

HERBICIDE TRIAL UPDATES

SFNMC FY 2020 ADVISORY MEETING
OCTOBER 30 – OCTOBER 31, 2019

STUDIES INSTALLED IN 2019

- BAREROOT Post-Emergent Herbicide Screening Study – year 4
- CONTAINER Ronstar®Flo Pre-emergent Herbicide Study – year 3
- CONTAINER TapOut® Post-Emergent Herbicide Study – year 1

BAREROOT POST-EMERGENT HERBICIDE SCREENING STUDY – YEAR 4

- To determine seedling tolerance to post-emergent herbicides not currently labeled for conifer nurseries (RR19-04, RR18-04, RR17-02)
- 10 herbicides applied at lowest labeled rate
- Applications made at 9 to 11 weeks post-sowing
- 4 replicated studies in loblolly pine, 1 replicated study in slash pine
- 4 SFNMC member nurseries: Georgia Forestry Commission, K and L Forest Nursery, IFCO Jesup GA nursery and IFCO White City AL nursery
- Manufacturers or dealers provided samples of herbicides
- Selection based on labeled weeds controlled (study not designed to quantify weed control)

17 POST-EMERGENT HERBICIDES TESTED SINCE 2016

- Basagran[®] (bentazon)
- Beacon[®] (primisulfuron)
- Defendor[®] (florasulam)
- Dismiss[®] (sulfentrazone)
- Envoke[®] (trifloxysulfuron)
- Frequency[®] (topramezone)
- Grasp[®] (penoxsulam)
- Mission[™] (flazasulfuron)
- Plateau[®] (imazapic)
- Ronstar[®]Flo (oxadiazon)*
- ShieldEx[®] (tolpyralate)
- Strada[®] (orthosulfamuron)
- TapOut[®] (clethodim)**
- Tenacity[®] (mesotrione)
- Valor[®] (flumioxazin)
- Velocity[®] (bispribac)
- Venue[™] (pyraflufen)

* Labeled for pre-emergent use in conifer nurseries

** Labeled to control grasses in conifer nurseries

10 POST-EMERGENT HERBICIDES TESTED IN 2019

- ~~Basagran[®] (bentazon)~~
- Beacon[®] (primisulfuron) - year 1
- Defendor[®] (florasulam) - year 4
- ~~Dismiss[®] (sulfentrazone)~~
- Envoke[®] (trifloxysulfuron) - year 4
- Frequency[®] (topramezone) - year 3
- Grasp[®] (penoxsulam) - year 3
- ~~Mission[™] (flazasulfuron)~~
- ~~Plateau[®] (imazapic)~~
- Ronstar[®]Flo (oxadiazon)* - year 2
- ShieldEx[®] (tolpyralate) - year 2
- Strada[®] (orthosulfamuron) - year 2
- ~~TapOut[®] (clethodim)**~~
- Tenacity[®] (mesotrione) - year 1
- ~~Valor[®] (flumioxazin)~~
- ~~Velocity[®] (bispiribac)~~
- Venue[™] (pyraflufen) - year 2

* Labeled for pre-emergent use in conifer nurseries

** Labeled to control grasses in conifer nurseries

10 POST-EMERGENT HERBICIDES TESTED IN 2019

Product	Primary Crop	Weeds controlled (our most common)	Mode of Action (Group)
Beacon®	corn	yellow nutsedge, morningglory, pigweed, sicklepod	ALS inhibitor (2)
Defendor®	turf	catchweed, kylinga, yellow nutsedge	ALS inhibitor (2)
Envoke®	cotton	horseweed, carpetweed, Florida beggarweed, morningglory, yellow and purple nutsedge, pigweed, sicklepod	ALS inhibitor (2)
Frequency®	ROW, pine plantations	Palmer amaranth, horseweed, morningglory, pigweed, crabgrass, goosegrass	Pigment Synthesis Inhibitor (27)
Grasp®	rice	eclipta, rice flatsedge, smartweed, pigweed	ALS inhibitor (2)
Ronstar®Flo	turf, conifer nurseries	crabgrass, goosegrass, annual sedge, prostrate spurge	PPO Inhibitor (14)
ShieldEx®	corn	Palmer amaranth, carpetweed, horseweed, morningglory, pigweed, crabgrass, goosegrass	Pigment Synthesis Inhibitor (27)
Strada®	rice	eclipta, rice flatsedge, morningglory, redstem, yellow nutsedge	ALS inhibitor (2)
Tenacity®	turf	carpetweed, crabgrass, goosegrass, lovegrass, marestalk, pigweed	Pigment Synthesis Inhibitor (27)
Venue™	fruit & nut trees, vines	Palmer amaranth, bedstraw, Florida beggarweed, carpetweed, eclipta, morningglory	PPO Inhibitor (14)



Tenacity® damage in slash
2 weeks after spraying
7-22-19



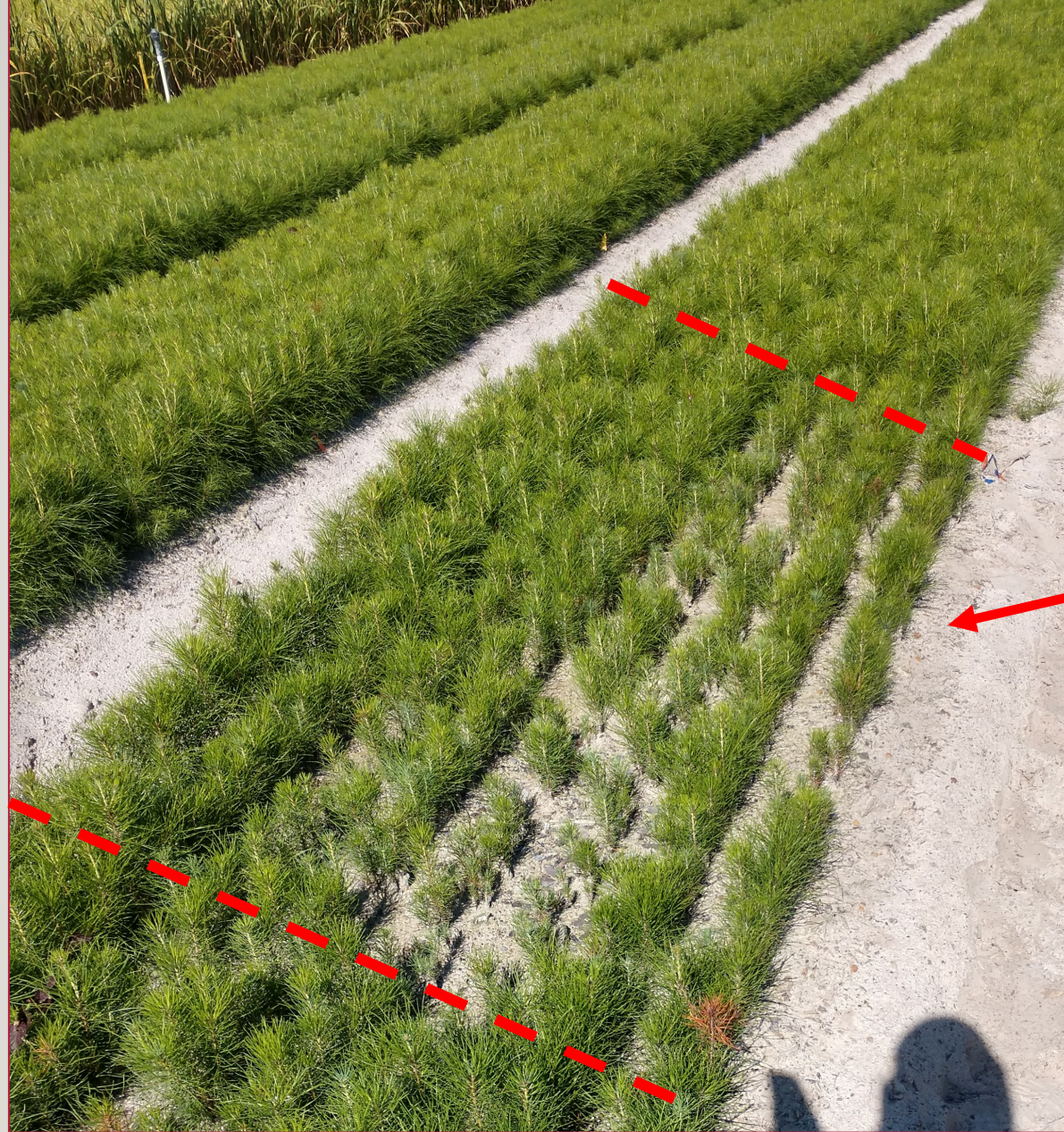
Grasp[®] plot in slash
6 weeks after spraying
8-22-19*

*Visual damage also seen in
Beacon[®], Defendor[®],
Tenacity[®] and
Frequency[®] plots
at this nursery



Grasp[®] plots in loblolly
8 weeks after spraying
8-29-19*

*Visual damage also seen
in Defendor[®] and
Tenacity[®] plots
at this nursery



Venue[®] plot in loblolly
8 weeks after spraying
9-3-19

SEEDLING COLLECTION AND MEASUREMENTS

- Seedling characteristics to be measured include:
 - Seedling density
 - Root collar diameter
 - Shoot height
 - Dry weight of shoots
 - Dry weight of roots
 - Notes of stem, needle or root deformity or discoloration

Photos of possible carryover effects taken June 14, 2019

Estimated plot locations
from 2018 post-emergent
herbicide screening study

Seedlings dug June 14, 2019 from
2018 post-emergent herbicide
study plots, and seedlings from
a bed not included in 2018 study

Post-2019 study:
Record locations of plots
for review in 2020



CONTAINER RONSTAR®FLO PRE-EMERGENT HERBICIDE STUDY – YEAR 3

- To identify safe (seedling tolerant) herbicide providing control of black willow and other weeds in containers (RR19-05, RR18-01)
- 2 SFNMC nurseries with 8 replicated studies: 4 in loblolly pine, 2 in longleaf pine, 1 in shortleaf pine, 1 in slash pine
- Increased sample size from previous trials (30 – 50 treated trays per installation)
- Single rate of 40 oz./ac applied
- Applications made on day of or one day after trays are sown and capped
- Applications made once per week for 2 weeks (Westervelt nursery) to 6 weeks (IFCO Moultrie GA nursery) to capture willow seed dissemination period and sow times for 4 pine species

Seedling tolerance results from Research Report 18-01 (YR 1)

Table 2. Container pine seedling characteristics treated with Ronstar®Flo in four species, IFCO Nursery, Moultrie, GA.

Species	Rate	Survival ¹ (% Fill)	Shoot Height (cm)	RCD (mm)	Shoot Weight (g)	Plug Weight ² (g)
Loblolly	0 oz./ac	92.7 a	26.2	3.72	2.05	11.38
	40 oz./ac	93.2 a	26.6	3.75	2.09	11.52
	80 oz./ac	90.2 a	26.7	3.78	2.12	11.69
	122 oz./ac	86.5 b	26.1	3.78	2.07	11.81
Longleaf	0 oz./ac	83.4	26.6	8.10	3.12	13.73
	40 oz./ac	82.9	26.4	8.18	3.08	13.77
	80 oz./ac	83.7	26.1	8.18	3.10	13.69
	122 oz./ac	79.8	26.3	8.30	3.18	13.89
Shortleaf	0 oz./ac	88.0	21.5	3.99	1.86	11.22
	40 oz./ac	89.1	21.8	3.92	1.90	11.37
	80 oz./ac	86.7	21.9	3.98	1.92	11.38
	122 oz./ac	88.0	22.0	3.98	1.90	11.36
Slash	0 oz./ac	93.5	28.7	4.22	2.77	12.61
	40 oz./ac	92.5	28.4	4.21	2.66	12.77
	80 oz./ac	89.9	27.8	4.14	2.61	12.78
	122 oz./ac	90.2	27.6	4.18	2.64	12.62

Seedling tolerance results from Research Report 19-05 (YR 2)

Table 1. Container pine seedling characteristics treated with Ronstar®Flo in two species, IFCO Nursery, Moultrie, GA.

Species	Application Date	Rate	Survival ¹ (% Fill)	Shoot Height (cm)	RCD (mm)	Shoot Weight (g)	Plug Weight ² (g)
Longleaf	3/21/18	0 oz./ac	85.0	29.6	8.86 a	4.10 a	13.74 a
		40 oz./ac	83.1	29.6	8.49 b	3.71 b	13.61 a
		80 oz./ac	84.2	29.9	8.83 ab	4.11 a	14.08 b
Longleaf	3/28/18	0 oz./ac	88.1 a	28.8	7.66 ab	3.50	12.07
		40 oz./ac	83.5 b	28.6	7.95 a	3.54	11.83
		80 oz./ac	87.0 a	29.3	7.45 b	3.58	11.81
Loblolly	4/2/18	0 oz./ac	97.8	30.1	3.65 a	2.00	10.39
		40 oz./ac	98.0	30.3	3.72 ab	1.99	10.29
		80 oz./ac	95.3	30.3	3.78 b	1.95	10.39
Loblolly	4/10/18	0 oz./ac	98.2	31.5	3.94	2.35 a	11.77 a
		40 oz./ac	97.4	31.2	3.89	2.25 a	11.21 b
		80 oz./ac	97.4	31.2	3.85	2.10 b	11.23 b

Willow control results from Research Report 18-01 (YR 1)

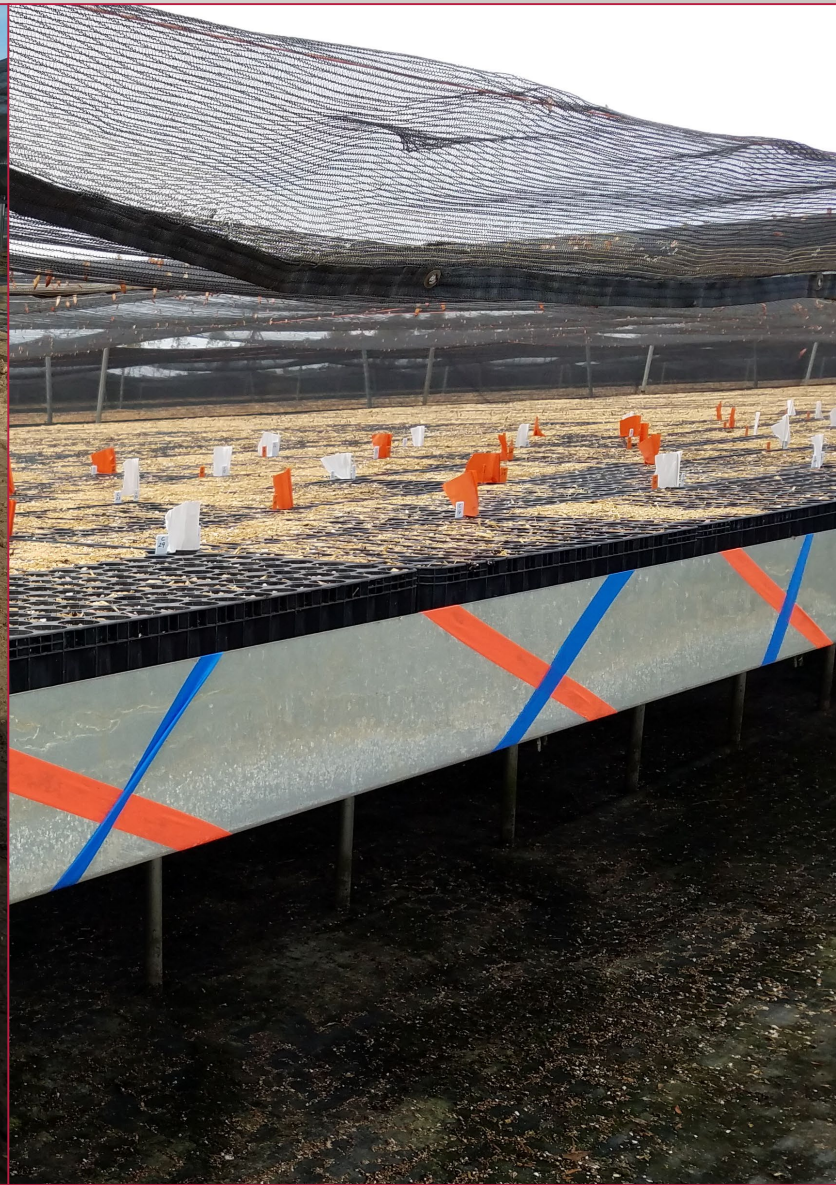
Table 3. Percent likelihood of no willow or other weed populations in containers treated with Ronstar®Flo in four species, IFCO Nursery, Moultrie, GA.

Species	Rate	% likelihood of 0 willows present in 1 container tray	% likelihood of 0 other weeds present in 1 container tray
Loblolly	0.0 oz./ac	20.0	80.0
	40 oz./ac	<u>86.7</u>	100.0
	80 oz./ac	<u>100.0</u>	86.7
	122 oz./ac	<u>93.3</u>	100.0
Longleaf	0.0 oz./ac	53.3	86.7
	40 oz./ac	<u>100.0</u>	100.0
	80 oz./ac	<u>100.0</u>	100.0
	122 oz./ac	<u>100.0</u>	100.0
Shortleaf	0.0 oz./ac	*	*
	40 oz./ac	*	*
	80 oz./ac	*	*
	122 oz./ac	*	*
Slash	0.0 oz./ac	*	66.7
	40 oz./ac	*	<u>100.0</u>
	80 oz./ac	*	<u>100.0</u>
	122 oz./ac	*	<u>93.3</u>

Willow control results from Research Report 19-05 (YR 2)

Table 2. Percent likelihood of no willow or other weed populations in containers treated with Ronstar®Flo in two species, IFCO Nursery, Moultrie, GA.

Species	Application Date	Rate	% likelihood of 0 willows present in 1 container tray	% likelihood of 0 other weeds present in 1 container tray
Longleaf	3/21/18	0 oz./ac	86.7	93.3
		40 oz./ac	100.0	100.0
		80 oz./ac	100.0	92.3
Longleaf	3/28/18	0 oz./ac	73.3	80.0
		40 oz./ac	<u>100.0</u>	<u>100.0</u>
		80 oz./ac	<u>100.0</u>	<u>100.0</u>
Loblolly	4/2/18 ¹	0 oz./ac	13.3	40.0
		40 oz./ac	<u>100.0</u>	73.3
		80 oz./ac	<u>100.0</u>	73.3
Loblolly	4/10/18	0 oz./ac	26.7	73.3
		40 oz./ac	<u>73.3</u>	<u>100.0</u>
		80 oz./ac	<u>46.7</u>	<u>100.0</u>



SEEDLING COLLECTION AND MEASUREMENTS

- Seedling characteristics to be measured include:
 - Seedling density
 - Root collar diameter
 - Shoot height
 - Dry weight of shoots
 - Dry weight of root plugs
- Willow and weed counts/identification will be made

CONTAINER TAPOUT® (CLETHODIM) POST-EMERGENT HERBICIDE STUDY – YEAR I

- To quantify the effect of multiple rates of the selective grass herbicide TapOut® (clethodim) on seedlings grown in container media and its effect on controlling grass in containers
- 1 SFNMC nursery (IFCO Moultrie GA) with 2 replicated studies: 1 in loblolly pine, 1 shortleaf pine
- Multiple rates of 4.5, 9 and 16 oz./ac applied (9 oz./ac is lowest labeled rate, 16 oz/ac is highest labeled rate)
- Applications made on June 5, 2019 at 7 weeks post-sowing in loblolly pine, at 4 weeks post-sowing in shortleaf pine



Selective Grass Herbicide

ACTIVE INGREDIENT:	BY WT.
*Clethodim	12.6%
OTHER INGREDIENTS	87.4%
TOTAL	100.0%

Contains Petroleum Distillates
*(E). 2-[1-[[[3-chloro-2-propenyl]oxy]imino]propyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexen-1-one. Contains 0.97 lbs. Clethodim per gal.

KEEP OUT OF REACH OF CHILDREN CAUTION

PRECAUTIONARY STATEMENTS Hazards to Humans & Domestic Animals CAUTION

Harmful if swallowed. Causes moderate eye irritation. Avoid contact with eyes, skin or clothing. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum or using tobacco. Prolonged or frequently repeated skin contact may cause allergic reactions in some individuals.

FIRST AID

IF SWALLOWED: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give anything by mouth to an unconscious person. **IF IN EYES:** Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor immediately for advice. **IF ON SKIN OR CLOTHING:** Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice. **IF INHALED:** Move person to fresh air. If person is not breathing, call 911 or an ambulance, and then give artificial respiration, preferably mouth-to-mouth, if possible. Call a poison control center or doctor for further treatment advice. **HOT LINE NUMBER:** Have the product container or label with you when calling a poison control center or doctor, or going for treatment. You may also contact (800) 424-9300, collect day or night, for emergency medical treatment information. **NOTE TO PHYSICIAN:** Ingestion of this product or subsequent vomiting can result in aspiration of light hydrocarbon liquid, which can cause pneumonia. If ingested, probable mucosal damage may contraindicate the use of gastric lavage. May pose an aspiration pneumonia hazard. Contains petroleum distillate.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling. REFER TO LABEL BOOKLET FOR COMPLETE DIRECTIONS FOR USE.

STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal.

PESTICIDE STORAGE: Store in original containers only. Keep container closed when not in use. Do not store near food or feed. In case of spill on floor or paved surfaces, mop and remove to chemical waste storage area until proper disposal can be made if product cannot be used according to the label.

PESTICIDE DISPOSAL: Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative of the nearest EPA Regional Office for guidance in proper disposal methods.

CONTAINER REUSE: Do not reuse this container unless it is specifically labeled for reuse. Do not reuse this container for any other purpose. Clean the container before reuse. Do not reuse this container for any other purpose. Cleaning the container before reuse is the responsibility of the person disposing of the container. Cleaning before refilling is the responsibility of the refiller. Offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or incineration, or, if allowed by State and local authorities, by burning. If burned, stay out of smoke. **Refillable Container (250 gallon & bulk):** Refill this container with pesticide only. Do not reuse this container for any other purpose. Cleaning the container before final disposal is the responsibility of the person disposing of the container. Cleaning before refilling is the responsibility of the refiller. Offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or incineration, or, if allowed by State and local authorities, by burning. If burned, stay out of smoke.

SEE INSIDE BOOKLET FOR ADDITIONAL PRECAUTIONARY STATEMENTS AND COMPLETE DIRECTIONS FOR USE

EPA Reg. No. 5905-578 AD 111014
EPA Est. No.: First letters of product batch code indicate producing establishment: 5905-AR-1=WA; 5905-GA-1=CG; 5905-IA-1=DI; 5905-CA-1=KC

Manufactured For
HELENA CHEMICAL COMPANY
225 SCHILLING BOULEVARD, SUITE 300
COLLIERVILLE, TENNESSEE 38017

DIRECTIONS FOR ANNUAL GRASSES (ALL CROPS)

- Apply only to actively growing grasses at specified weed heights.
- Apply when the first grass weed species in a mixed grass weed population reaches the specified growth stage for treatment.
- Use the high rate under heavy grass pressure and/or when grasses are at maximum height.
- Do not exceed the maximum per application rate listed in Table 1, CROP SPECIFIC USE DIRECTIONS, RESTRICTIONS AND LIMITATIONS FOR TAPOUT.

GRASS SPECIES	SCIENTIFIC NAME
Barleygrass	<i>Echinochloa crus-galli</i>
Broadleaf Signalgrass	<i>Bracharia platyphylla</i>
Brome	
California	<i>Bromus carinatus</i>
Chest	<i>Bromus cecilius</i>

DIRECTIONS FOR PERENNIAL GRASSES (ALL CROPS)

- Apply only to actively growing grasses at specified weed heights.
- Apply when the first grass weed species in a mixed grass weed population reaches the specified growth stage for treatment.
- Use the high rate under heavy grass pressure and/or when grasses are at maximum height.
- Do not exceed the maximum per application rate listed in Table 1, CROP SPECIFIC USE DIRECTIONS, RESTRICTIONS AND LIMITATIONS FOR TAPOUT.

CONIFER TREES

TAPOUT can be used to control labeled grasses in Christmas tree farms, conifer nurseries and conifer plantations (but not in forests).

COMMON NAME	SCIENTIFIC NAME
Arborvitae, American	<i>Thuja occidentalis</i>
Cedars	<i>Cedrus</i> spp.
Cypress	<i>Taxodium</i> spp.
Fir, Douglas	<i>Pseudotsuga menziesii</i>
Firs	<i>Abies</i> spp.

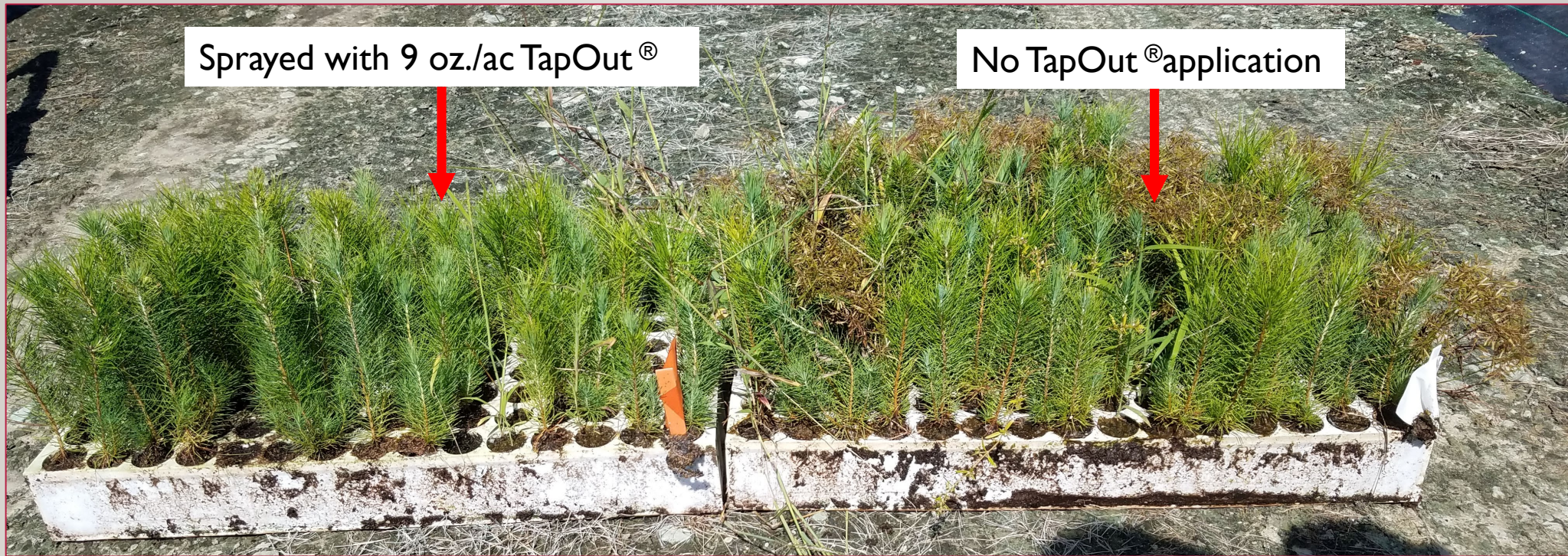
COMMON NAME	SCIENTIFIC NAME
Hemlock, Canadian/Eastern	<i>Tsuga canadensis</i>
Hemlock, Western	<i>Tsuga heterophylla</i>
Pines	<i>Pinus</i> spp.
Spruces	<i>Picea</i> spp.
Yew	<i>Taxus</i> spp.

Clovegrass (Dunkgrass)	<i>Eragrostis cilianensis</i>
Rabbitsfootgrass	<i>Polypogon monspeliensis</i>
Red Rice	<i>Oryza sativa</i>
Ryegrass	
Hardy	<i>Lolium remotum</i>
Italian	<i>Lolium multiflorum</i>
Seedling Johnsongrass	<i>Sorghum halepense</i>
Shattercane	<i>Sorghum bicolor</i>
Southwestern Cupgrass	<i>Eriochloa gracilis</i>
Sprangletop	
Amazon	<i>Leptochloa panicoides</i>
Bearded	<i>Leptochloa fascicularis</i>
Mexican	<i>Leptochloa uniuervia</i>
Red	<i>Leptochloa filiformis</i>

Quackgrass (<i>Elytrigia repens</i>)		
First Application	12	32
Repeat Application(s) (if regrowth occurs)	12	32
Rhizome Johnsongrass (<i>Sorghum halepense</i>)		
First Application	12 to 24	32
Repeat Application(s) (if regrowth occurs)	9 to 18	24
Wirestem Muhly (<i>Muhlenbergia frondosa</i>)		
First Application	4 to 8	32
Repeat Application(s) (if regrowth occurs)	4 to 8	32
Perennial Bluegrass		
[Roughstalk (<i>Poa trivialis</i>)]		
[Kentucky (<i>Poa pratensis</i>)]		
First Application	2 to 4	32
Repeat Application(s)	2 to 4	32
Bentgrass (<i>Agrostis</i> spp.)		
First Application	2 to 4	32
Repeat Application(s) (if regrowth occurs)	2 to 4	32

WEED HEIGHT (inches)	APPLICATION RATES	
	MINIMUM RATE Fl. Oz./A	MAXIMUM RATE Fl. Oz./A
3 (or up to 6" runners) 3 (or up to 6" runners)	12 12	32 32
4 to 8 4 to 8	12 12	32 32
2 to 6 2 to 6	12 12	32 32
4 to 8 4 to 8	12 12	32 32
4 to 12 4 to 12	12 12	32 32
12 to 24 6 to 18	12 9	32 24
4 to 8 4 to 8	12 12	32 32
2 to 4 2 to 4	12 12	32 32
2 to 4 2 to 4	—	32 32

TapOut[®] trial in shortleaf applied at 4 weeks post-sowing
Photo taken at 16 weeks after spray application*



*From visual inspection in September, most trays (treated and untreated) have grass in them. Depending on results from collections, consider factors of rates (too low?), timing (too late?), multiple sprays (too few?)

SEEDLING COLLECTION AND MEASUREMENTS

- Seedling characteristics to be measured include:
 - Seedling density
 - Root collar diameter
 - Shoot height
 - Dry weight of shoots
 - Dry weight of root plugs
- Grass counts/identification will be made

CONTACT

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