

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

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Abstract

Lontrel (clopyralid) was initially registered in 1998 for ornamental horticulture uses. This initial label contained an extensive list of ornamental horticulture plants where Lontrel could be used without causing phytotoxicity. From 1985 to 2002, IR-4 examined 66 ornamental plant species for phytotoxicity related to Lontrel applications. Of the researched crops, only two crops (*Hemerocallis* sp. and *Ilex cornuta*) can be added to the label at this time based on the data provided here.

Introduction

Lontrel (clopyralid) was initially registered in 1998 for ornamental horticulture uses. This initial label contained an extensive list of ornamental horticulture plants where Lontrel could be used without causing phytotoxicity. From 1985 to 2002, IR-4 tested 66 ornamental plant species examining phytotoxicity related to Lontrel applications.

Materials and Methods

Lontrel was applied as foliar treatment typically once at 0.125, 0.25 and 0.50 lb ai per acre. A minimum of three plants (replicate treatments) were required with most researchers exceeding this minimum. Phytotoxicity was recorded on a scale of 0 to 10 (0 = No phytotoxicity; 10 = Complete kill) one to three times typically from 1 week to 2 months after initial application. For more detailed materials and methods, please see Appendix 1: Protocols and review closely the researcher reports.

Lontrel was supplied to researchers (See list of researchers in Appendix 2) by Dow Elanco and Dow Agrosciences.

Results and Summary

Phytotoxicity

Based on the type and nature of injury seen with Lontrel applications in the conducted research, tested plant species were placed into four 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 3X rates did cause significant phytotoxicity, 3) significant injury sufficient to recommend growers not utilize this product, and 4) more data is needed to make informed recommendations.

Lontrel exhibited no or minimal negative impact on twenty eight plant genera or species with over the top applications (Table 1). Twenty six of these are already in the Lontrel label. One crop, already in the Lontrel label, showed no or minimal transitory injury seen at the 1X rate, but the 2X and/or 3X rates did cause significant phytotoxicity (Table 2). For 34 genera/species, more information is needed because only 1 or 2 trials were conducted (Table 3).

See Table 4 for a list of completed trials.

Table 1. List of Lontrel treated crops with no or minimal transitory injury.

<i>Abies balsamea</i> ¹	<i>Pinus palustris</i> ¹
<i>Abies grandis</i> ¹	<i>Pinus strobus</i> ¹
<i>Abies procera</i> ¹	<i>Pinus sylvestris</i> ¹
<i>Acer rubrum</i> ¹	<i>Pseudotsuga menziesii</i> ¹
<i>Hemerocallis</i> sp.	<i>Quercus coccinea</i> ¹
<i>Ilex cornuta</i>	<i>Quercus nuttallii</i> ¹
<i>Juniperus conferta</i> ¹	<i>Quercus agrifolia</i> ¹
<i>Juniperus horizontalis</i> ¹	<i>Quercus virginiana</i> ¹
<i>Leymus arenarius</i> ¹	<i>Rhododendron catawbiense</i> ¹
<i>Lilium longiflorum</i> ¹	<i>Rhododendron obtusum</i> ¹
<i>Picea abies</i> ¹	<i>Rhododendron roseum elegans</i> ¹
<i>Picea glauca</i> ¹	<i>Taxus eupidata</i> ¹
<i>Picea pungens</i> ¹	<i>Thuja nigra</i> ¹
<i>Pinus mugo</i> ¹ ssp. <i>Mugo</i>	<i>Thuja occidentalis</i> ¹

¹ Already registered

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

*Juglans nigra*¹

¹ Already registered

Table 3. List of Lontrel treated crops where more information is needed.

<i>Arenaria montana</i>	<i>Lamiastrum galeobdolon</i>
<i>Abrieta deltoidea</i>	<i>Liriope muscari</i>
<i>Berberis buxifolia</i>	<i>Liriope muscari variegata</i>
<i>Berberis thunbergii</i>	<i>Liriope spicata</i>
<i>Carex pensylvanica</i>	<i>Mazus reptans</i>
<i>Cerastium tomentosum</i>	<i>Mentha x piperita</i>
<i>Cornus amomum</i>	<i>Nepeta faassenii</i>
<i>Cornus sericea</i>	<i>Oenothera pallida</i>
<i>Dianthus deltoids</i>	<i>Photinia fraserii</i> ¹
<i>Erigeron karvinskianus</i>	<i>Silene caroliniana</i>
<i>Euonymus alatus</i>	<i>Thymus praecox</i>
<i>Forsythia intermedia</i>	<i>Thymus serpyllum</i>
<i>Fragaria</i> sp.	<i>Trifolium repens</i>
<i>Fraxinus</i> sp.	<i>Tsuga canadensis</i> ¹
<i>Hydrangea paniculata</i>	<i>Veronica repens</i>
<i>Ilex crenata</i>	<i>Vinca minor</i>
<i>Ilex meserveae</i>	<i>Weigela florida</i>

¹ In two trials, no or minimal transitory injury at all rates.

Table 4. Detailed Summary of Crop Safety Testing with Lontrel

PR #	Crop			Production Site	Researcher	Year	Application Method	Results	Reg ?	File Name
	Common Name	Latin Name	Cultivar							
10424	Fir	Abies sp.	A. balsamea	Field In-Ground	Ahrens	1985	Over the top	No injury at 0.133 and 0.266 lb ai per acre; no control of viola.	Y	20010903z.pdf
10424	Fir	Abies sp.	A. balsamea	Field In-Ground	Ahrens	1985	Over the top	No injury at 0.133, 0.266 and 0.562 lb ai per acre.	Y	20010903s.pdf
10424	Fir	Abies sp.	A. balsamea	Field In-Ground	Ahrens	1985	Over the top	No injury at 0.133, 0.266 and 0.562 lb ai per acre.	Y	20010903s.pdf
10424	Fir	Abies sp.	A. balsamea	Field In-Ground	Ahrens	1985	Over the top	No injury at 0.133 and 0.266 lb ai per acre; no control of viola.	Y	20010903z.pdf
10424	Fir	Abies sp.	A. balsamea	Field In-Ground	Ahrens	1986	Over the top	No injury at 0.133, 0.266 and 0.562 lb ai per acre (August applications).	Y	20010903t.pdf
10424	Fir	Abies sp.	A. balsamea	Field In-Ground	Ahrens	1986	Over the top	No injury at 0.133, 0.266 and 0.562 lb ai per acre (August applications).	Y	20010903t.pdf
10424	Fir	Abies sp.	A. balsamea	Field In-Ground	Ahrens	1988	Over the top	No injury at 0.133, 0.266 and 0.562 lb ai per acre.	Y	20010903u.pdf
10424	Fir	Abies sp.	A. balsamea	Field In-Ground	Ahrens	1988	Over the top	No injury at 0.133, 0.266 and 0.562 lb ai per acre.	Y	20010903u.pdf
10424	Fir	Abies sp.	A. balsamea	Field In-Ground	Ahrens	1989	Over the top	No injury at 0.125, 0.25, and 0.5 lb ai per acre.	Y	20010903u2.pdf
10424	Fir	Abies sp.	A. balsamea	Field In-Ground	Ahrens	1989	Over the top	No injury at 0.125, 0.25, and 0.5 lb ai per acre.	Y	20010903u2.pdf
10424	Fir	Abies sp.	A. grandis	Field In-Ground	Baunworth	1987	Over the top	No injury at 0.125, 0.25, and 0.5 lb ai per acre; good control of canada thistle.	Y	20010904c.pdf
10424	Fir	Abies sp.	A. grandis	Field In-Ground	Baunworth	1987	Over the top	No injury at 0.125, 0.25, and 0.5 lb ai per acre; good control of canada thistle.	Y	20010904c.pdf

PR #	Crop			Production Site	Researcher	Year	Application Method	Results	Reg ?	File Name
	Common Name	Latin Name	Cultivar							
10424	Fir	Abies sp.	A. grandis	Field In-Ground	Baunworth	1987	Over the top	No injury at 0.125, 0.25, and 0.5 lb ai per acre.	Y	20010904b.pdf
10424	Fir	Abies sp.	A. grandis	Field In-Ground	Baunworth	1987	Over the top	No injury at 0.125, 0.25, and 0.5 lb ai per acre.	Y	20010904b.pdf
10424	Fir	Abies sp.	A. procera	Field In-Ground	Baunworth	1987	Over the top	No injury at 0.125, 0.25, and 0.5 lb ai per acre; good control of canada thistle.	Y	20010904d.pdf
10424	Fir	Abies sp.	A. procera	Field In-Ground	Baunworth	1987	Over the top	No injury at 0.125, 0.25, and 0.5 lb ai per acre; good control of canada thistle.	Y	20010904d.pdf
11088	Maple, Red	Acer rubrum		Field Container	Glaze	1992	Over the top	Slight injury at 0.125, 0.25 and 0.5 lb ai per acre, but many plants were not marketable at the end of the experiment.	Y	20010902i.pdf
11088	Maple, Red	Acer rubrum		Field Container	Glaze	1992	Over the top	Slight injury at 0.125, 0.25 and 0.5 lb ai per acre, but many plants were not marketable at the end of the experiment.	Y	20010902i.pdf
11088	Maple, Red	Acer rubrum		Field Container	Glaze	1993	Over the top	No significant injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010902j.pdf
11088	Maple, Red	Acer rubrum		Field Container	Glaze	1993	Over the top	No significant injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010902j.pdf
11088	Maple, Red	Acer rubrum		Field Container	Linderman	1993	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010902k.pdf
11088	Maple, Red	Acer rubrum		Field Container	Linderman	1993	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010902k.pdf

PR #	Crop			Production Site	Researcher	Year	Application Method	Results	Reg ?	File Name
	Common Name	Latin Name	Cultivar							
23622	Sandwort	Arenaria sp.	A. montana	Field Container	Senesac	2001	Over the top	Slight to moderate injury at 0.125, 0.25, and 0.5 lb ai per acre.	N	200109011.pdf
23039	Rock Cress	Aubrieta sp.	A. deltoidea	Field Container	Senesac	2002	Over the top	No significant injury at 0.125, 0.25 and 0.5 lb ai per acre	N	20010901m.pdf
11247	Barberry	Berberis sp.	B. buxifolia 'Crymson Pygmy'	Field Container	Linderman	1993	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	N	20010902m.pdf
11247	Barberry	Berberis sp.	B. thunbergii	Field Container	Glaze	1993	Over the top	Slight injury with quick recovery at 0.125, 0.25 and 0.5 lb ai per acre; all plants marketable.	N	20010902l.pdf
23482	Sedge	Carex sp.	C. pennsylvanica	Field Container	Senesac	2002	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	N	20010901n.pdf
23054	Snow-In-Summer	Cerastium tomentosum		Field Container	Senesac	2002	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre	N	20010901o.pdf
13621	Dogwood, Silky	Cornus amomum		Field In-Ground	Garrett	2001	Over the top	Slight to significant injury increasing with rate 0.125, 0.25 and 0.5 lb ai per acre applied over the top of emerged seedlings; good control of dandelion, clover, vetch and eclipta.	N	20010901a.pdf
18724	Dogwood, Red Osier	Cornus sericea		Field In-Ground	Garrett	2001	Over the top	Slight to significant injury increasing with rate 0.125, 0.25 and 0.5 lb ai per acre applied over the top of emerged seedlings; good control of dandelion, clover, vetch and eclipta.	N	20010901b.pdf

PR #	Crop			Production Site	Researcher	Year	Application Method	Results	Reg ?	File Name
	Common Name	Latin Name	Cultivar							
18724	Dogwood, Red Osier	Cornus sericea	'Red Twig'	Field In-Ground	Ahrens/Mervosh	1999	Over the top	Light, commercially acceptable injury at 0.125, 0.25 and 0.5 lb ai per acre, with good recovery by midseason	N	20010901f.pdf
23481	Maiden Pink	Dianthus deltoides	'Brilliant'	Field Container	Senesac	2002	Over the top	No significant injury at 0.125, 0.25 and 0.5 lb ai per acre	N	20010901p.pdf
23055	Fleabane	Erigeron sp.	E. karvinskianus 'Bluenmeer'	Field Container	Senesac	2002	Over the top	Moderate to significant injury and reduction in fresh weight at 0.125, 0.25, and 0.5 lb ai per acre.	N	20010901q.pdf
13598	Winged Burning Bush	Euonymus alatus	'Compacta'	Field In-Ground	Ahrens/Mervosh	1999	Over the top	Moderate to severe injury with 0.125, 0.25, and 0.5 lb ai per acre; excellent control of horseweed.	N	20010901g.pdf
11064	Golden Bells	Forsythia sp.	F. intermedia	Field In-Ground	Ahrens	1993	Over the top	Slight injury at 0.125, moderate at 0.25 and 0.5 lb ai per acre with X-77; excellent control of hairy vetch.	N	20010902n.pdf
11064	Golden Bells	Forsythia sp.	F. x intermedia 'Lynwood Gold'	Field In-Ground	Ahrens/Mervosh	1999	Over the top	Minor transient injury at 0.125, 0.25 and 0.5 lb ai per acre; excellent control of horseweed.	N	20010901h.pdf
23623	Strawberry (Non-Bearing)	Fragaria sp.	'Pink Panda'	Field Container	Senesac	2001	Over the top	Slight injury at 0.125, 0.25 and 0.5 lb ai per acre.	N	20010901r.pdf
11054	Ash	Fraxinus sp.		Field In-Ground	Garrett	2001	Over the top	Slight to significant injury increasing with rate 0.125, 0.25 and 0.5 lb ai per acre applied over the top of emerged seedlings.	N	20010901c.pdf

PR #	Crop			Production Site	Researcher	Year	Application Method	Results	Reg ?	File Name
	Common Name	Latin Name	Cultivar							
11251	Daylily	Hemerocallis sp.		Field Container	Glaze	1993	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre; all plants marketable.	N	20010902o.pdf
11251	Daylily	Hemerocallis sp.		Field Container	Neal	2001	Over the top	Very slight injury with quick recovery at 0.125, 0.25 and 0.5 lb ai per acre.	N	20010901s.pdf
11251	Daylily	Hemerocallis sp.	'Anzac', 'SummerWine', 'Catherine Woodbury'	Field Container	Linderman	1993	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	N	20010902q.pdf
11251	Daylily	Hemerocallis sp.	'Happy Returns'	Field Container	Senesac	2001	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	N	20010901t.pdf
11251	Daylily	Hemerocallis sp.	'Signal'	Field Container	Senesac	1993	Over the top	No significant injury at 0.125, 0.25, and 0.5 lb ai per acre.	N	20010902p.pdf
13601	Hydrangea	Hydrangea sp.	H. paniculata 'Peegee'	Field In-Ground	Ahrens/Mervosh	1999	Over the top	Moderate to significant injury with 0.125, 0.25 and 0.5 lb ai per acre, but plants at the two lower rates recovered by August; excellent control of horseweed.	N	20010901i.pdf
11246	Holly	Ilex sp.	I. cornuta 'China Girl'	Field Container	Senesac	1993	Over the top	No injury at 0.125, 0.25, and 0.5 lb ai per acre.	N	20010902u.pdf
11246	Holly	Ilex sp.	I. cornuta 'Nana'	Field Container	Linderman	1993	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	N	20010902r.pdf
11246	Holly	Ilex sp.	I. cornuta 'Rotunda'	Field Container	Glaze	1993	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	N	20010902s.pdf
11246	Holly	Ilex sp.	I. crenata 'Green Lustre'	Field Container	Beste	1993	Over the top	Moderate injury (leaf cupping) at 0.125, 0.25 and 0.5 lb ai per acre.	N	20010902t.pdf
11245	Holly	Ilex sp.	I. meserveae 'Blue Girl' & 'Blue Bloy'	Field In-Ground	Ahrens/Mervosh	2000	Over the top	Moderate injury at 0.125, 0.25, and 0.5 lb ai per acre.	N	20010901u.pdf

PR #	Crop			Production Site	Researcher	Year	Application Method	Results	Reg ?	File Name
	Common Name	Latin Name	Cultivar							
21418	Walnut, Black (Non-Bearing)	Juglans nigra		Field In-Ground	Garrett	2001	Over the top	Slight to significant injury increasing with rate 0.125, 0.25 and 0.5 lb ai per acre applied over the top of emerged seedlings.	Y	20010901d.pdf
21418	Walnut, Black (Non-Bearing)	Juglans nigra		Field In-Ground	Garrett	2001	Over the top	Slight to significant injury increasing with rate 0.125, 0.25 and 0.5 lb ai per acre applied over the top of emerged seedlings.	Y	20010901d.pdf
10413	Juniper	Juniperus sp.	J. conferta	Field In-Ground	Derr	1988	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010904g.pdf
10413	Juniper	Juniperus sp.	J. conferta	Field In-Ground	Derr	1988	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010904g.pdf
11244	Juniper	Juniperus sp.	J. conferta 'Blue Pacific'	Field Container	Derr	1988	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010904f.pdf
11244	Juniper	Juniperus sp.	J. conferta 'Blue Pacific'	Field Container	Derr	1988	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010904f.pdf
11244	Juniper	Juniperus sp.	J. horizontalis	Field Container	Glaze	1993	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre; all plants marketable.	Y	20010902w.pdf
11244	Juniper	Juniperus sp.	J. horizontalis	Field Container	Glaze	1993	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre; all plants marketable.	Y	20010902w.pdf
10413	Juniper	Juniperus sp.	J. horizontalis	Field In-Ground	Talbert	1988	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010904h.pdf
10413	Juniper	Juniperus sp.	J. horizontalis	Field In-Ground	Talbert	1988	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010904h.pdf
11244	Juniper	Juniperus sp.	J. horizontalis 'Plumosa'	Field Container	Senesac	1993	Over the top	No significant injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010902v.pdf

PR #	Crop			Production Site	Researcher	Year	Application Method	Results	Reg ?	File Name
	Common Name	Latin Name	Cultivar							
11244	Juniper	Juniperus sp.	J. horizontalis 'Plumosa'	Field Container	Senesac	1993	Over the top	No significant injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010902v.pdf
23624	Yellow Archangel	Lamiastrum galeobdolon	'Herman's Pride'	Field Container	Senesac	2001	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre	N	20010901v.pdf
23625	Blue Lyme Grass	Leymus arenarius	'Blue Dune'	Field Container	Senesac	2001	Over the top	Slight injury at 0.125, 0.25 and 0.5 lb ai per acre	Y	20010901w.pdf
23625	Blue Lyme Grass	Leymus arenarius	'Blue Dune'	Field Container	Senesac	2001	Over the top	Slight injury at 0.125, 0.25 and 0.5 lb ai per acre	Y	20010901w.pdf
10411	Lily, Easter	Lilium longiflorum		Field In-Ground	Baunworth	1987	Over the top	N0 significant yellowing, but slight twisting and slight reduction in bulblet weight at 0.125, 0.25, and 0.5 lb ai per acre.	Y	20010904e.pdf
10411	Lily, Easter	Lilium longiflorum		Field In-Ground	Baunworth	1987	Over the top	N0 significant yellowing, but slight twisting and slight reduction in bulblet weight at 0.125, 0.25, and 0.5 lb ai per acre.	Y	20010904e.pdf
11253	Lilyturf, Creeping	Liriope sp.	L. muscari	Field Container	Derr	2001	Over the top	Virtually no injury or growth reduction at 0.125, 0.25 and 0.5 lb ai per acre.	N	20010901x.pdf
11252	Lilyturf, Creeping	Liriope sp.	L. muscari variegata	Field In-Ground	Glaze	1993	Over the top	Very slight injury at 0.125, 0.25 and 0.5 lb ai per acre.	N	20010902x.pdf
11252	Lilyturf, Creeping	Liriope sp.	L. spicata 'Big Blue'	Field In-Ground	Hart	2000	Over the top	Slight injury with complete recovery at 0.125, 0.25 and 0.5 lb ai per acre.	N	20010901i3.pdf
23626	Mazus	Mazus reptans		Field Container	Senesac	2001	Over the top	Slight injury at 0.125 and 0.25, moderate at 0.5 lb ai per acre.	N	20010901y.pdf

PR #	Crop			Production Site	Researcher	Year	Application Method	Results	Reg ?	File Name
	Common Name	Latin Name	Cultivar							
29227	Peppermint	<i>Mentha x piperita</i>		Field Container	Senesac	2002	Over the top	No significant injury at 0.125, 0.25, and 0.5 lb ai per acre.	N	20010901z.pdf
23058	Catnip	<i>Nepeta cataria</i>	N. faassenii 'Walker's Low'	Field Container	Senesac	2001	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre	N	20010902a.pdf
23060	Evening Primrose, Sundrops	<i>Oenothera</i> sp.	<i>O. pallida</i>	Field Container	Senesac	2002	Over the top	No significant injury or growth reduction at 0.125, 0.25 and 0.5 lb ai per acre.	N	20010902b.pdf
11249	Photinia	<i>Photinia</i> sp.	<i>P. fraserii</i>	Field Container	Linderman	1993	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	N	20010902y.pdf
11249	Photinia	<i>Photinia</i> sp.	<i>P. fraserii</i> 'Birmingham'	Field Container	Glaze	1993	Over the top	Very slight injury at 0.125, 0.25 and 0.5 lb ai per acre; all plants marketable.	N	20010902z.pdf
11073	Spruce, Norway	<i>Picea abies</i>		Field In-Ground	Talbert	1988	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre; great control of <i>Amaranthus</i> but no control of <i>Digitaria</i> or <i>Setaria</i> .	Y	20010904y.pdf
11073	Spruce, Norway	<i>Picea abies</i>		Field In-Ground	Talbert	1988	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre; great control of <i>Amaranthus</i> but no control of <i>Digitaria</i> or <i>Setaria</i> .	Y	20010904y.pdf
11073	Spruce, Norway	<i>Picea abies</i>		Field In-Ground	Ahrens	1993	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010903a.pdf
11073	Spruce, Norway	<i>Picea abies</i>		Field In-Ground	Ahrens	1993	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010903a.pdf

PR #	Crop			Production Site	Researcher	Year	Application Method	Results	Reg ?	File Name
	Common Name	Latin Name	Cultivar							
11074	Spruce, White; Cat	<i>Picea glauca</i>		Field In-Ground	Ahrens	1989	Over the top	No injury with 0.125, 0.25, and 0.5 lb ai per acre; good to great control of horseweed at the two high rates.	Y	20010904x.pdf
11074	Spruce, White; Cat	<i>Picea glauca</i>		Field In-Ground	Ahrens	1989	Over the top	No injury with 0.125, 0.25, and 0.5 lb ai per acre; good to great control of horseweed at the two high rates.	Y	20010904x.pdf
11074	Spruce, White; Cat	<i>Picea glauca</i>		Field In-Ground	Ahrens	1993	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010903b.pdf
11074	Spruce, White; Cat	<i>Picea glauca</i>		Field In-Ground	Ahrens	1993	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010903b.pdf
10503	Spruce	<i>Picea sp.</i>		Field In-Ground	Ahrens	1986		clopyralid + glyphosate - need to move to different PR number.	Y	20010904v.pdf
10503	Spruce	<i>Picea sp.</i>		Field In-Ground	Ahrens	1986		clopyralid + glyphosate - need to move to different PR number.	Y	20010904v.pdf
10503	Spruce	<i>Picea sp.</i>	<i>P. pungens</i>	Field In-Ground	Ahrens	1985	Over the top	No injury at 0.133, 0.266 and 0.532 lb ai per acre; excellent control of bird vetch.	Y	20010904r.pdf
10503	Spruce	<i>Picea sp.</i>	<i>P. pungens</i>	Field In-Ground	Ahrens	1985	Over the top	No injury at 0.133, 0.266 and 0.532 lb ai per acre; excellent control of bird vetch.	Y	20010904r.pdf
10503	Spruce	<i>Picea sp.</i>	<i>P. pungens</i>	Field In-Ground	Ahrens	1986	Over the top	No to slight needle chlorosis at 0.266, 0.532, and 1.064 lb ai per acre; excellent control of bird vetch.	Y	20010904s.pdf

PR #	Crop			Production Site	Researcher	Year	Application Method	Results	Reg ?	File Name
	Common Name	Latin Name	Cultivar							
10503	Spruce	Picea sp.	P. pungens	Field In-Ground	Ahrens	1986	Over the top	No to slight needle chlorosis at 0.266, 0.532, and 1.064 lb ai per acre; excellent control of bird vetch.	Y	20010904s.pdf
10503	Spruce	Picea sp.	P. pungens	Field In-Ground	Ahrens	1987	Over the top	No injury at 0.133, 0.266, and 0.399 lb ai per acre; good to excellent control of bird vetch.	Y	20010904t.pdf
10503	Spruce	Picea sp.	P. pungens	Field In-Ground	Ahrens	1987	Over the top	No injury at 0.133, 0.266, and 0.399 lb ai per acre; good to excellent control of bird vetch.	Y	20010904t.pdf
10503	Spruce	Picea sp.	P. pungens	Field In-Ground	Ahrens	1988	Over the top	No significant injury with 0.125, 0.25, and 0.5 lb ai per acre after two seasons of single applications.	Y	20010904w.pdf
10503	Spruce	Picea sp.	P. pungens	Field In-Ground	Ahrens	1988	Over the top	No significant injury with 0.133 and 0.266 lb ai per acre with June or July applications; excellent control of bird vetch, no control of field horsetail.	Y	20010904u.pdf
10503	Spruce	Picea sp.	P. pungens	Field In-Ground	Ahrens	1988	Over the top	No significant injury with 0.125, 0.25, and 0.5 lb ai per acre after two seasons of single applications.	Y	20010904w.pdf
10503	Spruce	Picea sp.	P. pungens	Field In-Ground	Ahrens	1988	Over the top	No significant injury with 0.133 and 0.266 lb ai per acre with June or July applications; excellent control of bird vetch, no control of field horsetail.	Y	20010904u.pdf

PR #	Crop			Production Site	Researcher	Year	Application Method	Results	Reg ?	File Name
	Common Name	Latin Name	Cultivar							
10650	Pine, Mugo & Mugho	Pinus mugo ssp. Mugo		Field Container	Ahrens	1989	Over the top	No injury at 0.125, 0.25, 0.5 lb ai per acre; good to excellent control of galinsoga but poor of spurge.	Y	20010904i.pdf
10650	Pine, Mugo & Mugho	Pinus mugo ssp. Mugo		Field Container	Ahrens	1989	Over the top	No injury at 0.125, 0.25, 0.5 lb ai per acre; good to excellent control of galinsoga but poor of spurge.	Y	20010904i.pdf
10650	Pine, Mugo & Mugho	Pinus mugo ssp. Mugo		Field Container	Beste	1992	Over the top	No injury or significant growth reduction at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010903c.pdf
10650	Pine, Mugo & Mugho	Pinus mugo ssp. Mugo		Field Container	Beste	1992	Over the top	No injury or significant growth reduction at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010903c.pdf
10650	Pine, Mugo & Mugho	Pinus mugo ssp. Mugo		Field Container	Glaze	1992	Over the top	Slight injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010903e.pdf
10650	Pine, Mugo & Mugho	Pinus mugo ssp. Mugo		Field Container	Glaze	1992	Over the top	Slight injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010903e.pdf
11090	Pine, Longleaf	Pinus palustris		Field Container	Glaze	1993	Over the top	No significant injury at 0.125, marginal at 0.25 and 0.5 lb ai per acre; all plants marketable.	Y	20010903f.pdf
11090	Pine, Longleaf	Pinus palustris		Field Container	Glaze	1993	Over the top	No significant injury at 0.125, marginal at 0.25 and 0.5 lb ai per acre; all plants marketable.	Y	20010903f.pdf

PR #	Crop			Production Site	Researcher	Year	Application Method	Results	Reg ?	File Name
	Common Name	Latin Name	Cultivar							
11090	Pine, Longleaf	Pinus palustris		Field Container	Glaze	1992	Over the top	No significant injury at 0.125, 0.25, and 0.5 lb ai per acre; most plants marketable.	Y	20010903d.pdf
11090	Pine, Longleaf	Pinus palustris		Field Container	Glaze	1992	Over the top	No significant injury at 0.125, 0.25, and 0.5 lb ai per acre; most plants marketable.	Y	20010903d.pdf
10502	Pine	Pinus sp.	P. strobus	Field In-Ground	Ahrens	1985	Over the top	Slight curling of needles and crooked stems.	Y	20010904l.pdf
10502	Pine	Pinus sp.	P. strobus	Field In-Ground	Ahrens	1985	Over the top	Slight curling of needles and crooked stems.	Y	20010904l.pdf
10502	Pine	Pinus sp.	P. strobus	Field In-Ground	Ahrens	1986	Directed spray	No significant injury at 0.133 and 0.266 lb ai per acre.	Y	20010904n.pdf
10502	Pine	Pinus sp.	P. strobus	Field In-Ground	Ahrens	1986	Directed spray	No injury at 0.133 and 0.266 lb ai per acre.	Y	20010904m.pdf
10502	Pine	Pinus sp.	P. strobus	Field In-Ground	Ahrens	1986	Directed spray	No injury at 0.133 and 0.266 lb ai per acre.	Y	20010904m.pdf
10502	Pine	Pinus sp.	P. strobus	Field In-Ground	Ahrens	1986	Directed spray	No significant injury at 0.133 and 0.266 lb ai per acre.	Y	20010904n.pdf
10502	Pine	Pinus sp.	P. strobus	Field In-Ground	Ahrens	1987	Directed spray	No significant injury at 0.125 and 0.25 lb ai per acre.	Y	20010904o.pdf
10502	Pine	Pinus sp.	P. strobus	Field In-Ground	Ahrens	1987	Directed spray	No significant injury at 0.125 and 0.25 lb ai per acre.	Y	20010904o.pdf
10502	Pine	Pinus sp.	P. strobus	Field In-Ground	Ahrens	1989	Directed spray	No significant injury at 0.125 and 0.5 lb ai per acre.	Y	20010904p.pdf
10502	Pine	Pinus sp.	P. strobus	Field In-Ground	Ahrens	1989	Directed spray	No significant injury at 0.125 and 0.5 lb ai per acre.	Y	20010904p.pdf

PR #	Crop			Production Site	Researcher	Year	Application Method	Results	Reg ?	File Name
	Common Name	Latin Name	Cultivar							
10502	Pine	Pinus sp.	P. strobus	Field In-Ground	Derr	1988	Over the top	No injury at 0.125, 0.25, and 0.5 lb ai per acre.	Y	20010904k.pdf
10502	Pine	Pinus sp.	P. strobus	Field In-Ground	Derr	1988	Over the top	No injury at 0.125, 0.25, and 0.5 lb ai per acre.	Y	20010904k.pdf
10502	Pine	Pinus sp.	P. sylvestris	Field In-Ground	Baunworth	1987	Over the top	No injury at 0.125, 0.25, and 0.5 lb ai per acre; good control of canada thistle.	Y	20010904j.pdf
10502	Pine	Pinus sp.	P. sylvestris	Field In-Ground	Baunworth	1987	Over the top	No injury at 0.125, 0.25, and 0.5 lb ai per acre; good control of canada thistle.	Y	20010904j.pdf
10415	Fir, Douglas	Pseudotsuga menziesii		Field In-Ground	Ahrens	1985	Over the top	No injury at 0.133, 0.266, 0.375 and 0.562 lb ai per acre.	Y	20010903v.pdf
10415	Fir, Douglas	Pseudotsuga menziesii		Field In-Ground	Ahrens	1985	Over the top	No injury at 0.133, 0.266, 0.375 and 0.562 lb ai per acre.	Y	20010903v.pdf
10415	Fir, Douglas	Pseudotsuga menziesii		Field In-Ground	Ahrens	1986	Directed spray	No injury at 0.133 and 0.266 lb ai per acre.	Y	20010903w.pdf
10415	Fir, Douglas	Pseudotsuga menziesii		Field In-Ground	Ahrens	1986	Directed spray	No injury at 0.133 and 0.266 lb ai per acre.	Y	20010903w.pdf
10415	Fir, Douglas	Pseudotsuga menziesii		Field In-Ground	Ahrens	1988	Over the top	No injury at 0.125, 0.25, and 0.5 lb ai per acre.	Y	20010903x.pdf
10415	Fir, Douglas	Pseudotsuga menziesii		Field In-Ground	Ahrens	1988	Over the top	No injury at 0.125, 0.25, and 0.5 lb ai per acre.	Y	20010903x.pdf
10415	Fir, Douglas	Pseudotsuga menziesii		Field In-Ground	Regan	1987	Over the top	No injury at 0.125, 0.25, and 0.5 lb ai per acre; excellent control of canada thistle.	Y	20010903y.pdf
10415	Fir, Douglas	Pseudotsuga menziesii		Field In-Ground	Regan	1987	Over the top	No injury at 0.125, 0.25, and 0.5 lb ai per acre; excellent control of canada thistle.	Y	20010903y.pdf

PR #	Crop			Production Site	Researcher	Year	Application Method	Results	Reg ?	File Name
	Common Name	Latin Name	Cultivar							
11060	Oak	Quercus sp.		Field In-Ground	Garrett	2001	Over the top	Slight to significant injury increasing with rate 0.125, 0.25 and 0.5 lb ai per acre applied over the top of emerged seedlings; excellent control of dandelion, clover, and eclipta.	Y	20010901e.pdf
11060	Oak	Quercus sp.		Field In-Ground	Garrett	2001	Over the top	Slight to significant injury increasing with rate 0.125, 0.25 and 0.5 lb ai per acre applied over the top of emerged seedlings; excellent control of dandelion, clover, and eclipta.	Y	20010901e.pdf
11255	Oak	Quercus sp.	Q. coccinea	Field Container	Linderman	1993	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010903g.pdf
11255	Oak	Quercus sp.	Q. coccinea	Field Container	Linderman	1993	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010903g.pdf
11255	Oak	Quercus sp.	Q. nuttallii	Field Container	Glaze	1993	Over the top	Slight injury at 0.125, 0.25 and 0.5 lb ai per acre; all plants marketable.	Y	20010903i.pdf
11255	Oak	Quercus sp.	Q. nuttallii	Field Container	Glaze	1993	Over the top	Slight injury at 0.125, 0.25 and 0.5 lb ai per acre; all plants marketable.	Y	20010903i.pdf
11089	Oak, Southern Live	Quercus virginiana	Q. agrifolia	Field Container	Glaze	1992	Over the top	Slight injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010903h.pdf
11089	Oak, Southern Live	Quercus virginiana	Q. agrifolia	Field Container	Glaze	1992	Over the top	Slight injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010903h.pdf

PR #	Crop			Production Site	Researcher	Year	Application Method	Results	Reg ?	File Name
	Common Name	Latin Name	Cultivar							
11089	Oak, Southern Live	Quercus virginiana	Q. virginiana	Field Container	Glaze	1993	Over the top	Virtually no injury at 0.125, 0.25 and 0.5 lb ai per acre; all plants marketable	Y	20010903j.pdf
11089	Oak, Southern Live	Quercus virginiana	Q. virginiana	Field Container	Glaze	1993	Over the top	Virtually no injury at 0.125, 0.25 and 0.5 lb ai per acre; all plants marketable	Y	20010903j.pdf
10651	Azalea, & Rhododendron	Rhododendron sp.		Field Container	Glaze	1992	Over the top	Moderate injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010903l.pdf
10651	Azalea, & Rhododendron	Rhododendron sp.		Field Container	Glaze	1992	Over the top	Moderate injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010903l.pdf
10651	Azalea, & Rhododendron	Rhododendron sp.	'Ocean Lake'	Field Container	Linderman	1993	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010903k.pdf
10651	Azalea, & Rhododendron	Rhododendron sp.	'Ocean Lake'	Field Container	Linderman	1993	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010903k.pdf
10651	Azalea, & Rhododendron	Rhododendron sp.	R. catawbiense 'Roseum Elegans'	Field Container	Beste	1992	Over the top	No significant injury or growth reduction at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010903o.pdf
10651	Azalea, & Rhododendron	Rhododendron sp.	R. catawbiense 'Roseum Elegans'	Field Container	Beste	1992	Over the top	No significant injury or growth reduction at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010903o.pdf
10651	Azalea, & Rhododendron	Rhododendron sp.	R. obtusum 'Hino Crimson'	Field Container	Beste	1992	Over the top	Slight initial injury with complete recovery in 5 weeks at 0.125, 0.25 and 0.5 lb ai per acre; no growth reduction.	Y	20010903n.pdf

PR #	Crop			Production Site	Researcher	Year	Application Method	Results	Reg ?	File Name
	Common Name	Latin Name	Cultivar							
10651	Azalea, & Rhododendron	Rhododendron sp.	R. obtusum 'Hino Crimson'	Field Container	Beste	1992	Over the top	Slight initial injury with complete recovery in 5 weeks at 0.125, 0.25 and 0.5 lb ai per acre; no growth reduction.	Y	20010903n.pdf
10651	Azalea, & Rhododendron	Rhododendron sp.	R. roseum elegans	Field Container	Senesac	1993	Over the top	No significant injury at 0.125, 0.25, and 0.5 lb ai per acre.	Y	20010903m.pdf
10651	Azalea, & Rhododendron	Rhododendron sp.	R. roseum elegans	Field Container	Senesac	1993	Over the top	No significant injury at 0.125, 0.25, and 0.5 lb ai per acre.	Y	20010903m.pdf
11087	Azalea, & Rhododendron	Rhododendron sp.	'Roseum Elegans'	Greenhouse	Ahrens	1989	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010904q.pdf
23061	Campion, Sea	Silene vulgaris ssp. Maritima	S. caroliniana	Field Container	Senesac	2002	Over the top	No to slight injury increasing with rate (0.125, 0.25 and 0.5 lb ai per acre)	N	20010902c.pdf
10504	Yew	Taxus sp.	T. euspidata	Field In-Ground	Ahrens/Mervosh	1999	Over the top	Slight curling of needles, but transient, at 0.125, 0.25, and 0.5 lb ai per acre.	Y	20010901j.pdf
10504	Yew	Taxus sp.	T. euspidata	Field In-Ground	Ahrens/Mervosh	1999	Over the top	Slight curling of needles, but transient, at 0.125, 0.25, and 0.5 lb ai per acre.	Y	20010901j.pdf
10412	Arborvitae	Thuja sp.	T. nigra	Field In-Ground	Ahrens	1989	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010903r.pdf
10412	Arborvitae	Thuja sp.	T. nigra	Field In-Ground	Ahrens	1989	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010903r.pdf
10412	Arborvitae	Thuja sp.	T. occidentalis	Field In-Ground	Talbert	1988	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010903q.pdf
10412	Arborvitae	Thuja sp.	T. occidentalis	Field In-Ground	Talbert	1988	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	Y	20010903q.pdf

PR #	Crop			Production Site	Researcher	Year	Application Method	Results	Reg ?	File Name
	Common Name	Latin Name	Cultivar							
23063	Thyme, Creeping	Thymus praecox	T. praecox 'Albiflorus	Field Container	Senesac	2001	Over the top	Very slight injury with complete recovery at 0.125, 0.25 and 0.5 lb ai per acre.	N	20010902d.pdf
23063	Thyme, Creeping	Thymus praecox	T. serpyllum	Field Container	Senesac	2002	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	N	20010902e.pdf
23064	Clover, White	Trifolium repens	'Atropurpureum'	Field Container	Senesac	2002	Over the top	Moderate to severe injury at 0.125, 0.25 and 0.5 lb ai per acre.	N	20010902f.pdf
10684	Hemlock, Canada	Tsuga canadensis		Field In-Ground	Ahrens	1989	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre	N	20010903r.pdf
11072	Hemlock	Tsuga sp.	T. canadensis	Field In-Ground	Ahrens	1993	Over the top	Minor transient injury at 0.125 and 0.25, moderate transient at 0.5 lb ai per acre with X-77; negligible injury by 5 months posttreatment	N	20010903p.pdf
23065	Speedwell, Brooklime	Veronica sp.	V. repens	Field Container	Senesac	2002	Over the top	No injury at 0.125, 0.25 and 0.5 lb ai per acre.	N	20010902g.pdf
13614	Periwinkle	Vinca sp.	V. minor	Field In-Ground	Derr	2001	Over the top	Virtually no injury or growth reduction at 0.125, 0.25 and 0.5 lb ai per acre.	N	20010902h.pdf
11070	Weigela	Weigela sp.	W. florida 'Java Red'	Field In-Ground	Ahrens/Mervosh	1999	Over the top	Significant injury, even mortality, at 0.125, 0.25, 0.5 lb ai per acre; excellent control of horseweed.	N	20010901k.pdf

Label Suggestions

It is suggested that *Hemerocallis* sp. and *Ilex cornuta* which exhibited no injury in these experiments be added to the Lontrel label.

Appendix 1: Protocol

None available at the current time.

Appendix 2: Contributing Researchers

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Appendix 3: Submitted Data

Researcher reports included in the printed copy of this report and those received by 6/15/09.
Reports on following pages are in alphanumeric order of author PR number.