop	WA	I	S	S	S	S	S	S	S
Clover, white	P	I	S	S	S	S	S	S	S
Dandelion, catsear	P	S-I	I	S	S	S	S	S	S
Dandelion, common	P	S	S	S	Unknown	S	S	S	S
Dichondra	P	S	I	S-I	S	Unknown	S	S	S
Dock (broadleaf, curly)	P	I	I-R	S	S	S-I	I	I	S-I
Dogfennel	P	R	Unknown	S	Unknown	Unknown	Unknown	Unknown	Unknown
Garlic, wild	P	S-I	R	S-I	S	Unknown	S-I	S-I	S-I
Geranium, Carolina	WA	S	S-I	S	I	Unknown	S	S	S
Hawkweed	P	S-I	R	S-I	Unknown	Unknown	S-I	S-I	S-I
Healall	P	S	R	S-I	Unknown	Unknown	S	S	S
Henbit	WA	I-R	I	S	S	S	I	S-I	S
Horseweed	WA, SA	I	Unknown	S	S	Unknown	Unknown	Unknown	S-I
Ivy, ground	P	I-R	I	S-I	S-I	S-I	I	I	S-I
Knawel	WA	R	I	S	Unknown	S	S-I	S-I	S
Knotweed, prostrate	SA	R	I	S	Unknown	Unknown	S-I	S-I	S
Lespedeza	SA	I-R	S	S	S	W	S-I	I	S
Mallow	SA	I-R	I	S-I	Unknown	S	S-I	S-I	S-I
Medic, black	A	R	I	S	S	S	I	S	S
Mugwort	P	I	I-R	S-I	Unknown	Unknown	I	I	I
Parsley-piert	WA	R	S-I	S-I	Unknown	S	S-I	R	S-I
Pennywort, lawn	P	S-I	S-I	S-I	Unknown	Unknown	S-I	S-I	S-I
Plantains	P	S	I-R	R	S	S	S	S	S
Purslane, common	SA	I	R	S	Unknown	S	I	I	S-I
Sorrel, red	P	R	S	S	S	Unknown	S-I	I	S
Speedwell, corn	WA	I-R	I-R	I-R	Unknown	Unknown	I-R	I-R	I-R
Spurge, prostrate	SA	I	I	S	S-I	S-I	I	S-I	S-I
Spurge, spotted	SA	I-R	S-I	S-I	S-I	S-I	S-I	S-I	S
Spurweed (lawn burweed)	WA	I	S-I	S	S	S	S-I	I	S
Strawberry, India mock	P	R	I	S-I	Unknown	Unknown	I	R	S-I
Vetch, common	WA, SA	S	S	S	S	S	S	S	S
Violet, Johnny jump-up, wild pansy	WA	I-R	I-R	S-I	S-I	I	I-R	I	I-R
Violet, wild	P	I-R	I-R	S-I	S-I	S-I	I-R	I	I-R
Woodsorrel (common yellow)	P	R	R	I	S-I	S-I	I-R	I-R	I-R
Yarrow	P	I	I-R	S	Unknown	Unknown	I-R	I	S-I
Yellow rocket	WA	S-I	I	S-I	Unknown	Unknown	S-I	S-I	S

**KEY:** A=annual; B=biennial; P=perennial; SA=summer annual; WA=winter annual; S=susceptible; I=intermediately susceptible, good control can sometimes be achieved with high rates, but a repeat treatment 3 to 4 weeks later, each at the standard or reduced rate, is usually more effective; R=resistant in most cases.

## Trade Names for Selected Postemergence Broadleaf Herbicides

<b>2,4-D</b> Dymec Lesco A-4D Weedar 64 Weedestroy AM-40 Amine Salt	<b>Atrazine</b> AAtrex 4L Bonus S* Purge II*	<b>MCPA + Mecoprop + Dichlorprop</b> Weedestroy Triamine II Weedestroy Triester II
<b>2,4-D + Dicamba</b> Lesco Eight-One 81 Selective Weedkiller	<b>Bentazon + Arazine</b> Prompt	<b>MCPA + Triclopyr + Dicamba</b> Horsepower (amine) Cool Power (ester)
<b>2,4-D + Dichlorprop (2,4-DP)</b> Turf D + DP amine Turf 2D + 2DP ester Weedone DPC	<b>Chlorsulfuron</b> Corsair	<b>Mecoprop (MCP)</b> Lescopex MCP 4 K Mecomec 4 Ortho Chickweed & Clover Control* Weedestroy MCP-4 Amine
<b>2,4-D + Mecoprop (or MCP)</b> Ortho Weed-B-Gon Weed Killer* Phenomec 2 MCP + 2D Amine Turf Herbicide 2 Plus 2 2,4-D + Triclopyr Chaser	<b>Dicamba</b> Banvel Vanquish	<b>Metsulfuron</b> Blade Manor
<b>2,4-D + Mecoprop + Dichlorprop</b> Weedestroy Triamine Weedestroy Triester Dissolve	<b>Diquat</b> Reward	<b>MSMA</b> Bueno 6 Diconate Diconate Super MSMA Turf MSMA 6.6
<b>2,4-D + Mecoprop + Dicamba</b> Lesco Three-Way MEC Amine-D MEC Amine-BG 33 Plus* Trimec Classic, Trimec Southern Trimec Bentgrass Triplet SF Weed-B-Gone for Southern Lawns Formula II*	<b>Glufosinate</b> Finale	<b>MSMA + 2,4-D + Mecoprop + Dicamba</b> Trimec Plus (Quadmec)
	<b>Glyphosate</b> Roundup Pro Roundup ProDry Roundup* Ortho Kleenup* Lesco Avail Weed Wrangler	<b>Simazine</b> Princep Liquid, Princep DF Regal Wynstar
	<b>Imazapic</b> Plateau DG Plateau	<b>Triclopyr + Clopyralid</b> Confront
	<b>MCPA + Mecoprop + Dicamba</b> Lesco Eliminate Trimec Encore Tri-Power	

\* Products available for homeowner use.

### ANNUAL GRASSY WEED CONTROL RATINGS FOR TURF HERBICIDES

Herbicide	Crabgrass	Goosegrass	Annual Bluegrass
Benefin	Good	Fair	Good
Bensulide	Good	Poor	Good
Clethodim	Good to Excellent	Good to Excellent	Good to Excellent
DCPA	Good	Poor	Good
Dithiopyr	Good to Excellent	Good	Good
Metolachlor	Good	Fair	Good
Napropamide	Good	Good	Good
Oryzalin	Good to Excellent	Good	Good
Oxadiazon	Good	Good	Good
Pendimethalin	Good to Excellent	Fair to Good	Good
Proflaminate	Good to Excellent	Good	Good
Quinclorac	Excellent	Not Registered	Not Registered
Siduron	Good	Fair	Not Registered

Excellent = 90 to 100% effective control; Good = 80 to 90% effective control; Fair = 70 to 80% effective control; Poor = less than 70% effective control.

## TURFGRASS DISEASE CONTROL

### L. TREDWAY, Plant Pathology Extension

When more than one brand name exists for an agricultural chemical, the name of brand that first came onto the market is listed first. Otherwise, brand names are listed in alphabetical order. The order in which brand names are given is not an indication of a recommendation or criticism.

#### TURFGRASS DISEASE CONTROL

Disease	Fungicide and Formulation*	Amount of Formulation (oz/1,000 sq ft)**	Application Interval (days)***
<b>ALGAE</b> ( <i>Cyanobacteria</i> )	chlorothalonil (Daconil, Chlorostar, Chlorothalonil, Concorde, Echo, Manicure)**** 82.5 WDG 6 F	1.8 to 3.25 2 to 4	7 to 14
	chlorothalonil + thiophanate-methyl**** (Spectro) 90 WDG	2 to 5.76	7 to 14
	copper hydroxide (Kocide) 54 DF	16	1 application
	mancozeb (Fore, Dithane, Mancozeb, Pentathlon, Protect) 75 WP, 80 WP 4 F	6 9.6	7 to 14
	mancozeb + copper hydroxide (Junction) 60 DF	4 to 8	7 to 14
	maneb (Pentathlon) 4F	9.6	7 to 14
<b>ANTHRACNOSE</b> ( <i>Colletotrichum graminicola</i> )	azoxystrobin (Heritage) 50 WG 0.8 TL	0.2 to 0.4 1 to 2	14 to 28 14 to 28
	azoxystrobin + propiconazole (Headway) 1.4ME	1.5 to 3	14 to 28
	chloroneb (Teremec, Terraneb) 65 SP	3 to 4	7 to 10
	chlorothalonil (Daconil, Chlorostar, Chlorothalonil, Concorde, Echo, Manicure)**** 82.5 WDG 6 F	2.75 to 3.25 3.25 to 5 3 to 3.6 3.6 to 5.5	7 to 14 14 7 to 14 14
	chlorothalonil + fenarimol (TwoSome) 4.4 F****	6 to 8	14 to 21
	chlorothalonil + propiconazole (Concert) 4.3SC****	4.5 to 5.5 5.5 to 8.5	7 to 14 14 to 28
	chlorothalonil + propiconazole + fludioxonil (Instrata) 3.6 SC	2.75 to 6	14 to 28
	chlorothalonil + thiophanate-methyl**** (Consyst) 67 WDG (Spectro) 90 WDG	2 to 8 3.72 to 5.76	7 to 14
	fenarimol (Rubigan) 1 AS	1.75 to 3.5	30
	fludioxonil (Medallion) 50 WP	0.25 to 0.5	14
	fluoxastrobin (Disarm) 4SC	0.18 to 0.36	14 to 28
	flutolanil + thiophanate-methyl (SysStar) 80 WDG	2 to 3	14 to 30
	iprodione (various brands) 2 F****	4 to 8	See label
	iprodione + thiophanate-methyl (26/36) 3.8F	2 to 4	14 to 21
	metconazole (Tourney) 50WDG	0.28 to 0.37	14 to 21
	myclobutanil (Eagle) 20EW 40WP	1.2 0.6	14 to 21 14 to 21
	polyoxin D (Endorse) 2.5 WP	4	7 to 14
	propiconazole (Banner MAXX, Propiconazole, Propiconazole Pro, Savvi, Spectator) 1 ME	1 to 2	14 to 28
	pyraclostrobin (Insignia) 20 WG	0.5 to 0.9	14 to 28

**TURFGRASS DISEASE CONTROL**

Disease	Fungicide and Formulation*	Amount of Formulation (oz/1,000 sq ft)**	Application Interval (days)***
<b>ANTHRACNOSE</b> (continued)	thiophanate-methyl (various brands) 50 WP 85 WDG 4 F	2 to 6 0.67 to 1.3 2 to 6	14 14 14
	triadimefon (Bayleton) 50 WSP	1	30 to 45
	trifloxystrobin (Compass) 50 WDG	0.15 to 0.25	14 to 21
	trifloxystrobin + triadimefon (Tartan) 2SC (Armada) 50WP	1 to 2 0.6 to 1.2	14 to 28
	triticonazole (Trinity) 1.7 SC (Triton) 70WDG	0.5 to 1 0.15 to 0.225	14 to 28 14 to 28
<b>BROWN PATCH</b> ( <i>Rhizoctonia Solani</i> )	azoxystrobin (Heritage) 50 WG 0.8 TL	0.2 to 0.4 1 to 2 oz	14 to 28 14 to 28
	azoxystrobin + propiconazole (Headway) 1.4ME	0.75 to 3	14 to 28
	chloroneb (Teremec, Terraneb) 65 SP	3 to 4	7 to 10
	chlorothalonil (Daconil, Chlorostar, Chlorothalonil, Concorde, Echo, Manicure) **** 82.5 WDG 6 F	1.8 to 3.23 3.7 to 5 2 to 3.6 4 to 5.5	7 to 14 14 7 to 14 14
	chlorothalonil + fenarimol (TwoSome) F****	3 to 6	7 to 10
	chlorothalonil + propiconazole (Concert) 4.3SC****	3 to 5.5 5.5 to 8.5	7 to 14 14 to 28
	chlorothalonil + propiconazole + fludioxonil (Instrata) 3.6 SC	2.75 to 6	14 to 21
	chlorothalonil + thiophanate-methyl**** (Consys) 67 WDG (Spectro) 90 WDG	2 to 8 2 to 5.76	7 to 14
	fenarimol (Rubigan) 1 AS	1.5	7 to 14
	fludioxonil (Medallion) 50 WP	0.2 to 0.25 0.5	7 14
	fluoxastrobin (Disarm) 4SC	0.09 to 0.36	14 to 28
	flutolanil (Prostar) 70 WP	1.5 to 3	14 to 21
	flutolanil + thiophanate-methyl (SysStar) 80 WDG	2 to 3	14 to 21
	iprodione (various brands)**** 2F	3 to 4	14 to 28
	iprodione + thiophanate-methyl (26/36) 3.8F	2 to 4	14 to 21
	mancozeb (Fore, Dithane, Mancozeb, Pentathlon, Protect) 4 F 75 WP, 80 WP	6.4 4	7
	mancozeb + copper hydroxide (Junction) 60 DF	4 to 8	7
	maneb (Pentathlon) 4F	4.8	7 to 14
	metconazole (Tourney) 50WDG	0.28 to 0.37	14 to 21
	myclobutanil (Eagle) 20EW 40WP	0.6 1.2	14 14
	polyoxin D (Endorse) 2.5 WP	4	7 to 14
	propiconazole (Banner MAXX, Propiconazole, Propiconazole Pro, Savvi, Spectator) 1 ME	1 to 2	14 to 21
	pyraclostrobin (Insignia) 20 WG	0.5 to 0.9	14 to 28

**TURFGRASS DISEASE CONTROL**

Disease	Fungicide and Formulation*	Amount of Formulation (oz/1,000 sq ft)**	Application Interval (days)***
<b>BROWN PATCH</b> (continued)	thiophanate-methyl (various brands) 50 WP 85 WDG 4 F	2 to 4 0.67 to 1.3 1 to 2	14 14 14
	thiophanate-methyl + iprodione (Fluid Fungicide, ProTurf) F****	1.1 to 2.1	7 to 14
	thiram (Spotrete) 4F 75 WDG	3.75 to 7.5 2.5 to 5	3 to 10 7 to 10
	triadimefon (Bayleton) 50 WSP	0.5 to 1	15 to 30
	trifloxystrobin (Compass) 50 WDG	0.1 to 0.2 0.15 to 0.25	14 21
	trifloxystrobin + triadimefon (Tartan) 2SC (Armada) 50WP	1 to 2 0.6 to 1.2	14 to 28
	triticonazole (Trinity) 1.7 SC (Triton) 70WDG	0.5 to 2 0.15 to 0.3	14 to 28 14 to 28
	vinclozolin**** (various brands) 50 EG	1	14 to 28
<b>COPPER SPOT</b> ( <i>Gloeocercospora sorghi</i> )	chlorothalonil (Daconil, Chlorostar, Chlorothalonil, Concorde, Echo, Manicure) **** 82.5 WDG 6 F	3.7 to 5 4 to 5.5	14
	chlorothalonil + fenarimol (TwoSome) 4.4 F****	3 to 9	10 to 21
	chlorothalonil + propiconazole (Concert) 4.3SC****	5.5 to 8.5	14
	chlorothalonil + thiophanate-methyl**** (Consyst) 67 WDG (Spectro) 90 WDG	3 to 8 3 to 5.76	7 to 14
	fenarimol (Rubigan) 1 AS	0.75 to 1.5	10 to 28
	flutolanil + thiophanate-methyl (SysStar) 80 WDG	2 to 3	14 to 21
	iprodione + thiophanate-methyl (26/36) 3.8F	2 to 4	14 to 21
	mancozeb (Fore, Dithane, Mancozeb, Pentathlon, Protect) 4 F 75 WP, 80 WP	6.4 to 12.8 4 to 8	7 to 14
	mancozeb + copper hydroxide (Junction) 60 DF	4 to 8	7 to 14
	maneb (Pentathlon) 4F	6.4 to 12.8	7 to 14
	myclobutanil (Eagle) 20EW 40WP	0.6 1.2	14 14
	thiophanate-methyl (various brands) 50 WP 85 WDG 4 F	2 to 4 0.67 to 1.3 2 to 4	14 14 14
	thiram (Spotrete) 4F	3.75 to 7.5	3 to 10
	triadimefon (Bayleton) 50 WSP	0.5 to 1	15 to 30
	<b>DEAD SPOT</b> ( <i>Ophiosphaerella agrostis</i> )	azoxystrobin + propiconazole (Headway) 1.4ME	1.5 to 3
boscalid**** (Emerald) 70WG		0.18	14
fludioxonil (Medallion) 50 WP		0.3 to 0.5	14
pyraclostrobin (Insignia) 20 WG		0.5 to 0.9	14 to 28

**TURFGRASS DISEASE CONTROL**

Disease	Fungicide and Formulation*	Amount of Formulation (oz/1,000 sq ft)**	Application Interval (days)***
<b>DOLLAR SPOT</b> <i>(Sclerotinia homoeocarpa)</i>	azoxystrobin + propiconazole (Headway) 1.4ME	0.75 to 3	14 to 28
	boscalid**** (Emerald) 70WG	0.13 to 0.18	14 to 28
	chlorothalonil (Daconil, Chlorostar, Chlorothalonil, Concorde, Echo, Manicure) **** 82.5 WDG 6 F	1 to 3.25 3.7 to 5 1 to 3.6 4 to 5.5	7 to 21 14 to 21 7 to 21 14 to 21
	chlorothalonil + fenarimol (TwoSome) 4.4 F****	3 to 4.5	14 to 21
	chlorothalonil + propiconazole (Concert) 4.3SC****	1.5 to 3 3 to 5.5 5.5 to 8.5	7 to 10 14 to 21 14 to 28
	chlorothalonil + propiconazole + fludioxonil (Instrata) 3.6 SC	2.75 to 6	21 to 28
	chlorothalonil + thiophanate-methyl**** (Consyst) 67 WDG (Spectro) 90 WDG	2 to 8 2 to 5.76	7 to 21 7 to 14
	fenarimol (Rubigan) 1 AS	0.75 to 1.5	10 to 28
	fluoxastrobin (Disarm) 4SC	0.18 to 0.36	14 to 21
	flutolanil + thiophanate-methyl (SysStar) 80 WDG	2 to 3	14 to 30
	iprodione (various brands)**** 2F	3 to 4	14 to 28
	iprodione + thiophanate-methyl (26/36) 3.8F	2 to 4	14 to 21
	mancozeb (Fore, Dithane, Mancozeb, Pentathlon, Protect) 4 F 75 WP, 80 WP	6.4 to 12.8 6 to 8	7 to 14
	mancozeb + copper hydroxide (Junction) 60 DF	4 to 8	7 to 14
	maneb (Pentathlon) 4F	9.6 to 12.8	7 to 14
	metconazole (Tourney) 50WDG	0.18 to 0.37	14 to 21
	myclobutanil (Eagle) 20EW 40WP	1.2 to 2.4 0.5 to 1.2	14 to 28 14 to 28
	propiconazole (Banner MAXX, Propiconazole, Propiconazole Pro, Savvi, Spectator) 1 ME	0.5 to 2	7 to 28
	pyraclostrobin (Insignia) 20 WG	0.9	14
	thiophanate-methyl (various brands) 50 WP 85 WDG 4 F	2 to 4 0.67 to 1.3 2 to 4	14 14 14
	thiophanate-methyl + iprodione (Fluid Fungicide, ProTurf) F****	1.1 to 2.1	7 to 14
	thiram (Spotrete) 4F 75 WDG	3.75 to 7.5 2.5 to 5	3 to 10 7 to 10
	triadimefon (Bayleton) 50 WSP	0.25 to 1	14 to 30
	trifloxystrobin + triadimefon (Tartan) 2SC (Armada) 50WP	1 to 2 0.6 to 1.2	14 to 28
	triticonazole (Trinity) 1.7 SC (Triton) 70WDG	0.5 to 1 0.15 to 0.225	14 to 28 14 to 28
	vinclozolin**** (various brands) 50 EG	1	21 to 28

**TURFGRASS DISEASE CONTROL**

Disease	Fungicide and Formulation*	Amount of Formulation (oz/1,000 sq ft)**	Application Interval (days)***
<b>FAIRY RING</b> ( <i>Basidiomycetes</i> )	azoxystrobin (Heritage) 50 WG 0.8 TL	0.4 2	28 28
	azoxystrobin + propiconazole (Headway) 1.4ME	3	28
	fluoxastrobin (Disarm) 4SC	0.36	28
	flutolanil (Prostar) 70 WP	2.2 to 4.5	21 to 30
	flutolanil + thiophanate-methyl (SysStar) 80 WDG	3 to 6.12	21 to 28
	metconazole (Tourney) 50WDG	0.37	21
	polyoxin D (Endorse) 2.5 WP	4	7
	pyraclostrobin (Insignia) 20 WG	0.9	28
	triadimefon (Bayleton) 50DF	1 to 2	14 to 21
<b>GRAY LEAF SPOT</b> ( <i>Pyricularia grisea</i> )	azoxystrobin (Heritage) 50 WG 0.7 TL	0.2 to 0.4 1 to 2	14 to 28 14 to 28
	azoxystrobin + propiconazole (Headway) 1.4ME	1.5 to 3	14 to 28
	chlorothalonil (Daconil, Chlorostar, Chlorothalonil, Concorde, Echo, Manicure) **** 82.5 WDG 6 F	1.8 to 3.25 3.7 to 5 2 to 3.6 4 to 5.5	7 to 21 14 7 to 21 14
	chlorothalonil + fenarimol (TwoSome) 4.4 F****	3 to 9	7 to 10
	chlorothalonil + propiconazole (Concert) 4.3SC****	3 to 5.5 5.5 to 8.5	7 to 14 14 to 21
	chlorothalonil + propiconazole + fludioxonil (Instrata) 3.6 SC	2.75 to 6	10 to 14
	chlorothalonil + thiophanate-methyl**** (Conyst) 67 WDG (Spectro) 90 WDG	2 to 8 3.72 to 5.76	7 to 14 ?
	fluoxastrobin (Disarm) 4SC	0.18 to 0.36	14 to 28
	flutolanil + thiophanate-methyl (SysStar) 80 WDG	2 to 3	14
	mancozeb (Fore, Dithane, Mancozeb, Pentathlon, Protect) 4 F 75 WP, 80 WP	6.4 to 12.8 8	7 to 14 14
	metconazole (Tourney) 50WDG	0.37	14
	propiconazole (Banner MAXX, Propiconazole, Propiconazole Pro, Savvi, Spectator) 1 ME	1 to 2	14
	pyraclostrobin (Insignia) 20 WG	0.5 to 0.9	14 to 28
	thiophanate-methyl (various brands) 50 WP or 4 F	4 to 6	14
	triadimefon (Bayleton) 50 WSP	0.5 to 1	14
	trifloxystrobin (Compass) 50 WDG	0.15 to 0.2 0.25	14 21
	trifloxystrobin + triadimefon (Tartan) 2SC (Armada) 50WP	1 to 2 0.6 to 1.2	14 to 28

**TURFGRASS DISEASE CONTROL**

Disease	Fungicide and Formulation*	Amount of Formulation (oz/1,000 sq ft)**	Application Interval (days)***
HELMINTHOSPORIUM LEAF SPOT/MELTING OUT (Bipolaris spp.; Drechslera spp.)	azoxystrobin (Heritage) 50 WG 0.8 TL	0.2 to 0.4 1 to 2	14 to 21 14 to 21
	azoxystrobin + propiconazole (Headway) 1.4ME	1.5 to 3	14 to 28
	chlorothalonil (Daconil, Chlorostar, Propiconazole, Concorde, Echo, Manicure) **** 82.5 WDG 6 F	1.8 to 3.25 3.7 to 5 2 to 3.6 4 to 5.5	7 to 21 14 to 21 7 to 21 14 to 21
	chlorothalonil + fenarimol (TwoSome) 4.4 F****	3 to 5.25	14 to 21
	chlorothalonil + propiconazole (Concert) 4.3SC****	3 to 5.5 5.5 to 8.5	7 to 14 14 to 21
	chlorothalonil + propiconazole + fludioxonil (Instrata) 3.6 SC	2.75 to 6	10 to 21
	chlorothalonil + thiophanate-methyl**** (Consyst) 67 WDG (Spectro) 90 WDG	2 to 8 2 to 5.76	7 to 21 7 to 14
	fludioxonil (Medallion) 50 WP	0.25 to 0.5	14 to 21
	fluoxastrobin (Disarm) 4SC	0.18 to 0.36	14 to 21
	flutolanil + thiophanate-methyl (SysStar) 80 WDG	2 to 3	14
	iprodione (various brands)**** 2F	3 to 4	14 to 28
	iprodione + thiophanate-methyl (26/36) 3.8F	2 to 4	14 to 21
	mancozeb (Fore, Dithane, Mancozeb, Pentathlon, Protect) 4 F 75 WP, 80 WP	6.4 4	7 to 14
	mancozeb + copper hydroxide (Junction) 60 DF	4 to 8	7 to 14
	maneb (Pentathlon) 4F	4.8 to 6.4	7 to 14
	myclobutanil (Eagle) 20EW 40WP	1.2 0.6	14 14
	polyoxin D (Endorse) 2.5 WP	4	7 to 14
	propiconazole (Banner MAXX, Propiconazole, Propiconazole Pro, Savvi, Spectator) 1 ME	1 to 2	14
	pyraclostrobin (Insignia) 20 WG	0.5 to 0.9	14 to 28
	thiophanate-methyl (various brands) 50 WP or 4 F	4 to 6	14
	thiophanate-methyl + iprodione (Fluid Fungicide, ProTurf) F****	1.1 to 2.1	7 to 14
	thiram (Spotrete) 4 F	3.75 to 7.5	3 to 10
	trifloxystrobin (Compass) 50 WDG	0.1 to 0.15 0.15 to 0.25	14 21 to 28
trifloxystrobin + triadimefon (Tartan) 2SC (Armada) 50WP	1 to 2 0.6 to 1.2	14 to 28	
triticonazole (Trinity) 1.7 SC (Triton) 70WDG	0.5 to 1 0.15 to 0.225	14 to 28 14 to 28	
vinclozolin**** (various brands) 50 EG	1	14 to 28	

**TURFGRASS DISEASE CONTROL**

<b>Disease</b>	<b>Fungicide and Formulation*</b>	<b>Amount of Formulation (oz/1,000 sq ft)**</b>	<b>Application Interval (days)***</b>
<b>LARGE PATCH (ZOYSIA PATCH)</b> <i>(Rhizoctonia solani)</i>	azoxystrobin (Heritage) 50 WG 0.8 TL	0.4 2	14 to 28 14 to 28
	azoxystrobin + propiconazole (Headway) 1.4ME	1.5 to 3	14 to 28
	fluoxastrobin (Disarm) 4SC	0.36	14 to 28
	flutolanil (Prostar) 70 WP	2.2	30
	iprodione (various brands)**** 2 F	4	14 to 21
	iprodione + thiophanate-methyl (26/36) 3.8F	2 to 4	14 to 21
	metconazole (Tourney) 50WDG	0.37	14
	myclobutanil (Eagle) 20EW 40WP	2.4 1.2	28 (fall) 28
	polyoxin D (Endorse) 2.5 WP	4	7 to 14
	propiconazole (Banner MAXX, Propiconazole, Propiconazole Pro, Savvi, Spectator) 1 ME	3 to 4	1 application
	thiophanate-methyl (various brands) 50 WP or 4F 85 WDG	2 to 4 0.67 to 1.3	14 14
	triadimefon (Bayleton) 50 WSP	1 to 2	fall and spring
	triticonazole (Trinity) 1.7 SC (Triton) 70WDG	0.5 to 1 0.15 to 0.3	14 to 28 14 to 28
<b>PINK PATCH</b> <i>(Limonomyces roseipellis)</i>	azoxystrobin (Heritage) 50 WG 0.8 TL	0.2 to 0.4 1 to 2	14 to 28 14 to 28
	azoxystrobin + propiconazole (Headway) 1.4ME	1.5 to 3	14 to 28
	chlorothalonil + propiconazole (Concert) 4.3SC****	3 to 5.5 5.5 to 8.5	7 to 14 14 to 21
	fluoxastrobin (Disarm) 4SC	0.18 to 0.36	14 to 28
	flutolanil (Prostar) 70 WP	1.5	21 to 28
	flutolanil + thiophanate-methyl (SysStar) 80 WDG	2	21 to 28
	propiconazole (Banner MAXX, Propiconazole, Propiconazole Pro, Savvi, Spectator) 1 ME	2	14 to 21
	pyraclostrobin (Insignia) 20 WG	0.5 to 0.9	14 to 28
	trifloxystrobin (Compass) 50 WDG	0.1 to 0.15 0.2 to 0.25	14 21
	trifloxystrobin + triadimefon (Tartan) 2SC (Armada) 50WP	1 to 2 0.6 to 1.2	14 to 28
vinclozolin**** (various brands) 50 EG	1	14 to 28	
<b>PINK SNOW MOLD/ MICRODOCHIUM PATCH</b> <i>(Microdochium nivale)</i>	azoxystrobin (Heritage) 50 WG 0.8 TL	0.2 to 0.4 0.7 2 3.5	10 to 28 1 application 10-28 (2 applications before snow cover) 1 application before snow cover
	azoxystrobin + propiconazole (Headway) 1.4ME	3 5.25	10 to 28 1 application
	chlorothalonil (Daconil, Chlorostar, Propiconazole, Concorde, Echo, Manicure) **** 82.5 WDG 6 F	5 5.5	21 to 28
	chlorothalonil + fenarimol (TwoSome) 4.4 F****	16	21 to 28
	chlorothalonil + propiconazole + fludioxonil (Instrata) 3.6 SC	5 to 11	late fall

**TURFGRASS DISEASE CONTROL**

Disease	Fungicide and Formulation*	Amount of Formulation (oz/1,000 sq ft)**	Application Interval (days)***
<b>PINK SNOW MOLD/ MICRODOCHIUM PATCH</b> (continued)	chlorothalonil + thiophanate-methyl**** (Consyst) 67 WDG (Spectro) 90 WDG	6 to 8 3.72 to 5.76	1 application 7 to 14
	fenarimol (Rubigan) 1 AS	8	1 to 2 applications
	fludioxonil (Medallion) 50 WP	0.5	1 application
	fluoastrobilin (Disarm) 4SC	0.18 to 0.36	14 to 28
	flutolanil + thiophanate-methyl (SysStar) 80 WDG	4 to 6.12	1 application
	iprodione (various brands)**** 2F	4 to 8	1 to 2 applications
	iprodione + thiophanate-methyl (26/36) 3.8F	2 to 4	14 to 21
	mancozeb + copper hydroxide (Junction) 60 DF	4 to 8	14 to 42
	maneb (Pentathlon) 4F	9.6 to 12.8	14 to 42
	metconazole (Tourney) 50WDG	0.37 to 0.44	late fall
	myclobutanil (Eagle) 20EW 40WP	1.2 to 2.4 0.6 to 1.2	prior to snow cover 1 application
	PCNB (various brands) 75 WP 10 G 4 F	3 to 8 80 to 160 12 to 16	28 to 42 prior to snowfall prior to snowfall
	polyoxin D (Endorse) 2.5 WP	4	7 to 14
	propiconazole (Banner MAXX, Propiconazole, Propiconazole Pro, Savvi, Spectator) 1 ME	2 to 4	fall to early spring
	pyraclostrobin (Insignia) 20 WG	0.5 to 0.9	14 to 28
	mancozeb (Fore, Dithane, Mancozeb, Pentathlon, Protect) 4 F 75 WP, 80 WP	9.6 to 12.8 6 to 8	14 to 42
	thiram (Spotrete) 4 F 75 WDG	3 to 12 3 to 8	fall and spring
	thiophanate-methyl (various brands) 50 WP 85 WDG 4 F	2 to 4 0.67 to 1.3 2 to 4	late fall to early winter 14 late fall to early winter
	triadimefon (Bayleton) 50 WSP	1 to 2	60 to 90
	trifloxystrobin (Compass) 50 WDG	0.2 to 0.25	fall to early spring
	trifloxystrobin + triadimefon (Tartan) 2SC (Armada) 50WP	2 1.2	fall to early spring
	triticonazole (Trinity) 1.7 SC (Trinton) 70WDG	0.5 to 1 0.15 to 0.3	14 to 28 1 to 2 applications late fall before snow cover
	vinclozolin**** (various brands) 50 EG	1	10 to 21
<b>POWDERY MILDEW</b> ( <i>Blumeria graminis</i> )	azoxystrobin (Heritage) 50 WG 0.8 TL	0.2 to 0.4 1 to 2	14 to 28 14 to 28
	azoxystrobin + propiconazole (Headway) 1.4ME	1.5 to 3	14 to 28
	chlorothalonil + fenarimol (TwoSome) 4.4 F	8 to 16	30
	chlorothalonil + propiconazole (Concert) 4.3SC****	4.5 to 8.5	14 to 28
	chlorothalonil + thiophanate-methyl**** (Consyst) 67 WDG (Spectro) 90 WDG	2 to 8 2 to 5.76	7 to 14

**TURFGRASS DISEASE CONTROL**

Disease	Fungicide and Formulation*	Amount of Formulation (oz/1,000 sq ft)**	Application Interval (days)***
<b>POWDERY MILDEW</b> (continued)	fenarimol (Rubigan) 1 AS	2 to 4	1 application
	fluoxastrobin (Disarm) 4SC	0.18 to 0.36	14 to 28
	mancozeb + copper hydroxide (Junction) 60 DF	4 to 8	7 to 14
	myclobutanil (Eagle) 20EW 40WP	1.2 0.6	14 to 28 14 to 28
	propiconazole (Banner MAXX, Propiconazole, Propiconazole Pro, Savvi, Spectator) 1 ME	1 to 2	14 to 28
	pyraclostrobin (Insignia) 20 WG	0.5 to 0.9	14 to 28
	triadimefon (Bayleton) 50 WSP	0.5 to 1	15 to 30
<b>PYTHIUM BLIGHT</b> ( <i>Pythium aphanidermatum</i> )	azoxystrobin (Heritage) 50 WG 0.8 TL	0.4 2	10 to 14 10 to 14
	azoxystrobin + propiconazole (Headway) 1.4ME	3	10 to 14
	chloroneb (Teremec, Terraneb) 65 SP	4	5 to 7
	cyazofamid (Segway) 3.33 SC	0.45 to 0.9	14 to 21
	ethazole (Koban) 30 WP (Terrazole) 35 WP	2 to 4.5 2 to 4	5 to 10 10 to 14
	fluopicolide + propamocarb (Stellar) 5.7SC	1.2 (maximum 2.4 oz/year)	14
	fluoxastrobin (Disarm) 4SC	0.18 to 0.36	14
	fosetyl AI (Signature) 80 WDG	4 8	14 21
	mancozeb (Fore, Dithane, Mancozeb, Pentathlon, Protect) 4 F 75 WP, 80 WP	12.8 8	5 5
	mancozeb + copper hydroxide (Junction) 60 DF	4 to 8	5
	maneb (Pentathlon) 4F	12.8	5
	mefenoxam (Subdue) 43 WSP (Subdue MAXX, Fenox, Mefenoxam, Quell) 2 ME (Subdue) 1 GR	0.11 to 0.56 0.5 to 1 5 to 25	10 to 21 10 to 21 10 to 14
	phosphorus acid (Alude, Resyst) 3.3 F (Magellan) 4.3 F (Vital) 4.2 F	5 to 10 4.1 to 8.2 6	7 to 14 14 to 21 14
	propamocarb (Banol) 6 S	1.3 to 4	7 to 21
	pyraclostrobin (Insignia) 20 WG	0.9	10 to 14
	<b>PYTHIUM ROOT DYSFUNCTION</b> ( <i>Pythium volutum</i> )	cyazofamid (Segway) 3.33 SC	0.45 to 0.9
pyraclostrobin (Insignia) 20 WG		0.9	14 to 28

**TURFGRASS DISEASE CONTROL**

Disease	Fungicide and Formulation*	Amount of Formulation (oz/1,000 sq ft)**	Application Interval (days)***
<b>PYTHIUM ROOT ROT</b> ( <i>Pythium spp.</i> )	azoxystrobin (Heritage) 50 WG 0.8 TL	0.4 2	10 to 14 10 to 14
	azoxystrobin + propiconazole (Headway) 1.4ME	3	10 to 14
	ethazole (Koban) 30 WP (Terrazole) 35 WP	5 to 6 2 to 4	5 to 10 10 to 14
	fluoxastrobin (Disarm) 4SC	0.18 to 0.36	14
	fosetyl AI (Signature) 80 WDG	4 8	14 21
	mefenoxam (Quell) 2 EC	0.5 to 1	10 to 21
<b>RAPID BLIGHT</b> ( <i>Labyrinthula spp.</i> )	mancozeb (Fore, Dithane, Mancozeb, Pentathlon, Protect) 80 WP	8	14
	pyraclostrobin (Insignia) 20 WG	0.5 to 0.9	14
	trifloxystrobin (Compass) 50 WDG	0.15 to 0.2 0.25	14 21
<b>RED THREAD</b> ( <i>Laetisaria fuciformis</i> )	azoxystrobin (Heritage) 50 WG 0.8 TL	0.2 to 0.4 1 to 2	14 to 28 14 to 28
	azoxystrobin + propiconazole (Headway) 1.4ME	1.5 to 3	14 to 28
	chlorothalonil (Daconil, Chlorostar, Chlorothalonil, Concorde, Echo, Manicure) **** 82.5 WDG 6 F	1.8 to 3.25 3.25 to 5 2 to 3.6 3.6 to 5.5	7 to 10 14 7 to 10 14
	chlorothalonil + fenarimol (TwoSome) 4.4 F****	3 to 9	7 to 10
	chlorothalonil + propiconazole (Concert) 4.3SC****	3 to 5.5 5.5 to 8.5	7 to 14 14 to 21
	chlorothalonil + propiconazole + fludioxonil (Instrata) 3.6 SC	2.75 to 6	14 to 21
	chlorothalonil + thiophanate-methyl**** (Consynt) 67 WDG (Spectro) 90 WDG	3 to 8 3 to 5.76	7 to 10 7 to 14
	fenarimol (Rubigan) 1 AS	8	30
	fluoxastrobin (Disarm) 4SC	0.18 to 0.36	14 to 28
	flutolanil (Prostar) 70 WP	1.5	21 to 28
	flutolanil + thiophanate-methyl (SysStar) 80 WDG	2 to 3	14 to 21
	iprodione (various brands)**** 2F	4	14
	iprodione + thiophanate-methyl (26/36) 3.8F	2 to 4	14 to 21
	mancozeb (Fore, Dithane, Mancozeb, Pentathlon, Protect) 4 F 75 WP, 80 WP	6.4 to 12.8 4 to 8	7 to 14
	mancozeb + copper hydroxide (Junction) 60 DF	4 to 8	7 to 14
	maneb (Pentathlon) 4F	6.4 to 12.8	7 to 14
	metconazole (Tourney) 50WDG	0.37	14
	myclobutanil (Eagle) 20EW 40WP	1.2 0.6	14 to 21 14 to 21
	polyoxin D (Endorse) 2.5 WP	4	7 to 14

**TURFGRASS DISEASE CONTROL**

Disease	Fungicide and Formulation*	Amount of Formulation (oz/1,000 sq ft)**	Application Interval (days)***
RED THREAD (continued)	propiconazole (Banner MAXX, Propiconazole, Propiconazole Pro, Savvi, Spectator) 1 ME	2	14 to 21
	pyraclostrobin (Insignia) 20 WG	0.5 to 0.9	14 to 28
	thiophanate-methyl (various brands) 50 WP 85 WDG 4 F	2 to 4 0.67 to 1.3 2 to 4	14 14 14
	thiram (Spotrete) 4 F	3.75 to 7.5	3 to 10
	triadimefon (Bayleton) 50 WSP	0.5 to 1	15 to 30
	trifloxystrobin (Compass) 50 WDG	0.1 to 0.15 0.2 to 0.25	14 21
	trifloxystrobin + triadimefon (Tartan) 2SC (Armada) 50WP	1 to 2 0.6 to 1.2	14 to 28
	triticonazole (Trinity) 1.7 SC (Triton) 70WDG	0.5 to 1 0.15 to 0.225	14 to 28 14 to 28
	vinclozolin**** (various brands) 50 EG	1	14 to 28
	RUST ( <i>Puccinia ssp.</i> )	azoxystrobin (Heritage) 50 WG 0.8 TL	0.2 to 0.4 1 to 2
azoxystrobin + propiconazole (Headway) 1.4ME		1.5 to 3	14 to 28
chlorothalonil (Daconil, Chlorostar, Chlorothalonil, Concorde, Echo, Manicure) **** 82.5 WDG 6 F		3.7 to 5 4.0 to 5.5	14 14
chlorothalonil + fenarimol (TwoSome) 4.4 F****		6 to 9	7 to 14
chlorothalonil + propiconazole (Concert) 4.3SC****		4.5 to 8.5	14 to 28
chlorothalonil + propiconazole + fludioxonil (Instrata) 3.6 SC		2.75 to 6	14 to 28
chlorothalonil + thiophanate-methyl**** (Consys) 67 WDG (Spectro) 90 WDG		3 to 5.76 3 to 8	7 to 14
fluoastrobin (Disarm) 4S		0.18 to 0.36	14 to 28
mancozeb (Fore, Dithane, Mancozeb, Pentathlon, Protect) 4 F 75 WP, 80 WP		6.4 4	7 to 14 7 to 14
maneb (Pentathlon) 4F		1.75	7 to 14
metconazole (Tourney) 50WDG		0.37	14
myclobutanil (Eagle) 20EW 40WP		1.2 0.6	14 to 28 14 to 28
propiconazole (Banner Maxx, Propiconazole, Propiconazole Pro, Savvi, Spectator) 1 ME		1 to 2	14 to 28
pyraclostrobin (Insignia) 20 WG		0.5 to 0.9	14 to 28
thiophanate-methyl (Cleary 3336) 50 WP		4 to 6	14
thiram (Spotrete) 4 F		3.75 to 7.5	3 to 10
triadimefon (Bayleton) 50 WSP		0.5 to 1	15 to 30
trifloxystrobin (Compass) 50 WDG		0.15 to 0.15 0.2 to 0.25	14 21

**TURFGRASS DISEASE CONTROL**

Disease	Fungicide and Formulation*	Amount of Formulation (oz/1,000 sq ft)**	Application Interval (days)***
<b>RUST</b> (continued)	trifloxystrobin + triadimefon (Tartan) 2SC (Armada) 50WP	1 to 2 0.6 to 1.2	14 to 28 14 to 28
	triticonazole (Trinity) 1.7 SC (Triton) 70WDG	0.5 to 1 0.15 to 0.225	14 to 28 14 to 28
<b>SOUTHERN BLIGHT</b> ( <i>Sclerotium rolfsii</i> )	azoxystrobin (Heritage) 50 WG 0.8 TL	0.2 to 0.4 1 to 2	14 to 28 14 to 28
	azoxystrobin + propiconazole (Headway) 1.4ME	1.5 to 3	14 to 28
	fluoxastrobin (Disarm) 4SC	0.18 to 0.36	14 to 28
	flutolanil (Prostar) 70 WP	1.5	21 to 28
	flutolanil + thiophanate-methyl (SysStar) 80 WDG	2	21 to 28
	triadimefon (Bayleton) 50 WSP	0.5 to 2	14 to 28
	trifloxystrobin + triadimefon (Tartan) 2SC (Armada) 50WP	1 to 2 0.6 to 1.2	14
<b>SPRING DEAD SPOT</b> ( <i>Ophiosphaerella korrae</i> ; <i>O. herpotricha</i> ; <i>O. narmari</i> )	azoxystrobin (Heritage) 50 WG 0.8 TL	0.4 2	14 to 28 14 to 28
	azoxystrobin + propiconazole (Headway) 1.4ME	3	14 to 28
	chlorothalonil + fenarimol (TwoSome) 4.4 F****	18	1 application
	fenarimol (Rubigan) 1 AS	6 4	1 application 14 to 30 (2 applications)
	fluoxastrobin (Disarm) 4SC	0.36	14 to 28
	myclobutanil (Eagle) 20EW 40WP	2.4 1.2	28 (fall) 28
	propiconazole (Banner MAXX, Propiconazole, Propiconazole Pro, Savvi, Spectator) 1 ME	4	30
	thiophanate-methyl (various brands) 40WP 4 F	4 to 6 4 to 6	14 14
<b>STRIPE SMUT</b> ( <i>Ustilago striiformis</i> )	chlorothalonil + propiconazole (Concert) 4.3SC****	4.5 to 8.5	fall or spring
	myclobutanil (Eagle) 20EW 40WP	1.2 0.6	14 14
	propiconazole (Banner MAXX, Propiconazole, Propiconazole Pro, Savvi, Spectator) 1 ME	1 to 2	fall or spring
	thiophanate-methyl (various brands) 50 WP 85 WDG 4 F	4 to 6 3 to 6.5 4 to 6	14 14 14
	triadimefon (Bayleton) 50 WSP	1	refer to label
	trifloxystrobin + triadimefon (Tartan) 2SC (Armada) 50WP	1 0.6	refer to label
<b>SUMMER PATCH</b> ( <i>Magnaporthe poae</i> )	azoxystrobin (Heritage) 50 WG 0.8 TL	0.2 to 0.4 1 to 2	14 to 28 14 to 28
	azoxystrobin + propiconazole (Headway) 1.4ME	1.5 to 3	14 to 28
	chlorothalonil + fenarimol (TwoSome) 4.4 F****	4.5 to 9	14

**TURFGRASS DISEASE CONTROL**

Disease	Fungicide and Formulation*	Amount of Formulation (oz/1,000 sq ft)**	Application Interval (days)***
<b>SUMMER PATCH</b> (continued)	chlorothalonil + propiconazole + fludioxonil (Instrata) 3.6 SC	6 to 11	14 to 28
	fenarimol (Rubigan) 1 AS	2 to 8	30
	fluoxastrobin (Disarm) 4SC	0.18 to 0.36	14 to 28
	fludioxonil (Medallion) 50 WP	0.5	14
	metconazole (Tourney) 50WDG	0.37	14
	myclobutanil (Eagle) 20EW 40WP	1.2 to 2.4 0.6 to 1.2	14 to 28 14 to 28
	propiconazole (Banner MAXX, Propiconazole, Propiconazole Pro, Savvi, Spectator) 1 ME	2 4	14 28
	pyraclostrobin (Insignia) 20 WG	0.5 to 0.9	14 to 28
	thiophanate-methyl (various brands) 50 WP 85 WDG 4 F	4 to 6 3 to 6.5 4 to 6	14 14 14
	triadimefon (Bayleton) 50 WSP	1 to 2	30 to 60
	trifloxystrobin (Compass) 50 WDG	0.2 to 0.25	21 to 28
	trifloxystrobin + triadimefon (Tartan) 2SC (Armada) 50WP	2 1.2	21 to 28
	triticonazole (Trinity) 1.7 SC (Triton) 70WDG	0.5 to 2 0.3 to 0.6	14 to 28 14 to 28
	<b>TAKE-ALL PATCH</b> ( <i>Gaeumannomyces graminis</i> )	azoxystrobin (Heritage) 50 WG 0.8 TL	0.4 2
azoxystrobin + propiconazole (Headway) 1.4ME		3	14 to 28
chlorothalonil + fenarimol (TwoSome) 4.4 F****		18	2 applications
fenarimol (Rubigan) 1 AS		4 to 8	30
fluoxastrobin (Disarm) 4SC		0.36	28
myclobutanil (Eagle) 20EW 40WP		2.4 1.2	28 (spring/fall) 28
propiconazole (Banner MAXX, Propiconazole, Propiconazole Pro, Savvi, Spectator) 1 ME		2 to 4	spring and fall
pyraclostrobin (Insignia) 20 WG		0.9	28
thiophanate-methyl (various brands) 50 WP or 4 F		4 to 6	14
triadimefon (Bayleton) 50 WS		1 to 2	21 to 28
triticonazole (Trinity) 1.7 SC (Triton) 70WDG		0.5 to 1 0.15 to 0.3	14 to 28 14 to 28 (1 to 2 applications spring and fall)
<b>YELLOW PATCH</b> ( <i>Rhizoctonia cerealis</i> )	azoxystrobin (Heritage) 50 WG 0.8 TL	0.4 2	28 28
	azoxystrobin + propiconazole (Headway) 1.4ME	3	28
	chlorothalonil + propiconazole + fludioxonil (Instrata) 3.6 SC	8 to 11	late fall
	fludioxonil (Medallion) 50 WP	0.5	1 application
	fluoxastrobin (Disarm) 4SC	0.18 to 0.36	14 to 28
	flutolanil (Prostar) 70 WP	1.5	21 to 28

**TURFGRASS DISEASE CONTROL**

Disease	Fungicide and Formulation*	Amount of Formulation (oz/1,000 sq ft)**	Application Interval (days)***
<b>YELLOW PATCH</b> (continued)	flutolanil + thiophanate-methyl (SysStar) 80 WDG	2	21 to 28
	metconazole (Tourney) 50WDG	0.37 to 0.44	late fall
	polyoxin D (Endorse) 2.5 WP	4	7 to 14
	propiconazole (Banner MAXX, Propiconazole, Propiconazole Pro, Savvi, Spectator) 1 ME	3 to 4	1 application
	thiophanate-methyl (various brands) 50 WP or 4 F	4 to 6	14
<b>YELLOW TUFT</b> ( <i>Sclerophthora macrospora</i> )	fosetyl AI (Signature) 80 WDG	4 8	14 21
	mefenoxam (Subdue WSP) 43 WSP (Subdue Maxx, Fenox, Quell, Mefenoxam) 2 ME (Subdue GR) 1 G	0.11 to 0.56 0.5 to 1 5 to 25	10 to 21 10 to 21 10 to 14
<b>ZOYSIA PATCH</b>	See LARGE PATCH		

- \* Other trade names with the same active ingredients are labeled for use on turfgrasses and can be used according to label directions.
- \*\* Apply fungicides in 2 to 5 gal of water per 1,000 sq ft according to label directions. Use lower rates for preventive and higher rates for curative applications.
- \*\*\* Use shorter intervals when conditions are very favorable for disease.
- \*\*\*\* Products containing chlorothalonil, iprodione, and vinclozolin are no longer labeled for use on home lawns.
- \*\*\*\*\* Remove slime molds by mowing, raking, or washing. Fungicide can be used if very unsightly.

**NEMATICIDES FOR TURF**  
**L. TREDWAY, Plant Pathology Extension**

**NEMATICIDES FOR TURF\***

Nematicide and Formulation	Amount of Formulation Per 1,000 sq ft	Precautions and Remarks
1,3-dichloropropene (Curfew)	4 to 5	Curfew is a restricted use pesticide and may only be applied by custom applicators certified by Dow Agrosiences. Curfew should not be applied within 100 feet of an occupied structure or any well used for potable water. Do not enter treated area for 24 hours after application. Curfew may be applied throughout the year, but turfgrass should be actively growing at the time of application. Soil moisture should be adequate to support good turf growth and maintained at that level for at least 7 days after application. One-half inch of irrigation or rainfall must be applied to the area to be treated within 18 hours prior to application and as soon as possible following application. Refer to label for additional application guidelines.
fenamiphos (Nemacur) 3 EC 10 G	9.7 fl oz 2.3 lb	Nemacur 10G and 3EC are restricted use pesticides. Carefully follow label directions before and during application. Do not apply to hydrological soil group A soils that are excessively drained and predominately sand or loamy sand. Do not use on residential lawns or public recreation areas other than golf courses. Nemacur 10G may also be used on cemetery and industrial grounds turfgrass areas. Do not apply more than 200 lb of 10G per acre per year or more than twice per year of the 3EC. Distribute product evenly over area. Irrigate area immediately using a minimum of 0.5 in. of water. Do not treat newly seeded areas. Do not apply granular nematicides with hand-held spreaders that might allow the dust to be inhaled. Do not apply where water runoff is likely to occur. Sod should not be cut or handled for 30 days after treatment. 3EC is not recommended for use on tees and greens. Do not treat more than 10 acres of turf on any golf course in a 24-hour period. Any application must be followed by a minimum 3-day interval before another application is made. Do not apply within 10 feet of any surface body of water or surface drains. Do not apply between noon and sunset from June through September.

\* Sting nematodes can cause severe damage in sandy soils, and nematicides may be needed to grow high-quality turf if these nematodes are present. Other nematodes are difficult to control in turf, and good management may help the turf tolerate these nematodes.

**Further Information**

*Diseases of Tall Fescue.* Plant Pathology Information Turfgrass Disease Note No. 6.  
*Disease-like Problems on Turfgrass in North Carolina.* Plant Pathology Information Turfgrass Disease Note No. 5.  
*Problems on Centipedegrass.* Plant Pathology Turfgrass Disease Information Note No. 1.  
*Turfgrass Pest Management Manual,* N.C. Cooperative Extension Service, AG-348 (available only at your county's Extension Center).  
*Diseases of Cool-Season Grasses.* N.C. Cooperative Extension Service, AG-361.

Copies of these publications are available from your county Cooperative Extension center.

## GROWTH REGULATORS FOR TURFGRASSES

F. H. YELVERTON, R. COOPER, L. S. WARREN JR., and T. W. GANNON, Crop Science Department

### GROWTH REGULATORS FOR TURFGRASSES

Purpose	Brand	Amount of Formulation Per Acre	Pounds Active Ingredient Per Acre	Precautions and Remarks
<b>COOL SEASON GRASSES</b>				
<b>WELL-MAINTAINED TURF</b> Seedhead and foliar suppression	mefluidide (Embark) 0.2	5 pt/15 to 150 gal water	0.125	See Embark 2-S for low-maintenance cool-season turf. Follow label directions and precautions.
	trinexapac-ethyl (Governor) 0.17 G	30 to 258 lb	0.05 to 0.44	Apply 30 to 41 lb per acre to greens, 53 to 152 lb per acre to fairways less than 0.5 in. cut, and 152 to 258 lb per acre to residential and commercial turf. Do not exceed 2.5 lb active ingredient per acre per year. These rates should provide 50% turf suppression for 4 weeks with minimal yellowing.
Foliar suppression	(Primo Maxx) 1 MEC or (T-Nex) 1AQ (Primo WSB) 25 WP	6 to 44 fl oz 2.75 to 21.8 oz	0.085 to 0.34 0.085 to 0.34	Application rate varies with turfgrass species and height of cut. Apply to actively growing, nonstressed turf. More growth suppression occurs at lower mowing heights. See label for specific rate and other directions and precautions. Repeat applications can be made, but do not exceed a total of 21.4 pt per acre per year of Primo Maxx or a total of 174 oz per acre per year of Primo WSB. Do not exceed a total of 19 pt per acre per year of T-Nex. Refer to the respective Primo label for guidelines regarding mowing prior to and following application. Mix with 0.5 to 4 gal of water per 1,000 sq ft (20 to 174 gal per acre). Primo can be applied to putting greens. See label for instructions.
	ethephon (Ethephon or Proxy) 2 SL	1.7 gal	3.4	May be applied to Kentucky bluegrass, perennial ryegrass, bentgrass, and tall and fine fescues. Do not apply to golf course putting greens. Apply in 22 to 174 gal of water per acre. Do not use a surfactant. Plant growth regulator effect will not be seen until 7 to 10 days after application. May be reapplied to Kentucky bluegrass and perennial ryegrass at 7-week intervals. Repeat applications to bentgrass and tall and fine fescue may be made at 4-week intervals.
	flurprimidol (Cutless 50 W) 50 WP	0.75 to 3 lb/50 to 200 gal water	0.37 to 1.5	Rates depend upon grass species and cultivar. Apply to bentgrass, Kentucky bluegrass, and perennial ryegrass in late spring-early summer and/or late summer-early fall. Time the second application to occur at least 3 months before expected winter dormancy. Do not apply to putting greens. Do not exceed 1.5 lb per acre per application on coarse-textured soils. Treated areas should receive 0.5 in. of irrigation within 24 hr after application. Resume mowing 3 to 5 days after application.
	flurprimidol + trinexapac-ethyl (Legacy) 1.51 SL	5 to 22 fl oz	0.059 to 0.26	Tolerant species include bentgrass greens and fairways, Kentucky bluegrass, and perennial ryegrass. Do not use on turf grown for sale or other commercial use as sod or seed production. Do not seed 3 weeks before or 3 weeks after application. Wait 6 to 8 weeks after sprigging or laying sod before applying. Use only 5 to 8 fl oz per acre on bentgrass greens. Repeat applications at 2- to 6-week intervals until 4 weeks before the onset of inactive growth.
	paclobutrazol (TGR Turf Enhancer 2 SC or Trimit 2 SC) 2 SC	1 to 2 pt /43 to 200 gal water	0.25 to 0.5	Apply in spring after greenup and after turf has been mowed once or twice. Apply at least 1 month before onset of high temperatures. In late summer-early fall, apply at least 1 month before anticipated first killing frost. Apply with 0.5 to 0.9 lb nitrogen per 1000 sq ft of a nonburning fertilizer. Apply 0.25 in. of water within 24 hr after application to remove product from foliage and onto soil surface. See label for special rates and directions for applications to bentgrass, putting greens, and overseeded bermudagrass. Repeat applications within the same growing season may be made but refer to label for instructions. Do not apply more than three times annually. Do not use on areas containing greater than 70% <i>Poa annua</i> . Do not seed within 6 weeks prior to or 2 weeks after applications.
	trinexapac-ethyl (Primo Maxx) 1 MEC or (T-Nex) 1AQ (Primo WSB) 25 WP	6 to 22 fl oz 2.75 to 10.9 oz	0.085 to 0.17 0.085 to 0.17	Application rates are for mowing heights of less than or equal to 0.5 in. Apply to actively growing, non-stressed turf. Rate varies with turfgrass species. See label for specific rate and other directions and precautions. Repeat applications can be made but do not exceed a total of 21.4 pt per acre per year of Primo Maxx or a total of 174 oz per acre per year of Primo WSB. Do not exceed a total of 19 pt per acre per year of T-Nex. Refer to the respective Primo label for guidelines regarding mowing prior to and following applications. Mix with 0.5 to 4 gal of water per 1,000 sq ft (20 to 174 gal per acre). Primo can be applied to putting greens. See label for instructions.

**GROWTH REGULATORS FOR TURFGRASSES**

Purpose	Brand	Amount of Formulation Per Acre	Pounds Active Ingredient Per Acre	Precautions and Remarks
<b>COOL SEASON GRASSES (continued)</b>				
<b>LOW-MAINTENANCE TURF</b> Seedhead and foliar suppression	chlorsulfuron (Telar DF) 75 DF + mefluidide (Embark 2-S) 2 S	0.25 oz + 0.5 pt	0.012 + 0.125	For growth and seedhead suppression in fescue/bluegrass stands. Apply up until seedhead emergence. Do not apply Telar DF to turf less than 1 year old. Grass seed may be planted in treated areas 6 months after treatment but cultivation is recommended. For broadcast applications, do not exceed 0.5 oz Telar DF per acre within a 12-month period. Telar DF alone can also be used for weed control in bahiagrass, bermudagrass, fescue, and bluegrass.
	glyphosate (Touchdown Pro) 3 LC	4 to 8 fl oz/10 to 40 gal water	0.09375 to 0.1875	Touchdown Pro may be used on turf described in "GENERAL USE AREAS" section of the label. 4 to 5 oz will suppress annual grasses, such as ryegrass, wild barley, and wild oats, growing in turf areas. 6 oz will suppress Kentucky bluegrass and serve as a mowing substitute. 8 oz will suppress fine fescue and tall fescue and serve as a mowing substitute. A nonionic surfactant containing at least 75% active ingredient at 0.25% v/v (1 qt per 100 gal) or ammonium sulfate at 0.5% by weight (4.25 to 17 lb per 100 gal) may be added.
	imazethapyr + imazapyr (Event) 1.46 lb/gal	8 to 10 fl oz	0.09 to 0.11	Apply to tall fescue, perennial ryegrass, and bluegrass only. Apply after the turf is at 100% greenup and has at least 2 in. of vertical growth. The addition of a nonionic surfactant containing at least 80% active ingredient at 0.25% v/v of the spray (2 pt per 100 gal of spray mixture) is required. Do not use on newly established stands less than 1 year old or on highly managed turf. Do not reseed before 3 months after application. See label for herbicide tank mix options. Follow label directions and precautions.
	maleic hydrazide (Retard) 2.25 lb/gal (Royal Slo-Gro) 1.5 lb/gal (Liquid Growth Retardant) 0.6 lb/gal	1.3 gal/50 gal water 2 gal/30 to 50 gal water 5 gal/45 gal water	3	Treat in the spring when the grass is actively growing but before seedhead appears. Applications made after seedhead appears will suppress subsequent seedheads. Do not apply to turf less than 3 years old, and do not reseed within 3 days after application. Treated turf may appear less dense and temporarily discolored. Optimum results may not be obtained if rainfall or overhead irrigation occurs within 12 hr following application. Remove excess grass clippings and fallen leaves before application. Do not add a surfactant. Follow label directions and precautions.
	mefluidide (Embark 2-S) 2 S	1.5 to 2 pt/15 to 150 gal water	0.38 to 0.5	Apply after uniform spring greenup until approximately 2 weeks before seedheads appear. Do not apply to turf within four growing months after seeding, and do not reseed within 3 days after application. Treated turf may appear less dense and temporarily discolored. Optimum results may not be obtained if rainfall or overhead irrigation occurs within 8 hr following application. Remove excess clippings and fallen leaves before application. Adding 1 to 2 qt of nonionic surfactant per 100 gal of spray solution may enhance suppression; however, discoloration may also be increased. Follow label directions and precautions.
	metsulfuron methyl (Escort XP) 60 DF	0.25 to 0.5 oz	0.009 to 0.018	Apply to well-established tall fescue and perennial bluegrass turf. Can tank mix with 0.125 to 0.25 pt per acre of Embark to improve pgr performance. Treat after 2 to 3 inches of new growth but before seed stalk formation. Temporary discoloration may occur. Do not use on stressed turf.
<b>WARM SEASON GRASSES</b>				
<b>WELL-MAINTAINED TURF</b> Seedhead and foliar suppression	trinexapac-ethyl (Governor) 0.17 G	12 to 258 lb	0.02 to 0.44	Apply 12 to 41 lb per acre to greens, 30 to 77 lb per acre to fairways less than 0.5 in. cut, and 41 to 258 lb per acre to residential and commercial turf. Do not exceed 2.5 lb active ingredient per acre per year. These rates should provide 50% turf growth suppression for 4 weeks with minimal yellowing.
	(Primo Maxx) 1 MEC or (T-Nex) 1 AQ (Primo WSB) 25 WP	2.7 to 88 fl oz 1.35 to 43.6 oz	0.085 to 0.68 0.085 to 0.68	Application rate varies with turfgrass species and height of cut. Apply to actively growing, nonstressed turf. More growth suppression occurs at lower mowing heights. See label for specific rate and other directions and precautions. Repeat applications can be made but do not exceed a total of 21.4 pt per acre per year of Primo Maxx or 174 oz per acre per year of Primo WSB. Do not exceed a total of 19 pt per acre per year of T-Nex. Refer to the respective Primo label for guidelines regarding mowing prior to and following application. Mix with 0.5 to 4 gal of water per 1,000 sq ft (20 to 174 gal per acre). Primo can be applied to putting greens. See label for directions.
	mefluidide (Embark) 0.2	10 pt/15 to 150 gal water	0.25	For St. Augustinegrass. See Embark 2-S for low-maintenance warm season turf. Follow label directions and precautions.

**GROWTH REGULATORS FOR TURFGRASSES**

Purpose	Brand	Amount of Formulation Per Acre	Pounds Active Ingredient Per Acre	Precautions and Remarks
<b>WARM SEASON GRASSES (continued)</b>				
<b>WELL-MAINTAINED TURF</b> Foliar suppression	flurprimidol (Cutless 50 W) 50 WP	0.75 to 3 lb/50 to 200 gal water	0.37 to 1.5	Rates depend upon grass species and cultivar. Apply to Tifway, Tifgreen, common bermudagrass, or zoysiagrass. Treated areas should receive 0.5 in. of irrigation within 24 hr of application. Resume mowing. Overseed 2 to 3 weeks after fall application with a desired perennial ryegrass.
	flurprimidol + trinexapac-ethyl (Legacy) 1.51 SL	8 to 15 fl oz	0.094 to 0.177	Tolerant species include Tifway and TifSport bermudagrass, zoysiagrass, and seashore paspalum. Do not use on turf grown for sale or other commercial use as sod or seed production. Do not seed 3 weeks before or 3 weeks after application. Wait 6 to 8 weeks after sprigging or laying sod before applying. Repeat applications at 2- to 6-week intervals until 4 weeks before winter dormancy.
	paclobutrazol (TGR Turf Enhancer 2 SC or Trimit 2 SC) 2 SC	2 to 3 pt/43 to 200 gal water	0.5 to 0.75	Use any time when established hybrid bermudagrass and St. Augustinegrass are green, are actively growing, and have recovered from dormancy (filled in fully following winter). Apply with 0.5 to 0.9 lb nitrogen per 1,000 sq ft of a nonburning fertilizer. Apply 0.25 in. of water within 24 hr after application to remove product from foliage and onto soil surface. A repeat application within the same growing season may be made, but not sooner than 8 weeks following initial application. Do not apply more than 3 times annually. Do not use on areas containing greater than 70% <i>Poa annua</i> . Refer to label to determine bermudagrass and St. Augustine cultivar response relating to sensitivity, growth, and color response. Do not seed within 6 weeks prior to or 2 weeks after application.
	trinexapac-ethyl (Primo Maxx) 1 MEC or (T-Nex) 1 AQ (Primo WSB) 25 WP	2.7 to 13 fl oz 1.35 to 6.5 oz	0.042 to 0.085 0.042 to 0.085	Application rates are for mowing heights of less than or equal to 0.5 in. Apply to actively growing, non-stressed turf. Rate varies with turfgrass species. See label for specific rate and other directions and precautions. Repeat applications can be made but do not exceed a total of 21.4 pt per acre per year of Primo Maxx or a total of 174 oz per acre per year of Primo WSB. Do not exceed a total of 19 pt per acre per year of T-Nex. Refer to the respective Primo label for guidelines regarding mowing prior to and following applications. Mix with 0.5 to 4 gal of water per 1000 sq ft (20 to 174 gal per acre). Primo can be applied to putting greens. See label for directions.
<b>LOW-MAINTENANCE TURF</b> Seedhead and foliar suppression	glyphosate (Roundup Pro) 4 lb/gal	6 fl oz/10 to 25 gal water	0.2	Apply to bahiagrass only. Apply after full greenup of the bahiagrass (about late May) and make only one application per year. Do not apply to turf less than 3 years old. Treated turf may appear less dense and temporarily discolored. Optimum results may not be obtained if rainfall or overhead irrigation occurs within 6 hr following application. This is a nonselective herbicide. If application exceeds the above recommended rates, it can result in permanent loss of turf.
	(Touchdown Pro) 3 LC	0.375 to 4 pt/10 to 40 gal water	0.14 to 1.5	Touchdown Pro may be used on dormant or actively growing bermudagrass and bahiagrass turf described in "GENERAL USE AREAS" section of label. May be tank mixed with 0.25 to 2 oz of Oust for residual weed control. Check label for correct rates. Touchdown Pro will control winter annual weeds less than 6 in. tall and also 4-to 6-leaf tall fescue in dormant turf. Use only on well-established bermudagrass. Injury may occur, but regrowth will occur under moist conditions. Bahiagrass vegetative growth and seedheads may be suppressed approximately 45 days when applied 1 to 2 wk after spring greenup and before seedhead emergence. A second application at 45 days will extend suppression to approximately 120 days.
	imazapic (Plateau) 2 ASU	2 fl oz	0.031	Only government entities may buy Plateau. Used for bahiagrass seedhead suppression. Apply to bahiagrass in spring after full greenup but approximately 3 to 4 weeks prior to expected seedhead emergence or 7 to 10 days after mowing. Do not apply to wetlands. Add a surfactant according to label directions. Bahiagrass may appear less dense and discolored following application.
	imazapic + glyphosate (Journey) 2.25 AS	11 to 32 fl oz	0.19 to 0.56	Use in noncrop areas. Temporary turf discoloration may occur. Apply 4 to 8 fl oz per acre on a small area first to determine rate needed for desired results. Do not use with methylated seed oil. Do not apply to drought-stressed turf. Apply after full turf greenup.
	imazethapyr + imazapyr (Event) 1.46 lb/gal	8 to 10 fl oz	0.09 to 0.11	Apply to bahiagrass only. Apply after the turf is at 100% greenup and has at least 2 in. of vertical growth. The addition of a nonionic surfactant containing at least 80% active ingredient at 0.25% v/v of the spray (2 pt per 100 gal of spray mixture) is required. Do not use on newly established stands less than 1 year old or on highly managed turf. Do not reseed before 3 months after application. See label for herbicide tank mix options. Follow label directions and precautions.

**GROWTH REGULATORS FOR TURFGRASSES**

Purpose	Brand	Amount of Formulation Per Acre	Pounds Active Ingredient Per Acre	Precautions and Remarks
<b>WARM SEASON GRASSES (continued)</b>				
LOW-MAINTENANCE TURF Seedhead and foliar suppression (continued)	maleic hydrazide (Retard) 2.5 lb/gal (Royal Slo-Gro) 1.5 lb/gal (Liquid Growth Retardant) 0.6 lb/gal	1.3 gal/50 gal water 2 gal/30 to 50 gal water 5 gal/45 gal water	3 3 3	Apply to bahiagrass only. Apply in late spring but before seedheads appear. Applications made after seedhead appearance will suppress subsequent seedheads. Do not apply to turf less than 3 years old and do not reseed within 3 days after application. Treated turf may appear less dense and temporarily discolored. Optimum results may not be obtained if rainfall or overhead irrigation occurs within 12 hr following application. Remove excess grass clippings and leaves before application. Do not add a surfactant. Follow label directions and precautions. A repeat application may be needed 6 weeks after initial application.
	mefluidide (Embark 2-S) 2 S	2 qt/15 to 150 gal water	1	Apply to bermudagrass only. Apply in late spring until about 2 weeks before seedhead appearance. Do not apply to turf within 4 growing months after seeding, and do not reseed within 3 days after application. Treated turf may appear less dense and temporarily discolored. Optimum results may not be obtained if rainfall or overhead irrigation occurs within 8 hr following application. Remove excess grass clippings and leaves before application. Adding 1 to 2 qt of a nonionic surfactant per 100 gal of spray solution may enhance suppression; however, discoloration may also be increased. Follow label directions and precautions.
	sulfometuron methyl (Oust) 75 DG	0.5 oz/30 to 50 gal water	0.02 lb	Apply to bahiagrass in late spring or early summer before seedheads appear. Do not apply to wetlands or where runoff water may flow onto agricultural lands or forests. Injury of desirable trees may result if applications are made near plants or where their roots extend or may be subjected to runoff from treated areas. Do not apply to turf less than 3 years old. Treated turf may appear less dense and temporarily discolored. Do not add a surfactant. Follow label directions and precautions.
	sulfometuron methyl + chlorsulfuron (Landmark MP) 50 + 25 DG (Landmark II MP) 56.25 + 18.75 DG	0.9 oz 1 oz	0.042 0.047	For established bermudagrass and centipede-improved turf. Temporarily suppresses foliar and seedhead growth while controlling many grass and broadleaf weeds. Apply 30 days after breaking dormancy or either late fall or early winter. Landmark MP may discolor or cause top kill of desired turf species. Do not apply to turf less than 1 year old. Annual retreatments may reduce turf vigor.
	sulfometuron methyl + metsulfuron methyl (Oust Extra) 56.25 + 15 DG	0.5 to 2 oz	0.022 to 0.088	For use on well-established, unimproved bermudagrass and centipedegrass. Apply 30 days after breaking dormancy. Can also be applied in late fall or early winter depending on weed presence. Oust Extra can be tank mixed with 3 to 4 lb active ingredient per acre MSMA on bermudagrass during the summer. Do not add a surfactant.
<b>ANNUAL BLUEGRASS</b>				
Suppression	flurprimidol (Cutless 50 W) 50 WP	0.25 to 0.5 lb/50 to 100 gal water	0.12 to 0.25	Apply to actively growing bentgrass putting greens in spring after third or fourth mowing or in the fall. Repeat, if necessary, at 3- to 6-week intervals, not to exceed 2 lb per acre per growing season. Delay overseeding 2 weeks after application. Make final fall application 8 weeks before onset of winter dormancy.
		1 to 1.5 lb/50 to 200 gal water	0.5 to 0.75	Apply to bentgrass, Kentucky bluegrass, and perennial ryegrass in late spring-early summer and/or late summer-early fall. Time the second application to occur at least 3 months before expected winter dormancy. Management practices that encourage vigorous growth of perennial turfgrass following application will enhance conversion. <i>Poa annua</i> discoloration will be visible 7 to 10 days after treatment and last for 3 to 6 weeks. Do not apply to putting greens. Treated areas should receive 0.5 in. of irrigation within 24 hr after application. Resume mowing 3 to 5 days after application.
	flurprimidol + trinexapac-ethyl (Legacy) 1.51 SL	5 to 30 fl oz	0.059 to 0.354	Use in cool season turfgrasses, such as bentgrass greens and fairways, Kentucky bluegrass, and perennial ryegrass. Repeat applications at 2- to 6-week intervals. Annual bluegrass suppression is gradual and could take several growing seasons. Start treatments in early spring and continue through early fall.
	maleic hydrazide (Retard) 2.25 lb/gal (Royal Slo-Glo) 1.5 lb/gal (Liquid Growth Retardant) 0.6 lb/gal	1 qt/30 to 40 gal water 2 qt/30 to 40 gal water 1.25 gal/30 to 40 gal water	0.56 0.75 0.75	Treat after two normal mowings but before seedhead appears. Applications made after seedhead appears will suppress subsequent seedheads. Do not apply to golf greens. Do not apply to turf less than 3 years old, and do not reseed within 3 days after application. Treated turf may appear less dense and temporarily discolored. Optimum results may not be obtained if rainfall or overhead irrigation occurs within 12 hr following application. Remove excess grass clippings and fallen leaves before application. Do not add a surfactant. Follow label directions and precautions for use on fairways.

**GROWTH REGULATORS FOR TURFGRASSES**

Purpose	Brand	Amount of Formulation Per Acre	Pounds Active Ingredient Per Acre	Precautions and Remarks
<b>ANNUAL BLUEGRASS (continued)</b>				
Suppression (continued)	mefluidide (Embank 2-S) 2 S (Embank) 0.2	0.5 pt/15 to 150 gal water 2 to 5 pt/15 to 150 gal water	0.125 0.05 to 0.125	Apply after uniform greenup but before first appearance of seedheads. Do not apply to turf within 4 growing months after seeding, and do not reseed within 3 days after application. Treated turf may appear less dense and temporarily discolored. Optimum results may not be obtained if rainfall or overhead irrigation occurs within 8 hr following application. Remove excess grass clippings and leaves before application. Adding 1 to 2 qt of a nonionic surfactant per 100 gal of spray solution enhances suppression; however, discoloration may also be increased. Follow label directions and precautions for use of fairways and tees.
	paclobutrazol (31-3-9 Fertilizer with TGR <i>Poa annua</i> Control 0.42%)	128 lb	0.5	Apply only to bentgrass, Kentucky bluegrass, perennial ryegrass fairways, or bentgrass greens with less than a 70% <i>Poa annua</i> infestation. Follow label directions and precautions. Note: This product supplies 0.9 lb N per 1,000 sq ft.
	(15-0-29 High K Fertilizer with TGR <i>Poa annua</i> Control 0.34%)	98 lb to 146 lb	0.33 to 0.5	Apply only to bentgrass, zoysiagrass, Kentucky bluegrass, and Kentucky bluegrass/perennial ryegrass fairways, tees, and roughs, as well as bentgrass greens with less than 70% <i>Poa annua</i> infestation. Note: This product supplies 0.5 lb N per 1,000 sq ft.
	(TGR Turf Enhancer 2 SC or Trimmit 2 SC) 2 SC	6.4 to 48 fl oz/43 to 200 gal water	0.1 to 0.75	Apply on hybrid bermudagrass, bentgrass, perennial ryegrass, and Kentucky bluegrass/perennial ryegrass fairways, tees, and roughs. Can also be applied to bentgrass putting greens. Apply in spring after greenup or regrowth has begun and after mowing once or twice. Apply with a nonburning fertilizer. Apply 0.25 in. of water within 24 hr after application to remove product from foliage and onto soil surface. See label for rates and other directions for applications to bentgrass putting greens and overseeded bermudagrass. Do not apply more than 3 times annually. Do not use on areas containing more than 70% <i>Poa annua</i> . For bentgrass putting greens, do not apply more than 0.25 lb active ingredient per acre per application.
<b>OVERSEEDED BERMUDAGRASS TURF</b>				
Foliar suppression	flurprimidol (Cutless 50 W) 50 WP	0.75 to 3 lb/50 to 200 gal water	0.37 to 1.5	Rates depend upon grass species and cultivar. Apply to zoysiagrass, Tifway, Tifgreen, and common bermudagrass in late spring-early summer and/or late summer-early fall. Time the second application to occur 8 to 10 weeks before expected winter dormancy. Do not apply to putting greens. Do not exceed 1.5 lb per acre per application on coarse-textured soils. Treated areas should receive 0.5 in. of irrigation within 24 hr after application. Resume mowing 3 to 5 days after application.
	flurprimidol + trinexapac-ethyl (Legacy) 1.51 SL	5 to 30 fl oz	0.059 to 0.354	Use in cool season turfgrasses, such as bentgrass greens and fairways, Kentucky bluegrass, and perennial ryegrass. Repeat applications at 2- to 6-week intervals. Annual bluegrass suppression is gradual and could take several growing seasons. Start treatments in early spring and continue through early fall.
	maleic hydrazide (Royal Slo-Gro) 1.5 lb/gal (Liquid Growth Retardant) 0.6 lb/gal	1.5 gal/50 gal water 3.3 gal/50 gal water	2.25	Apply in late September or early October to inhibit bermudagrass growth and allow winter overseeding to establish. Overseed no sooner than 48 hr after application. Follow label directions and precautions for use on greens and fairways.
	paclobutrazol (TGR Turf Enhancer 2 SC or Trimmit 2 SC) 2 SC	6.4 to 16 fl oz/43 to 200 gal water	0.1 to 0.25	Apply any time after overseeded turf has successfully established itself. Do not apply after March 15 to avoid delay in bermudagrass green-up. Apply with 0.25 to 0.5 lb N per 1,000 sq ft of a nonburning fertilizer. Apply 0.25 in. of water within 24 hr after application to remove product from foliage and onto soil surface. Repeat applications can be made but do not apply more than 3 times annually. Do not use on areas containing more than 70% <i>Poa annua</i> . Do not seed within 6 weeks prior to or 2 weeks after application. Do not apply to 'Tifdwarf' putting greens.
	trinexapac-ethyl (Governor) 0.17G	129 to 165 lb	0.22 to 0.28	Apply before verticutting, scalping, or spiking the bermudagrass. Apply 1 to 5 days before overseeding. To minimize yellowing, use iron at recommended rates or available nitrogen at 0.2 to 0.5 lb per 1,000 square feet.
(Primo Maxx) 1 MEC or (T-Nex) 1 AQ (Primo WSB) 25 WP	6 to 44 fl oz 2.75 to 21.8 oz	0.08 to 0.34 0.08 to 0.34	Application rate varies with turfgrass species and height of cut. Apply to actively growing, nonstressed turf. More growth suppression occurs at lower mowing heights. See label for specific rate and other directions and precautions. Repeat applications can be made but do not exceed a total of 21.4 pt per acre per year of Primo Maxx or a total of 174 oz per acre per year of Primo WSB. Do not exceed 19 pt per acre per year of T-Nex. Refer to the respective Primo label for guidelines regarding mowing prior to and following application. Mix with 0.5 to 4 gal of water per 1,000 sq ft (20 to 174 gal per acre). Primo can be applied to putting greens. See label for directions.	

**GROWTH REGULATORS FOR TURFGRASSES**

Purpose	Brand	Amount of Formulation Per Acre	Pounds Active Ingredient Per Acre	Precautions and Remarks
<b>LAWN EDGING</b>	maleic hydrazide (Retard) 2.25 lb/gal (Royal Slo-Gro) 1.5 lb/gal (Liquid Growth Retardant) 0.6 lb/gal	1.33 gal/100 gal water 2 gal/100 gal water	3 3	Apply in spring to a 6-in. band along sidewalks. Consult instructions on applicator for delivery dosage.
	mefluidide (Embark) 0.2	1.36 gal/174 gal water	0.27	For Kentucky bluegrass, tall fescue, chewings fescue, red fescue, perennial ryegrass, and St. Augustinegrass. For bermudagrass, use 5.45 gal in 174 gal water. Apply in 6- to 12-in. bands. Avoid overlapping.
	trinexapac-ethyl (Governor) 0.17G	100 to 259 lb	0.17 to 0.44	Do not exceed 2.5 lb active ingredient per acre per year. These rates should provide 50% turf growth suppression for 4 weeks with minimal yellowing.
	(Primo Maxx) 1 MEC (T-Nex) 1 AQ (Primo WSB) 25 WP			Apply 0.75 to 2 oz per 1,000 linear feet of Primo Maxx or T-Nex, or 0.4 to 2 oz per 1,000 linear ft of Primo WSB. Apply to actively growing, nonstressed turf. Apply along perimeter of lawns, sidewalks, curbs, parking lots, driveways, flower beds, or fences. Apply in an 8- to 12-in. band along the perimeter of the lawn to reduce growth of turf into adjacent areas. Application rate varies with turf species. Follow label directions for repeat applications and other precautions.

## AQUATIC WEED CONTROL

R. J. RICHARDSON, Crop Science Department, and K. D. GETSINGER, US Army Engineer Research and Development Center, Vicksburg, MS, and Adjunct Professor, Crop Science Department, NC State University

Several options, including hand removal, cultural, mechanical, biological, and chemical control techniques are available for the management of aquatic weeds. The applicator should choose the most efficacious, environmentally acceptable and cost-effective alternative that is available for a particular weed problem. The particular management strategy to use in a given situation will depend on the intended use of the body of water, fish, and wildlife populations that may be impacted, type of environment in which the weed problem occurs, and the particular weed species of concern. Before selecting your management strategy, **be sure to have the weed(s) of concern identified by a qualified individual.**

Assistance in weed identification is available from the

Cooperative Extension center in your county. Expanded herbicide recommendations for aquatic sites may be found in AG-1, the North Carolina Agricultural Chemicals Manual. Additional information on management techniques also may be obtained from the county Extension center; ask for AG-437, *Weed Management in Small Ponds*; AG-438, *Weed Control in Irrigation Water Supplies*; and AG-449, *Hydrilla, A Rapidly Spreading Aquatic Weed in North Carolina*. Information on pond construction, stocking, and general pond management may be found in AG-424, *Pond Management Guide*. Additional information may be found on the Aquatic Weed Management Web site: <http://www.weedscience.ncsu.edu/aquaticweeds>.

### BIOLOGICAL CONTROL OF AQUATIC WEEDS WITH TRIPLOID GRASS CARP

While the triploid, sterile grass carp is a cost-effective control method, it is best suited for use in small ponds, where submersed aquatic plants are not required for fish and wildlife habitat. Grass carp are effective on most **submersed weeds**. They generally are less effective on algae and weeds in the floating and emergent groups. Refer to the chart below for information on the relative effectiveness of grass carp for different weeds.

Grass carp are normally stocked at 15 fish per acre in small ponds. In larger ponds, they are usually stocked at 15 to 20 fish per **vegetated** acre. Large fish (minimum of 8 to 10 inches long) should be stocked to prevent loss due to predation by large bass and wading birds. If the surface of the pond is **completely covered** with vegetation, some limited herbicide application or mechanical removal of weeds from a portion of the pond will be necessary before stocking to allow oxygen to reach the underlying water. Grass carp may be stocked at any time of the

growing season, but best results are usually obtained by a late summer or fall stocking.

No permit is required to purchase up to 150 triploid grass carp for stocking a private pond. At a stocking rate of 15 fish per acre of water, 150 triploid grass carp are adequate to control vegetation in a 10-acre pond. A permit from the Wildlife Resources Commission is required for larger stockings. Grass carp may be purchased from a licensed distributor. (For a list of North Carolina vendors, see <http://www.ncagr.com/aquacult/grasscarp.html>.)

Permits, a list of certified distributors, and additional information on stocking of the triploid grass carp may be obtained from the Wildlife Resources Commission, Chief of Inland Fisheries, 1721 Mail Service Center, Raleigh, NC 27699-1721, or call at (919) 733-3633.

#### BIOLOGICAL CONTROL OF AQUATIC WEEDS WITH TRIPLOID GRASS CARP

Weed	Relative Effectiveness	Comments
<b>ALGAE</b> Filamentous (green and bluegreen) and planktonic	Poor	High stocking rates (60 to 75 or more fish per acre) with small fish (4 to 6 in. size) are required to achieve temporary control; control usually decreases as fish grow larger and are unable to feed on the algae.
<b>MACROALGAE</b> Chara and Nitella	Good to Excellent	Chara usually is beneficial to fish and wildlife.
<b>FLOATING AND FLOATING-LEAVED WEEDS</b> Duckweeds, watermeal	Poor	Small fish at very high stocking rates (see filamentous algae above) may give control; larger fish at normal stocking rates usually are not effective.
Water ferns (Azolla and Salvinia)	Fair to Poor	
Alligatorweed, water lilies, water primrose, lotus, watershield, spatterdock, waterhyacinth	Poor	Grass carp may feed lightly on weeds in this group, but control is usually unacceptable.
<b>EMERGENT AND MARGINAL WEEDS</b> Cattails, rushes, common reed, bulrushes, pickerelweed, pennywort, arrowhead	Poor	Grass carp may feed lightly on weeds in this group, but control is usually unacceptable.
<b>SUBMERSED WEEDS</b>	Good to Excellent	Most rooted and free-floating submersed weeds in ponds are readily controlled with triploid grass carp; control may be poorer on the watermilfoils, particularly Eurasian waterfoil.

**WAITING PERIOD (IN DAYS) BEFORE USING WATER AFTER APPLICATION OF HERBICIDES FOR AQUATIC WEED CONTROL**

Herbicide	Irrigation <sup>1</sup>	Fish Consumption	Watering Livestock	Swimming
<b>2,4-D</b> (various formulations and manufacturers)	Water use restrictions vary by formulation and manufacturer. In general, if water is used for irrigating sensitive crops, 2,4-D should not be used. Turfgrasses are generally tolerant to low concentrations of 2,4-D. Also, many 2,4-D formulations are NOT labelled for aquatic use. Read the label before purchasing and/or use.			
<b>carfentrazone</b> (Stingray)	1 to 14	No restrictions	0 to 1	No restrictions
<b>copper</b> (Copper sulfate pentahydrate, including Bluestone and EarthTec; and complexed copper formulations, including Algae-Pro, Captain, Clearigate, Cutrine-Plus, Cutrine-Plus Granular, K-Tea, Komeen, etc.)	No restrictions	No restrictions	No restrictions	No restrictions
<b>diquat</b> (Reward)	3 to 5 <sup>2</sup>	No restrictions	1	No restrictions
<b>endothall</b> (Aquathol K) (Aquathol Super K) (Hydrothol 191) (Hydrothol 191 granular)	7 to 25 7 7 to 25 7 to 25	No restrictions	7 to 25 No restrictions 7 to 25 7 to 25	No restrictions
<b>fluridone</b> (Sonar 4AS, Sonar SRP)	7 to 30 <sup>3</sup>	No restrictions	No restrictions	No restrictions
<b>glyphosate</b> (AquaMaster, Aqua Neat, Rodeo, Touchdown Pro)	No restrictions	No restrictions	No restrictions	No restrictions
<b>imazamox</b> (Clearcast)	1+	No restrictions	No restrictions	No restrictions
<b>imazapyr</b> (Habitat)	120	No restrictions	No restrictions	No restrictions
<b>penoxsulam</b> (Galleon)	Varies by commodity	No restrictions	No restrictions	No restrictions
<b>sodium carbonate peroxyhydrate</b> (GreenClean Pro, Pak 27)	No restrictions	No restrictions	No restrictions	No restrictions
<b>triclopyr</b> (Renovate 3, Renovate OTF)	120 0 to established grass	No restrictions	Next growing season for lactating dairy animals	No restrictions

<sup>1</sup> Irrigation restrictions may be removed for specific products if a laboratory assay of treated water meets a standard as stated on the product label.

<sup>2</sup> Water use restrictions of 3 days apply to irrigation of turf and nonfood crops; the five-day restriction is for food crops (including tobacco) and preparation of agricultural sprays.

<sup>3</sup> Water-use restrictions for irrigation vary with formulation. See label for precautions. A 30-day restriction may be insufficient if applied to small ponds intended for irrigation of very sensitive crops, such as tobacco.

## POND DYES

Pond dyes may be used to prevent the growth of filamentous algae and submersed macrophyte vegetation. Pond dyes are not herbicides and do not directly kill aquatic plants. They function by blocking light penetration to the bottom of the pond. As a result, these products are most effective when applied very early in the growing season.

The use of a pond dye in aquacultural ponds usually is not recommended, as they tend to inhibit phytoplankton productivity that is needed to produce oxygen and provide food for zooplankton, which are the major food of fry and the smaller juvenile fishes. Application rates usually are about one part per million or 1 gallon per acre for a pond averaging 4 feet deep (i.e., to grow at very low light levels. Several of the

available pond dyes 1 gallon per 4 acre-feet of water) for algae and most submersed weeds. For hydrilla, the rate needs to be doubled, due to its ability are registered by the EPA for aquatic weed control. Pond dyes *should not be applied to drinking water supplies or to streams or any body of water where there is any substantial outflow.* Refer to the product label for additional restrictions and registered application sites.

### POND DYES

Examples of Pond Dyes	EPA Registered
Admiral Liquid Aquashade	Yes Yes.

## EFFECTIVENESS OF HERBICIDES AND TRIPLOID GRASS CARP FOR CONTROL OF WEEDS COMMONLY FOUND IN NORTH CAROLINA PONDS

Key: NR = Not Recommended; P = Poor; G = Good; ID = Insufficient Data; F = Fair; E = Excellent

Weeds	2,4-D	carfentrazone	copper compounds	diquat	diquat +copper	endothall		fluridone	glyphosate	imazamox	imazapyr	peroxide compounds	penoxsulam	triclopyr	triploid grass carp
						Aquathol	Hydrothol								
<b>ALGAE</b>															
Planktonic	NR	NR	G	P	G	NR	P	NR	NR	NR	NR	G	NR	NR	NR
Filamentous	NR	NR	G	E	E	NR	E	NR	NR	NR	NR	ID	NR	NR	P
Chara / Nitella	NR	ID	G	G	E	NR	G	NR	NR	NR	NR	ID	NR	NR	E
<b>FLOATING PLANTS</b>															
Azolla (mosquito fern)	NR	ID	F	E	E	NR	NR	E	NR	ID	NR	NR	G	NR	P
Duckweed	P	G	P	G	G	NR	NR	E	NR	NR	NR	NR	G	P	P
Frogbit	F	ID	NR	E	E	NR	NR	NR	P	E	E	NR	ID	G	P
Salvinia, common	NR	ID	P	E	E	NR	NR	E	G	E	ID	NR	ID	NR	P
Salvinia, giant	NR	ID	P	E	E	F	NR	E	G	P	G	NR	E	NR	P
Waterhyacinth	E	G	NR	G	G	NR	NR	F	G	E	G	NR	E	E	P
Watermeal	NR	NR	NR	P	P	NR	NR	G	NR	NR	NR	NR	P	NR	P
Water lettuce	NR	G	NR	G	G	G	G	NR	E	G	E	NR	E	NR	P
<b>EMERSED PLANTS</b>															
Alligatorweed	P	F	NR	NR	NR	NR	NR	F	G	G	G	NR	G	G	P
American lotus	G	NR	NR	NR	NR	NR	NR	G	E	F	G	NR	ID	G	P
Cattail	F	NR	NR	F	F	NR	NR	G	E	G-E	E	NR	ID	F	P
Creeping waterprimrose	E	F	NR	NR	NR	NR	NR	F	E	F	E	NR	G	E	P
Floating hearts	P	NR	NR	F	F	E	E	F	G	G	G	NR	F	P	P
Fragrant waterlily	G	NR	NR	NR	NR	NR	NR	G	E	G	E	NR	ID	G	P
Grass species	NR	NR	NR	F	F	NR	NR	F	E	F	E	NR	ID	NR	P
Parrotfeather	E	F	NR	NR	NR	NR	NR	NR	F	G	E	NR	G	E	NR
Phragmites (Common reed)	NR	NR	NR	NR	NR	NR	NR	NR	G	F-G	E	NR	NR	F	P
Pickeralweed	G	NR	NR	NR	NR	NR	NR	NR	F	E	E	NR	ID	G	P
Rush	NR	NR	NR	NR	NR	NR	NR	NR	G	ID	G	NR	ID	F	P
Spaddeedock	P	NR	NR	NR	NR	NR	NR	G	E	G	E	NR	ID	F	P
Smartweeds	F	NR	NR	F	F	NR	NR	F	G	G	G	NR	F	G	P
Waterpennywort	G	NR	NR	F	F	NR	NR	G	E	E	E	NR	F	G	P
Watershield	E	NR	NR	F	F	NR	NR	F	E	G	G	NR	ID	E	P

**EFFECTIVENESS OF HERBICIDES AND TRIPLOID GRASS CARP FOR CONTROL OF WEEDS COMMONLY FOUND IN NORTH CAROLINA PONDS**

Key: NR = Not Recommended; P = Poor; G = Good; ID = Insufficient Data; F = Fair; E = Excellent

Weeds	2,4-D	carfentrazone	copper compounds	diquat	diquat +copper	endothall		fluridone	glyphosate	imazamox	imazapyr	peroxide compounds	penoxsulam	triclopyr	triploid grass carp
						Aquathol	Hydrothol								

**SUBMERSED PLANTS**

Bladderwort	P	ID	NR	F	F	P	P	E	NR	F-G	NR	NR	ID	P	E
Cabomba	NR	ID	NR	F	F	F	F	F	NR	F	NR	NR	ID	NR	F
Coontail	G	ID	NR	E	E	E	E	E	NR	NR	NR	NR	ID	G	E
Egeria (Brazilian elodea)	NR	ID	F	E	E	P	P	E	NR	ID	NR	NR	G	NR	E
Eurasian watermilfoil	E	G	NR	G	G	E	NR	E	NR	F	NR	NR	G	E	P
Hydrilla, monoecious	NR	ID	F	G	E	E	E	E	NR	F	NR	NR	G	NR	E
Naiad, brittle	NR	ID	G	E	E	E	E	E	NR	ID	NR	NR	F	NR	E
Naiad, Southern	NR	ID	G	P	G	P	P	G	NR	ID	NR	NR	F	NR	E
Parrotfeather	E	ID	NR	G	G	E	E	E	NR	F	NR	NR	G	E	F
Pondweed species	NR	ID	NR	E	E	E	E	E	NR	G	NR	NR	G	NR	E
Proliferating spikerush	NR	ID	NR	NR	NR	NR	NR	F	NR	F	NR	NR	F	NR	E
Variable leaf milfoil	E	G	NR	E	E	E	E	G	NR	NR	NR	NR	NR	E	P

## Integrated Pest Management: The Sensible Approach to Turf Care

Many pest problems can cause your turf to look bad—diseases, weeds, insects, and animals. Some people have all of these problems.

Is a pesticide the proper solution? Or is it better to make changes in cultural practices? Both methods, and some others as well, may be needed. The balanced use of all available methods is called Integrated Pest Management (IPM).

The idea is simple. It involves using all available prevention and control methods to keep pests from reaching damaging levels. The goal is to produce a good turf and minimize the influence of pesticides on people, the environment, and turf.

IPM methods include: 1) use of best adapted grasses; 2) proper use of cultural practices, such as watering,

mowing, and fertilization; and 3) proper selection and use of pesticides when necessary. Early detection and prevention will minimize pest damage, saving time, effort, and money. Should such a problem occur, determine the cause or causes, then choose the safest, most effective control or controls available.

When chemical control is necessary, select the proper pesticide, follow label directions, and apply when the pest is most susceptible. Treat only those areas in need. Regard pesticides as only one of many tools available for turf care.

To learn more about IPM, pest identification, turf care, and proper use of pesticides go on-line at [www.TurfFiles.ncsu.edu](http://www.TurfFiles.ncsu.edu). The county's Cooperative Extension agent may also be of assistance.

### Misuse of Pesticides

It is a violation of the law to use any pesticide in a manner not permitted by its labeling.

As a protection from violating the law, never apply any pesticide in a manner or for a purpose other than as instructed on the label, or in labeling accompanying the pesticide product. Don't ignore the instructions for use of protective clothing and devices and for storage and disposal of pesticide wastes, including containers.

All recommendations for pesticide use included in this manual were legal as of November 2008, but the status of registration and use patterns are subject to change by actions of state and federal regulatory agencies.