



## NCWSS/WSWS Joint Weed Contest

The purpose of the North Central Collegiate Weed Science/Western Society of Weed Science Contest is to provide an educational experience from which students attending universities or colleges in the North Central and Western regions can broaden their applied skills in Weed Science. The contest provides an opportunity for Weed Science students to meet and talk with each other, be exposed to researchers from other universities and industry, and apply what they have learned using a contest to measure their capabilities.

Participating in this contest will provide you with a valuable experience and recognition for your future career endeavors. Finally, this contest aims to increasing the visibility of the current and future importance of Weed Science for the agricultural industry.

### **CONTEST RULES**

*Note: Student cell phones or other communication devices will not be permitted during the day of the contest. Any violation of this rule may result in disqualification of that student from the contest.*

#### A. Eligibility

Any undergraduate or graduate student currently enrolled and pursuing an A.S., B.Sc., M.Sc. or Ph.D. is eligible to participate. Each team will consist of three or four students. If a team has four students, the top three total scores will be used to calculate a team score. If a team has three students, all three scores will be used to calculate the team score. A team may be composed of: (a) graduates, (b) undergraduates, or (c) combination (graduates and undergraduates). A combination team must compete as a graduate team; however, the undergraduate students remain eligible for individual undergraduate awards. There is no restriction on the number of teams a college or university may enter in the contest. If a college or university does not have sufficient students for a team, up to three students may enter as individuals.

All students graduating with a B.S. degree six months before the contest (and not actively enrolled in a graduate program) will be able to participate as an undergraduate. Students will be able to participate five times as a graduate student in the North Central Collegiate Weed Science Contest.

Undergraduate and graduate students may win the individual award once per degree (once as undergraduate, once as MS, and once as PhD student), but then they are no longer eligible to compete in that degree classification. Once an undergraduate student wins the individual award, they may no longer compete as an undergraduate student but could compete as a graduate student. Once an undergraduate or graduate student wins the overall individual award in the graduate degree category, they will no longer be eligible to compete as a student unless they continue with an additional degree program. To maintain the participation involved with industry, past winners (who are still in their degree program) can serve in a volunteer role as a judge, grader, etc.

**Regional Eligibility will be based on geography and past participation.** Those universities that have competed at the North Central Weed Science Society student weeds contest in 3 of the last 4 stand-alone NCWSS contests will have their graduate team placed in the North Central Division of this joint contest, whereas all other WSWS graduate teams will be placed in the Western Division. Undergraduate teams will be combined into a single division.

#### B. Awards

Plaques will be awarded for the following categories for a total of 33 awards:

Team – The team with the highest combined score from all events (Weed Identification, Written Test on Herbicide Application, Team Sprayer Calibration, Unknown Herbicide, and Problem Solving and Recommendation) will be the overall team winner, for both the graduate and undergraduate divisions. Second and third place teams will also be recognized. In addition, the graduate and undergraduate teams scoring highest in the team sprayer calibration event will receive a plaque.

Individual – The individual with the highest combined scores from the events Weed Identification, Written Test on Herbicide Application, Herbicide Identification, and Problem Solving and Recommendation will be the overall individual winner, for both the graduate and undergraduate divisions. Second and third place individuals will also be recognized (6 plaques). The highest individual scores by a graduate and an undergraduate student for each contest event (Weed Identification, Written Test on Herbicide Application, Herbicide Identification, and Problem Solving and Recommendation) will be recognized with a plaque (8 plaques).

Category:	Placing	# Plaques
NCWSS Graduate Team	First	4 (1 for each team member)
	Second	4 (1 for each team member)
	Third	4 (1 for each team member)
WSWS Graduate Team	First	4 (1 for each team member)
	Second	4 (1 for each team member)
	Third	4 (1 for each team member)
Undergraduate Team	First	4 (1 for each team member)
	Second	4 (1 for each team member)
	Third	4 (1 for each team member)
NCWSS Field Calibration Graduate Team	First	4 (1 for each team member)
WSWS Field Calibration Graduate Team	First	4 (1 for each team member)
Field Calibration Undergraduate Team	First	4 (1 for each team member)
NCWSS Graduate Individual	First	1
	Second	1
	Third	1
WSWS Graduate Individual	First	1
	Second	1
	Third	1
Undergraduate Individual	First	1
	Second	1
	Third	1
NCWSS Graduate Individual Weed ID	First	1
NCWSS Graduate Individual Herbicide ID	First	1
NCWSS Graduate Individual Problem Solving	First	1
NCWSS Graduate Individual Written Calibration	First	1
WSWS Graduate Individual Weed ID	First	1
WSWS Graduate Individual Herbicide ID	First	1
WSWS Graduate Individual Problem Solving	First	1
WSWS Graduate Individual Written Calibration	First	1
Undergraduate Individual Weed ID	First	1
Undergraduate Individual Herbicide ID	First	1
Undergraduate Individual Problem Solving	First	1
Undergraduate Individual Written Calibration	First	1

### C. Events

The contest will consist of four events.

1. **Weed Identification (100 points).** The purpose of this event is for students to demonstrate their ability to identify weeds at all plant life stages and to use appropriate terminology for those species. The list of 75 species will be selected by the contest organizer from the most current "Composite List of Weeds," published by Weed Science Society of America ([www.wssa.net](http://www.wssa.net)), unless specific exceptions are announced prior to the contest. Common names, Latin binomials, and spellings must conform to this list and will be sent to each participating university and posted on the NCWSS website at least 4 months prior to the contest. The organizer will select 30 of these species for the contest. Contest plants will be grown in either a field nursery or greenhouse and may be in any stage of growth or development, including seed samples.

Each student will identify 25 mature weeds, weed seedlings, or weed seeds for a total of 100 points. Students will be responsible for the correct Latin name (but not authority) and common name and spelling. Each sample is worth five points: two points for the common name and its correct spelling and three points for the Latin name, and its correct spelling, capitalization and underline. Contestants will identify five additional species to break any ties.

Common names, Latin names, and spellings must conform to the most current "Composite List of Weeds," compiled by the Standardized Plant Names subcommittee of the WSSA, published by Weed Science Society of America ([www.wssa.net](http://www.wssa.net)), unless specific exceptions are announced prior to the contest.

Weed identification is scored as an individual event (100 points) and as a team event (composite score of top three individuals in case of four-member team or all individuals for a three-member team, up to 300 points for the team)

2. **Herbicide Application Technology.** This event consists of two sections: a Written Test and a Team Sprayer Calibration event.

- A. **Written Test on Herbicide Application (50 points).** The purpose of this event is to assess the students' ability to do calculations that are related to herbicide application and related agronomic practices. Questions may be related to all aspects of herbicide application. Potential topics may include (but are not limited to) sprayer calibration, application volume, load ticket calculations, active ingredient calculations, adjuvant rate, area calculations, metric and English unit conversions, ability to use a pesticide label, nozzle nomenclature and selection, sprayer pressure, droplet size, drift reduction techniques, etc. The test will be comprised of multiple-choice calculation problems. A primary reference may be the TeeJet Agricultural Spray Products Catalog. Students will be provided with calculators and any other necessary reference materials. Personal calculators or other devices brought by the students are not permitted. A calculator will be provided at the event.

The Written Test may last from 30-60 minutes, per the discretion of the contest organizer. The Written Test must be reviewed by at least 3 members of the contest subcommittee at least one week prior to the contest to verify that it is reasonable in length and difficulty and to make recommended changes, if needed.

The Written Test portion is scored as an individual event worth 50 points per person and as a team event (composite score of top three individuals in case of four-member team or all individuals for a three-member team, up to 150 points for the team).

- B. **Team Sprayer Calibration (200 points).** The purpose of this event is to evaluate a team's ability to calibrate and properly operate a research backpack sprayer. This is a team event and will not be used in calculating individual scores. However, students competing as individuals (less than 3 members per team) may also compete in this event.

All safety equipment, sprayer components, calculators, stopwatches and TeeJet Agricultural Spray Products catalogs will be provided by the society and/or contest host. Use of personal calculators will not be permitted. Safety glasses must be worn by all students, judges, observers, etc., who are in the calibration event area. 50 points will be deducted from team score if a judge sees a student without safety glasses during the time they are working on the problem.

Each team will be given a basic (easily solved) written problem that will be calculated during this session. The answers to the question will provide the parameters (application volume, recommended droplet size, etc.) to which a CO<sub>2</sub> backpack sprayer is to be calibrated. Each team will be expected to choose the appropriate nozzle tips, speed, and pressure for accurate calibration and application. Each team will be asked to deliver a designated number of gallons/acre or liters/hectare over a given length or area demonstrating proper sprayer use.

Scoring will be based on accuracy of calibration and application. Time will be used to break any ties. Time will start when the team approaches the spray table. When a team is ready to make the calibration run, they are to advise the judge and the time will be stopped. If time reaches 25 minutes the judge will instruct the contestants to stop. Once time is stopped, no further adjustments can be made to the sprayer. The calibrated sprayer is then used by a contestant to spray a predetermined area with the judge watching for proper boom height, speed and uniformity of spray pattern. Following the application evaluation,

each nozzle will be checked for accurate output. Variation in output up to  $\pm 4\%$  variation per nozzle will be allowed. As an example, if the correct nozzle output is 150 ml/15 sec, the acceptable range will be 144 to 156 mL/15 sec.

Scoring is as follows:

- Correct problem calculation (35 points)
- Correct boom height (15 points)
- Correct speed (15 points)
- Uniform spray pattern (15 points)
- Nozzle selection (40 points, 10 points/nozzle)
- Screen selection (20 points, 5 points/screen)

Sprayer output (60 points, 15 points per nozzle. Each 1% over or under the 4% allowance will result in a loss of 1 point. For example, if a nozzle is producing 8% less than the correct calculated output, 4 points will be deducted.)

Total = 200 points

The basic written problem must be reviewed by at least 3 members of the contest subcommittee at least one week prior to the contest to verify it is reasonable in difficulty and length, and to make recommendations for changes, if necessary. There should also be a thorough evaluation of all equipment prior to the contest to insure it is working properly.

### 3. Herbicide Identification.

The purpose of this event is for students to demonstrate their ability to identify herbicide site of action and active ingredient based on symptomology seen on treated plants and selectivity among different species. The contest organizer will select 30 herbicide active ingredients from the WSSA-Herbicide Site of Action Classification List (<http://wssa.net/wssa/weed/herbicides/>). Herbicide name, chemical family, WSSA/HRAC code (group number), and site of action must conform to this list. A final list of herbicides (including herbicide common name, trade name, group number, site of action, herbicide family, application timing/rate, and relevant spray additives) and potential crops/weeds for the herbicide identification portion of the contest will be posted on the NCWSS website prior to the contest, but information regarding herbicides will not be provided during the contest.

The contest will have 15 herbicide plots with a minimum of 10 plant species. Crop and weed species will be planted and treated with herbicides as outlined above. Each plant row will be identified to species, and herbicide-tolerant traits, if any, will be indicated. Each contestant will identify the herbicide applied to ten plots and each plot will be worth 10 points. Five additional plots will be identified to break any ties. There can be a control plot in the contest, which must be identified as a control. A herbicide may be used more than once in the event plots.

Students competing on graduate student teams will receive 5 points for the correct common name, 3 points for the correct herbicide family, 1 point for the correct site of action, and 1 point for group number. Students competing on undergraduate student teams will receive 5 points for the correct site of action and 5 points for group number. Students competing as undergraduate individuals on graduate teams will be scored like graduate students for the team score, and as undergraduate students for the individual competition. For undergraduate students, correct common name will be used only as a tiebreaker.

Herbicide Identification is scored as an individual event worth 100 points per person and as a team event (composite score of top three individuals in case of four-member team and all team or individuals for a three-member team, up to 300 points for the team).

### 4. Problem Solving and Recommendation.

The purpose of this event is for students to demonstrate their ability to troubleshoot a plant production problem in a field (agronomic, horticulture, turf) or non-crop situation and recommend an effective solution to that problem. Recommendations must comply with accepted practices. Students should consider all factors which influence plant growth and development when making their evaluation. Although several possible answers may be correct, the best answer considering all alternatives will be determined by a designated advisory panel.

This event is to be presented and handled in a "role-playing" situation. The student will be asked to assume the role of an extension, sales, or research person when dealing with the client. Any commodity (corn, soybean, wheat, vegetable, turf, etc.) or scenario (such as herbicide injury, weed resistance, agronomic errors, etc.) is eligible to be the focus of the Problem Solving and Recommendation event. Students should be provided with sufficient background information to accurately simulate a field call where the extension, sales, or research person would have similar resources available.

Each student will handle only one situation. Students will be selected randomly for each possible situation. Ideally, each team member will evaluate a different situation. Scores will be normalized within a situation. The top performer within each situation will participate in a common scenario (not used in the preliminary round) to determine the overall winner.

Students will be evaluated by the role-playing farmer and situation judge based on the following criteria:

25 points – How the student approached the farmer.

45 points – Assessment of situation; determine the problem.

15 points – Recommendation for the current year

15 points – Recommendation for next year (or future years)

Problem Solving and Recommendation is scored as an individual event worth 100 points per person and as a team event (composite score of top three individuals in case of four-member team and all team or individuals for a three-member team, up to 300 points for the team).

#### D. Advisory Panel

An advisory panel will be responsible for scoring the contest. The panel will be the final authority concerning all questions regarding scores. Individuals from the host location will be the authority for all questions relating to the field portion of the contest.

#### E. Location

The North Central Collegiate Weed Science Contest will be held at any facility with the capability of providing all the designated events. The Resident Education and Industry Committees shall jointly work to identify and secure future contest host locations. Any location must be within the North Central Weed Science Society territory. With NCWSS board approval, the Resident Education Committee can choose to hold the contest in conjunction with other regional societies at a location outside of the NCWSS territory.

Additions or changes to the North Central Collegiate Weed Science Contest may be accomplished by a majority vote of the NCWSS Board of Directors. The contest committee has the authority to make minor changes, subject to approval of the President of the Society. Any other school outside the NCWSS society that wants to participate in the contest will need prior approval from the Resident Education Committee and the host.

2026 NCWSS/WSWS Student Weed Contest – Weed Identification List

	<b>Common Name</b>	<b>Latin Name</b>	<b>Family</b>
1	Palmer amaranth	<i>Amaranthus palmeri</i>	Amaranthaceae
2	redroot pigweed	<i>Amaranthus retroflexus</i>	Amaranthaceae
3	waterhemp	<i>Amaranthus tuberculatus</i>	Amaranthaceae
4	poison hemlock	<i>Conium maculatum</i>	Apiaceae
5	wild carrot	<i>Daucus carota</i>	Apiaceae
6	wild parsnip	<i>Pastinaca sativa</i>	Apiaceae
7	hemp dogbane	<i>Apocynum cannabinum</i>	Apocynaceae
8	common milkweed	<i>Asclepias syriaca</i>	Apocynaceae
9	common duckweed	<i>Lemna minor</i>	Araceae
10	common ragweed	<i>Ambrosia artemisiifolia</i>	Asteraceae
11	giant ragweed	<i>Ambrosia trifida</i>	Asteraceae
12	common burdock	<i>Arctium minus</i>	Asteraceae
13	devils beggarticks	<i>Bidens frondosa</i>	Asteraceae
14	musk thistle	<i>Carduus nutans</i>	Asteraceae
15	chicory	<i>Cichorium intybus</i>	Asteraceae
16	Canada thistle	<i>Cirsium arvense</i>	Asteraceae
17	bull thistle	<i>Cirsium vulgare</i>	Asteraceae
18	horseweed	<i>Erigeron canadensis</i>	Asteraceae
19	common sunflower	<i>Helianthus annuus</i>	Asteraceae
20	dandelion	<i>Taraxacum officinale</i>	Asteraceae
21	common cocklebur	<i>Xanthium strumarium</i>	Asteraceae
22	shepherds purse	<i>Capsella bursa-pastoris</i>	Brassicaceae
23	wild mustard	<i>Sinapis arvensis</i>	Brassicaceae
24	field pennycress	<i>Thlaspi arvense</i>	Brassicaceae
25	common chickweed	<i>Stellaria media</i>	Caryophyllaceae
26	kochia	<i>Bassia scoparia</i>	Chenopodiaceae
27	common lambsquarters	<i>Chenopodium album</i>	Chenopodiaceae
28	Russian thistle	<i>Salsola tragus</i>	Chenopodiaceae
29	field bindweed	<i>Convolvulus arvensis</i>	Convolvulaceae
30	ivyleaf morningglory	<i>Ipomoea hederacea</i>	Convolvulaceae
31	buffalo gourd	<i>Cucurbita foetidissima</i>	Cucurbitaceae
32	yellow nutsedge	<i>Cyperus esculentus</i>	Cyperaceae
33	common teasel	<i>Dipsacus fullonum</i>	Dipsacaceae
34	cutleaf teasel	<i>Dipsacus laciniatus</i>	Dipsacaceae
35	leafy spurge	<i>Euphorbia esula</i>	Euphorbiaceae
36	sericea lespedeza	<i>Lespedeza cuneata</i>	Fabaceae
37	hemp sesbania	<i>Sesbania herbacea</i>	Fabaceae
38	henbit	<i>Lamium amplexicaule</i>	Lamiaceae
39	purple deadnettle	<i>Lamium purpureum</i>	Lamiaceae
40	purple loosestrife	<i>Lythrum salicaria</i>	Lythraceae
41	velvetleaf	<i>Abutilon theophrasti</i>	Malvaceae

42	Venice mallow	<i>Hibiscus trionum</i>	Malvaceae
43	prickly sida	<i>Sida spinosa</i>	Malvaceae
44	devils claw	<i>Proboscidea louisianica</i>	Martyniaceae
45	carpetweed	<i>Mollugo verticillata</i>	Molluginaceae
46	common pokeweed	<i>Phytolacca americana</i>	Phytolaccaceae
47	buckhorn plantain	<i>Plantago lanceolata</i>	Plantaginaceae
48	blackseed plantain	<i>Plantago rugelii</i>	Plantaginaceae
49	cheatgrass	<i>Bromus tectorum</i>	Poaceae
50	field sandbur	<i>Cenchrus spinifex</i>	Poaceae
51	bermudagrass	<i>Cynodon dactylon</i>	Poaceae
52	large crabgrass	<i>Digitaria sanguinalis</i>	Poaceae
53	barnyardgrass	<i>Echinochloa crus-galli</i>	Poaceae
54	goosegrass	<i>Eleusine indica</i>	Poaceae
55	quackgrass	<i>Elymus repens</i>	Poaceae
56	fall panicum	<i>Panicum dichotomiflorum</i>	Poaceae
57	common reed	<i>Phragmites australis</i>	Poaceae
58	giant foxtail	<i>Setaria faberi</i>	Poaceae
59	yellow foxtail	<i>Setaria pumila</i>	Poaceae
60	bristly foxtail	<i>Setaria verticillata</i>	Poaceae
61	green foxtail	<i>Setaria viridis</i>	Poaceae
62	shattercane	<i>Sorghum bicolor</i>	Poaceae
63	johnsongrass	<i>Sorghum halepense</i>	Poaceae
64	wild buckwheat	<i>Fallopia convolvulus</i>	Polygonaceae
65	Pennsylvania smartweed	<i>Persicaria pensylvanica</i>	Polygonaceae
66	prostrate knotweed	<i>Polygonum aviculare</i>	Polygonaceae
67	curly dock	<i>Rumex crispus</i>	Polygonaceae
68	common purslane	<i>Portulaca oleracea</i>	Portulacaceae
69	common mullein	<i>Verbascum thapsus</i>	Scrophulariaceae
70	jimsonweed	<i>Datura stramonium</i>	Solanaceae
71	horsenettle	<i>Solanum carolinense</i>	Solanaceae
72	eastern black nightshade	<i>Solanum ptychanthum</i>	Solanaceae
73	buffalobur	<i>Solanum rostratum</i>	Solanaceae
74	common cattail	<i>Typha latifolia</i>	Typhaceae
75	puncturevine	<i>Tribulus terrestris</i>	Zygophyllaceae

2026 NCWSS/WSWS Student Weed Contest – Potential Crop and Weed List for the Unknown Herbicide Event

<u>Crops</u>	<u>Weeds</u>
alfalfa	<i>Amaranth</i> spp.
canola	barnyardgrass
cereal rye	common cocklebur
cotton	common lambsquarters
field corn	common purslane
field pea	downy brome
grain sorghum	fall panicum
oat	giant ragweed
pearl millet	green foxtail
pinto bean	hemp sesbania
popcorn	<i>Ipomea</i> spp.
pumpkin	large crabgrass
soybean	horseweed
sugar beet	shattercane
sunflower	velvetleaf
tillage radish	yellow nutsedge
tomato	
wheat (spring)	

## 2026 NCWSS/WSWS Student Weed Contest Unknown Herbicide List

	Common Name	Trade Name	Group Number	Site of Action	Herbicide Family	Timing	Rate (per Acre)	Adjuvant*
1	2,4-D	Enlist One	4	Auxin Mimics	Phenoxy-carboxylates	POST	2 pts	AMS
2	acetochlor	Harness	15	Inhibition of Very Long-Chain Fatty Acid Synthesis	$\alpha$ -Chloroacetamides	PRE	2 pts	None
3	atrazine	Aatrex	5	Inhibition of Photosynthesis at PSII - Serine 264 Binders	Triazines	PRE	4 pts	None
4	bentazon	Basagran 5L	6	Inhibition of Photosynthesis at PSII - Histidine 215 Binders	Benzothiadiazinone	POST	1.6 pts	COC, AMS
5	clethodim	Select Max	1	Inhibition of Acetyl CoA Carboxylase	Cyclohexanediones	POST	10 fl oz	COC, AMS
6	clomazone	Command 3ME	13	Inhibition of Deoxy-D-Xyulose Phosphate Synthase	Isoxazolidinone	PRE	2 pts	None
7	clopyralid	Stinger	4	Auxin Mimics	Pyridine-carboxylates	POST	4 fl oz	None
8	cloransulam-methyl	FirstRate	2	Inhibition of Acetolactate Synthase	Triazolopyrimidine - Type 1	PRE	0.75 oz	None
9	dicamba	Clarity	4	Auxin Mimics	Benzoates	POST	16. fl oz	None
10	flumioxazin	Valor EZ	14	Inhibition of Protoporphyrinogen Oxidase	N-Phenyl-imides	PRE	2 fl oz	None
11	fluthiacet-methyl	Cadet	14	Inhibition of Protoporphyrinogen Oxidase	N-Phenyl-imides	POST	0.6 fl oz	COC, AMS
12	fomesafen	Flexstar	14	Inhibition of Protoporphyrinogen Oxidase	Diphenyl ethers	POST	1 pt	COC, AMS
13	glufosinate-ammonium	Liberty Ultra	10	Inhibition of Glutamine Synthetase	Phosphinic acids	POST	24 fl oz	AMS
14	glyphosate	Roundup PowerMAX 3	9	Inhibition of Enolpyruvyl Shikimate Phosphate Synthase	Glycine	POST	30 fl oz	AMS
15	imazethapyr	Pursuit	2	Inhibition of Acetolactate Synthase	Imidazolinones	PRE	4 fl oz	None
16	isoxaflutole	Balance Flexx	27	Inhibition of Hydroxyphenyl Pyruvate Dioxygenase	Isoxazoles	PRE	6 fl oz	None
17	lactofen	Cobra	14	Inhibition of Protoporphyrinogen Oxidase	Diphenyl ethers	POST	12.5 fl oz	COC, AMS
18	mesotrione	Callisto	27	Inhibition of Hydroxyphenyl Pyruvate Dioxygenase	Triketones	PRE	6 fl oz	None
19	metolachlor	Dual II Magnum	15	Inhibition of Very Long-Chain Fatty Acid Synthesis	$\alpha$ -Chloroacetamides	PRE	1.33 pts	None
20	metribuzin	Tricor 4F	5	Inhibition of Photosynthesis at PSII - Serine 264 Binders	Triazinones	PRE	1 pt	None
21	nicosulfuron	Accent Q	2	Inhibition of Acetolactate Synthase	Sulfonylureas	POST	0.9 oz	COC, AMS
22	paraquat	Gramoxone SL 3.0	22	PS I Electron Diversion	Pyridiniums	POST	2 pts	COC
23	pendimethalin	Prowl H2O	3	Inhibition of Microtubule Assembly	Dinitroanilines	PRE	3 pts	None
24	pyroxasulfone	Zidua SC	15	Inhibition of Very Long-Chain Fatty Acid Synthesis	Isoxazolines	PRE	3.25 fl oz	None
25	quizalofop-ethyl	Assure II	1	Inhibition of Acetyl CoA Carboxylase	Aryloxyphenoxy-propionates	POST	7 fl oz	COC, AMS
26	rimsulfuron	Resolve DF	2	Inhibition of Acetolactate Synthase	Sulfonylureas	POST	1 oz	NIS, AMS
27	saflufenacil	Sharpen	14	Inhibition of Protoporphyrinogen Oxidase	N-Phenyl-imides	PRE	1 fl oz	None
28	sulfentrazone	Spartan 4F	14	Inhibition of Protoporphyrinogen Oxidase	N-Phenyl-triazolinones	PRE	8 fl oz	None
29	tembotrione	Laudis	27	Inhibition of Hydroxyphenyl Pyruvate Dioxygenase	Triketones	POST	3 fl oz	MSO, AMS
30	topramezone	Armezon	27	Inhibition of Hydroxyphenyl Pyruvate Dioxygenase	Pyrazoles	POST	1 fl oz	MSO, AMS

\*NIS @ 0.25% v/v, COC @ 1% v/v, MSO @ 1% v/v, AMS @ 8.5 lb/100 gal