

**IR-4 Ornamental Horticulture Program  
Halosulfuron Crop Safety**

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**Acknowledgements**

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## **Abstract**

Since 1996 IR-4 has completed 244 trials with products containing halosulfuron (Sedgehammer, Manage) on 94 crops. The data contained in this report was generated to expand the current SedgeHammer label to include both directed and over the top applications on certain plant species along with adding nursery production sites. The halosulfuron rates in the 2006 testing program were 0.045, 0.09 and 0.18 pounds active ingredient per acre (lb ai per A) as the 1X, 2X and 4X rates. Of the 94 plant genera or species examined, 23 exhibited no or minimal transient injury after application at all three rates. Seven crops exhibited no phytotoxicity at 0.045 lb ai per acre, but did have some injury at the higher rates. Twenty-eight crops exhibited phytotoxicity at even the lowest rate.

## **Introduction**

Control of broadleaved weeds and sedges in the production of woody and herbaceous perennials can be problematic because nurseries grow many different types of plants and not all genera or species are listed on labels. These weeds can also be difficult to control in landscape settings for the same reason. Three herbicides, SedgeHammer, Sulfentrazone, and V-10142 75WDG, were chosen for 2006 research activities into level of crop safety on over 50 different plant species. This report covers the results from SedgeHammer during this past year and since 1996 when halosulfuron was first tested through IR-4.

SedgeHammer contains the same formulation as Manage. This formulation was purchased by Gowan from Dow. While research was conducted under both names and Table 5 contains both names, the report text uses SedgeHammer throughout.

## **Materials and Methods**

In the 2006 protocol, two applications of SedgeHammer were made approximately 30 days apart. The application rates were 0.045, 0.09, and 0.18 lb ai per acre, plus a water treated control. A minimum of four plants (replicate treatments) were required with many researchers exceeding this minimum. Phytotoxicity was recorded on a scale of 0 to 10 (0 = No phytotoxicity; 10 = Complete kill) at 1, 2, 4, 8, and 12 weeks after initial application. Some researchers also included readings 3 to 4 days after the initial and second applications. For more detailed materials and methods and available protocols from previous years' research activities, please see Appendix 1: Protocols.

SedgeHammer and Manage were supplied to researchers (See list of researchers in Appendix 2) by Gowan and Dow AgroSciences, respectively.

## **Results and Summary**

### ***Efficacy***

There are several reports of efficacy throughout the researcher reports. However, the main impetus to the research contained here was crop safety and the efficacy results cannot be considered exhaustive. Please see Table 5 for details on efficacy.

### ***Phytotoxicity***

Based on the type and nature of injury seen with SedgeHammer applications in the research conducted since 1995, tested plant species were placed into three categories: 1) no significant phytotoxicity or growth differences from the untreated check or any injury was transitory, 2) no or minimal transitory injury seen at the 1X rate, but the 2X and/or 4X rates did cause significant phytotoxicity, 3) Significant injury sufficient to recommend growers not utilize this product, and 4) More trials are needed to clarify response.

SedgeHammer exhibited no or minimal negative impact on a wide range of plant species (Table

1). Twenty-three plant genera or species fell into this category. Some minimal injury may be acceptable for growers if applications are made several weeks to months in advance of crop sale particularly for woody ornamental crops. For 7 crop species, there was no or little injury exhibited at the lowest tested rates, but significant phytotoxicity occurred at the higher rates (Table 2). Twenty-eight crops exhibited damage sufficient to recommend growers not utilize SedgeHammer as an over-the-top treatment (Table 3).

Table 4 contains a list of plants where either only one trial was conducted or there was sufficiently divergent results among researchers to recommend additional testing.

Please see Table 5 for a list of research on SedgeHammer and the summary of the results received so far.

**Table 1. List of SedgeHammer treated crops with no or minimal transitory injury with over the top applications.**

<i>Buxus microphylla</i>	<i>Juniperus chinensis</i>
<i>Euonymus sp.</i>	<i>Juniperus conferta</i>
<i>Gardenia augusta</i>	<i>Juniperus horizontalis</i>
<i>Hemerocallis sp (See Gilliam 2006)</i>	<i>Lagerstroemia indica</i>
<i>Hosta sp.</i>	<i>Liriope muscari (See Neal 2006)*</i>
<i>Hydrangea sp.</i>	<i>Magnolia sp.</i>
<i>Ilex cornuta</i>	<i>Quercus rubra</i>
<i>Ilex crenata</i>	<i>Rhododendron sp.</i>
<i>Ilex x meserveae</i>	<i>Spirea sp.</i>
<i>Ilex rotunda</i>	<i>Thuja occidentales</i>
<i>Ilex vomitoria 'nana'</i>	<i>Trachelospermum asiaticum (See Lieth 2006)</i>
<i>Illicium parviflorum</i>	

\* Growth rate decreased significantly as rate increased.

**Table 2. List of SedgeHammer treated crops with no or minimal transitory injury seen at the 1X rate, but the 2X or 4X rate did cause significant phytotoxicity with over the top applications.**

<i>Canna sp.</i>	<i>Quercus prinus</i>
<i>Chasmanthium latifolium</i>	<i>Quercus velutina</i>
<i>Fraxinus pennsylvanica</i>	<i>Spirea x bumalda</i>
<i>Quercus acutissima</i>	

\* No injury observed with directed application.

**Table 3. List of SedgeHammer treated crops exhibiting significant injury with over the top applications.**

<i>Abelia X grandiflora</i>	<i>Acer rubrum</i>
<i>Abies balsamea</i>	<i>Berberis thunbergii</i>

*Carya sp.*  
*Cercis canadensis*  
*Chamaebatiaria sp.*  
*Chamaecyparis thyoides*  
*Cornus florida*  
*Cotoneaster dammeri*  
*Cotoneaster horizontalis*  
*Delosperma sp.*  
*Fragraria x ananassa*  
*Gypsophila elegans*  
*Hedera helix*  
*Juniperus virginiana*

*Mazus reptans*  
*Myrica pensylvanica*  
*Phalaris arundinacea*  
*Picea abies*  
*Picea glauca*  
*Platanus occidentalis*  
*Prunus sp.*  
*Robinia pseudoacacia*  
*Rudbeckia fuligida speciosa*  
*Salvia sp.*  
*Taxus sp.*  
*Viburnum sp.*

\* No injury observed with directed application.

**Table 4. List of SedgeHammer treated crops where more data is needed for recommendation.**

<i>Arenaria montana</i>	<i>Leymus arenarius</i>	<i>Picea glauca (seedlings)</i>
<i>Acer rubrum *</i>	<i>Ligustrum sp.</i>	<i>Pinus sp.</i>
<i>Betula sp. *</i>	<i>Liriodendron tulipifera</i>	<i>Rosa sp. **</i>
<i>Buddleia daviddi</i>	<i>Mahonia aquifolium</i>	<i>Schizachyrium scoparium</i>
<i>Calamagrostis acutiflora</i>	<i>Muhlenbergia capillaris</i>	<i>Taxodium distichum</i>
<i>Chamaecyparis pisifera</i>	<i>Nandina domestica</i>	<i>Thymus praecox</i>
<i>Cuphea sp.</i>	<i>Nepeta cataria</i>	<i>Trachelospermum</i>
<i>Echinacea purpurea</i>	<i>Ophiopogon japonicus</i>	<i>jasminoides</i>
<i>Echinacea sp.</i>	<i>Panicum virgatum</i>	<i>Trachycarpus fortunei</i>
<i>Geditsia sp. *</i>	<i>Pennisetum setaceum</i>	<i>Tsuga canadensis</i>
<i>Helleborus niger</i>	<i>Pentas sp.</i>	<i>Vinca minor</i>
<i>Juglans nigra</i>	<i>Phlox sp.</i>	
<i>Lantana sp.</i>	<i>Picea abies (seedlings)</i>	

\* No injury observed with directed application.

\*\* Significant different responses among cultivars

**Table 5. Summary of Crop Safety Testing with SedgeHammer**

Notes: Table entries are sorted by crop Latin name. Results summaries for SedgeHammer and Manage are included in this table without distinction between the two products because they contain the same formulation of halosulfuron. Only those trials with research reports received by 4/15/07 are listed below.

PR #	Product	Crop			Production Site	Researcher(s)	Year	Application Type	Results Summary
		Common Name	Latin Name	Cultivar					
13670	SedgeHammer	Abelia	<i>Abelia sp.</i>	A. x grandiflora 'John Creech'	Field Container	Neal	2006	Over the top	Moderate to significant injury increasing with rate (0.047, 0.094, 0.188 lb ai per acre).
13670	SedgeHammer	Abelia	<i>Abelia sp.</i>	A. x grandiflora 'Little Richard'	Field Container	Gilliam	2006	Over the top	Slight to moderate injury increasing with rate and time (0.047, 0.094, 0.188 lb ai per acre).
26165	SedgeHammer	Fir, Fraser	<i>Abies fraseri</i>		Field Container	Freiberger	2006	Over the top	No to very slight injury at 0.045 lb ai per acre, slight to moderate at higher rates; no growth reduction
25474	SedgeHammer	Fir, Fraser	<i>Abies fraseri</i>		Field In-Ground	Ahrens/Mervosh	2006	Over the top	No injury to dormant trees, unacceptable injury to actively growing trees at all rates (0.047, 0.094 and 0.188 lb ai per acre with NIS)
13668	Manage	Fir	<i>Abies sp.</i>	A. balsamea	Field In-Ground	Ahrens/Mervosh	2001	Over the top	Moderate injury (chlorosis and necrosis) at all rates (0.045, 0.09, 0.18 lb ai per acre); poor control of Asiatic dayflower.
25476	SedgeHammer	Maple, Red	<i>Acer rubrum</i>		Field Container	Altland	2006	Over the top	Significant injury with single application at all rates (0.047, 0.094 and 0.188 lb ai/A)
25476	SedgeHammer	Maple, Red	<i>Acer rubrum</i>		Field Container	Freiberger	2006	Over the top	High injury at all rates (0.045, 0.09, 0.18 lb ai per acre)
12457	SedgeHammer	Maple	<i>Acer sp.</i>	R. rubrum 'Red Sunset'	Field In-Ground	Kuhns	2003	Directed	No injury at 0.045, 0.09, and 0.18 lb ai per acre; good weed control at 4 weeks after treatment, but not at 9 weeks after treatment.
21436	SedgeHammer	Sandwort	<i>Arenaria sp.</i>	A. montana	Field Container	Senesac	2001	Over the top	Minor to moderate phytotoxicity at all rates, with only the lowest rate recovering by 6 weeks after treatment (0.045, 0.09, 0.18 lb ai per acre).

PR #	Product	Crop			Production Site	Researcher(s)	Year	Application Type	Results Summary
		Common Name	Latin Name	Cultivar					
13674	SedgeHammer	Barberry	<i>Berberis sp.</i>	B. thunbergii 'Rosy Glow'	Field Container	Derr	2002	Over the top	Moderate to significant injury increasing with rate (0.045, 0.09, 0.18 lb ai per acre).
13710	SedgeHammer	Birch	<i>Betula sp.</i>		Field In-Ground	Beste/Frank	2005	Over the top	Moderate but transient injury at all rates (0.045, 0.09, 0.18 lb ai per acre with NIS).
13710	SedgeHammer	Birch	<i>Betula sp.</i>	'Heritage' and 'Duratree'	Field In-Ground	Kuhns	2003	Directed	No injury at 0.045, 0.09, and 0.18 lb ai per acre; good weed control at 4 weeks after treatment, but not at 9 weeks after treatment.
25002	Manage	Butterfly Bush	<i>Buddleia davidii</i>	'Black Knight'	Field Container	Derr	2005	Over the top	Very low injury at 0.045 lb ai per acre, low at 0.09 and 0.18 lb ai per acre.
21443	Manage	Boxwood	<i>Buxus sp.</i>		Field Container	Derr	2005	Over the top	No injury at 0.045, 0.09, 0.18 lb ai per acre
21443	Manage	Boxwood	<i>Buxus sp.</i>	B. microphylla 'Green Velvet'	Field Container	Senesac	2001	Over the top	Slight, transient injury increasing with rate (0.031, 0.062, 0.124 lb ai per acre).
21443	Manage	Boxwood	<i>Buxus sp.</i>	B. microphylla var japonica	Field Container	Derr	2002	Over the top	Slight injury increasing with rate (0.045, 0.09, 0.18 lb ai per acre) and with reduction of fresh weight at highest rate; poor pre-emergent control of large crabgrass and spotted spurge.
21443	Manage	Boxwood	<i>Buxus sp.</i>	B. microphylla var koreana	Field Container	Gilliam	2006	Over the top	No injury until 4 weeks after initial treatment when pronounced chlorosis appeared at all rates (0.047, 0.094, 0.188 lb ai per acre) and plants were significantly stunted.
23501	Manage	Feather Reed Grass	<i>Calamagrostis acutiflora</i>	'Karl Foerster'	Field Container	Neal	2005	Broadcast	None at 0.045 lb ai per acre; slight and temporary at 0.09 and 0.18 lb ai per acre.
25350	SedgeHammer	Canna	<i>Canna sp.</i>	'Cherry'	Field Container	Fraelich	2006	Over the top	Slight, moderate and high injury at 0.045, 0.09, 0.18 lb ai per acre with NIS.
25928	SedgeHammer	Hickory	<i>Carya sp.</i>	Pecan	Field In-Ground	Beste/Frank	2006	Over the top	Slight injury only at 4X rate but unacceptable growth reduction at all rates (0.045, 0.09, 0.18 lb ai per acre with NIS).
13713	SedgeHammer	Red Bud, Eastern	<i>Cercis canadensis</i>		Field In-Ground	Beste/Frank	2005	Foliar	Unacceptable injury (0.045, 0.09, 0.18 lb ai per acre with NIS).

PR #	Product	Crop			Production Site	Researcher(s)	Year	Application Type	Results Summary
		Common Name	Latin Name	Cultivar					
25344	SedgeHammer	Fernbush	<i>Chamaebatiaria sp.</i>		Field Container	Klett	2006	Over the top	Experiment B: Severe injury at all rates (0.047, 0.094 and 0.188 lb ai per acre with Capsil surfactant)
25344	SedgeHammer	Fernbush	<i>Chamaebatiaria sp.</i>		Field Container	Klett	2006	Over the top	Experiment C: Moderate to high injury at all rates (0.047, 0.094 and 0.188 lb ai per acre with Capsil surfactant)
25344	SedgeHammer	Fernbush	<i>Chamaebatiaria sp.</i>		Field Container	Klett	2006	Over the top	Experiment A: Slight to moderate injury at 0.047 lb ai per acre with Capsil surfactant, high at 0.094 and 0.188 lb ai
21445	SedgeHammer	False cypress	<i>Chamaecyparis obtusa</i>	C. pisifera 'Filifera Aurea'	Field Container	Senesac	2001	Over the top	No injury at 0.031, 0.062, and 0.124 lb ai per acre.
13664	SedgeHammer	False cypress	<i>Chamaecyparis obtusa</i>	C. thyoides	Field In-Ground	Beste/Frank	2005	Foliar	Unacceptable injury (0.045, 0.09, 0.18 lb ai per acre with NIS).
13664	SedgeHammer	False cypress	<i>Chamaecyparis obtusa</i>	C. thyoides 'White Cedar'	Field In-Ground	Beste/Frank	2006	Over the top	Unacceptable injury and growth reduction at all rates (0.045, 0.09 and 0.18 lb ai per acre + NIS)
23503	Manage	Northern Sea Oats, Wild Oats	<i>Chasmanthium latifolium</i>		Field Container	Neal	2005	Broadcast	No injury at 0.045 lb ai per acre, significant at 0.09 and 0.18 lb ai per acre.
13681	SedgeHammer	Dogwood, Flowering	<i>Cornus florida</i>		Field In-Ground	Beste/Frank	2005	Foliar	Unacceptable injury (0.045, 0.09, 0.18 lb ai per acre with NIS).
13655	SedgeHammer	Cotoneaster	<i>Cotoneaster sp.</i>	C. dammeri 'Skolghshomen'	Field Container	Beste/Frank	2006	Over the top	Significant but transient injury with all rates (0.047, 0.094, 0.188) and plants were stunted in comparison to the untreated ones.
13655	SedgeHammer	Cotoneaster	<i>Cotoneaster sp.</i>	C. horizontalis	Field Container	Neal	2006	Over the top	Moderate to significant injury increasing with rate (0.047, 0.094, 0.188 lb ai per acre).
25346	SedgeHammer	Mexican Heather, False Heather, Elfin Herb	<i>Cuphea hyssopifolia</i>	C. allyson	Field Container	Derr	2006	Over the top	Slight injury at all rates with complete recovery at the lower rates (0.045, 0.09, 0.18 lb ai per acre).
25346	SedgeHammer	Mexican Heather, False Heather, Elfin Herb	<i>Cuphea hyssopifolia</i>	'Itsy Bitsy White'	Field Container	Lieth	2006	Over the top	High injury and growth reduction at all rates (0.045, 0.09, 0.18 lb ai per acre).
25342	SedgeHammer	Delosperma sp.	<i>Delosperma sp.</i>	'Kelaidis'	Field Container	Klett	2006	Over the top	Experiment C: Slight injury at 0.047 lb ai per acre with Capsil surfactant, moderate at 0.094 and 0.188 lb ai
25342	SedgeHammer	Delosperma sp.	<i>Delosperma sp.</i>	'Kelaidis'	Field Container	Klett	2006	Over the top	Experiment A: Moderate to high injury with increasing rates (0.047, 0.094 and 0.188 lb ai per acre with Capsil surfactant)

PR #	Product	Crop			Production Site	Researcher(s)	Year	Application Type	Results Summary
		Common Name	Latin Name	Cultivar					
25342	SedgeHammer	Delosperma sp.	<i>Delosperma sp.</i>	'Kelaidis'	Field Container	Klett	2006	Over the top	Experiment B: Significant injury with almost complete recovery at end of trial at all rates (0.047, 0.094 and 0.188 lb ai per acre with Capsil surfactant)
25351	SedgeHammer	Purple Coneflower	<i>Echinacea sp.</i>		Field Container	Klett	2006	Over the top	Experiment A: Severe injury at all rates (0.047, 0.094 and 0.188 lb ai per acre with Capsil surfactant)
25351	SedgeHammer	Purple Coneflower	<i>Echinacea sp.</i>		Field Container	Klett	2006	Over the top	Experiment C: No significant injury at 0.047 lb ai per acre with Capsil surfactant, high at 0.094 and 0.188 lb ai
25351	SedgeHammer	Purple Coneflower	<i>Echinacea sp.</i>		Field Container	Klett	2006	Over the top	Experiment B: Significant injury with complete recovery at 0.047 lb ai per acre with Capsil surfactant, high at 0.094 and 0.188 lb ai
25351	SedgeHammer	Purple Coneflower	<i>Echinacea sp.</i>	E. purpurea magnus	Field Container	Fraelich	2006	Over the top	Very slight injury with complete recovery at higher rates; no growth reduction (0.045, 0.09, 0.18 lb ai per acre with NIS).
25351	SedgeHammer	Purple Coneflower	<i>Echinacea sp.</i>	E. purpurea 'Magnus'	Field Container	Boydston	2006	Over the top	Severe injury after one application (0.045, 0.09, 0.18 lb ai per acre).
13657	SedgeHammer	Purpleleaf Wintercreeper	<i>Euonymus radicans</i>	E. fortunei	Field In-Ground	Gilliam	2005	Foliar	No injury (0.045, 0.09, 0.18 lb ai per acre).
25006	SedgeHammer	Euonymus	<i>Euonymus sp.</i>		Field Container	Derr	2005	Over the top	Very slight injury at all rates (0.045, 0.09, 0.18 lb ai per acre).
21437	SedgeHammer	Strawberry (Non-Bearing)	<i>Fragaria sp.</i>	F. x ananassa 'Pink Panda'	Field Container	Senesac	2001	Over the top	Moderate injury increasing with rate (0.045, 0.09, 0.18 lb ai per acre).
13232	SedgeHammer	Ash, Green	<i>Fraxinus pennsylvanica</i>		Field In-Ground	Beste/Frank	2005	Ground broadcast foliar	Low to moderate injury and reduced plant growth increasing with rate (0.045, 0.09, 0.18 lb ai per acre with NIS).
25352	SedgeHammer	Cape Jasmine, Radicans	<i>Gardenia augusta 'Radicans'</i>		Field Container	Czarnota	2006	Over the top	No injury at 0.042 lb ai per acre.
25352	SedgeHammer	Cape Jasmine, Radicans	<i>Gardenia augusta 'Radicans'</i>		Field Container	Derr	2006	Over the top	No injury at all rates (0.045, 0.09, 0.18 lb ai per acre).
25352	SedgeHammer	Cape Jasmine, Radicans	<i>Gardenia augusta 'Radicans'</i>	'Radicans'	Field Container	Fraelich	2006	Over the top	No injury or growth reduction at all rates (0.045, 0.09, 0.18 lb ai per acre with NIS).
13722	SedgeHammer	Honey Locust	<i>Gleditsia sp.</i>	G. triacanthos var inermis 'Skyline'	Field In-Ground	Kuhns	2003	Directed	No injury at 0.045, 0.09, and 0.18 lb ai per acre; good weed control at 4 weeks after treatment, but not at 9 weeks after treatment.

PR #	Product	Crop			Production Site	Researcher(s)	Year	Application Type	Results Summary
		Common Name	Latin Name	Cultivar					
25673	SedgeHammer	Baby's-Breath	<i>Gypsophila elegans</i>		Field Container	Senesac	2006	Over the top	Unacceptable injury at all rates (0.045, 0.09, 0.18 lb ai per acre with NIS).
25004	SedgeHammer	English Ivy	<i>Hedera helix L. ssp. Helix</i>		Field Container	Derr	2005	Over the top	Significant injury increasing with rate (0.045, 0.09, 0.18 lb ai per acre).
25004	SedgeHammer	English Ivy	<i>Hedera helix L. ssp. Helix</i>		Field Container	Boydston	2006	Over the top	Severe injury at all rates (0.045, 0.09, 0.18 lb ai per acre).
25004	SedgeHammer	English Ivy	<i>Hedera helix L. ssp. Helix</i>	'Glacier Ivy'	Field Container	Fraelich	2006	Over the top	Moderate injury at 0.045 and 0.09 lb ai per acre with NIS, severe at 0.018 lb ai per acre; severe stunting at all rates
25345	SedgeHammer	Hellebore, Christmas rose, Lenten Rose	<i>Helleborus niger</i>		Field Container	Klett	2006	Over the top	Experiment C: Slight injury at 0.047 and 0.094 lb ai per acre with Capsil surfactant, moderate at 0.188 lb ai
25345	SedgeHammer	Hellebore, Christmas rose, Lenten Rose	<i>Helleborus niger</i>		Field Container	Klett	2006	Over the top	Experiment A: No significant injury after 1st application at all rates (0.047, 0.094 and 0.188 lb ai per acre with Capsil surfactant), significant after 2nd application at 4X
25345	SedgeHammer	Hellebore, Christmas rose, Lenten Rose	<i>Helleborus niger</i>		Field Container	Klett	2006	Over the top	Experiment B: No significant injury after 1st application at all rates (0.047, 0.094 and 0.188 lb ai per acre with Capsil surfactant), significant after 2nd application at 4X
11772	Manage	Daylily	<i>Hemerocallis sp.</i>		Field Container	Fraelich	1996	Broadcast	Very slight injury at 0.062 and 0.125 lb ai per acre with no injury at 0.031 lb ai per acre; good to excellent nutsedge control increasing with rate.
11772	Manage	Daylily	<i>Hemerocallis sp.</i>		Field Container	Neal	2001	Over the top	Minor to moderate injury increasing with rate (0.045, 0.09, 0.18 lb ai per acre).
11772	Manage	Daylily	<i>Hemerocallis sp.</i>		Field Container	Gilliam	2005	Foliar	No injury (0.045, 0.09, 0.18 lb ai per acre).
11772	Manage	Daylily	<i>Hemerocallis sp.</i>	'Happy Returns'	Field Container	Senesac	2001	Over the top	Slight injury 6 weeks after treatment with all rates (0.045, 0.09, 0.18 lb ai per acre).
11772	Manage	Daylily	<i>Hemerocallis sp.</i>	'Little Red Hot'	Field Container	Gilliam	1996	Over the top	Significant visible injury and growth reduction increasing with rate (0.063, 0.126, 0.252 lb ai per acre).

PR #	Product	Crop			Production Site	Researcher(s)	Year	Application Type	Results Summary
		Common Name	Latin Name	Cultivar					
11772	Manage	Daylily	<i>Hemerocallis sp.</i>	'Stella D'Oro'	Field Container	Derr	2001	Over the top	Slight, transient injury at all rates with only the highest reducing shoot fresh weight (0.045, 0.09, 0.18 lb ai per acre); fair to good pre-emergent oxalis control.
25008	SedgeHammer	Hosta	<i>Hosta sp.</i>		Field Container	Gilliam	2005	Over the top	No visible injury at any rate; increased growth observed with 0.18 lb ai per acre
25008	SedgeHammer	Hosta	<i>Hosta sp.</i>	'Francee'	Field Container	Derr	2001	Over the top	Minor visible injury with significant fresh weight reduction at all rates (0.045, 0.09, 0.18 lb ai per acre); poor to great spotted spurge control.
25008	SedgeHammer	Hosta	<i>Hosta sp.</i>	'Gold Standard'	Field Container	Fraelich	2006	Over the top	Slight injury at 0.045 and 0.09 lb ai per acre with NIS, moderate at 0.18 lb ai per acre; growth reduction at all rates
25008	SedgeHammer	Hosta	<i>Hosta sp.</i>	'Golden Tiara'	Field Container	Mathers	2006	Over the top	No injury after first application with only very slight injury occurring at the highest rate after the second application (0.047, 0.094, 0.188 lb ai per acre).
25008	SedgeHammer	Hosta	<i>Hosta sp.</i>	H. plantaginea 'Royal Standard'	Field Container	Gilliam	2006	Over the top	Slight transient injury increasing with rate (0.047, 0.094, 0.188 lb ai per acre) with a slight reduction in plant size.
25008	SedgeHammer	Hosta	<i>Hosta sp.</i>	'Halcyon'	Field Container	Derr	2005	Over the top	Very slight injury at all rates (0.045, 0.09, 0.18 lb ai per acre).
25010	SedgeHammer	Hydrangea	<i>Hydrangea sp.</i>		Field Container	Derr	2005	Over the top	Very low injury at all rates (0.045, 0.09, 0.18 lb ai per acre).
25010	SedgeHammer	Hydrangea	<i>Hydrangea sp.</i>	H. paniculata 'Pink Diamond'	Field Container	Norcini	2005	Over the top	No phytotoxicity at 0.045 lb ai per acre and 0.09 and 0.18 lb ai per acre plants recovered by 12 WAT
11773	Manage	Holly	<i>Ilex sp.</i>		Field Container	Fraelich	1996	Broadcast	Very slight injury at 0.062 and 0.125 lb ai per acre with no injury at 0.031 lb ai per acre; good to excellent control of nutsedge and oxalis increasing with rate.
11773	Manage	Holly	<i>Ilex sp.</i>	I. cornuta 'bufordii nana'	Field Container	Neal	2006	Over the top	No significant injury at 0.047, 0.094, and 0.188 lb ai per acre.
11773	Manage	Holly	<i>Ilex sp.</i>	I. crenata 'Chesapeake'	Field Container	Beste	2003	Over the top	Slight to moderate injury increasing with rate (0.045, 0.09, 0.18 lb ai per acre).

PR #	Product	Crop			Production Site	Researcher(s)	Year	Application Type	Results Summary
		Common Name	Latin Name	Cultivar					
11773	Manage	Holly	<i>Ilex sp.</i>	I. crenata 'Compacta'	Field Container	Derr	2002	Over the top	Virtually no injury at all rates (0.045, 0.09, 0.18 lb ai per acre); poor pre-emergent control of large crabgrass and spotted spurge.
11773	Manage	Holly	<i>Ilex sp.</i>	I. crenata 'Green Lustre'	Field Container	Norcini	2005	Over the top	Very slight injury decreasing over time at all rates (0.045, 0.09, 0.18 lb ai per acre); Virtually no control of spurge, woodsorrel, crabgrass and coreopsis.
11773	Manage	Holly	<i>Ilex sp.</i>	I. crenata 'Helleri'	Field Container	Beste	2003	Over the top	Slight chlorosis increasing with rate which decreased over time (0.045, 0.09, 0.18 lb ai per acre).
11764	Manage	Holly	<i>Ilex sp.</i>	I. crenata 'Rotundifolia'	Field In-Ground	Beste	1997	Over the top	No significant injury or reduction in growth at any rate (0.031, 0.062, 0.125 lb ai per acre); good to excellent control of yellow nutsedge, but little control of morningglory or henbit.
11773	Manage	Holly	<i>Ilex sp.</i>	I. meserveae	Field Container	Gilliam	2005	Over the top	No injury at all rates (0.045, 0.09, 0.18 lb ai per acre).
11764	Manage	Holly	<i>Ilex sp.</i>	I. rotunda	Field In-Ground	Czarnota	2005	Over the top	Very slight injury at 0.0675, 0.135, and 0.27 lb ai per acre.
11764	Manage	Holly	<i>Ilex sp.</i>	I. rotunda	Field In-Ground	Czarnota	2006	Over the top	No injury at 0.042 lb ai per acre.
11764	Manage	Holly	<i>Ilex sp.</i>	I. verticillata	Field In-Ground	Beste/Frank	2005	Over the top	No injury after single application but slight injury after second application, increasing with rate with no impact marketability at end of experiment (0.045, 0.09, 0.18 lb ai per acre with NIS).
11773	Manage	Holly	<i>Ilex sp.</i>	I. x meserveae 'Blue Princess'	Field Container	Altland	2006	Over the top	No injury at any rate (0.047, 0.094 and 0.188 lb ai/A)
11773	Manage	Holly	<i>Ilex sp.</i>	I. x meserveae 'China Girl'	Field Container	Gilliam	1996	Over the top	No significant visible injury or difference in growth indices with 0.063, 0.126, and 0.252 lb ai per acre.
25426	SedgeHammer	Holly, Dwarf Yaupon	<i>Ilex vomitoria 'nana'</i>		Field Container	Gilliam	2006	Over the top	No visible injury and no impact on plant size with any rate (0.047, 0.094, 0.188 lb ai per acre).
25426	SedgeHammer	Holly, Dwarf Yaupon	<i>Ilex vomitoria 'nana'</i>		Field Container	Neal	2006	Over the top	No significant injury at 0.047, 0.94 and 1.88 lb ai per acre.
26580	SedgeHammer	Anise Tree	<i>Illicium sp.</i>	I. parviflorum	Field In-Ground	Czarnota	2005	Over the top	Very slight injury at 0.0675, 0.135, and 0.27 lb ai per acre.

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		Common Name	Latin Name	Cultivar					
26580	SedgeHammer	Anise Tree	<i>Illicium sp.</i>	I. parviflorum	Field In-Ground	Czarnota	2006	Over the top	No injury at 0.042 lb ai per acre.
13222	SedgeHammer	Walnut, Black (Non-Bearing)	<i>Juglans nigra</i>		Field In-Ground	Beste/Frank	2005	Foliar	Slight to moderate injury increasing with rate and dissipating with time (0.045, 0.09, 0.18 lb ai per acre with NIS).
13222	SedgeHammer	Walnut, Black (Non-Bearing)	<i>Juglans nigra</i>		Field In-Ground	Beste/Frank	2006	Over the top	Significant injury and growth reduction with complete recovery at trial's end at all rates (0.045, 0.09 and 0.18 lb ai per acre + NIS)
11769	Manage	Juniper	<i>Juniperus sp.</i>		Field Container	Fraelich	1996	Broadcast	No injury at 0.031, 0.062, and 0.125 lb ai per acre; good to excellent control of nutsedge increasing with rate.
11769	Manage	Juniper	<i>Juniperus sp.</i>	J. chinensis procumbens	Field Container	Gilliam	1996	Over the top	No injury at 0.063, 0.126, and 0.252 lb ai per acre.
11769	Manage	Juniper	<i>Juniperus sp.</i>	J. conferta 'Blue Pacific'	Field Container	Gilliam	2005	Over the top	No injury at all rates (0.045, 0.09, 0.18 lb ai per acre).
11769	Manage	Juniper	<i>Juniperus sp.</i>	J. conferta 'Blue Pacific'	Field Container	Gilliam	2006	Over the top	No significant visible injury at any rate (0.047, 0.094, 0.188 lb ai per acre) but there was a reduction in plant size.
11769	Manage	Juniper	<i>Juniperus sp.</i>	J. conferta 'Blue Pacific'	Field Container	Senesac	2001	Over the top	Slight injury at all rates (0.031, 0.062, 0.124 lb ai per acre).
11769	Manage	Juniper	<i>Juniperus sp.</i>	J. horizontalis 'Bar Harbor'	Field Container	Derr	2005	Over the top	No injury at at 0.045, 0.09, 0.18 lb ai per acre.
11769	Manage	Juniper	<i>Juniperus sp.</i>	J. horizontalis 'Bar Harbor'	Field Container	Senesac	2001	Over the top	No injury at any rate (0.031, 0.063, 0.0124 lb ai per acre).
11760	Manage	Juniper	<i>Juniperus sp.</i>	J. horizontalis 'Plumosa Compacta'	Field In-Ground	Ahrens/Mervosh	1995	Broadcast foliar	No injury at 0.031, 0.063, and 0.125 lb ai per acre; moderate control of crabgrass and moderate to good control of annual sedges increasing with rate.
11760	Manage	Juniper	<i>Juniperus sp.</i>	J. horizontalis 'Plumosa Compacta'	Field In-Ground	Ahrens/Mervosh	1996	Broadcast ground	No injury at 0.031, 0.063, and 0.125 lb ai per acre with second-year applications to the same plants; excellent control of annual sedges and horseweed, moderate to good control of prostrate spurge, and poor control of carpet weed.
11769	Manage	Juniper	<i>Juniperus sp.</i>	J. horizontalis 'Wiltonii'	Field Container	Gilliam	2005	Over the top	No injury at all rates (0.045, 0.09, 0.18 lb ai per acre).

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		Common Name	Latin Name	Cultivar					
11769	Manage	Juniper	<i>Juniperus sp.</i>	J. horizontalis 'Wiltonii'	Field Container	Neal	2001	Over the top	Slight tip chlorosis and necrosis at all rates with recovery over time (0.045, 0.09, 0.18 lb ai per acre).
11769	Manage	Juniper	<i>Juniperus sp.</i>	J. horizontalis 'Wiltonii'	Field Container	Norcini	2005	Over the top	No injury at all rates (0.045, 0.09, 0.18 lb ai per acre); No control of spurge, woodsorrel, eclipta, hawkweed, and coreopsis.
13216	SedgeHammer	Cedar, Red	<i>Juniperus virginiana</i>		Field In-Ground	Beste/Frank	2005	Foliar	Unacceptable injury at all rates (0.045, 0.09, 0.18 lb ai per acre with NIS).
13694	SedgeHammer	Crape Myrtle	<i>Lagerstroemia indica</i>		Field In-Ground	Czarnota	2005	Over the top	No injury at 0.0675, 0.135, and 0.27 lb ai per acre.
13694	SedgeHammer	Crape Myrtle	<i>Lagerstroemia indica</i>		Field In-Ground	Czarnota	2005	Over the top	No injury at 0.0675, 0.135, and 0.27 lb ai per acre.
13694	SedgeHammer	Crape Myrtle	<i>Lagerstroemia indica</i>		Field In-Ground	Czarnota	2006	Over the top	No injury at 0.042 lb ai per acre.
24989	Manage	Crape Myrtle	<i>Lagerstroemia indica</i>	'Acoma'	Field Container	Gilliam	2005	Foliar	No injury at 0.045, 0.09, 0.18 lb ai per acre.
24989	Manage	Crape Myrtle	<i>Lagerstroemia indica</i>	'Cheyenne'	Field Container	Norcini	2005	Over the top	Very low injury at all rates (0.045, 0.09, 0.18 lb ai per acre); Virtually no control of spurge, woodsorrel and crabgrass.
24989	Manage	Crape Myrtle	<i>Lagerstroemia indica</i>	L. x Tuscarora	Field Container	Neal	2006	Over the top	No significant injury at 0.047, 0.094, and 0.188 lb ai per acre.
21438	SedgeHammer	Yellow Archangel	<i>Lamiastrum galeobdolon</i>	'Herman's Pride'	Field Container	Senesac	2001	Over the top	Slight to moderate transient injury increasing with rate (0.045, 0.09, 0.18 lb ai per acre).
25353	SedgeHammer	Shrub Verbena	<i>Lantana sp.</i>		Field Container	Derr	2006	Over the top	Slight injury at all rates (0.045, 0.09, 0.18 lb ai per acre).
21439	SedgeHammer	Blue Lyme Grass	<i>Leymus arenarius</i>	'Blue Dune'	Field Container	Senesac	2001	Over the top	Very slight injury increasing with rate (0.045, 0.09, 0.18 lb ai per acre).
25013	Manage	Privet	<i>Ligustrum sp.</i>	'Chinense'	Field Container	Derr	2005	Over the top	Low injury at 0.045 and 0.09 lb ai per acre, moderate at 0.18 lb ai per acre.
13230	SedgeHammer	Tulip Tree	<i>Liriodendron tulipifera</i>		Field In-Ground	Beste/Frank	2005	Foliar	Low injury and plants marketable at all rates (0.045, 0.09, 0.18 lb ai per acre with NIS).
25670	SedgeHammer	Lilyturf, Big Blue;Giant	<i>Liriope muscari</i>		Field Container	Gilliam	2005	Over the top	No visible injury, but plant growth was significantly suppressed at 0.09 lb ai per acre
25011	SedgeHammer	Lilyturf, Creeping	<i>Liriope sp.</i>	L. muscari variegata	Field Container	Derr	2005	Over the top	No injury 44 DAT with all rates (0.045, 0.09, 0.18 lb ai per acre).

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		Common Name	Latin Name	Cultivar					
25011	SedgeHammer	Lilyturf, Creeping	<i>Liriope sp.</i>	L. muscari variegata	Field Container	Neal	2006	Over the top	Significant injury at all rates (0.047, 0.098, 0.188 lb ai per acre)
25011	SedgeHammer	Lilyturf, Creeping	<i>Liriope sp.</i>	L. muscari variegata 'Aztec'	Field Container	Derr	2006	Over the top	No to slight injury but shoot weight decreased significantly as rate increased (0.045, 0.09, 0.18 lb ai per acre).
13659	SedgeHammer	Magnolia	<i>Magnolia sp.</i>		Field In-Ground	Czarnota	2006	Over the top	No injury at 0.042 lb ai per acre.
13659	SedgeHammer	Magnolia	<i>Magnolia sp.</i>	M. grandiflora	Field In-Ground	Czarnota	2005	Over the top	No injury at 0.0675, 0.135, and 0.27 lb ai per acre.
20871	SedgeHammer	Magnolia, Star	<i>Magnolia stellata</i>	'Pinkie'	Field Container	Senesac	2001	Over the top	No injury with 0.031, 0.062 and 0.124 lb ai per acre.
21448	SedgeHammer	Oregon Grape	<i>Mahonia aquifolium</i>	M. repens	Field Container	Senesac	2001	Over the top	Slight to moderate injury increasing with rate (0.031, 0.062, 0.124 lb ai per acre).
12459	SedgeHammer	Apple & Crabapple (Non-Bearing)	<i>Malus sp.</i>	M. baccata	Field In-Ground	Beste/Frank	2005	Foliar	Unacceptable injury at all rates (0.045, 0.09, 0.18 lb ai per acre with NIS).
21440	SedgeHammer	Mazus	<i>Mazus reptans</i>		Field Container	Senesac	2001	Over the top	Slight to moderate injury increasing with rate (0.045, 0.09, 0.18 lb ai per acre) abating slightly with time.
25441	Manage	Muhly, hairyawn	<i>Muhlenbergia capillaris</i>		Field Container	Neal	2005	Broadcast	No injury at all rates (0.045, 0.09, 0.18 lb ai per acre).
13698	SedgeHammer	Bayberry	<i>Myrica pensylvanica</i>		Field In-Ground	Beste/Frank	2005	Foliar	Unacceptable injury at all rates (0.045, 0.09, 0.18 lb ai per acre with NIS).
25779	SedgeHammer	Heavenly Bamboo	<i>Nandina domestica</i>	'Nana'	Field Container	Gilliam	2005	Foliar	No injury at 0.045, 0.09, 0.18 lb ai per acre.
21441	SedgeHammer	Catnip	<i>Nepeta cataria</i>	N. x faassenii 'Walker's Low'	Field Container	Senesac	2001	Over the top	No injury at 0.045 lb ai per acre and minor injury at 0.09 and 0.18 lb ai per acre.
25463	SedgeHammer	Mondo Grass, Lilyturf, Ker-Gawl	<i>Ophiopogon sp.</i>	O. japonicus variegata	Field Container	Derr	2006	Over the top	No injury at all rates (0.045, 0.09, 0.18 lb ai per acre).
23505	Manage	Switch-Grass	<i>Panicum virgatum</i>	'Shenandoah'	Field Container	Neal	2005	Broadcast	No injury at 0.045 and 0.09 lb ai per acre; slight and temporary at 0.18 lb ai per acre.
25101	Manage	Fountain Grass	<i>Pennisetum setaceum</i>		Field Container	Neal	2005	Broadcast	No injury at 0.045 lb ai per acre; slight at 0.09 lb ai per acre; moderate at 0.018 lb ai per acre.
25354	SedgeHammer	Pentas	<i>Pentas sp.</i>	'Ruby Red'	Field Container	Derr	2006	Over the top	Slight injury 0.045 and 0.09 lb ai per acre and moderate at 0.18 lb ai per acre.

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25289	Manage	Ribbon-Grass, Gardeners-Garters	<i>Phalaris arundinacea</i>	'Strawberries and Cream'	Field Container	Neal	2005	Broadcast	Slight at 0.045 lb ai per acre, but severe at 0.09 and 0.18 lb ai per acre.
13743	SedgeHammer	Phlox	<i>Phlox sp.</i>	'Emerald Blue'	Field In-Ground	Derr	2005	Over the top	Significant injury 9 DAT, but plants grew out of it by 44 DAT.
25012	Manage	Phlox	<i>Phlox sp.</i>	P. subulata 'Emerald Blue'	Field Container	Derr	2005	Over the top	Low injury at 0.045, 0.09, 0.18 lb ai per acre; good to excellent control of bittercress and common groundsel
25347	SedgeHammer	Spruce, Norway	<i>Picea abies</i>		Field Container	Altland	2006	Over the top	Slight injury after 2nd application only at 2X, rates (0.047, 0.094 and 0.188 lb ai/A)
25347	SedgeHammer	Spruce, Norway	<i>Picea abies</i>		Field Container	Freiberger	2006	Over the top	Very slight injury and no growth reduction at all rates (0.045, 0.09, 0.18 lb ai per acre)
13213	SedgeHammer	Spruce, Norway	<i>Picea abies</i>		Field In-Ground	Beste/Frank	2005	Foliar	Unacceptable injury at all rates (0.045, 0.09, 0.18 lb ai per acre with NIS).
13213	SedgeHammer	Spruce, Norway	<i>Picea abies</i>		Field In-Ground	Garrett	1998	Over the top - seedbeds	Slight injury on seedlings at all rates (0.031, 0.062, 0.125 lb ai per acre); poor control of heavily infested nutsedge.
13214	SedgeHammer	Spruce, White; Cat	<i>Picea glauca</i>		Field In-Ground	Garrett	1998	Over the top - seedbeds	No significant injury at 0.031, 0.062, and 0.125 lb ai per acre; some control of nutsedge increasing with rate.
13214	SedgeHammer	Spruce, White; Cat	<i>Picea glauca</i>		Field In-Ground	Beste/Frank	2005	Foliar	Unacceptable injury at all rates (0.045, 0.09, 0.18 lb ai per acre with NIS).
13211	SedgeHammer	Pine, Austrian	<i>Pinus nigra</i>		Field In-Ground	Beste/Frank	2005	Ground, broadcast, foliar	No significant injury at all rates (0.045, 0.09, 0.18 lb ai per acre with NIS).
13211	SedgeHammer	Pine, Austrian	<i>Pinus nigra</i>		Field In-Ground	Beste/Frank	2006	Over the top	No significant injury and growth reduction at all rates (0.045, 0.09 and 0.18 lb ai per acre + NIS); no reduction in seedling marketability
13210	SedgeHammer	Pine, Red	<i>Pinus resinosa</i>		Field In-Ground	Beste/Frank	2005	Over the top	No injury at 0.045 and 0.09 lb ai per acre; significant at 0.18 lb ai per acre but plants recovered
13210	SedgeHammer	Pine, Red	<i>Pinus resinosa</i>		Field In-Ground	Beste/Frank	2006	Over the top	No significant injury at all rates (0.045, 0.09 and 0.18 lb ai per acre + NIS); slight stunting but no reduced market value

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13209	SedgeHammer	Pine, White	<i>Pinus strobus</i>		Field In-Ground	Garrett	1998	Over the top	No injury at any rate (0.031, 0.062, 0.125 lb ai per acre); poor to good control increasing with rate.
13209	SedgeHammer	Pine, White	<i>Pinus strobus</i>		Field In-Ground	Beste/Frank	2005	Over the top	No injury at 0.045 lb ai per acre with NIS; significant at 0.09 and 0.18 lb ai per acre but plants recovered.
13209	SedgeHammer	Pine, White	<i>Pinus strobus</i>		Field In-Ground	Beste/Frank	2006	Over the top	Significant but transient injury at all rates (0.045, 0.09 and 0.18 lb ai per acre + NIS); no reduction in growth or seedling marketability
12173	SedgeHammer	Pine, Loblolly	<i>Pinus taeda</i>		Field In-Ground	Garrett	1998	Over the top	No significant visible injury, but plants at the 0.63 and 0.125 lb ai per acre rates were stunted; moderate to excellent control of nutsedge increasing with rate.
12173	SedgeHammer	Pine, Loblolly	<i>Pinus taeda</i>		Field In-Ground	Beste/Frank	2005	Over the top	Significant injury; plants recovered and marketable at 0.09 and 0.18 lb ai per acre rates
13727	SedgeHammer	Plane Tree, Sycamore	<i>Platanus sp.</i>	P. occidentalis	Field In-Ground	Beste/Frank	2005	Foliar	Unacceptable injury (0.045, 0.09, 0.18 lb ai per acre with NIS).
13229	SedgeHammer	Cherry (Non-Bearing)	<i>Prunus sp.</i>	P. americana	Field In-Ground	Beste/Frank	2005	Over the top	Significant, persistent injury at all rates (0.045, 0.09, 0.18 lb ai per acre with NIS).
13735	SedgeHammer	Cherry (Non-Bearing)	<i>Prunus sp.</i>	P. avium	Field Container	Altland	2006	Over the top	Significant injury with single application at all rates (0.047, 0.094 and 0.188 lb ai/A)
13229	SedgeHammer	Cherry (Non-Bearing)	<i>Prunus sp.</i>	P. serotina	Field In-Ground	Beste/Frank	2005	Over the top	Significant, persistent injury at all rates (0.045, 0.09, 0.18 lb ai per acre with NIS).
13215	SedgeHammer	Fir, Douglas	<i>Pseudotsuga menziesii</i>		Field In-Ground	Ahrens/Mervosh	2006	Over the top	No injury to dormant trees, slight to moderate injury to actively growing trees at all rates (0.047, 0.094 and 0.188 lb ai per acre with NIS)
26166	SedgeHammer	Fir, Douglas	<i>Pseudotsuga menziesii</i>	P. menziesii glauca	Field Container	Freiberger	2006	Over the top	Very slight injury after 1st, high after 2nd application at all rates (0.045, 0.09, 0.18 lb ai per acre)
13220	SedgeHammer	Oak, Sawtooth	<i>Quercus acutissima</i>		Field In-Ground	Beste/Frank	2005	Foliar	Low to moderate injury at all rates (0.045, 0.09, and 0.18 lb ai per acre with NIS); plants marketable.
13220	SedgeHammer	Oak, Sawtooth	<i>Quercus acutissima</i>		Field In-Ground	Beste/Frank	2006	Over the top	Significant injury and growth reduction at all rates (0.045, 0.09 and 0.18 lb ai per acre + NIS); no reduction in seedling marketability

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		Common Name	Latin Name	Cultivar					
13217	SedgeHammer	Oak, White	<i>Quercus alba</i>		Field In-Ground	Beste/Frank	2005	Over the top	Acceptable injury and plants marketable at all rates (0.045, 0.09, 0.18 lb ai per acre with NIS).
13217	SedgeHammer	Oak, White	<i>Quercus alba</i>		Field In-Ground	Beste/Frank	2006	Over the top	Significant injury with complete recovery at all rates (0.045, 0.09 and 0.18 lb ai per acre + NIS); growth reduction at 2X and 4X rates; no reduction in seedling marketability
25459	SedgeHammer	Oak, Northern Red	<i>Quercus rubra</i>		Field Container	Altland	2006	Over the top	Virtually no injury at any rate (0.047, 0.094 and 0.188 lb ai/A)
25459	SedgeHammer	Oak, Northern Red	<i>Quercus rubra</i>		Field Container	Fraelich	2006	Over the top	No injury at 0.045 lb ai per acre with NIS, very slight at 0.09 and 0.18 lb ai per acre; no growth reduction
25459	SedgeHammer	Oak, Northern Red	<i>Quercus rubra</i>		Field Container	Freiberger	2006	Over the top	Very slight injury and no growth reduction at all rates (0.045, 0.09, 0.18 lb ai per acre)
13219	SedgeHammer	Oak, Northern Red	<i>Quercus rubra</i>		Field In-Ground	Beste/Frank	2005	Over the top	Moderate but transient injury at all rates (0.045, 0.09, 0.18 lb ai per acre with NIS).
13219	SedgeHammer	Oak, Northern Red	<i>Quercus rubra</i>		Field In-Ground	Beste/Frank	2006	Ground Broadcast Foliar	Moderate but transient injury and height reduction at all rates (0.047, 0.094, and 0.18 lb ai per acre with NIS)
12458	SedgeHammer	Oak	<i>Quercus sp.</i>	Q. bicolor	Field In-Ground	Beste/Frank	2006	Over the top	Significant injury but no growth reduction at all rates (0.045, 0.09 and 0.18 lb ai per acre with NIS); no reduction in seedling marketability
12458	SedgeHammer	Oak	<i>Quercus sp.</i>	Q. nuttalli	Field In-Ground	Beste/Frank	2006	Over the top	Significant injury with complete recovery, growth reduction at all rates (0.047, 0.094 and 0.188 lb ai per acre + NIS); no reduction in seedling market value
12458	SedgeHammer	Oak	<i>Quercus sp.</i>	Q. prinus	Field In-Ground	Beste/Frank	2005	Foliar	Acceptable injury; plants marketable at all rates (0.045, 0.09, 0.18 lb ai per acre with NIS).
12458	SedgeHammer	Oak	<i>Quercus sp.</i>	Q. prinus	Field In-Ground	Beste/Frank	2006	Ground Broadcast Foliar	Significant injury after first application at 0.047, 0.094 and 0.188 lb ai per acre with NIS; plants recovered and were marketable at end of trial.
13221	SedgeHammer	Oak, Black	<i>Quercus velutina</i>		Field In-Ground	Beste/Frank	2005	Foliar	Low injury and plants marketable at all rates (0.045, 0.09, 0.18 lb ai per acre with NIS).

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		Common Name	Latin Name	Cultivar					
13221	SedgeHammer	Oak, Black	<i>Quercus velutina</i>		Field In-Ground	Beste/Frank	2006	Ground Broadcast Foliar	Significant injury and growth reduction at 0.047, 0.094 and 0.188 lb ai per acre with NIS; plants recovered and were marketable at end of trial
11770	Manage	Azalea	<i>Rhododendron sp.</i>		Field Container	Fraelich	1996	Broadcast	No injury at 0.031 and 0.062 lb ai per acre and very slight injury at 0.125 lb ai per acre; moderate to excellent control of nutsedge increasing with rate.
11770	Manage	Azalea	<i>Rhododendron sp.</i>	'Congo'	Field Container	Gilliam	2006	Over the top	No injury at any rate until 8 weeks after treatment when slight purpling of leaves was exhibited increasing with rate (0.047, 0.094, 0.188 lb ai per acre) and plants were slightly stunted.
11770	Manage	Azalea	<i>Rhododendron sp.</i>	'Fashion'	Field Container	Gilliam	1996	Over the top	No significant injury at 0.063 and 0.126 lb ai per acre and slight injury at 0.252 lb ai per acre, but no differences occurred in growth indices.
11770	Manage	Azalea	<i>Rhododendron sp.</i>	'Fashion'	Field Container	Norcini	2005	Over the top	Slight to moderate injury increasing with rate (0.045, 0.09, 0.18 lb ai per acre).
11770	Manage	Azalea	<i>Rhododendron sp.</i>	'Formosa'	Field Container	Derr	2002	Over the top	Slight injury increasing with rates and reduction of fresh weight (0.045, 0.09, 0.18 lb ai per acre).
11774	Manage	Rhododendron	<i>Rhododendron sp.</i>	'Formosa'	Field Container	Derr	2005	Over the top	Very slight, but transient injury at all rates (0.045, 0.09, 0.18 lb ai per acre).
11761	Manage	Azalea	<i>Rhododendron sp.</i>	'Formosa'	Field In-Ground	Derr	2005	Over the top	No injury at 0.045, 0.09, 0.18 lb ai per acre.
11770	Manage	Azalea	<i>Rhododendron sp.</i>	'Midnight Flare'	Field Container	Gilliam	2005	Over the top	No visible injury (0.045, 0.09, 0.18 lb ai per acre).
11770	Manage	Azalea	<i>Rhododendron sp.</i>	'Nuccio's Wild Cherry'	Field Container	Wilen	2006	Over the top	Acceptable injury at all rates (0.045, 0.09, 0.18 lb ai per acre).
11770	Manage	Azalea	<i>Rhododendron sp.</i>	'Pink Gumpo'	Field Container	Neal	2006	Over the top	No significant injury at 0.047, 0.094 and 0.188 lb ai per acre.
11774	Manage	Rhododendron	<i>Rhododendron sp.</i>	'R. catawbiense 'Nova Zembla'	Field Container	Gilliam	1996	Over the top	No injury at 0.063 lb ai per acre, but 0.126 and 0.252 lb ai per acre exhibited minor but transient injury.

PR #	Product	Crop			Production Site	Researcher(s)	Year	Application Type	Results Summary
		Common Name	Latin Name	Cultivar					
11766	Manage	Rhododendron	<i>Rhododendron sp.</i>	R. catawbiense 'Roseum Elegans'	Field In-Ground	Ahrens/Mervosh	1995	Broadcast Foliar	Minor but transient injury at 0.031, 0.063, and 0.125 lb ai per acre; moderate control of crabgrass and moderate to good control of annual sedges increasing with rate.
11766	Manage	Rhododendron	<i>Rhododendron sp.</i>	R. catawbiense 'Roseum Elegans'	Field In-Ground	Ahrens/Mervosh	1996	Broadcast	Moderate injury increasing with rate with second-year applications on same plants (0.031, 0.063, 0.125 lb ai per acre); excellent control of annual sedge and horseweed, moderate to great control of prostrate spurge, and poor to good control of carpetweed.
11766	Manage	Rhododendron	<i>Rhododendron sp.</i>	R. catawbiense 'Roseum Elegans'	Field In-Ground	Beste	1997	Over the top	Slight transient injury at all rates (0.031, 0.062, 0.125 lb ai per acre) with the highest rate exhibiting stunting; excellent control of yellow nutsedge at all rates.
11770	Manage	Azalea	<i>Rhododendron sp.</i>	R. obtusum 'Delaware Valley White'	Field Container	Beste	1998	Over the top	Slight to moderate transient chlorosis increasing with rate (0.031, 0.063, 0.125 lb ai per acre) with only the 0.125 lb ai per acre treatment causing growth reduction.
11770	Manage	Azalea	<i>Rhododendron sp.</i>	R. obtusum 'Hershey Red'	Field Container	Beste	1998	Over the top	Slight to moderate transient chlorosis increasing with rate (0.031, 0.063, 0.125 lb ai per acre) with growth reduction in the 0.063 and 0.125 lb ai per acre treatments.
11770	Manage	Azalea	<i>Rhododendron sp.</i>	R. obtusum 'Hershey Red'	Field Container	Beste	2003	Over the top	Slight chlorosis increasing with rate which disappeared within 2 weeks after treatment (0.045, 0.09, 0.18 lb ai per acre).
11761	Manage	Azalea	<i>Rhododendron sp.</i>	R. obtusum 'Hino Crimson'	Field In-Ground	Beste	1997	Over the top	Slight transient visible injury at all rates (0.031, 0.062, 0.125 lb ai per acre) with reduction in growth exhibited at all rates.
11770	Manage	Azalea	<i>Rhododendron sp.</i>	R. obtusum 'Hinocrimson'	Field Container	Beste	2003	Over the top	Slight to moderate chlorosis increasing with rate which disappeared within 2 weeks after treatment (0.045, 0.09, 0.18 lb ai per acre).

PR #	Product	Crop			Production Site	Researcher(s)	Year	Application Type	Results Summary
		Common Name	Latin Name	Cultivar					
11761	Manage	Azalea	<i>Rhododendron sp.</i>	R. obtusum 'Kaempo'	Field In-Ground	Beste	1997	Over the top	No visible injury or growth reduction at any rate (0.031, 0.062, 0.125 lb ai per acre); no control of Pennsylvania smartweed, reduction of eclipta and yellownutsedge.
11774	Manage	Rhododendron	<i>Rhododendron sp.</i>	'Tradition'	Field Container	Czarnota	2006	Over the top	No injury at 0.042 lb ai per acre.
12460	SedgeHammer	Black Locust	<i>Robinia pseudoacacia</i>		Field In-Ground	Beste/Frank	2005	Foliar	Unacceptable injury at all rates (0.045, 0.09, 0.18 lb ai per acre with NIS).
25340	SedgeHammer	Rose	<i>Rosa sp.</i>	'Beloved'	Field Container	Gilliam	2006	Over the top	No visible injury and no significant impact on plant size (0.047, 0.094, 0.188 lb ai per acre).
13702	SedgeHammer	Rose	<i>Rosa sp.</i>	'Knockout'	Field In-Ground	Gilliam	2005	Foliar	No injury (0.045, 0.09, 0.18 lb ai per acre).
25340	SedgeHammer	Rose	<i>Rosa sp.</i>	'Moonshadow'	Field Container	Gilliam	2006	Over the top	No visible injury and no impact on plant size with any rate (0.047, 0.094, 0.188 lb ai per acre).
25340	SedgeHammer	Rose	<i>Rosa sp.</i>	'Nearly Wild'	Field Container	Lieth	2006	Over the top	High injury and growth reduction at all rates (0.045, 0.09, 0.18 lb ai per acre); plants unmarketable
25340	SedgeHammer	Rose	<i>Rosa sp.</i>	'Oranges & Lemons'	Field Container	Mathers	2006	Over the top	Moderate injury at all rates (0.047, 0.094, 0.188 lb ai per acre).
25340	SedgeHammer	Rose	<i>Rosa sp.</i>	R. multiflora	Field Container	Freiberger	2006	Over the top	High injury at all rates (0.045, 0.09, 0.18 lb ai per acre)
25340	SedgeHammer	Rose	<i>Rosa sp.</i>	'Sea Foam'	Field Container	Senesac	2006	Over the top	Unacceptable injury at all rates (0.045, 0.09, 0.18 lb ai per acre with NIS).
25340	SedgeHammer	Rose	<i>Rosa sp.</i>	'Solstice'	Field Container	Gilliam	2006	Over the top	No visible injury and no impact on plant size with any rate (0.047, 0.094, 0.188 lb ai per acre).
20860	SedgeHammer	Coneflower, Orange	<i>Rudbeckia fulgida speciosa</i>	'Becky'	Field Container	Derr	2006	Over the top	No significant injury at 0.045 and 0.09 lb ai per acre, moderate at 0.18 lb ai per acre.
25348	SedgeHammer	Sage, Ramona	<i>Salvia sylvestris</i>	S. elegans 'Tangerine'	Field Container	Derr	2006	Over the top	Slight, moderate and unacceptable injury as rate increased (0.045, 0.09, 0.18 lb ai per acre).
25348	SedgeHammer	Sage, Ramona	<i>Salvia sylvestris</i>	S. nemorosa 'May Night'	Field Container	Lieth	2006	Over the top	Significant injury and growth reduction at all rates (0.045, 0.09, 0.18 lb ai per acre).
25348	SedgeHammer	Sage, Ramona	<i>Salvia sylvestris</i>	S. nemorosa 'Snow Hill'	Field Container	Boydston	2006	Over the top	Severe injury at all rates (0.045, 0.09, 0.18 lb ai per acre).

PR #	Product	Crop			Production Site	Researcher(s)	Year	Application Type	Results Summary
		Common Name	Latin Name	Cultivar					
23506	Manage	Little Blue Stem	<i>Schizachyrium scoparium</i>		Field Container	Neal	2005	Broadcast	No injury at 0.045 and 0.09 lb ai per acre; slight and temporary at 0.18 lb ai per acre.
25341	SedgeHammer	Bridal-Wreath	<i>Spiraea sp.</i>	'Goldflame'	Field Container	Ahrens/Mervosh	2006	Over the top	Severe injury and stunting at all rates (0.047, 0.094 and 0.188 lb ai/A)
25341	SedgeHammer	Bridal-Wreath	<i>Spiraea sp.</i>	S. decumbens	Field Container	Senesac	2006	Over the top	Virtually no injury at 0.045 lb ai per acre with NIS, slight with complete recovery at 0.09 and 0.18 lb ai per acre
25341	SedgeHammer	Bridal-Wreath	<i>Spiraea sp.</i>	S. japonica 'Little Princess'	Field Container	Neal	2006	Over the top	Slight transient injury at 0.047 and 0.094 lb ai per acre and moderate unacceptable injury at 0.188 lb ai per acre.
25341	SedgeHammer	Bridal-Wreath	<i>Spiraea sp.</i>	S. x bumalda 'Anthony Waterer'	Field Container	Beste/Frank	2006	Over the top	No injury or growth reduction at all rates (0.047, 0.094 and 0.188 lb ai/A with NIS) by trial's end; plants marketable
25341	SedgeHammer	Bridal-Wreath	<i>Spiraea sp.</i>	S. x bumalda 'Gold Mound'	Field Container	Derr	2006	Over the top	No significant injury at 0.045 and 0.09 lb ai per acre; unacceptable at 0.18 lb ai per acre.
25341	SedgeHammer	Bridal-Wreath	<i>Spiraea sp.</i>	S. x bumalda 'Goldmound'	Field Container	Mathers	2006	Over the top	Slight to moderate injury increasing with time and second application (0.047, 0.94, 0.188 lb ai per acre).
13233	SedgeHammer	Bald Cypress	<i>Taxodium distichum</i>		Field In-Ground	Czarnota	2005	Over the top	No injury at 0.0675, 0.135, and 0.27 lb ai per acre.
13233	SedgeHammer	Bald Cypress	<i>Taxodium distichum</i>		Field In-Ground	Czarnota	2006	Over the top	No injury at 0.042 lb ai per acre.
13233	SedgeHammer	Bald Cypress	<i>Taxodium distichum</i>		Field In-Ground	Beste/Frank	2005	Over the top	Unacceptable injury at all rates (0.045, 0.09, 0.18 lb ai per acre with NIS).
11768	Manage	Yew	<i>Taxus sp.</i>	T. cuspidata	Field Container	Fraelich	2006	Over the top	No injury or growth reduction at all rates (0.045, 0.09, 0.18 lb ai per acre with NIS).
11759	Manage	Yew	<i>Taxus sp.</i>	T. cuspidata	Field In-Ground	Ahrens/Mervosh	1995	Broadcast foliar	Moderate damage increasing with rate (0.031, 0.063, 0.125 lb ai per acre) and plants were not marketable.

PR #	Product	Crop			Production Site	Researcher(s)	Year	Application Type	Results Summary
		Common Name	Latin Name	Cultivar					
11759	Manage	Yew	<i>Taxus sp.</i>	T. cuspidata	Field In-Ground	Ahrens/Mervosh	1996	Broadcast	Moderate damage increasing with rate (0.031, 0.063, 0.125 lb ai per acre) with second year applications to same plants; excellent control of annual sedges and horseweed, moderate to good control of prostrate spurge, and poor to good control of carpetweed.
11759	Manage	Yew	<i>Taxus sp.</i>	T. cuspidata capitata	Field In-Ground	Ahrens/Mervosh	1996	Over the top - dormant	No injury at 0.031 lb ai per acre, but commercially unacceptable damage occurred at 0.063 and 0.125 lb ai per acre; poor to good control of horseweed and annual bluegrass.
11759	Manage	Yew	<i>Taxus sp.</i>	T. cuspidata capitata	Field In-Ground	Ahrens/Mervosh	1997	Over the top - dormant	Moderate, commercially unacceptable damage at all rates (0.031, 0.063, 0.125 lb ai per acre); no control of annual blugrass, poor control of horseweed at 0.031 lb ai per acre with excellent at the two higher rates, and excellent control of hawksbeard at all rates.
11768	Manage	Yew	<i>Taxus sp.</i>	T. x media 'Fairview'	Field Container	Senesac	2001	Over the top	Slight to moderate injury increasing with rate (0.031, 0.062, 0.124) and applications at end of season.
11765	Manage	Arborvitae	<i>Thuja sp.</i>	T. occidentalis	Field In-Ground	Ahrens/Mervosh	1995	Broadcast foliar	Minor injury decreasing over time at all rates (0.031, 0.063, 0.125 lb ai per acre).
11765	Manage	Arborvitae	<i>Thuja sp.</i>	T. occidentalis	Field In-Ground	Ahrens/Mervosh	1996	Over the top	Minor to moderate injury at all rates (0.031, 0.063, 0.125 lb ai per acre); excellent control of annual sedges and horseweed, moderate to great control of prostrate spurge and poor to good control of carpetweed.
11765	Manage	Arborvitae	<i>Thuja sp.</i>	T. occidentalis	Field In-Ground	Czarnota	2005	Over the top	Very slight injury at 0.0675, 0.135, and 0.27 lb ai per acre.
11765	Manage	Arborvitae	<i>Thuja sp.</i>	T. occidentalis	Field In-Ground	Czarnota	2006	Over the top	No injury at 0.042 lb ai per acre.
11775	Manage	Arborvitae	<i>Thuja sp.</i>	T. occidentalis 'Elegantissima'	Field Container	Czarnota	2006	Over the top	No injury at 0.042 lb ai per acre.
11765	Manage	Arborvitae	<i>Thuja sp.</i>	T. occidentalis globosa	Field In-Ground	Ahrens/Mervosh	1996	Over the top - dormant	Moderate injury at all rates (0.031, 0.063, 0.125 lb ai per acre); poor control of quackgrass and horseweed.

PR #	Product	Crop			Production Site	Researcher(s)	Year	Application Type	Results Summary
		Common Name	Latin Name	Cultivar					
11765	Manage	Arborvitae	<i>Thuja sp.</i>	T. occidentalis globosa	Field In-Ground	Ahrens/Mervosh	1997	Over the top - dormant	Moderate injury at all rates (0.031, 0.063, 0.125 lb ai per acre) with the second-year application to plants; poor control of quackgrass and moderate to good control of hawksbeard and horseweed.
11775	Manage	Arborvitae	<i>Thuja sp.</i>	T. occidentalis nigra	Field Container	Gilliam	1996	Over the top	No injury or differences in growth indices at all rates (0.063, 0.126, 0.262 lb ai per acre).
21442	SedgeHammer	Thyme, Creeping	<i>Thymus praecox</i>	'Albiflorus'	Field Container	Senesac	2001	Over the top	No injury at 0.045 and 0.09 lb ai per acre, but slight injury occurred at 0.18 lb ai per acre.
25339	SedgeHammer	Jasmine, Asian	<i>Trachelospermum asiaticum</i>		Field Container	Gilliam	2006	Over the top	No visible injury and no impact on plant size with any rate (0.047, 0.094, 0.188 lb ai per acre).
25339	SedgeHammer	Jasmine, Asian	<i>Trachelospermum asiaticum</i>		Field Container	Lieth	2006	Over the top	High injury and growth reduction at all rates (0.045, 0.09, 0.18 lb ai per acre); plants unmarketable
25339	SedgeHammer	Jasmine, Asian	<i>Trachelospermum asiaticum</i>	'Green'	Field Container	Fraelich	2006	Over the top	No injury or growth reduction at all rates (0.045, 0.09, 0.18 lb ai per acre with NIS).
26462	SedgeHammer	Jasmine, Star;Confederate	<i>Trachelospermum jasminoides</i>		Field Container	Wilen	2006	Over the top	Acceptable injury at all rates (0.045, 0.09, 0.18 lb ai per acre).
26574	SedgeHammer	Palm, Windmill	<i>Trachycarpus fortunei</i>		Field In-Ground	Czarnota	2005	Over the top	Slight injury at 0.0675, 0.135, and 0.27 lb ai per acre, increasing with rate and second application.
26574	SedgeHammer	Palm, Windmill	<i>Trachycarpus fortunei</i>		Field In-Ground	Czarnota	2006	Over the top	No injury at 0.042 lb ai per acre.
11762	Manage	Hemlock	<i>Tsuga sp.</i>	T. canadensis	Field In-Ground	Ahrens/Mervosh	1995	Broadcast foliar	No significant injury at any rate (0.031, 0.063, 0.125 lb ai per acre).
11762	Manage	Hemlock	<i>Tsuga sp.</i>	T. canadensis	Field In-Ground	Ahrens/Mervosh	1996	Over the top	No significant injury at any rate (0.031, 0.063, 0.125 lb ai per acre)' excellent control of annual sedge and horseweed, moderate to good control of prostrate spurge and poor to good control of carpetweed.
25015	SedgeHammer	Viburnum, arrowwood	<i>Viburnum dentatum</i>		Field Container	Freiberger	2006	Over the top	High injury and growth reduction at all rates (0.045, 0.09, 0.18 lb ai per acre)
25015	SedgeHammer	Viburnum, arrowwood	<i>Viburnum dentatum</i>	'Autumn Jazz'	Field Container	Altland	2006	Over the top	Significant injury with single application at all rates (0.047, 0.094 and 0.188 lb ai/A)

PR #	Product	Crop			Production Site	Researcher(s)	Year	Application Type	Results Summary
		Common Name	Latin Name	Cultivar					
25015	SedgeHammer	Viburnum, arrowwood	<i>Viburnum dentatum</i>	'Chicago Lustre'	Field Container	Beste/Frank	2006	Over the top	Unacceptable injury and growth reduction at all rates (0.047, 0.094 and 0.188 lb ai/A with NIS)
25015	SedgeHammer	Viburnum, arrowwood	<i>Viburnum dentatum</i>	'Mirrorleaf'	Field Container	Derr	2005	Over the top	Very little to minor injury increasing with rate (0.045, 0.09, 0.18 lb ai per acre).
26502	SedgeHammer	Arrowwood	<i>Viburnum sp.</i>	V. carlesii	Field Container	Altland	2006	Over the top	Significant injury with single application at all rates (0.047, 0.094 and 0.188 lb ai/A)
26502	SedgeHammer	Arrowwood	<i>Viburnum sp.</i>	V. tinus compacta	Field Container	Neal	2006	Over the top	Moderate unacceptable injury at all rates (0.125, 0.25, 0.5 lb ai per acre).
25017	SedgeHammer	Periwinkle	<i>Vinca sp.</i>	V. minor 'Bowles'	Field Container	Lieth	2006	Over the top	Virtually no injury but significant growth reduction at all rates (0.045, 0.09, 0.18 lb ai per acre).

## Label Suggestions

It is recommended that in addition to the directed uses on established ornamental plantings in landscapes, certain over the top uses be added to the label as well as use in ornamental production nurseries.

The following listed species can be added to the label as being tolerant to over-the-top applications of SedgeHammer:

*Buxus microphylla*  
*Euonymus sp.*  
*Gardenia augusta*  
*Hosta sp.*  
*Hydrangea sp.*  
*Ilex cornuta*  
*Ilex crenata*  
*Ilex x meserveae*  
*Ilex rotunda*  
*Ilex vomitoria 'nana'*

*Illicium parviflorum*  
*Juniperus chinensis*  
*Juniperus conferta*  
*Juniperus horizontalis*  
*Lagerstroemia indica*  
*Magnolia sp.*  
*Quercus rubra*  
*Rhododendron sp.*  
*Spirea sp.*  
*Thuja occidentales*

Since *Hemerocallis*, *Liriope muscari*, and *Trachelospermum* have tended to exhibit tolerance, these species could be listed on the label with the caution of preliminary testing on a small portion of the crop prior to applying to the entire crop.

If these label changes are made, it is highly recommended that the following species be listed as not tolerant to over-the-top SedgeHammer applications:

*Abelia X grandiflora*  
*Abies balsamea*  
*Acer rubrum*  
*Berberis thunbergii*  
*Carya sp.*  
*Cercis canadensis*  
*Chamaebatiaria sp.*  
*Chamaecyparis thyoides*  
*Cornus florida*  
*Cotoneaster dammeri*  
*Cotoneaster horizontalis*  
*Delosperma sp.*  
*Fragraria x ananassa*  
*Gypsophila elegans*

*Hedera helix*  
*Juniperus virginiana*  
*Mazus reptans*  
*Myrica pensylvanica*  
*Phalaris arundinacea*  
*Picea abies*  
*Picea glauca*  
*Platanus occidentalis*  
*Prunus sp.*  
*Robinia pseudoacacia*  
*Rudbeckia fuligida speciosa*  
*Salvia sp.*  
*Taxus sp.*  
*Viburnum sp*

## **Appendix 1: Available Protocols**

**PROTOCOL FOR CLEARING HALOSULFURON ON ORNAMENTALS**

Date: 03/03

General label directions: As Proposed in Table

Research program:

Site (species, variety, etc.) - As Attached

Pest(s) - As Attached

Pesticide (common name and trade name) - Halosulfuron (MANAGE 75 WDG)

**For label, material & if needed spray oil surfactant contact:**

Monsanto, Don Suttner (314) 694-1213, FAX# 314-694-4940; e-mail: donald.l.suttner@monsanto.com

Formulation- Use only EPA registered product

Experimental design:

Plot size (must be adequate to reflect actual use condition)

Replicates Minimum of 4 Treatment Units

Controls (untreated controls to be included in all experiments)

Application: Use 0.25% to 0.5% non-ionic surfactant.

Dosages - 1x 0.045 lbs.ai/A

2x 0.090 lbs.ai/A

4x 0.180 lbs.ai/A

Volume - 10-50 GPA

Timing - (Interval) 2 times a year

Number Applications: 2 over-the-top applications

Reports:

Method of application: (treatments should be made over the top of the plants using application equipment consistent with conventional commercial equipment).

Report completely on experimental design and method of application.

Weather - Maintain temperature and precipitation (including irrigation) data.

Soil type - Identify soil type used in experimental area.

Product - When submitting data, include EPA registration number of product used.

Efficacy - Data should include both actual counts and percent control as well as an indication that infestation was light, heavy, etc.

Record all application and evaluation dates.

Phytotoxicity - Record phytotoxicity data at all rates. Use a 0-10 scale. 0 = No Phytotoxicity 10 = complete kill.

If appropriate also include a rating for: Chlorosis, Percent of Defoliation (0-10 scale) and stunting (0-10). Indicate if marketable or not.

**PROPOSED LABEL DIRECTIONS AFTER EXPERIMENTAL PROGRAM**

CROP	USE	RATE	DIRECTIONS FOR USE	LIMITATIONS
As Attached	As Attached	0.031 to 0.062 lbs.ai/A	Do not spray over transplants until 90 days after planting.	None

Please direct questions and forward data to: J. Ray Frank, IR-4 Project, 6916 Boyers Mill Road, New Market, MD 21774, Phone: (301) 898-5332, FAX# (301) 898-5937.

## Phytotoxicity to ornamental horticulture plants from tools to manage broadleaf weeds and sedges.

### Ornamental Protocol Number: 06-010

**Objective:** Determine phytotoxicity of Manage (halosulfuron), Sulfentrazone 0.2G, and V-10142 to unlabelled perennial plants commonly grown in nurseries.

### Experimental Design:

**Plot Size:** Must be adequate to reflect actual use conditions.

**Replicates:** Minimum of 3 replications (preferably 4) with 3 plants per replicate

**Application Instructions:** Apply first application over the top of plants just breaking dormancy or, under climates where plants do not go totally dormant, apply prior to active growth in the spring. See table for product specific information.

**Plant Materials:** See attached list of plant materials. Plants grown in field containers are preferred to in-ground.

**Evaluations:** Record plant height & width at initial and final evaluations. At 1, 2, and 4 weeks after each application, record phytotoxicity on a scale of 0 to 10 (0 = No phytotoxicity; 10 = Complete kill). If appropriate, also include ratings for chlorosis, defoliation, stunting or other growth effects on a scale of 0 to 10 (0 = No effect; 10 = Complete plant affected). If any phytotoxicity is observed in treated plants, take pictures comparing treated and untreated plant material.

*If different application methods or evaluations are made, please clearly specify differences in final report and explain how they enhanced results.*

**Recordkeeping:** Keep detailed records of weather conditions including temperature and precipitation, soil-type or soil-less media, application equipment, irrigation, liner size, plant height & width, and plant growth stage at application and data collection dates.

### Treatments:

Product	Rate	Special Instructions	Contact Information to obtain materials and any needed adjuvants
Sedgehammer 75WG (halosulfuron)	1 oz per acre (0.047 lb ai)	Always use 0.25% v/v of a non ionic surfactant. If severe phyto symptoms do not occur and where feasible apply a second application 4-6 weeks later at identical rates.	Kory Wheeler 928-819-1592 <a href="mailto:Kwheeler@gowanco.com">Kwheeler@gowanco.com</a>
	2 oz per acre (0.094 lb ai)		
	4 oz per acre (0.188 lb ai)		
Sulfentrazone 0.2G (sulfentrazone – 0.2% active)	0.125 lb ai/acre	2 applications on a 4 week interval	FMC, Bobby Walls, 919-735-3862, <a href="mailto:bobby_walls@fmc.com">bobby_walls@fmc.com</a>
	0.25 lb ai/acre		
	0.5 lb ai/acre		
V-10142 75WG	0.5 lb ai/acre	2 applications on a 4 week interval	Valent, Joe Chamberlin, 770-985-0303, <a href="mailto:jcham@valent.com">jcham@valent.com</a>
	1.0 lb ai/acre		
	2.0 lb ai/acre		
Untreated	--	--	
<b>Comparison Treatment</b>			
Sulfentrazone 4F	4 fl oz per acre (0.125 lb ai/acre)	2 applications on a 4 week interval	FMC, Bobby Walls, 919-735-3862, <a href="mailto:bobby_walls@fmc.com">bobby_walls@fmc.com</a>
	8 fl oz per acre (0.25 lb ai/acre)		
	16 fl oz per acre (0.5 lb ai/acre)		

### Reports:

Reports must include:

- Results summary (no more than one page)
- Summary table with appropriate statistical analyses
- Experimental design and materials and methods
- Appendices: raw data and recordkeeping information as listed above
- If pictures were taken, please include them.

A report submitted electronically is preferred but not required. If the report is provided electronically, the basic report can be sent in MS Word or WordPerfect, the recordkeeping information as pdf or other electronic documents, and the raw data in MS Excel or other suitable program such as ARM.

**Please direct questions to:** Cristi Palmer, IR-4 HQ, Rutgers University, 681 US Hwy 1 S, North Brunswick, NJ 08902-3390, Phone 732-932-9575 x629, [palmer@aesop.rutgers.edu](mailto:palmer@aesop.rutgers.edu) OR Ely Vea, 308 Aston Forest Lane, Crownsville, MD 21032, Phone & FAX#: 410-923-4880, E-mail: [evvea@comcast.net](mailto:evvea@comcast.net).

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Revised By: CLP

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### **Appendix 3: Submitted Data**

Data on following pages are in order of PR number with the exception of certain reports from Drs. Ahrens/Mervosh, Altland, Czarnota, Czarnota, Derr, Derr, Freiburger, Gilliam, Klett, Kuhns, Mathers, Neal, Neal, Norcini, and Senesac. These reports cover multiple PR numbers and are at the beginning of this Appendix.