

## Comparison of Soil Residual Herbicides

Trial Number: UW-2018-WC-2 Lancaster/Preliminary data (August 2018), not for publication

**Daniel H. Smith**, Southwest Regional Specialist and **Richard Proost**, Southeast Agronomist, Nutrient and Pest Management Program;  
**Rodrigo Werle**, Weed Science Extension Specialist, Department of Agronomy, University of Wisconsin-Madison and UW-Extension

The authors would like to acknowledge Lancaster ARS staff and Wisconsin Cropping Systems Weed Science (WiscWeeds) Team: Maxwell Oliveira, Victor Ribeiro, Sarah Striegel, Nikola Arsenijevic and Ryan DeWerff.

### Site description

Soil type: Fayette

Crop: Soybean

% OM: 2.4

Variety: Asgrow AG21X8

pH: 7.3

Date planted: 5/24/2018

Fertilization: None

Planting depth: 1.5 in

Row spacing: 30 in

Plot size: 10 x 25 ft

Planting population: 145,000

Previous cropping and tillage: Corn;

fall chisel- 2 pass spring vertical tillage

Main weeds present: Waterhemp,

common lambsquarters

Other pesticides used: None

Experimental design and statistical analysis:

4 reps, randomized complete block

### Herbicide application information

Date treated: 5-25-18

Treatment: PRE

Soil moisture (surface): Dry

Soil temperature at 2 inch depth (°F) : 70°

Air temperature (°F): 78°

Weed speed (mph)/direction: 1-3/NW

Relative humidity: 67%

Cloud cover: 40%

Application equipment: CO<sub>2</sub> backpack sprayer,

GPA: 15, PSI: 26, MPH: 3, nozzle tips: XR11002,

spacing: 20 in, height: 20 in, application width: 6.67 ft

Trial will be replicated in multiple locations in 2019, and a final data report will be available in the Fall of 2019, complete with statistical analysis. Herbicide rates were based on industry recommended rates; the authors support using maximum labeled rates. Herbicide choices should be based on both herbicide efficacy and price. Length of rotational restrictions should always be considered.

### Preliminary Weed Control Ratings from the Lancaster ARS Trial Site

| Preliminary Weed Control Ratings from the Lancaster ARS Trial Site |                                                    |                                                    |  | WATERHEMP                                                                     |             | COMMON LAMBSQUARTERS |             |                |
|--------------------------------------------------------------------|----------------------------------------------------|----------------------------------------------------|--|-------------------------------------------------------------------------------|-------------|----------------------|-------------|----------------|
| Soybean growth stage (days after treatment)                        |                                                    |                                                    |  | V3 (25 DAT)                                                                   | R2 (50 DAT) | V3 (25 DAT)          | R2 (50 DAT) |                |
| Trt #                                                              | Herbicide and application rate (ac <sup>-1</sup> ) |                                                    |  | Greater than 91% is considered acceptable. Average % control (standard error) |             |                      |             | Price Estimate |
| 2                                                                  | 102                                                | Pursuit (4 fl oz)                                  |  | 24 (13)                                                                       | 18 (7)      | 100 (0)              | 100 (0)     |                |
| 3                                                                  | 103                                                | Classic (3 oz)                                     |  | 43 (19)                                                                       | 33 (13)     | 100 (0)              | 100 (0)     |                |
| 4                                                                  | 104                                                | FirstRate (0.6 oz)                                 |  | 13 (8)                                                                        | 6 (4)       | 100 (0)              | 100 (0)     |                |
| 5                                                                  | 105                                                | Tricor DF (10.7 oz)                                |  | 98 (1)                                                                        | 92 (3)      | 96 (4)               | 87 (9)      |                |
| 6                                                                  | 106                                                | Spartan (8 fl oz)                                  |  | 90 (4)                                                                        | 85 (5)      | 100 (0)              | 100 (0)     |                |
| 7                                                                  | 107                                                | Valor SX (3 oz)                                    |  | 100 (0)                                                                       | 96 (3)      | 94 (3)               | 87 (5)      |                |
| 8                                                                  | 108                                                | Sharpen (1 fl oz)                                  |  | 83 (8)                                                                        | 65 (20)     | 88 (5)               | 68 (10)     |                |
| 9                                                                  | 109                                                | Warrant (24 fl oz)                                 |  | 68 (16)                                                                       | 66 (13)     | 57 (11)              | 41 (18)     |                |
| 10                                                                 | 110                                                | Warrant (48 fl oz)                                 |  | 91 (4)                                                                        | 82 (7)      | 72 (11)              | 60 (19)     |                |
| 11                                                                 | 111                                                | Dual II Magnum (13.4 fl oz)                        |  | 95 (5)                                                                        | 94 (4)      | 55 (14)              | 35 (12)     |                |
| 12                                                                 | 112                                                | Dual II Magnum (26.7 fl oz)                        |  | 95 (2)                                                                        | 94 (4)      | 80 (4)               | 63 (5)      |                |
| 13                                                                 | 113                                                | Outlook (9 fl oz)                                  |  | 96 (2)                                                                        | 88 (5)      | 77 (4)               | 62 (10)     |                |
| 14                                                                 | 114                                                | Outlook (18 fl oz)                                 |  | 98 (3)                                                                        | 92 (4)      | 86 (4)               | 68 (13)     |                |
| 15                                                                 | 115                                                | Zidua (1.5 oz)                                     |  | 92 (4)                                                                        | 86 (7)      | 84 (4)               | 68 (8)      |                |
| 16                                                                 | 116                                                | Zidua (3 oz)                                       |  | 100 (0)                                                                       | 98 (1)      | 87 (2)               | 76 (4)      |                |
| 17                                                                 | 117                                                | Authority Assist (10 fl oz)                        |  | 100 (1)                                                                       | 99 (0)      | 100 (0)              | 100 (0)     |                |
| 18                                                                 | 118                                                | Sonic (6.45 oz)                                    |  | 96 (3)                                                                        | 95 (4)      | 100 (0)              | 100 (0)     |                |
| 19                                                                 | 119                                                | Surveil (3.5 oz)                                   |  | 99 (1)                                                                        | 91 (5)      | 99 (1)               | 99 (1)      |                |
| 20                                                                 | 120                                                | Valor XLT (3 oz)                                   |  | 97 (2)                                                                        | 94 (4)      | 100 (0)              | 100 (0)     |                |
| 21                                                                 | 121                                                | Broadaxe XC (25 fl oz)                             |  | 97 (4)                                                                        | 95 (4)      | 100 (0)              | 100 (0)     |                |
| 22                                                                 | 122                                                | Authority MTZ (12 oz)                              |  | 85 (9)                                                                        | 75 (15)     | 100 (0)              | 100 (0)     |                |
| 23                                                                 | 123                                                | Authority Supreme (8 fl oz)                        |  | 97 (4)                                                                        | 92 (5)      | 100 (0)              | 100 (0)     |                |
| 24                                                                 | 124                                                | Verdict (5 fl oz)                                  |  | 97 (3)                                                                        | 91 (5)      | 87 (6)               | 82 (5)      |                |
| 25                                                                 | 125                                                | Prefix (32 fl oz)                                  |  | 100 (0)                                                                       | 99 (1)      | 90 (2)               | 80 (6)      |                |
| 26                                                                 | 126                                                | Fierce (3.75 oz)                                   |  | 99 (1)                                                                        | 98 (1)      | 100 (0)              | 99 (1)      |                |
| 27                                                                 | 127                                                | Boundary (28.8 fl oz)                              |  | 100 (0)                                                                       | 73 (22)     | 92 (3)               | 83 (4)      |                |
| 28                                                                 | 128                                                | Canopy DF (2.25 oz)                                |  | 64 (19)                                                                       | 47 (19)     | 100 (0)              | 100 (0)     |                |
| 29                                                                 | 129                                                | Enlite (2.8 oz)                                    |  | 100 (0)                                                                       | 97 (1)      | 100 (0)              | 100 (0)     |                |
| 30                                                                 | 130                                                | Afforia (2.5 oz)                                   |  | 98 (2)                                                                        | 95 (2)      | 98 (2)               | 93 (3)      |                |
| 31                                                                 | 131                                                | Trivence (6 oz)                                    |  | 96 (2)                                                                        | 91 (4)      | 100 (0)              | 99 (1)      |                |
| 32                                                                 | 132                                                | Zidua PRO (6 fl oz)                                |  | 99 (1)                                                                        | 93 (6)      | 99 (1)               | 99 (2)      |                |
| 33                                                                 | 133                                                | Fierce XLT (4 oz)                                  |  | 100 (0)                                                                       | 97 (1)      | 100 (0)              | 100 (0)     |                |
| 34                                                                 | 134                                                | Fierce MTZ (3 oz Fierce + 6 oz metribuzin co-pack) |  | 100 (0)                                                                       | 97 (1)      | 96 (3)               | 96 (2)      |                |

# Lancaster Agricultural Research Station (LARS): Field history and weather

Past Field History by:  
Doug Wiedenbeck and Tim Wood LARS

Waterhemp was first observed in 2008 at the trial site. According to station records, waterhemp was first seen in a grass waterway approaching from a neighboring CRP field. Waterhemp remained mostly unnoticed until soybeans were planted in 2013. At this point, the population had intensified and has since been an issue; research trials have severely limited management options.

## Weather Summary

Lancaster, WI Collected By: Rita Riely, LARS

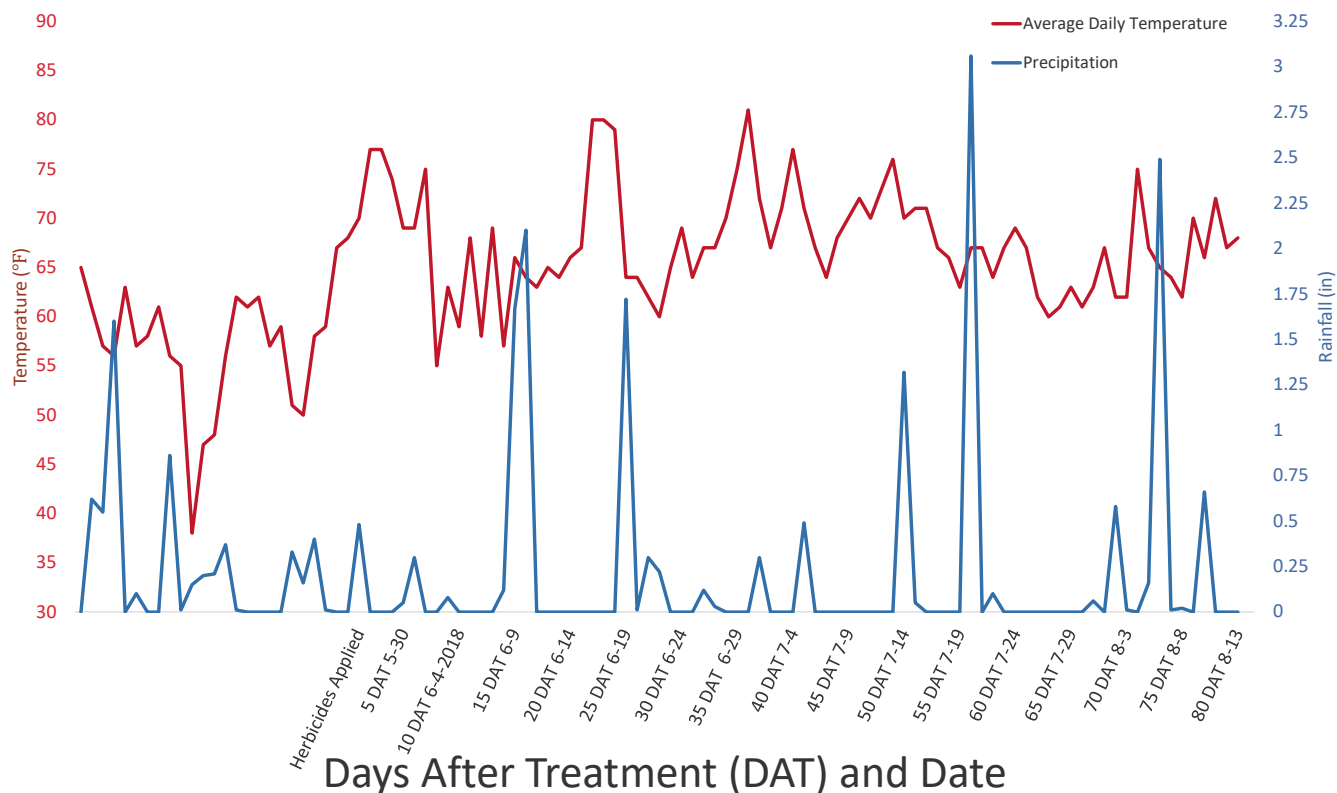
## CROP ROTATION AND HERBICIDE USE

| Year | Crop    | Herbicide Program                                                               | Tillage                              |
|------|---------|---------------------------------------------------------------------------------|--------------------------------------|
| 2013 | Soybean | PPI Prowl (1.75 pt/ac) + Pursuit Plus (1.25 qt/ac)<br>POST Managed for research | Field cultivation                    |
| 2014 | Corn    | PRE Lumax EZ (3 qt/ac) POST None                                                | Vertical tillage                     |
| 2015 | Corn    | Roundup PowerMAX (29 oz/ac)                                                     | No-till, cover crop research         |
| 2016 | Corn    | Roundup PowerMAX (29 oz/ac)                                                     |                                      |
| 2017 | Corn    | Lumax EZ (3 qt/ac)<br>POST Roundup PowerMAX (29 oz/ac)                          |                                      |
| 2018 | Soybean | Herbicide evaluation research plots                                             | Fall chisel, 2-pass vertical tillage |

## MONTHLY SUMMARIES

| Month | Air Temperature (°F) |         |          | Rain (in)<br>Total |
|-------|----------------------|---------|----------|--------------------|
|       | Avg                  | Avg Low | Avg High |                    |
| May   | 64.7                 | 54.7    | 74.7     | 6.41               |
| June  | 69.6                 | 61.5    | 77.7     | 6.35               |
| July  | 67.5                 | 62.0    | 81.2     | 9.31               |

## Lancaster Agricultural Research Station Weather Data May 1 - August 13, 2018



## Plot image key

Note that some plot photos may be missing a few plants due to planter issues, not herbicide injury.

Look between the rows for weeds



|                         |                          |                                      |         |
|-------------------------|--------------------------|--------------------------------------|---------|
| Herbicide               | Tricor DF                |                                      | 5       |
| Active Ingredients      | metribuzin               |                                      |         |
| Application Timing/Date | PRE 5/25/18              | Application Rate (ac <sup>-1</sup> ) | 10.7 oz |
| Site of Action          | Photosystem II Inhibitor |                                      |         |

This section contains treatment information



**Nontreated**



|                         |               |                                      |         |
|-------------------------|---------------|--------------------------------------|---------|
| Herbicide               | Pursuit       |                                      | 2       |
| Active Ingredient       | imazethapyr   |                                      |         |
| Application Timing/Date | PRE 5/25/18   | Application Rate (ac <sup>-1</sup> ) | 4 fl oz |
| Site of Action          | ALS Inhibitor |                                      |         |



|                         |                   |                                      |      |
|-------------------------|-------------------|--------------------------------------|------|
| Herbicide               | Classic           |                                      | 2    |
| Active Ingredient       | chlorimuron-ethyl |                                      |      |
| Application Timing/Date | PRE 5/25/18       | Application Rate (ac <sup>-1</sup> ) | 3 oz |
| Site of Action          | ALS Inhibitor     |                                      |      |



|                         |                    |                                      |        |
|-------------------------|--------------------|--------------------------------------|--------|
| Herbicide               | FirstRate          |                                      | 2      |
| Active Ingredients      | cloransulam-methyl |                                      |        |
| Application Timing/Date | PRE 5/25/18        | Application Rate (ac <sup>-1</sup> ) | 0.6 oz |
| Site of Action          | ALS Inhibitor      |                                      |        |



|                         |                          |                                      |         |
|-------------------------|--------------------------|--------------------------------------|---------|
| Herbicide               | Tricor DF                |                                      | 5       |
| Active Ingredients      | metribuzin               |                                      |         |
| Application Timing/Date | PRE 5/25/18              | Application Rate (ac <sup>-1</sup> ) | 10.7 oz |
| Site of Action          | Photosystem II Inhibitor |                                      |         |

Preliminary data (August, 2018), not for publication. Always Read, Follow and Understand the Pesticide Label — The Label is the Law. Information presented does not constitute a recommendation or endorsement.



|                         |               |                                      |         |
|-------------------------|---------------|--------------------------------------|---------|
| Herbicide               | Spartan       |                                      | 14      |
| Active Ingredients      | sulfentrazone |                                      |         |
| Application Timing/Date | PRE 5/25/18   | Application Rate (ac <sup>-1</sup> ) | 8 fl oz |
| Site of Action          | PPO Inhibitor |                                      |         |



|                         |               |                                      |      |
|-------------------------|---------------|--------------------------------------|------|
| Herbicide               | Valor SX      |                                      | 14   |
| Active Ingredients      | flumioxazin   |                                      |      |
| Application Timing/Date | PRE 5/25/18   | Application Rate (ac <sup>-1</sup> ) | 3 oz |
| Site of Action          | PPO Inhibitor |                                      |      |



|                         |               |                                      |         |
|-------------------------|---------------|--------------------------------------|---------|
| Herbicide               | Sharpen       |                                      | 14      |
| Active Ingredients      | saflufenacil  |                                      |         |
| Application Timing/Date | PRE 5/25/18   | Application Rate (ac <sup>-1</sup> ) | 1 fl oz |
| Site of Action          | PPO Inhibitor |                                      |         |



|                         |                                 |                                      |          |
|-------------------------|---------------------------------|--------------------------------------|----------|
| Herbicide               | Warrant                         |                                      | 15       |
| Active Ingredients      | acetochlor                      |                                      |          |
| Application Timing/Date | PRE 5/25/18                     | Application Rate (ac <sup>-1</sup> ) | 24 fl oz |
| Site of Action          | Long-chain Fatty Acid Inhibitor |                                      |          |



|                         |                                 |                                      |          |
|-------------------------|---------------------------------|--------------------------------------|----------|
| Herbicide               | Warrant                         |                                      | 15       |
| Active Ingredients      | acetochlor                      |                                      |          |
| Application Timing/Date | PRE 5/25/18                     | Application Rate (ac <sup>-1</sup> ) | 48 fl oz |
| Site of Action          | Long-chain Fatty Acid Inhibitor |                                      |          |



|                         |                                 |                                      |            |
|-------------------------|---------------------------------|--------------------------------------|------------|
| Herbicide               | Dual II Magnum                  |                                      | 15         |
| Active Ingredients      | S-metolachlor                   |                                      |            |
| Application Timing/Date | PRE 5/25/18                     | Application Rate (ac <sup>-1</sup> ) | 13.4 fl oz |
| Site of Action          | Long-chain Fatty Acid Inhibitor |                                      |            |

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|                         |                                 |                                      |            |
|-------------------------|---------------------------------|--------------------------------------|------------|
| Herbicide               | Dual II Magnum                  |                                      | 15         |
| Active Ingredients      | S-metolachlor                   |                                      |            |
| Application Timing/Date | PRE 5/25/18                     | Application Rate (ac <sup>-1</sup> ) | 26.7 fl oz |
| Site of Action          | Long-chain Fatty Acid Inhibitor |                                      |            |



|                         |                                 |                                      |          |
|-------------------------|---------------------------------|--------------------------------------|----------|
| Herbicide               | Outlook                         |                                      | 15       |
| Active Ingredients      | dimethenamid-P                  |                                      |          |
| Application Timing/Date | PRE 5/25/18                     | Application Rate (ac <sup>-1</sup> ) | 18 fl oz |
| Site of Action          | Long-chain Fatty Acid Inhibitor |                                      |          |



|                         |                                 |                                      |      |
|-------------------------|---------------------------------|--------------------------------------|------|
| Herbicide               | Zidua                           |                                      | 15   |
| Active Ingredients      | pyroxasulfone                   |                                      |      |
| Application Timing/Date | PRE 5/25/18                     | Application Rate (ac <sup>-1</sup> ) | 3 oz |
| Site of Action          | Long-chain Fatty Acid Inhibitor |                                      |      |



|                         |                                 |                                      |         |
|-------------------------|---------------------------------|--------------------------------------|---------|
| Herbicide               | Outlook                         |                                      | 15      |
| Active Ingredients      | dimethenamid-P                  |                                      |         |
| Application Timing/Date | PRE 5/25/18                     | Application Rate (ac <sup>-1</sup> ) | 9 fl oz |
| Site of Action          | Long-chain Fatty Acid Inhibitor |                                      |         |



|                         |                                 |                                      |        |
|-------------------------|---------------------------------|--------------------------------------|--------|
| Herbicide               | Zidua                           |                                      | 15     |
| Active Ingredients      | pyroxasulfone                   |                                      |        |
| Application Timing/Date | PRE 5/25/18                     | Application Rate (ac <sup>-1</sup> ) | 1.5 oz |
| Site of Action          | Long-chain Fatty Acid Inhibitor |                                      |        |



|                                         |                                       |                                      |               |   |
|-----------------------------------------|---------------------------------------|--------------------------------------|---------------|---|
| Herbicide                               | Authority Assist                      |                                      | 14            | 2 |
| Active Ingredients                      | sulfentrazone + imazethapyr           |                                      |               |   |
| Application Timing/Date                 | PRE 5/25/18                           | Application Rate (ac <sup>-1</sup> ) | 10 fl oz      |   |
| Equivalent Tank Mix (ac <sup>-1</sup> ) | 8.3 fl oz Spartan + 3.3 fl oz Pursuit |                                      |               |   |
| Site of Action                          | PPO Inhibitor                         |                                      | ALS Inhibitor |   |

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|                                         |                                    |                                      |               |   |
|-----------------------------------------|------------------------------------|--------------------------------------|---------------|---|
| Herbicide                               | Sonic                              |                                      | 14            | 2 |
| Active Ingredients                      | sulfentrazone + cloransulam-methyl |                                      |               |   |
| Application Timing/Date                 | PRE 5/25/18                        | Application Rate (ac <sup>-1</sup> ) | 6.45 oz       |   |
| Equivalent Tank Mix (ac <sup>-1</sup> ) | 8 fl oz Spartan + 0.6 oz FirstRate |                                      |               |   |
| Site of Action                          | PPO Inhibitor                      |                                      | ALS Inhibitor |   |



|                                         |                                   |                                      |               |   |
|-----------------------------------------|-----------------------------------|--------------------------------------|---------------|---|
| Herbicide                               | Valor XLT                         |                                      | 14            | 2 |
| Active Ingredients                      | flumioxazin + chlorimuron-ethyl   |                                      |               |   |
| Application Timing/Date                 | PRE 5/25/18                       | Application Rate (ac <sup>-1</sup> ) | 3 oz          |   |
| Equivalent Tank Mix (ac <sup>-1</sup> ) | 1.8 oz Valor SX + 1.24 oz Classic |                                      |               |   |
| Site of Action                          | PPO Inhibitor                     |                                      | ALS Inhibitor |   |



|                                         |                                        |                                      |               |    |
|-----------------------------------------|----------------------------------------|--------------------------------------|---------------|----|
| Herbicide                               | Authority MTZ                          |                                      | 5             | 14 |
| Active Ingredients                      | metribuzin + sulfentrazone             |                                      |               |    |
| Application Timing/Date                 | PRE 5/25/18                            | Application Rate (ac <sup>-1</sup> ) | 12 oz         |    |
| Equivalent Tank Mix (ac <sup>-1</sup> ) | 4.35 oz Tricor DF + 4.35 fl oz Spartan |                                      |               |    |
| Site of Action                          | Photosystem II Inhibitor               |                                      | PPO Inhibitor |    |



|                                         |                                    |                                      |               |   |
|-----------------------------------------|------------------------------------|--------------------------------------|---------------|---|
| Herbicide                               | Surveil                            |                                      | 14            | 2 |
| Active Ingredients                      | flumioxazin + cloransulam-methy    |                                      |               |   |
| Application Timing/Date                 | PRE 5/25/18                        | Application Rate (ac <sup>-1</sup> ) | 3.5 oz        |   |
| Equivalent Tank Mix (ac <sup>-1</sup> ) | 2.5 oz Valor SX + 0.5 oz FirstRate |                                      |               |   |
| Site of Action                          | PPO Inhibitor                      |                                      | ALS Inhibitor |   |



|                                         |                                               |                                      |               |    |
|-----------------------------------------|-----------------------------------------------|--------------------------------------|---------------|----|
| Herbicide                               | Broadaxe XC                                   |                                      | 15            | 14 |
| Active Ingredients                      | S-metolachlor + sulfentrazone                 |                                      |               |    |
| Application Timing/Date                 | PRE 5/25/18                                   | Application Rate (ac <sup>-1</sup> ) | 25 fl oz      |    |
| Equivalent Tank Mix (ac <sup>-1</sup> ) | 20.6 fl oz Dual II Magnum + 4.4 fl oz Spartan |                                      |               |    |
| Site of Action                          | Long-chain Fatty Acid Inhibitor               |                                      | PPO Inhibitor |    |



|                                         |                                    |                                      |                                 |    |
|-----------------------------------------|------------------------------------|--------------------------------------|---------------------------------|----|
| Herbicide                               | Authority Supreme                  |                                      | 14                              | 15 |
| Active Ingredients                      | sulfentrazone + pyroxasulfone      |                                      |                                 |    |
| Application Timing/Date                 | PRE 5/25/18                        | Application Rate (ac <sup>-1</sup> ) | 8 fl oz                         |    |
| Equivalent Tank Mix (ac <sup>-1</sup> ) | 4.15 fl oz Spartan + 2.45 oz Zidua |                                      |                                 |    |
| Site of Action                          | PPO Inhibitor                      |                                      | Long-chain Fatty Acid Inhibitor |    |

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|                                         |                                      |                                      |               |    |
|-----------------------------------------|--------------------------------------|--------------------------------------|---------------|----|
| Herbicide                               | Verdict                              |                                      | 15            | 14 |
| Active Ingredients                      | dimethenamid-P + saflufenacil        |                                      |               |    |
| Application Timing/Date                 | PRE 5/25/18                          | Application Rate (ac <sup>-1</sup> ) | 5 fl oz       |    |
| Equivalent Tank Mix (ac <sup>-1</sup> ) | 4.15 fl oz Outlook + 1 fl oz Sharpen |                                      |               |    |
| Site of Action                          | Long-chain Fatty Acid Inhibitor      |                                      | PPO Inhibitor |    |



|                                         |                              |                                      |                                 |    |
|-----------------------------------------|------------------------------|--------------------------------------|---------------------------------|----|
| Herbicide                               | Fierce                       |                                      | 14                              | 15 |
| Active Ingredients                      | flumioxazin + pyroxasulfone  |                                      |                                 |    |
| Application Timing/Date                 | PRE 5/25/18                  | Application Rate (ac <sup>-1</sup> ) | 3.75 oz                         |    |
| Equivalent Tank Mix (ac <sup>-1</sup> ) | 2.6 oz Valor SX + 2 oz Zidua |                                      |                                 |    |
| Site of Action                          | PPO Inhibitor                |                                      | Long-chain Fatty Acid Inhibitor |    |



|                                         |                                  |                                      |               |   |
|-----------------------------------------|----------------------------------|--------------------------------------|---------------|---|
| Herbicide                               | Canopy DF                        |                                      | 5             | 2 |
| Active Ingredients                      | metribuzin + chlorimuron-ethyl   |                                      |               |   |
| Application Timing/Date                 | PRE 5/25/18                      | Application Rate (ac <sup>-1</sup> ) | 2.25 oz       |   |
| Equivalent Tank Mix (ac <sup>-1</sup> ) | 1.95 oz Tricor DF + 1 oz Classic |                                      |               |   |
| Site of Action                          | Photosystem II Inhibitor         |                                      | ALS Inhibitor |   |



|                                         |                                                 |                                      |               |    |
|-----------------------------------------|-------------------------------------------------|--------------------------------------|---------------|----|
| Herbicide                               | Prefix                                          |                                      | 15            | 14 |
| Active Ingredients                      | S-metolachlor + fomesafen                       |                                      |               |    |
| Application Timing/Date                 | PRE 5/25/18                                     | Application Rate (ac <sup>-1</sup> ) | 32 fl oz      |    |
| Equivalent Tank Mix (ac <sup>-1</sup> ) | 18.2 fl oz Dual II Magnum + 16.2 fl oz Flexstar |                                      |               |    |
| Site of Action                          | Long-chain Fatty Acid Inhibitor                 |                                      | PPO Inhibitor |    |



|                                         |                                            |                                      |                          |   |
|-----------------------------------------|--------------------------------------------|--------------------------------------|--------------------------|---|
| Herbicide                               | Boundary                                   |                                      | 15                       | 5 |
| Active Ingredients                      | S-metolachlor + metribuzin                 |                                      |                          |   |
| Application Timing/Date                 | PRE 5/25/18                                | Application Rate (ac <sup>-1</sup> ) | 28.8 fl oz               |   |
| Equivalent Tank Mix (ac <sup>-1</sup> ) | 19.8 fl oz Dual II Magnum + 6 oz Tricor DF |                                      |                          |   |
| Site of Action                          | Long-chain Fatty Acid Inhibitor            |                                      | Photosystem II Inhibitor |   |



|                                         |                                                         |                                      |               |   |   |
|-----------------------------------------|---------------------------------------------------------|--------------------------------------|---------------|---|---|
| Herbicide                               | Enlite                                                  |                                      | 14            | 2 | 2 |
| Active Ingredients                      | flumioxazin + chlorimuron-ethyl + thifensulfuron-methyl |                                      |               |   |   |
| Application Timing/Date                 | PRE 5/25/18                                             | Application Rate (ac <sup>-1</sup> ) | 2.8 oz        |   |   |
| Equivalent Tank Mix (ac <sup>-1</sup> ) | 2.0 oz Valor SX + 0.32 oz Classic + 0.05 oz Harmony     |                                      |               |   |   |
| Site of Action                          | PPO Inhibitor                                           | ALS Inhibitor                        | ALS Inhibitor |   |   |

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|                                         |                                                         |                                      |               |
|-----------------------------------------|---------------------------------------------------------|--------------------------------------|---------------|
| Herbicide                               | Afforia                                                 |                                      |               |
| Active Ingredients                      | flumioxazin + thifensulfuron-methyl + tribenuron-methyl |                                      |               |
| Application Timing/Date                 | PRE 5/25/18                                             | Application Rate (ac <sup>-1</sup> ) | 2.5 oz        |
| Equivalent Tank Mix (ac <sup>-1</sup> ) | 2 oz Valor SX + 0.25 oz Harmony + 0.25 oz Express       |                                      |               |
| Site of Action                          | PPO Inhibitor                                           | ALS Inhibitor                        | ALS Inhibitor |



|                                         |                                             |                                      |                                 |
|-----------------------------------------|---------------------------------------------|--------------------------------------|---------------------------------|
| Herbicide                               | Zidua PRO                                   |                                      |                                 |
| Active Ingredients                      | imazethypyr + pyroxasulfone + saflufenacil  |                                      |                                 |
| Application Timing/Date                 | PRE 5/25/18                                 | Application Rate (ac <sup>-1</sup> ) | 6 fl oz                         |
| Equivalent Tank Mix (ac <sup>-1</sup> ) | 4 fl oz Pursuit + 2 oz Zidua + 1 oz Sharpen |                                      |                                 |
| Site of Action                          | ALS Inhibitor                               | PPO Inhibitor                        | Long-chain Fatty Acid Inhibitor |



|                                         |                                               |                                      |                                  |
|-----------------------------------------|-----------------------------------------------|--------------------------------------|----------------------------------|
| Herbicide                               | Fierce MTZ                                    |                                      |                                  |
| Active Ingredients                      | metribuzin + flumioxazin + pyroxasulfone      |                                      |                                  |
| Application Timing/Date                 | PRE 5/25/18                                   | Application Rate (ac <sup>-1</sup> ) | 3 oz Fierce + 6 fl oz metribuzin |
| Equivalent Tank Mix (ac <sup>-1</sup> ) | 6 fl oz metribuzin+ 2 oz Valor + 1.5 oz Zidua |                                      |                                  |
| Site of Action                          | Photosystem II Inhibitor                      | PPO Inhibitor                        | Long-chain Fatty Acid Inhibitor  |



|                                         |                                                       |                                      |               |
|-----------------------------------------|-------------------------------------------------------|--------------------------------------|---------------|
| Herbicide                               | Trivence                                              |                                      |               |
| Active Ingredients                      | metribuzin + flumioxazin + chlorimuron-ethyl          |                                      |               |
| Application Timing/Date                 | PRE 5/25/18                                           | Application Rate (ac <sup>-1</sup> ) | 6 oz          |
| Equivalent Tank Mix (ac <sup>-1</sup> ) | 3.56 oz Tricor DF + 1.5 oz Valor SX + 0.94 oz Classic |                                      |               |
| Site of Action                          | Photosystem II Inhibitor                              | PPO Inhibitor                        | ALS Inhibitor |



|                                         |                                                 |                                      |               |
|-----------------------------------------|-------------------------------------------------|--------------------------------------|---------------|
| Herbicide                               | Fierce XLT                                      |                                      |               |
| Active Ingredients                      | flumioxazin + pyroxasulfone + chlorimuron-ethyl |                                      |               |
| Application Timing/Date                 | PRE 5/25/18                                     | Application Rate (ac <sup>-1</sup> ) | 4 oz          |
| Equivalent Tank Mix (ac <sup>-1</sup> ) | 1.9 oz Valor SX + 1.46 oz Zidua + 1 oz Classic  |                                      |               |
| Site of Action                          | PPO Inhibitor                                   | Long-chain Fatty Acid Inhibitor      | ALS Inhibitor |

Preliminary data (August, 2018), not for publication. Always Read, Follow and Understand the Pesticide Label — The Label is the Law. Information presented does not constitute a recommendation or endorsement.

Waterhemp plants were submitted to the University of Illinois Plant Clinic for molecular herbicide resistance screening. **The results confirmed glyphosate resistance.** PPO Inhibitor resistance was also screened for and not detected.

**Note:** This publication contains preliminary data from August 2018. Please contact Rodrigo Werle ([rwerle@wisc.edu](mailto:rwerle@wisc.edu)) of the UW-Madison, Department of Agronomy for information on final data.

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**The Nutrient and Pest Management (NPM) Program**  
 phone (608) 265-2660  
 email ([npm@hort.wisc.edu](mailto:npm@hort.wisc.edu))  
 or visit our website: [ipcm.wisc.edu](http://ipcm.wisc.edu)