Nursery Herbicides

David South

OPERATIONAL HERBICIDES

Oxyfluorfen (72 hr REI)

- 2EC formulations

GOAL 2XL

Oxyfluorfen 2E (Quali-pro)
(24 hr REI)

GALIGAN (MANA) (24 hr REI)

OXYSTAR 2E (Agri Star)

DO NOT USE
GALIGAN SLAPSHOT (has glyphosate)

- 4F formulations

- GOALTENDER
- GALIGAN H20

1 quart per acre (0.5 lb a.i./acre) at sowing…
(some apply 2 quarts per acre)

After soil stabilizer….. with soil stabilizer

Before mulching with bark (South) but some apply after mulching with bark.

INJURY

Goal 2 XL, 2 pints per acre

Without tarp

With pre-plant tarp

INJURY

GoalTender 4 F, 1 pint per acre

Without tarp

With pre-plant tarp

Crop injury ratings 2003-04, Salinas, CA

Herbicide	Rate	Plastic	Injury
Goal 2 XL	2 pt/A	No	7.0
Goal 2 XL	2 pt/A	Yes	0.7 *
GoalTender 4 F	1 pt/A	No	6.5
GoalTender 4 F	1 pt/A	Yes	1.1 *
Untreated	0	No	1.5

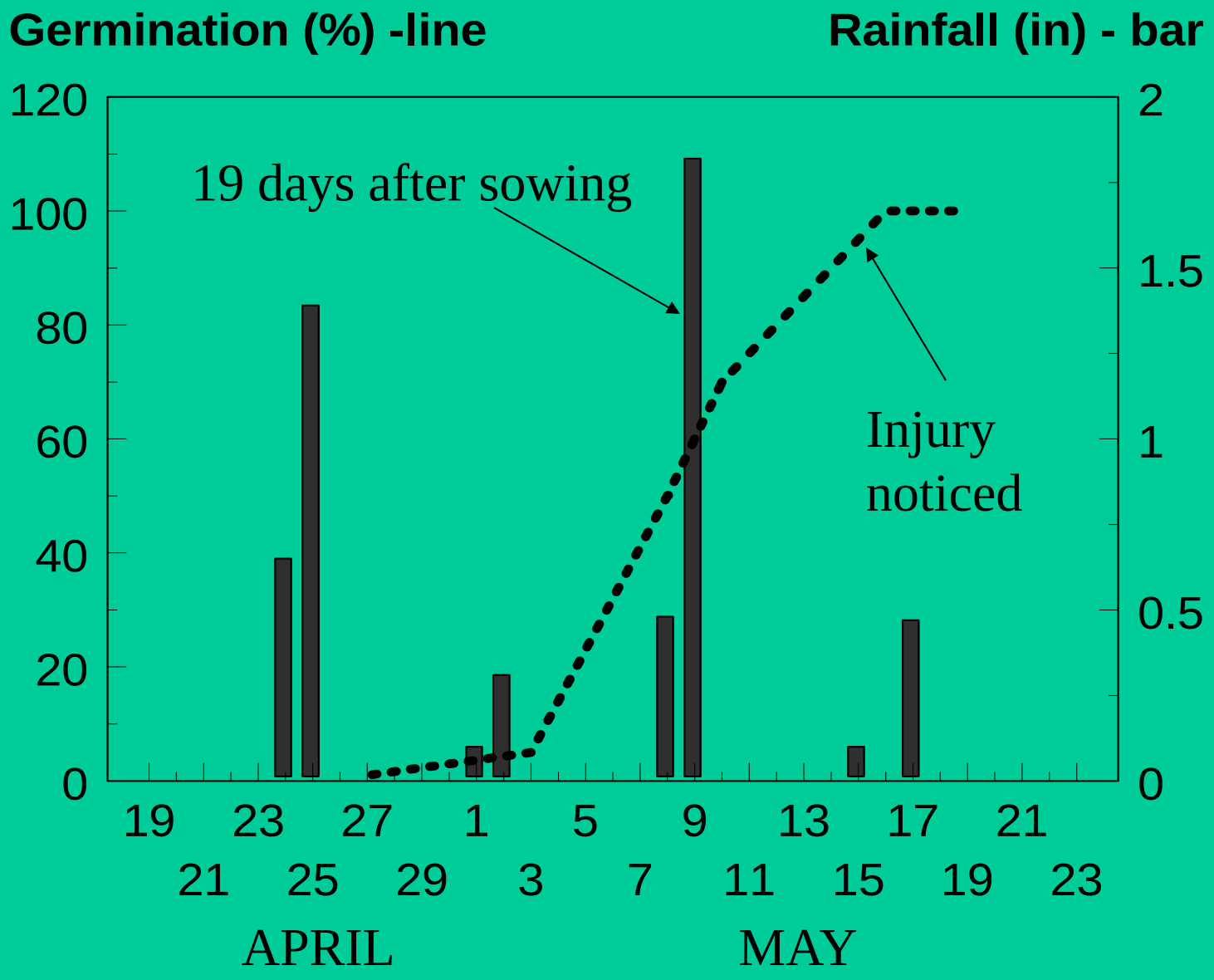
0 = no injury, 10 = dead

Nursery Activities

Applying Bed Stabilizer

To reduce soil splash and soil erosion


No Agrilock = Goal Injury - 2007


Germination (%) -line
Rainfall (in) - bar
120
100
80
60
40
20
0
2
1.5
1
0.5
0
19 days after sowing
Injury noticed
19 23 27 1 5 9 13 17 21
21 25 29 3 7 11 15 19 23
APRIL
MAY

0X

1X

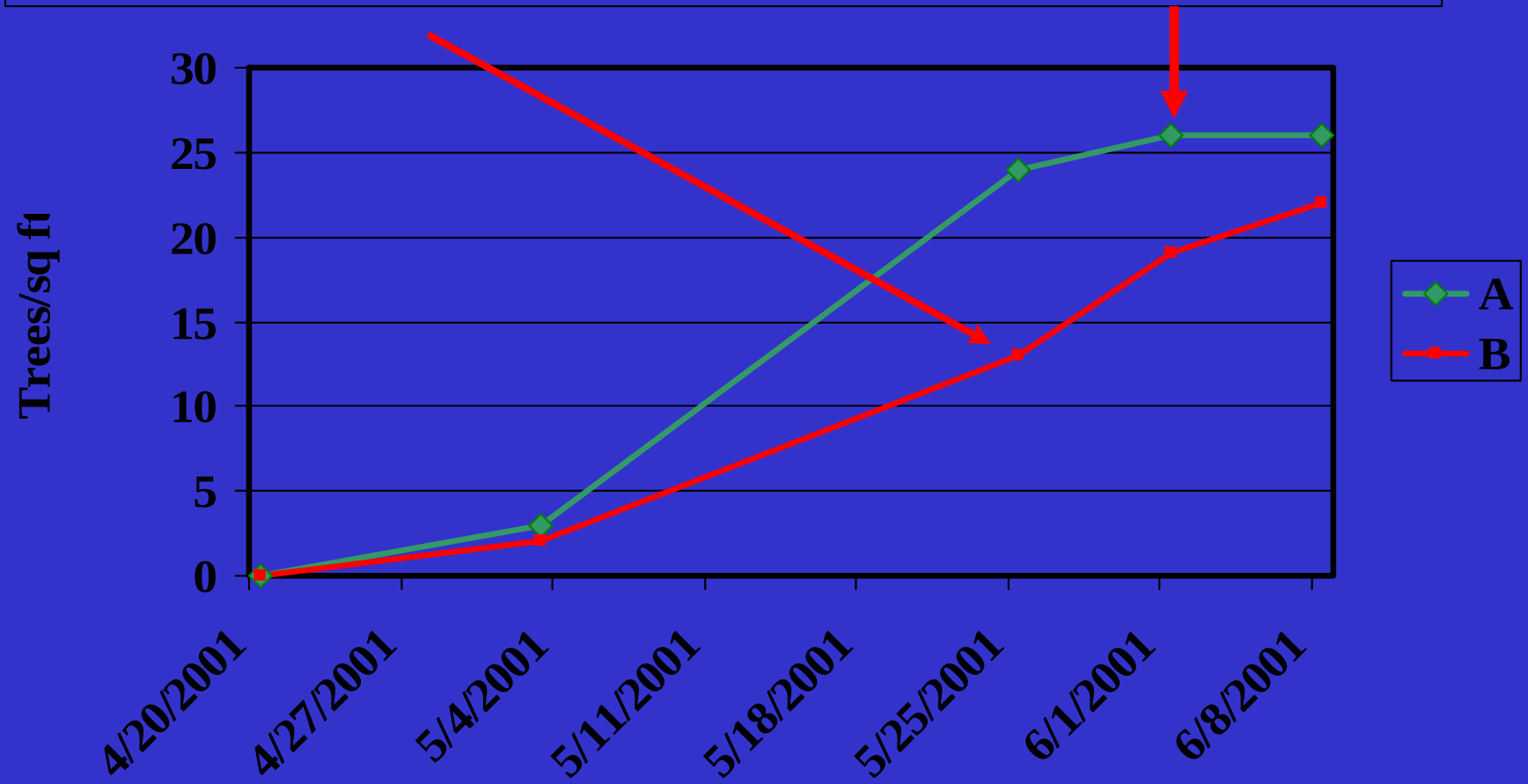
2X

Stabilizer Rate	Weed/ft^2 May	Pines/ft^2 May
0X	0.00 a	18.3 a
1X	0.04 b	31.7 b
2X	0.07 b	34.2 b
lsd	*0.03*	*3.0*

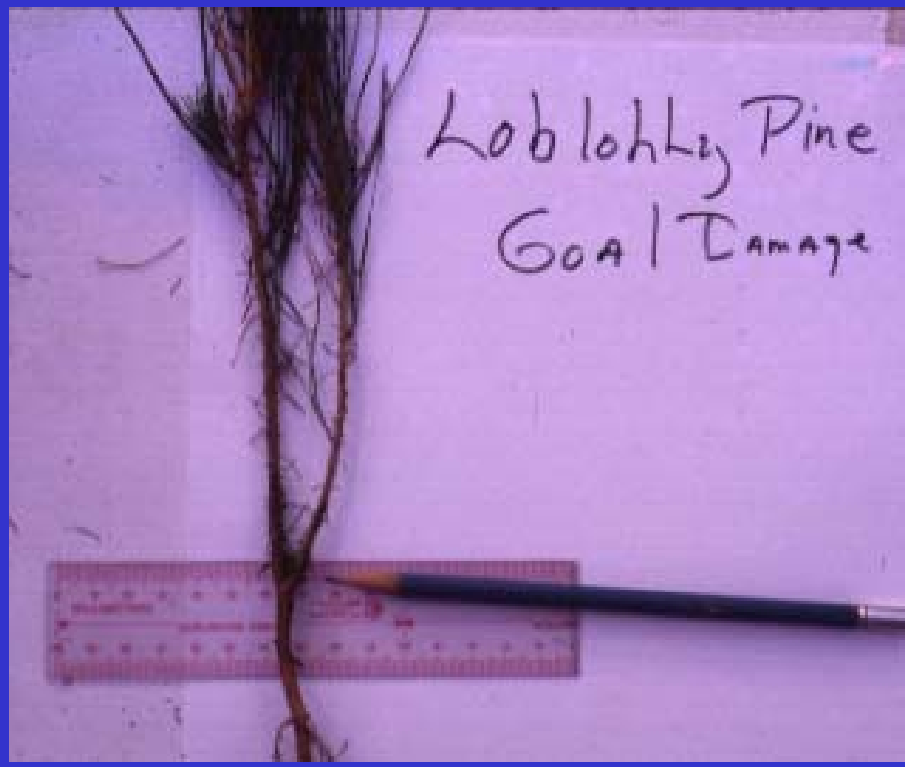
When to apply first GOAL postemergence application?

How soon can I apply GoalTender?

When to apply first application of GoalTender Goal 2XL



Goal EC injury applied too soon




Dow AgroSciences
GoalTender™
Herbicide
™Trademark of Dow AgroSciences LLC
Goal 4F

Labels read the same

but prior to emergence. For weed control in emerged conifers, GoalTender may be applied over-the-top, but application should be delayed a minimum of 5 weeks after seedling emergence. If application is made during cool, cloudy weather, make certain that seedlings have hardened-off prior to spraying.

According to EPA...

"The use of certain words such as "should," "may" or "recommend" in advisory statements has the potential to lead the product user to erroneously believe that he/she must comply with such statements, when in fact such statements do not have to be followed.“

Pesticide Registration (PR) Notice 2000-5
Guidance for Mandatory and Advisory Labeling Statements

Weekly Goal applications improve weed control

Make sure you have a copy of the supplemental label

REI 12 hours (afternoon spray - Monday-Thursday)

Safer on pines than Goal 2XL

Some control of spurge… and morningglory

The total amount of Cobra applied per season must not exceed 26 fl ounces per acre. This is equal to four applications At 6.5 ounces/application… or five applications at 5.1 ounces

Grass herbicides

- fluazifop-butyl
- sethoxydim
- clethodim

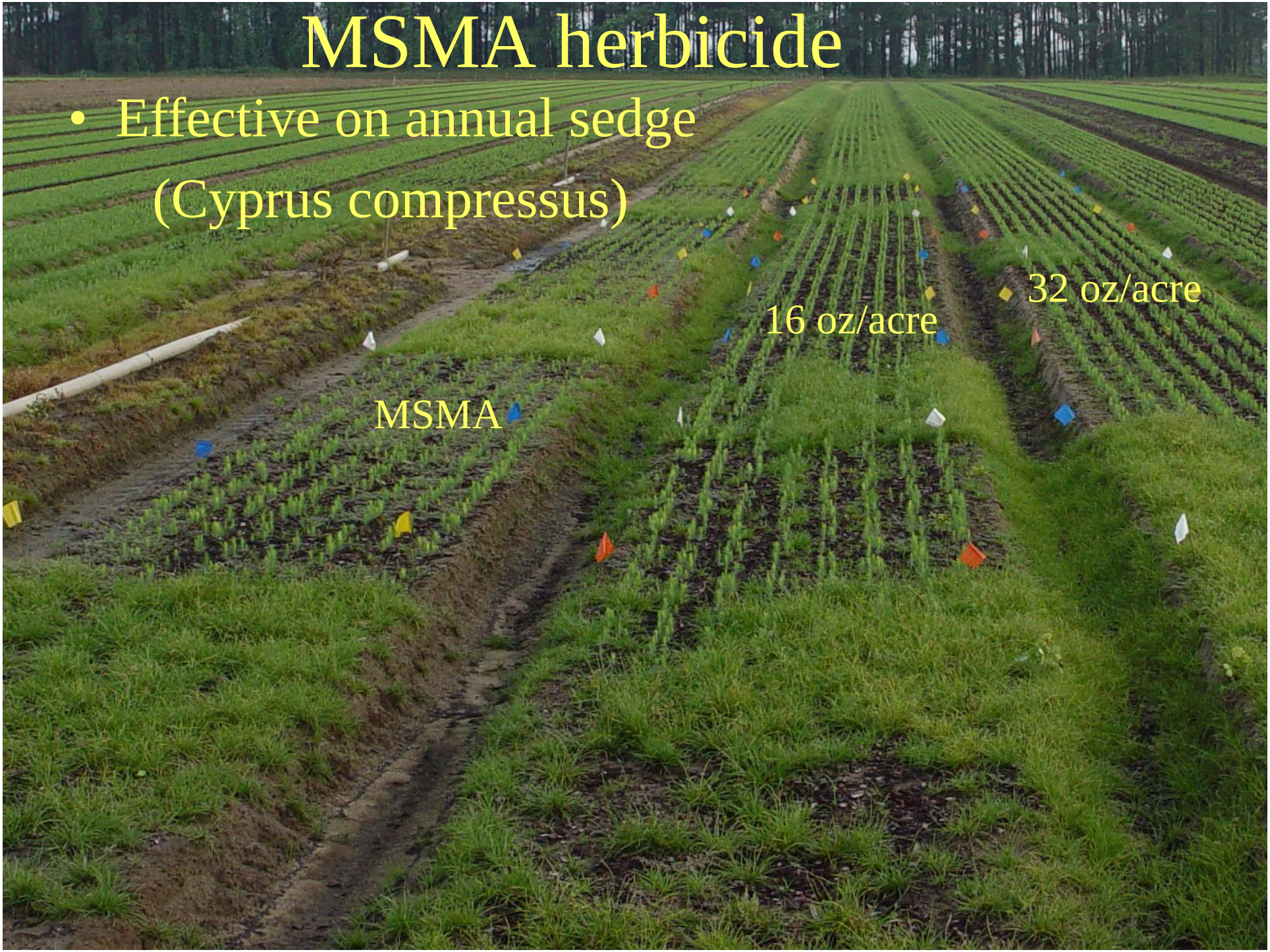
Grass herbicides

- fluazifop-butyl
- Fusilade DX 2EC (Syngenta)
- sethoxydim

  Sethoxydim E Pro (Nufarm)
- clethodim
- Arrow (MANA)
- Envoy (Valent)
- HM0714 (Helena)

MSMA herbicide

- Effective on annual sedge (Cyprus compressus)



MSMA

Table 1. Estimates of yellow and purple nutsedge control with herbicides commonly used in agronomic and vegetable crops. The tolerance of pine seedlings has not been tested.

Herbicide activity	Herbicide	Rate	Yellow nutsedge	Purple nutsedge
		Kg ai/ha	- - - - - - - - - Percent control - - - - - - - -	
Soil activity only	Metolachlor PRE[a]	1.40	55 to 85	< 20
	Fomesafen PRE[b]	0.56	85	< 35
	Fomesafen POST	0.42	50 to 60	?
Foliar activity only	Bentazon POST[c]	1.12	75	< 20
	Glyphosate POST[d]	2.24	55	70
	MSMA POST[e]	1.12	45	30
	MSMA POST	2.24	90	65
Soil and Foliar Activity	Imazapic POST[f]	0.07	90	95
	Imazethapyr POST[g]	0.07	60	70
	Halosulfuron[h]	0.07	85 to 95	85 to 95
	Trifloxysulfuron[i]	N/A	75 to 95	?

NUTSEDGE (*CYPERUS* SPP.) ERADIATION: IMPOSSIBLE DREAM?

TED M. WEBSTER

Purchase of MSMA

- Sale of MSMA for forestry, non-crop areas, residential turf, bearing and non-bearing fruit and nuts, will stop on December 31, 2009. Use of MSMA at these sites will stop a year later on December, 31, 2010.

- If you plan on applying MSMA to control weeds in non-crop areas, you will not be allowed to purchase any product next year.

fomesafen

- **Be sure you have a state 24-C label**

  PRE (AL, AR, GA, MS, NC, SC, TX) do not use on fine textured soils.

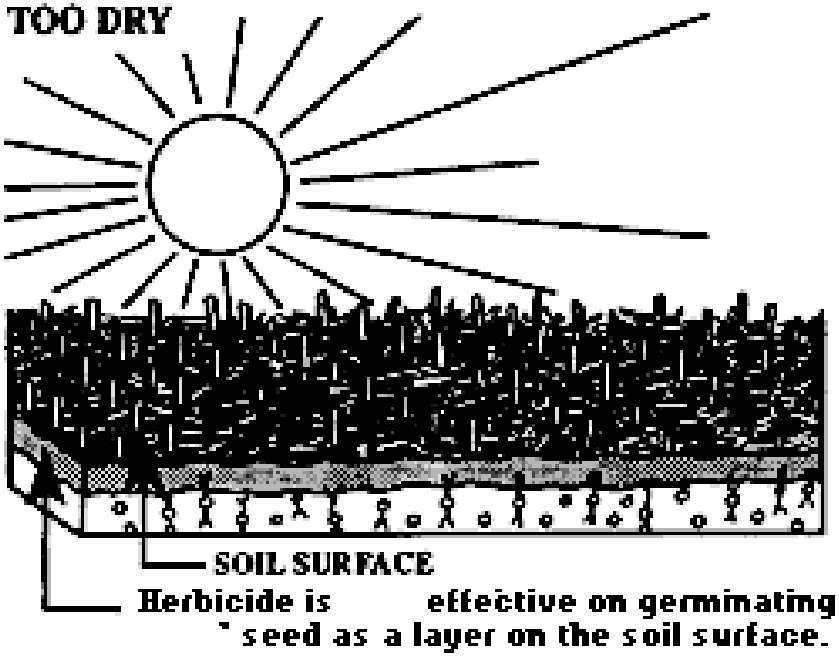
  POST (NC no surfactant)

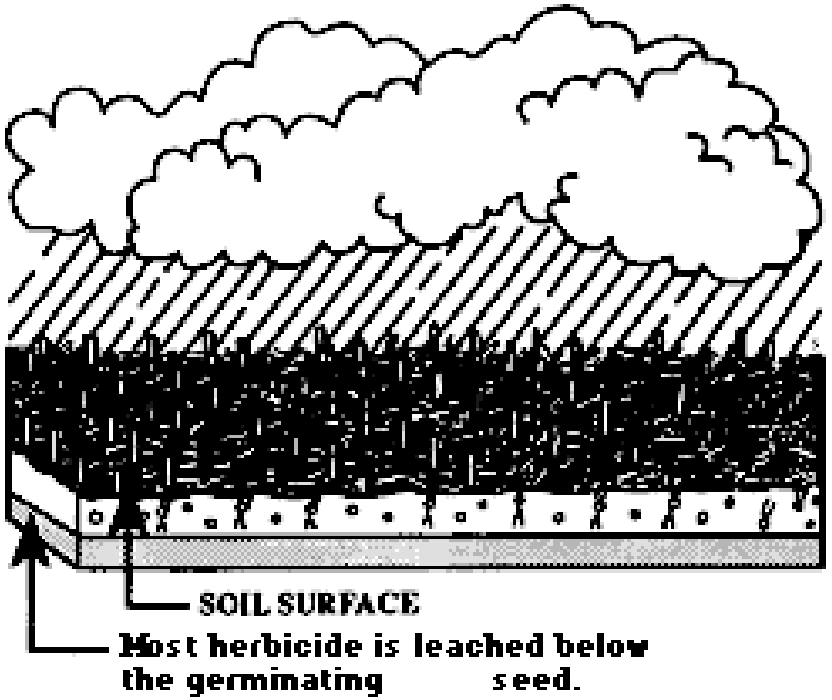
  I

  Injury can occur on sandy soils when applied at a 2X rate. A lack of rainfall can increase the risk of injury.

Reflex injury

Why we saw injury
From Reflex in 2002





EPTC

PINE SEEDLING NURSERIES (LOBLOLLY, SLASH, LONGLEAF, SHORTLEAF)

Apply and incorporate 7 pints EPTAM 7-E per acre 14 days prior to seeding.

PINE SEEDLING NURSERIES (LOBLOLLY, SLASH, LONGLEAF, SHORTLEAF)

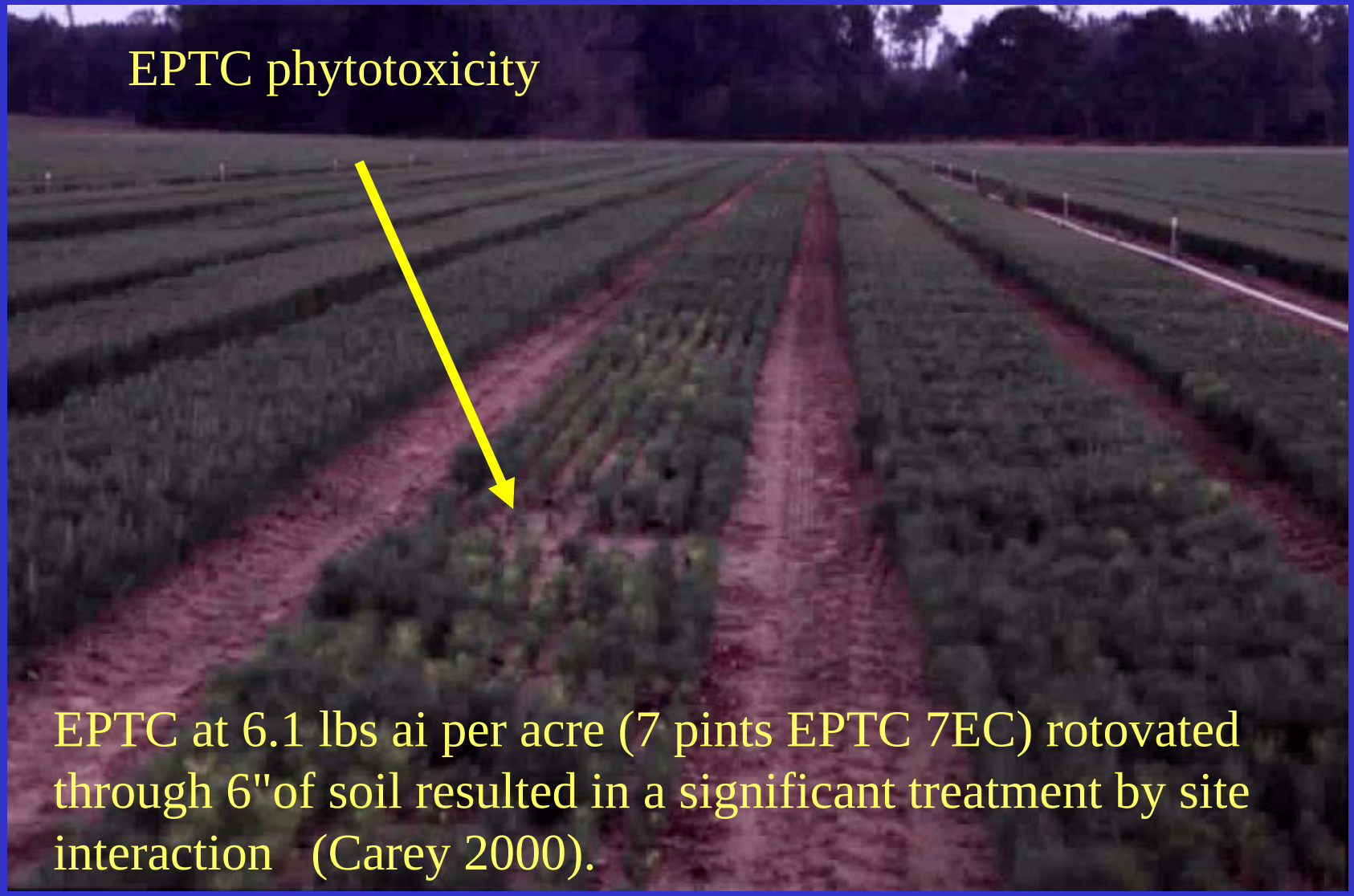
Apply and incorporate 7 pints EPTAM 7-E per acre 14 days prior to seeding.

Temporary control of nutsedge

EPTC Control

EPTC Control


CONTROL
CP
CP/SECT
CP/EPTC


EPTC phytotoxicity
EPTC at 6.1 lbs ai per acre (7 pints EPTC 7EC) rotovated through 6"of soil resulted in a significant treatment by site interaction (Carey 2000).

EPTC at 4 lbs ai per acre (4.5 pints EPTC 7EC) rotovated through 6"of soil resulted in a slight (about 20%) early crop stunting but plants overcame the effect after 40 days (Bullock, Merck, Lanier and Rakestraw 1986).

EPTC at 6.1 lbs ai per acre (7 pints EPTC 7EC) rotovated through 6"of soil resulted in a significant treatment by site interaction (Carey 2000).

1 b. By EPTC averaged over fumigation and species in Georgia

EPTC[C]	May	October	RCD	Ones	Plants	Shoot	Root
Yes	18.4	19.4	4.3	5.0	16.1	52.2	9.4
No	18.3	19.6	4.4	5.5	17.5	48.7	10.1
Lsd	*2.3*	*2.4*	*0.2*	*1.9*	*2.4*	*4.7*	*1.1*

1 c. For EPTC treatment averaged over fumigation in Mississippi

EPTC	May	Oct.	RCD	Ones	Plants	Shoot	Root
Yes	25.4	23.8	3.7a	2.3a	15.7	49 a	13.1
No	25.1	23.6	4.4b	7.2b	17.2	87 b	14.0
Lsd	*1.3*	*1.4*	*2.0*	*3.6*	*2.4*	*11*	*1.6*

EPTC PRECAUTION

- When properly applied and weather conditions exist for normal plant growth through the season, EPTAM 7-E will not harm the treated crop nor should harmful soil residues remain beyond harvest. However, during germination and early growth, extended periods of unusually cold and wet or hot and dry weather…., may weaken crop seedlings.

How do you control this weed?

How do you control sicklepod?

FUMIGATION IS NOT THE RIGHT ANSWER!

clopyralid

Supplemental Labeling

Dow AgroSciences

Dow AgroSciences LLC 9330 Zionsville Road Indianapolis, IN 46268-1054 USA

Stinger*

EPA Reg. No. 62719-73

Control of Sicklepod and Other Susceptible Broadleaf Weeds in Southern Pine Seedbeds in Forest Nurseries

For distribution and use only in the states of Alabama, Arkansas, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas and Virginia

Application Timing

General broadleaf weed control: For best results, apply when weeds are small and actively growing.
Sicklepod: For best results, apply after the majority of basal leaves have emerged.

Application

Apply at a broadcast rate of 1/4 to 1/2 pt per acre in a spray volume of 20 or more gallons per acre. Application may be made any time after May 1, but some needle curling may occur if applied during active conifer growth. When making spot applications, use a calibrated boom, or if a hand-held sprayer is used, care should be taken to apply the spray uniformly and at a rate equivalent to a broadcast

clopyralid

supplemental label

For sicklepod, clover and horseweed

Start out with the low rate (1/4 pint per acre) and treat small acreage first. Once you get used to the product, you can treat larger acres. Do not use a crop-oil or surfactant.
In some cases, stem curling will result but seedlings will usually grow out of this condition. Probably best to wait till the seedlings have some shoot growth (past the "umbrella" stage) around 5 weeks after sowing.

clopyralid

As expected, legumes (Black Locust and Red Bud) are injured when using clopyralid. Thomas Frazier has also seen some injury on Black Alder, Hackberry, and White Dogwood. In contrast, the following hardwoods showed no injury when growing on a high organic matter soil (4.5% to 5%). Results at other nurseries may differ. Yellow Poplar, White Ash, River Birch, Button Bush, Red Osier, Witch Hazel, Persimmon, Cypress, Common Apple, Crab Apple, Indigo Bush, Blackgum Cherry, Gray Dogwood, Silky Dogwood, Green Ash, White Oak, Sugar Maple, Red Maple, Scots Pine, White Pine, Red Cedar, Black Walnut, Chestnut, Overcup Oak, Northern Red Oak, Chinkapin Sawtooth Oak, Willow Oak, Bear Oak, Swamp Chestnut Oak, Hazelnut, Sycamore, Water Oak.

How do you control marestail or **horseweed** ?

4 to 8 oz of Stinger/acre

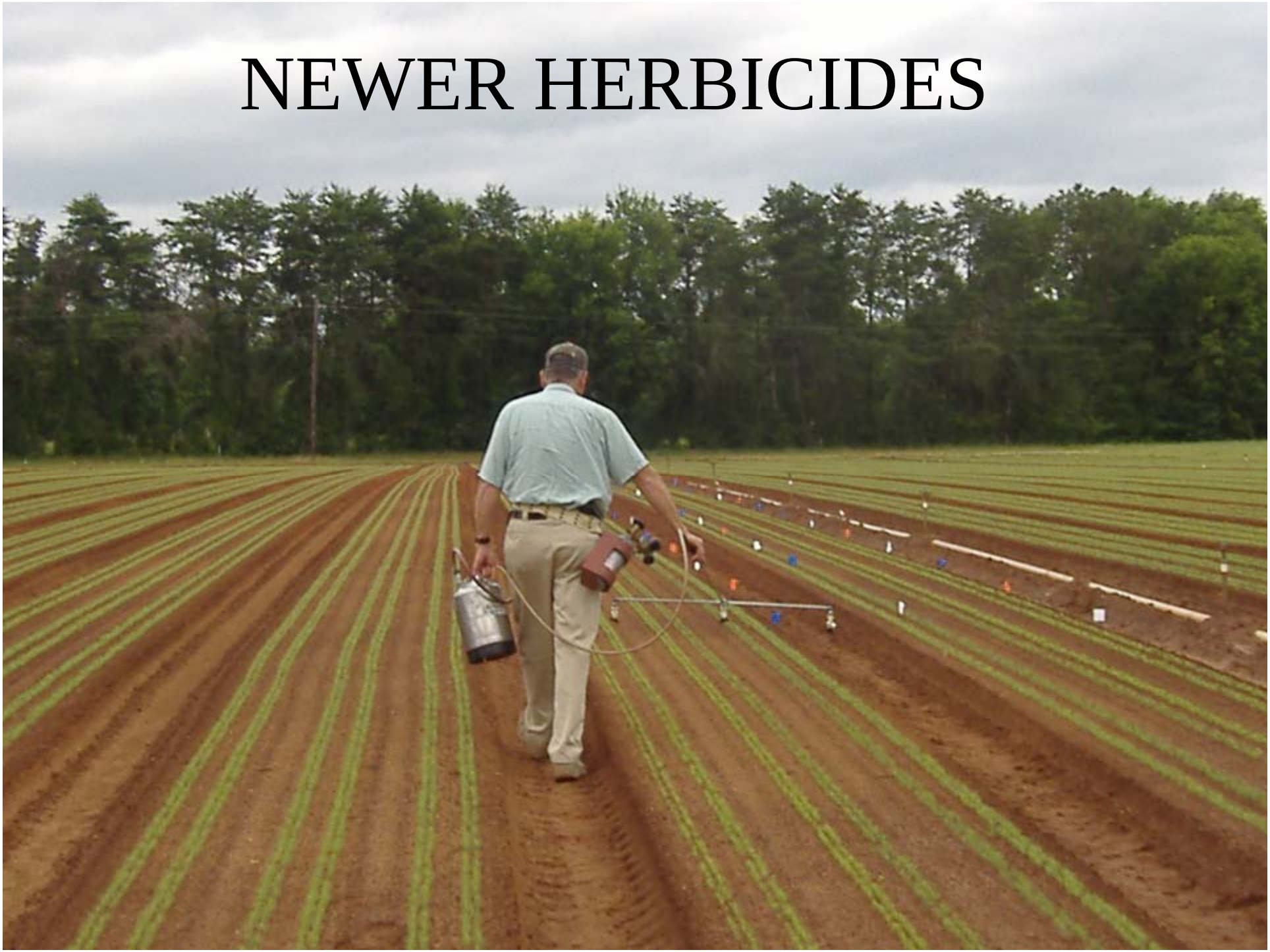
Postemergence only
Up to 5 leaf stage

How do you control white clover?

4 to 8 oz of Stinger/acre

Postemergence only

NEWER HERBICIDES



Pendimethalin

Established Container, or Field-Grown Nursery Stock[2, 3]	1. **DO NOT** apply during bud swell, bud break or at time of first flush of new growth. 2. Apply as a directed or over-the-top spray. 3 If newly budded or graphed rootstock, make an application using a shielded sprayer. 4. Care must be taken to ensure there are no cracks in the soil where **PENDULUM AquaCap** could come into contact with the roots.


We've got some
GOOD NEWS
and some
BAD NEWS


May PendulumAC
May Pendulum
+June PendulumAC
Control


Pendulum AquaCap
No morningglory


MAY 21

September 15, 2008

Control Pendulum

Knots from pendimethalin

11 11:23AM

Knots – May 19 application

Herbicide Galls by nursery

Pendimethalin	Camden	Elberta	Jesup	Trenton	Trenton - two
Lb/acre	----------%----------				
0	0	4	0	0	0
2 + 2	3	24	100	0	--
2	2	23	28	0	2
4	--	--	--	--	18
6	--	--	--	--	30
$LSD_{0.05}$	5	14	12	--	8
P > F	0.2193	0.0080	0.0001	--	0.0002

Questions??

TOWER

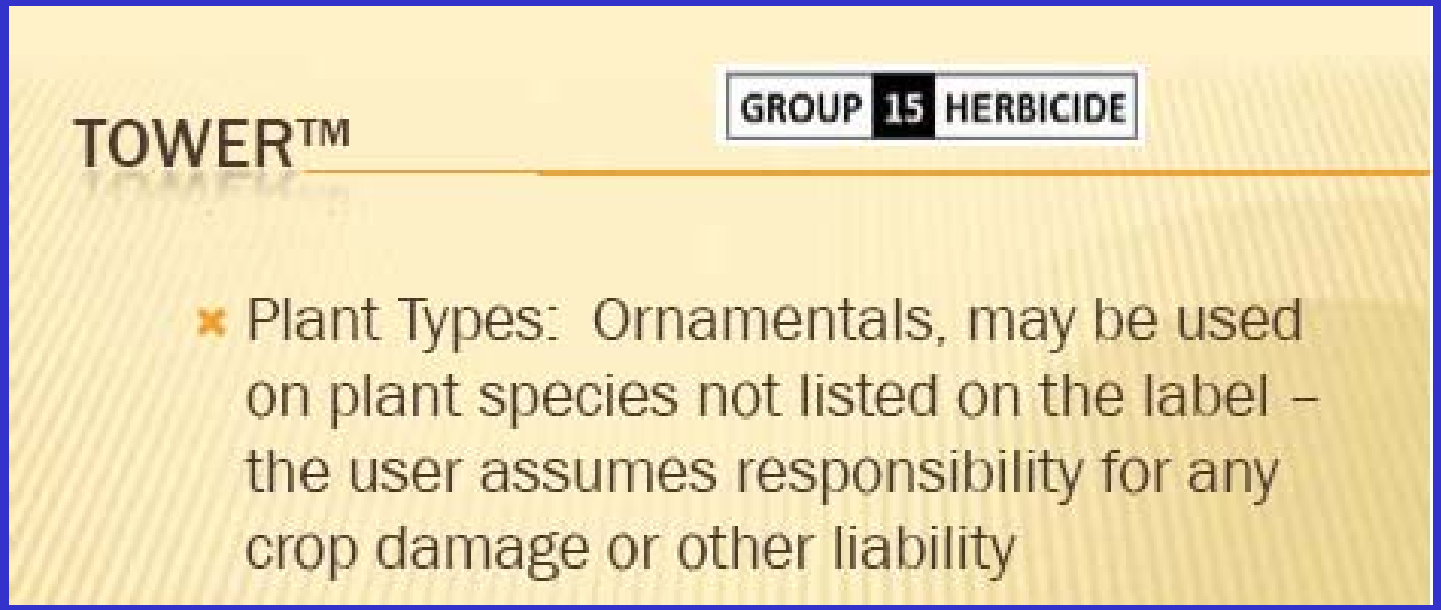
TOWER™

GROUP 15 HERBICIDE

TOWER

- BASF, 6EC
- Active Ingredient: 63.9% dimethenamid-P
- Preemergence control of certain annual grasses, certain broadleaf weeds and sedges in field nurseries and landscaped ornamental areas
- Signal Word: Warning
- Use Rates: 21–32 fl. oz./acre
- PPE: Coveralls, shoes plus socks, chemical-resistant gloves, protective eyewear
- REI: Ag – 12 hours, Non-ag – spray dries

TOWER



We only tested up to 24 ounces/acre

Elberta 2005; 2006
Shubuta 2005; 2006
Atmore 2006

TOWER

Weeds and Grasses Controlled

Over 50 weeds are listed on the **Tower** label, including annual grasses, broadleaves and certain nutsedges.

- *Amaranthus* spp.
- Annual sedges
- Barnyardgrass
- Bluegrass spp.
- Carpetweed
- Crabgrass spp.
- Common purslane
- Doveweed
- Goosegrass
- Nightshade spp.
- Nodding spurge
- Spotted spurge
- Yellow nutsedge
- And more

FreeHand

100 lbs = 1 lb pendimethalin and 0.75 lbs dimethenamid

FreeHand

FREEHAND™

GROUP 3 15 HERBICIDES

- PPE: Coveralls, shoes plus socks, chemical-resistant gloves, protective eyewear
- REI: Ag – 24 hours, Non-ag – dusts have settled
- Plant Types: Ornamentals, may be used on plant species not listed on the label – the user assumes responsibility for any crop damage or other liability

- Weeds Controlled or Suppressed: bittercress, crabgrass, doveweed, eclipta, Florida pusley, liverwort, mulberry weed, phyllanthus (long-stalked), pigweeds, spurges, yellow nutsedge, etc.

FreeHand

Some weeds define the weed control program: Eclipta

- Best: Broadstar and Freehand
- Fair: OH2, Rout, OO, HGH
- Not as good: Snapshot, Showcase, and Surflan
- Poor: Barricade, Pendulum, Ronstar

Dr. Joe Neal

FreeHand

Freehand – How does it compare?

Herbicide	Ann. Grass	Bitter -cress	Dove weed	Eclipta	Spurge	Phyl- lanthus
Freehand	**G**	**G**	**E**	**F-G**	**G**	**F**
OH2	**G**	**G**	**P**	**P-F**	**G**	**F**
Snapshot	**G**	**F**	**P**	**P-F**	**F – G**	**P**
Broadstar	**F**	**G**	**G**	**F**	**G**	**G**
Pendulum	**G**	**F**	**P**	**P**	**G**	**P**

Dr. Joe Neal

Metsulfuron methyl

Vegetation Manager™

ACTIVE INGREDIENT:
METSULFURON METHYL
METHYL 2-[[[[(4-METHOXY-6-METHYL-
1,3,5-TRIAZIN-2-YL)AMINO]-
CARBONYL]AMINO]SULFONYL]BENZOATE 60%
INERT INGREDIENTS: 40%
TOTAL: 100%

METSULFURON METHYL DF

DRY FLOWABLE

SPECIMEN LABEL

DO NOT USE ON FOOD OR FEED CROPS EXCEPT AS RECOMMENDED

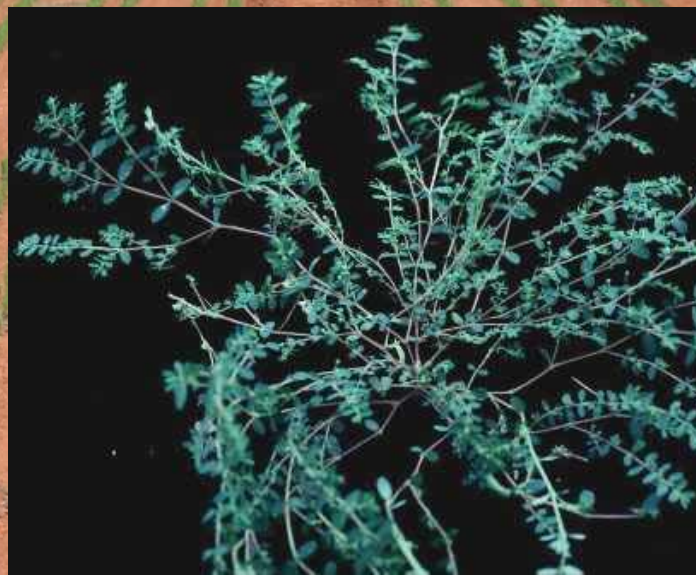
DUPONT

DuPont™ Escort® XP

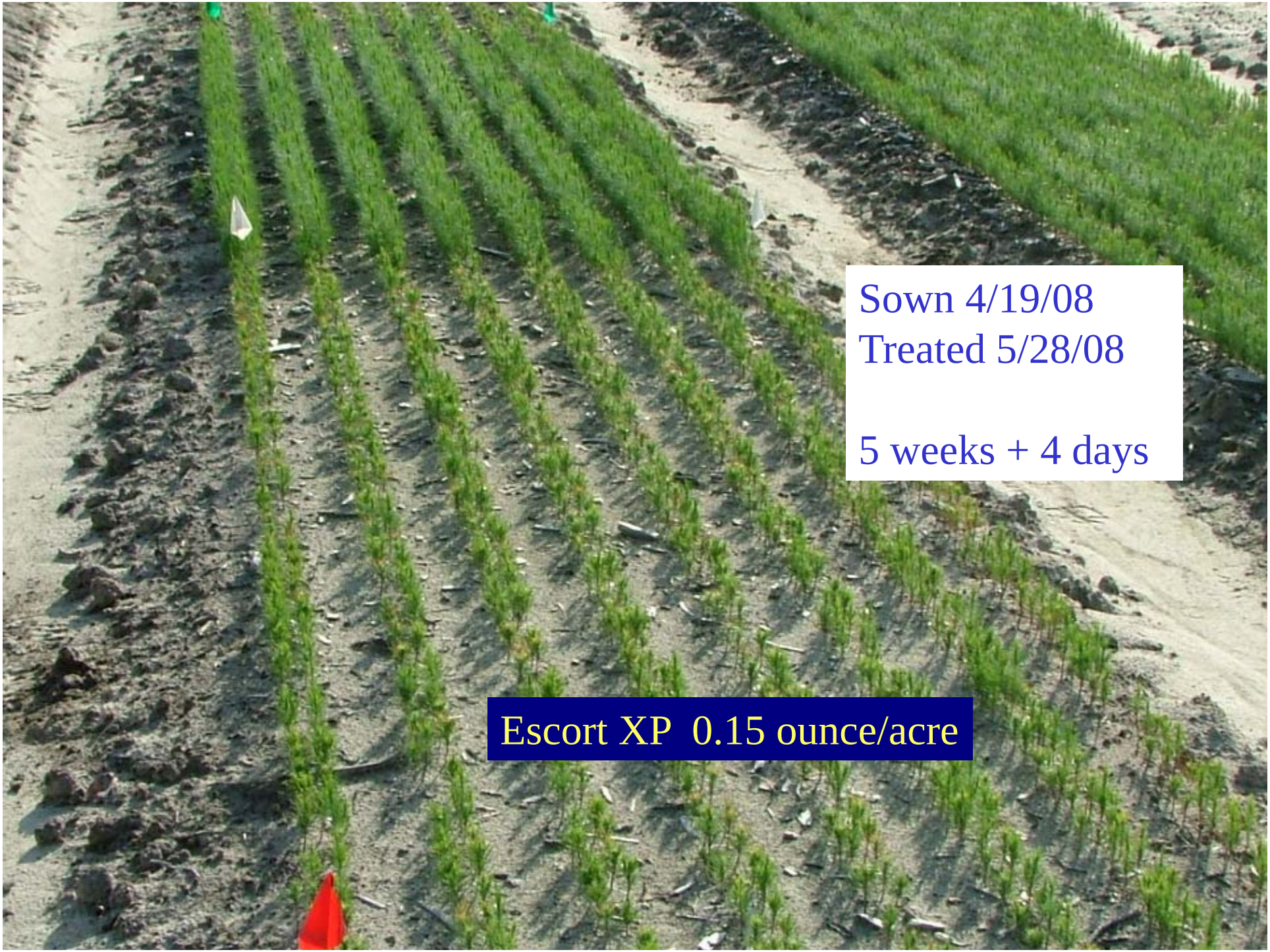
herbicide

0.75 = 0.15 ounce product/acre
1X = 0.2 ounce
1.5 X = 0.3 ounce

$3.20 per acre

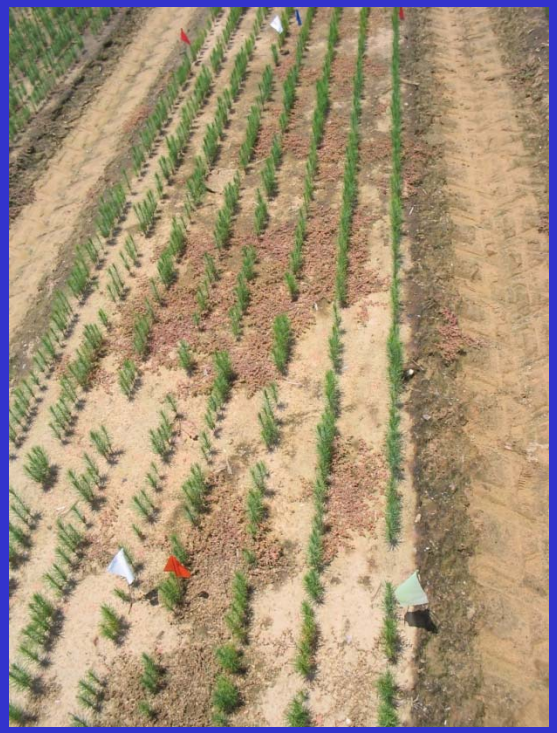



Sown 4/24/08
Treated 5/22/08
Treated 4 weeks after sowing
Escort XP 0.15 ounce/acre


Sown 4/19/08
Treated 5/28/08
5 weeks + 4 days
Escort XP 0.15 ounce/acre

Metsulfuron (5.1 g ai/acre)
photo taken about 92 hours after application

broadcast



control

Trials with stunting - height

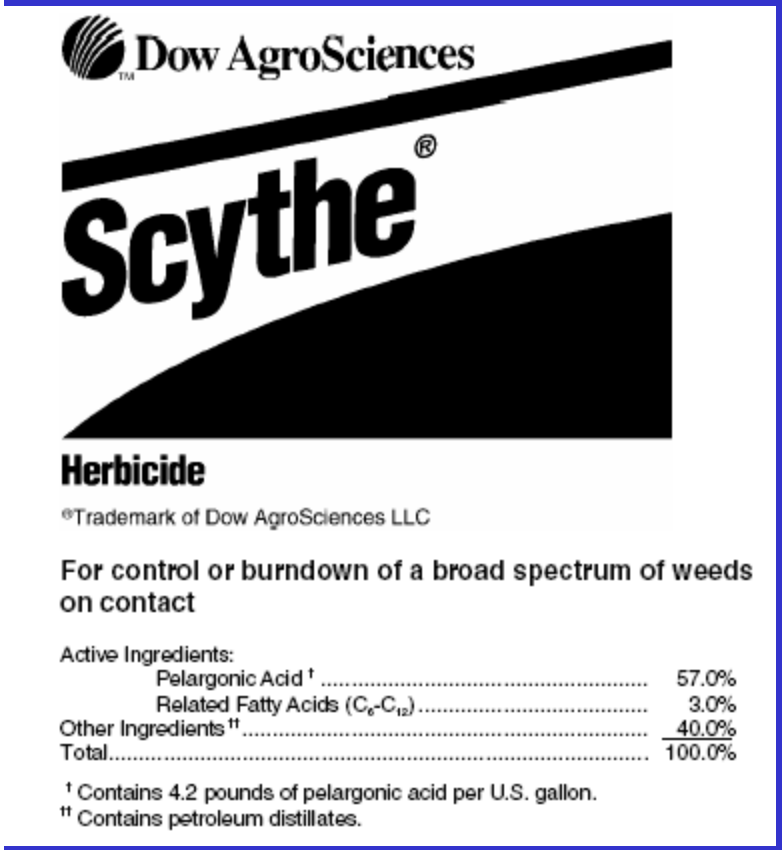
- Atmore 2000
- Elberta 2000
- Camden 2000
- Verbena 2000
- Atmore 2001
- Byromvile 2001
- Ashburn 2001
- Trenton 2001
- Goldsboro 2001
- Elberta 2001
- Shubuta 2001
- Shubuta 2003
- Elberta 2004
- Shubuta 2004
- Atmore 2004
- Elberta 2005
- Shubuta 2005
- Taylor 2006
- Flint River 2006
- Trenton 2007
- Flint River 2007
- Trenton 2008
- Camden 2008
- Jessup 2008

Slash pine is less tolerant of sulfometuron

ESCORT® XP may be applied on conifer and hardwood plantations, and noncrop sites that contain areas of temporary surface water caused by the collection of water between planting beds, **in equipment ruts**, or in other depressions created by management activities

Equipment rut

Scythe trials



Dow AgroSciences

Scythe®

Herbicide

®Trademark of Dow AgroSciences LLC

For control or burndown of a broad spectrum of weeds on contact

Active Ingredients:	
Pelargonic Acid †	57.0%
Related Fatty Acids (C_6-C_{12})	3.0%
Other Ingredients ††	40.0%
Total	100.0%

† Contains 4.2 pounds of pelargonic acid per U.S. gallon.
†† Contains petroleum distillates.

4% Broadcast = 1 gal/a
8% Broadcast = 2 gal/a
8% Directed = 2 gal/a

Visible effects occur within hours. Made of natural fatty acids,

Scythe Herbicide works by removing or “burning” the waxy cuticle of green vegetation.

Trials with pelargonic acid

Non-Crop Use Sites and Use Methods

Use Methods: See the corresponding numbers in the "Use Methods" section under "General Information" for use descriptions and precautions.

Non-Crop Group	Non-Crop Use Sites	Use Methods
Turf, Flowers, Bedding and Landscape Plants	Turfgrass (maintenance, sod or seed production), bedding plant, flowers, and ornamentals	1,2,3,4,5,6
Trees and Shrubs	Christmas trees, forest and commercial trees, landscape trees, nursery trees or shrubs, and fiber farms	1,2,5
Greenhouse and Indoor Use	All crops, plants, and structures	1,2,3,7
Non-Crop, Industrial, and Public Areas	Farmstead, homestead, fallow land, storage areas, schools, paved areas, rights-of-way (*e.g.*, road, railroad, utilities), parking lots, recreation areas (*e.g.*, athletic fields, campgrounds, golf courses, playgrounds), walks, industrial sites (*e.g.*, lumberyard, tank farms, buildings).	1,2,7
Structures, Buildings, and Walkways	Bench, deck, equipment, floor, roof, wall, walks, and evaporative cooling pads.	7
Dry Aquatic Sites, Dry Drainage Systems and Around Aquatic Sites	Applications must be made 72 hours prior to reflooding of dry aquatic sites. Dry ditches, dry canals, ditch banks, and for use above the water line or after drawdown of agricultural irrigation water and ditch systems, industrial ponds and disposal systems, and impounded water areas.	1,7

1. **Vegetative Burndown:** General control of weeds for seedbed or site preparation, non-crop and around aquatic sites. Spot treatments may be used in crop and pasture situations.
2. **Directed and Shielded Sprays:** Applications may be made in and around desirable plants when contact of foliage and green bark is avoided.

5. **Sucker Control, Pruning and Trimming:** To burn back unwanted basal sucker growth on woody trees and foliage growth on vines, and excessive cane growth in brambles. Apply only to unwanted vegetative parts. Apply before suckers become woody.

1 gallon/acre - $45

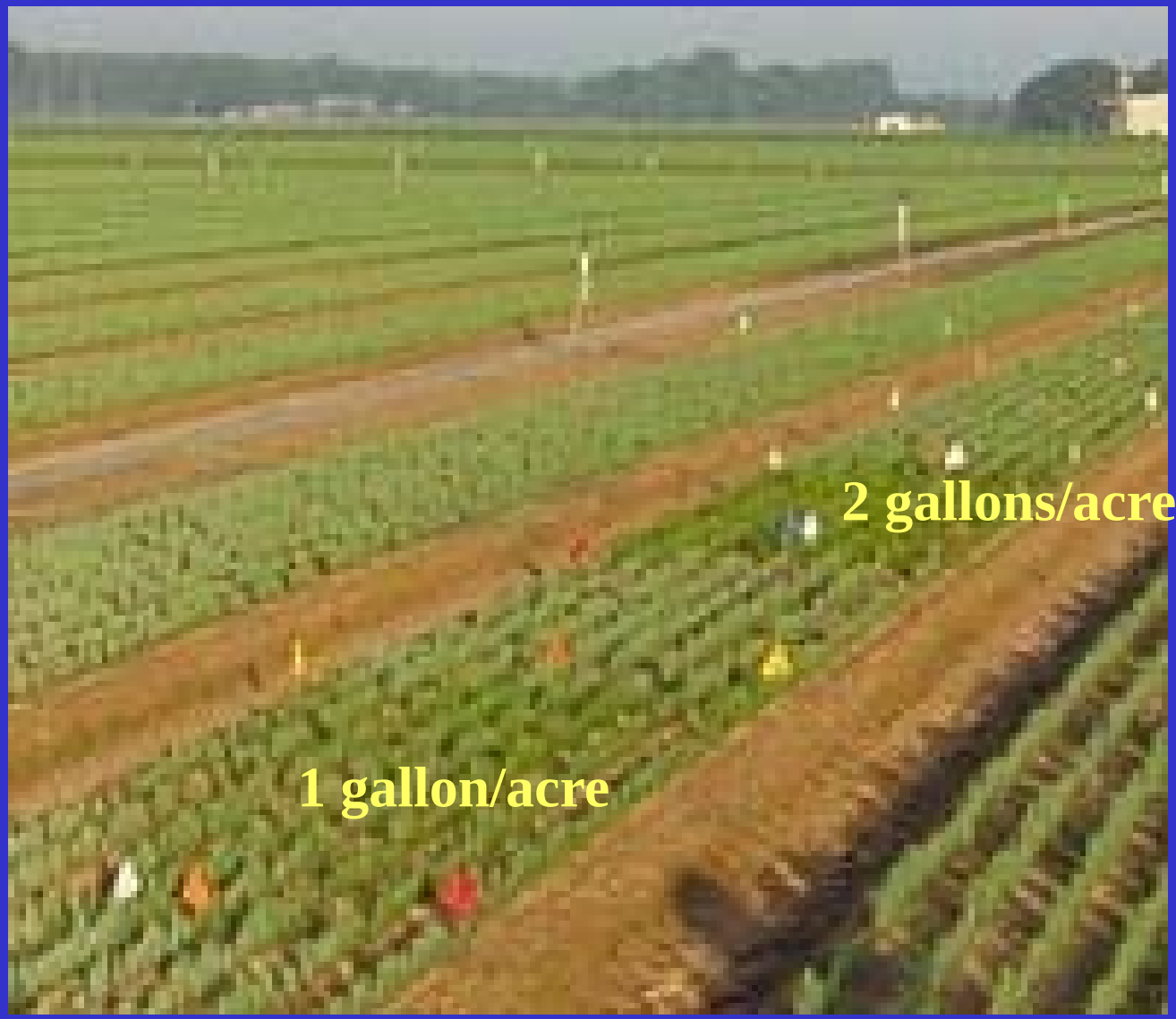
2 gallons/acre $90

2 gallons/acre

4 gallons/acre

As with many herbicides, AI/acre is more important than percentage….

Scythe Plots taken about 16 hours after application



Scythe Plots taken about 92 hours after application

Broadcast

Directed

HARDWOODS

Table 1. A partial list of hardwoods produced in forest tree nurseries in 2002–2003 (adapted from McNabb and VanderSchaaf 2003).

Common name	Genus	Species	Seedlings produced
Oak	*Quercus*	various	27,325,800
Green ash	*Fraxinus*	*pennsylvanica*	2,621,500
Yellow poplar	*Liriodendron*	*tulipifera*	1,282,800
Dogwood	*Cornus*	*florida*	892,900
Pecan	*Carya*	*illinoensis*	892,000
Sycamore	*Platanus*	*occidentalis*	782,000
Sweetgum	*Liquidambar*	*styraciflua*	638,200
Black walnut	*Juglans*	*nigra*	508,000
Cottonwood	*Populus*	*deltoides*	320,000
Others	—	—	11,849,000
Total			47,112,200

Table 1. Weeds mentioned by hardwood nursery managers in 2006.

Common name	Species	State
Barnyardgrass	*Echinochloa crus-galli*	Michigan
Hairy crabgrass	*Digitaria sanguinalis*	Wisconsin
Goosegrass	*Eleusine indica*	Arkansas
Sourgrass	*Digitaria insularis*	Alabama
Witchgrass	*Panicum capillare*	New Hampshire
Yellow nutsedge	*Cyperus rotundus*	Alabama, Iowa
Carpetweed	*Mollugo verticillata*	New Hampshire
Creeping charlie	*Glechoma hederacea*	Iowa
Chickweed	*Stellaria media*	Michigan
White clover	*Trifolium repens*	Minnesota, West Virginia
Dayflower	*Commelina communis*	Iowa
Eclipta	*Eclipta alba*	Oklahoma
Horseweed	*Conyza canadensis*	Michigan, Wisconsin
Redroot pigweed	*Amaranthus retroflexus*	Louisiana, New Hampshire
Common purslane	*Portulaca oleracea*	New Hampshire, Wisconsin
Spurge	*Chamaesyce maculata*	Alabama, New Hampshire, Wisconsin

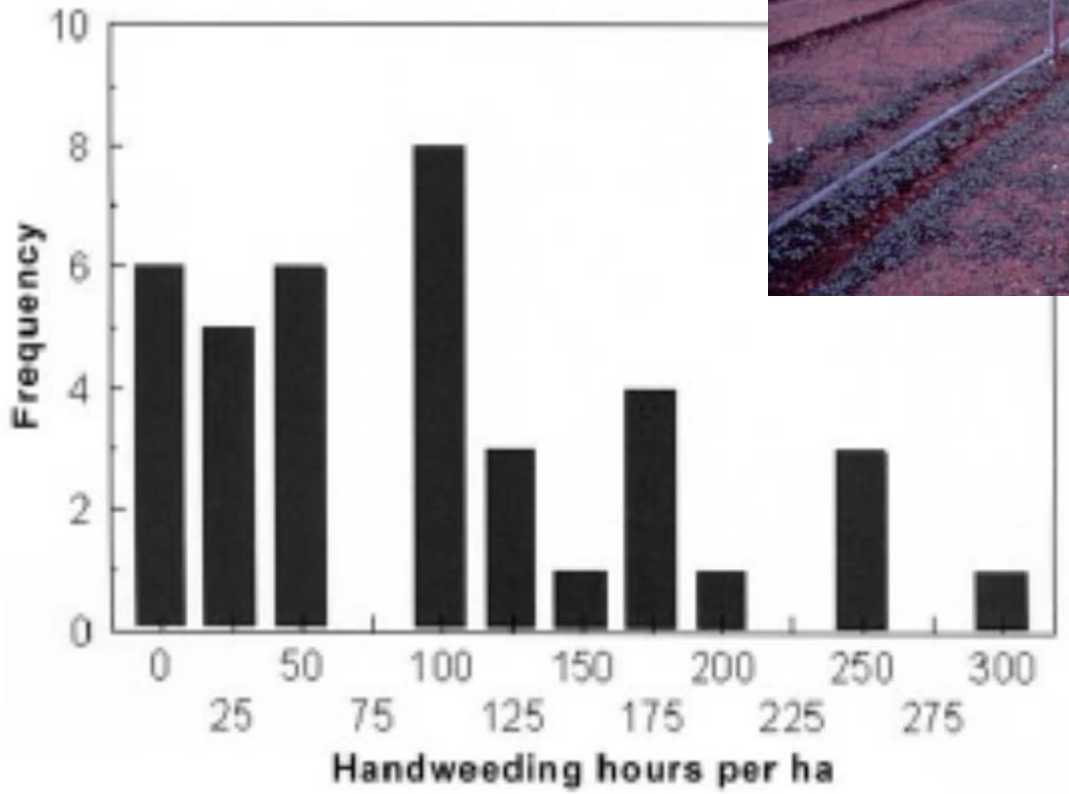


Figure 2. Annual hand weeding required in hardwood seedbeds (data from a 2006 survey of hardwood nurseries). One nursery with no hand weeding employed sanitation practices, soil fumigation, and multiple applications of herbicides.

Table 2. A partial list of pesticides used at 15 hardwood nurseries and the total amount used on 51 ha in 2001.

Common name	Original trade name	Additional trade names	Total used in 2001 (kg ai)	Restricted use pesticide	Restricted entry interval (h)
Herbicides					
clopyralid	Lontrel	Stinger	2.3	No	12
fluazifop-butyl	Fusilade	—	9.5	No	12
glyphosate	Roundup	Various	51.3	No	4
oryzalin	Surflan		0.2	No	24
oxyfluorfen	Goal	Galigan	10.4	No	24
napropamide	Devrinol		148	No	12
prodiamine	Barricade	Endurance; Factor	33.6	No	12
sethoxydim	Poast	Sethoxydim	28	No	12
trifluralin	Treflan	Trifluralin	7.7	No	12
		Total	291		

6 southern nurseries –

Goal, Vantage, Poast, Roundup, Treflan

20 northern nurseries –

Princep, Goal, Endurance Pendulum, Dacthal, Vantage, Roundup Fusilade, Poast, Devrinol, Paraquat

Hardwood Weed Control: Iowa Department of Natural Resources Forestry, Iowa State Nursery

Roger Jacob

Pre-Emergent Treatments

We have a pre-emergent herbicide that we apply on each species after sowing and before germination. These, of course, vary by species groups, and the timing can be altered for weather and other factors.

Post-Emergent Treatments

Post-emergent treatments may be used during the growing season according to weather and weed growth. We will normally apply an application of Pendulum® 3.3EC (4.7 L /ha [2 qt/ac]) around the first of July. This is usually done during irrigation to avoid spotting of the leaves and consequential stunting of plants. We may also apply a treatment of Vantage® or Fusilade® DX if we have enough grass pressure to warrant this application. Spot treatments of Lontrel® or Stinger® may be applied, mainly for thistle. Spot treatments of Classic® may also be used for yellow nutsedge (*Cyperus esculentus*). In areas of known yellow nutsedge pressure, we will use Pennant® as a pre-emergent wherever it is safe on the crop.

We have also developed shielded sprayers for spraying between rows, between beds, and along pipeline areas. These sprayers are mainly used with Roundup® Original, although pre-emergent herbicides are often added to try to discourage regrowth.

Table 1. Iowa State Forest Nursery, Ames 2008 Herbicide Program.

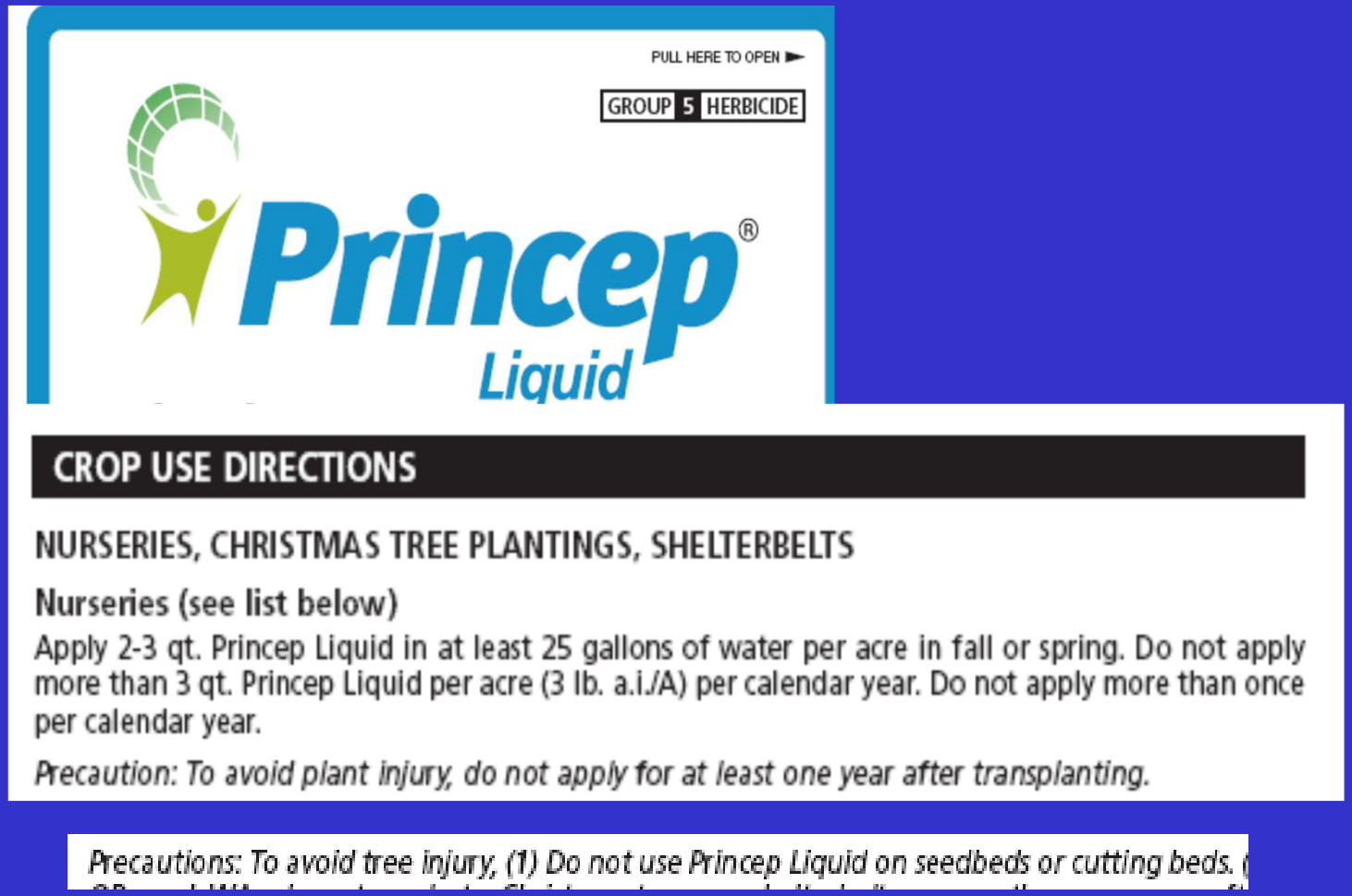
Herbicide used	Application rate	Nursery crop
Surflan®	4.7 L/ha (2 qt/ac)	Serviceberry (*Amelanchier* spp.)
		Ninebark (*Physocarpus* spp.)
		Elderberry (*Sambucus* spp.)
Pendulum® 3.3EC	4.7 L/ha (2 qt/ac)	Buttonbush (*Cephalanthus occidentalis*)
		Arrowwood (*Viburnum recognitum*)
		Nannyberry (*Viburnum lentago*)
		Cranberry (*Viburnum opulus*)
		Basswood (*Tilia americana*)
		Hard maple (*Acer* spp.)
		Hackberry (*Celtis occidentalis*)
		Chokeberry (*Aronia* spp.)
Pendulum® 3.3EC	2.4 L/ha (1 qt/ac)	Sycamore (*Platanus occidentalis*)
		River birch (*Betula nigra*)
Princep® 4L	2.4 L/ha (1 qt/ac)	Gray dogwood (*Cornus racemosa*)
Pendulum® 3.3EC	4.7 L/ha (2 qt/ac)	Red-osier dogwood (*Cornus stolonifera*)
		Silky dogwood (*Cornus amomum*)
		Wild plum (*Prunus* spp.)
		Chokecherry (*Prunus virginiana*)
		Nanking cherry (*Prunus tomentosa*)
		Black cherry (*Prunus serotina*)
		Kentucky coffeetree (*Gymnocladus dioicus*)

Vantage® or Fusilade® can be used as a post-emergent to kill grasses over all species, except during the first 3 weeks after germination.
A second application of Pendulum® 3.3EC may be applied, if needed, after plants reach approximately 5 cm (2 in) in height. This usually occurs in mid-June to July. When applying, wet the plants first and water immediately after, or apply while watering.
Stinger® or Lontrel® can be applied over the crop for some broadleaf control, particularly thistle.
Scepter® can be applied over the crop to control some broadleaf species, particularly in poplar and oak species.
Classic® can be applied over the crop to control nusedge, particularly in oak species.

Princep® 4L	4.7 L/ha (2 qt/ac)	Silver maple (*Acer saccharum*)	S
Pendulum® 3.3EC	4.7 L/ha (2 qt/ac)		
Princep® 4L	7.1 L/ha (3 qt/ac)	All oaks (*Quercus* spp.)	S
Goal® 2XL	2.4 L/ha (1 qt/ac)	Walnut (*Juglans* spp.)	S
Pendulum® 3.3EC	4.7 L/ha (2 qt/ac)	Pecan (*Carya illinoensis*)	S
Roundup® Original	4.7 L/ha (2 qt/ac)	Hickory (*Carya* spp.)	S
		All carryover hardwoods	1-3 yr.
Princep® 4L	4.7 L/ha (2 qt/ac)	Hazelnut (*Corylus americana*)	S
Pendulum® 3.3EC	4.7 L/ha (2 qt/ac)	All carryover shrubs	1-2 yr.

Sugarberry

Sweetberry



Iowa has a loam soil

Shielded herbicide applicators

Fall sowing

Integrated approach results in few weeds

Straw mulches introduce weed seed

Integrated approach results in few weeds

Agrilock does not introduce weed seed

Questions?

halosulfuron