Applied Weed Control Technology
Tropical Turf Grass Management
Research to develop improved control of grassy weeds in Bermuda sport turf.
10/19/2015

Dr. Joe DeFrank – UH-TPSS

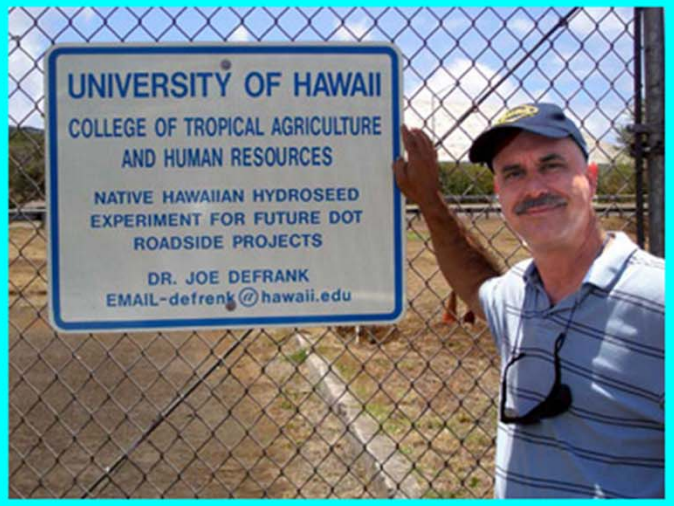
Tropical Plant & Soil Sciences Department
University of Hawaii at Manoa

For more information on topics covered

http://www.ctahr.hawaii.edu/deFrankJ/index.htm

WEED CONTROL IN HAWAII WITH DR. JOE DEFRANK

Professor of Weed Science - University of Hawaii Department of Tropical Plant and Soil Science



Weed Science 481-Fall 2011- Lecture notes and handouts

Weed ID Gallery - Economically Important weeds in vegetables, turf and potted ornamentals in Hawaii.

Streaming Media Content

Plants for People: Beverage Crops, Fall 2011 with Dr. Skip Bittenbender

ASHS 2011 WORKSHOP: Propagation Techniques of Select Tropical Ornamentals, Specialty Crops, and Native Plants in Hawaii

TPSS 491/711 Digital Tools for Scientific Content Fall 2012

For more information on topics covered

http://www.ctahr.hawaii.edu/deFrankJ/index.htm

Weed Control in Tropical Turf and Roadside Landscapes Planted to Native Hawaiian Plants. Seminar presented at the 15th Annual Crop Protection Services Seminar and Tradeshow on May 15, 2015 (posted 05/18/15).

Master Gardening Training, Oahu: Weed Science-2015 (posted 03/30/15).

Weed Control in Tropical Cropping Systems. Departmental seminar in Tropical Plant and Soil Science. (posted 03/23/15).

Time of Year Considerations for Grassy Weed Control in Warm Season Turf. Seminar presented at the Pacific Agriculture Sales and Service Trade Show. (posted 02/03/15).

Pesticide Safety, weed control and no-till organic farming technique. Workshop for World Farmer Exchange on Maui 2014 to 2015 (posted 11/03/14).

Improved Air Layer methods for Tropical Hardwood: Fruits, Ornamentals and Forest Species. Lecture for TPSS 364 Fall 2014.

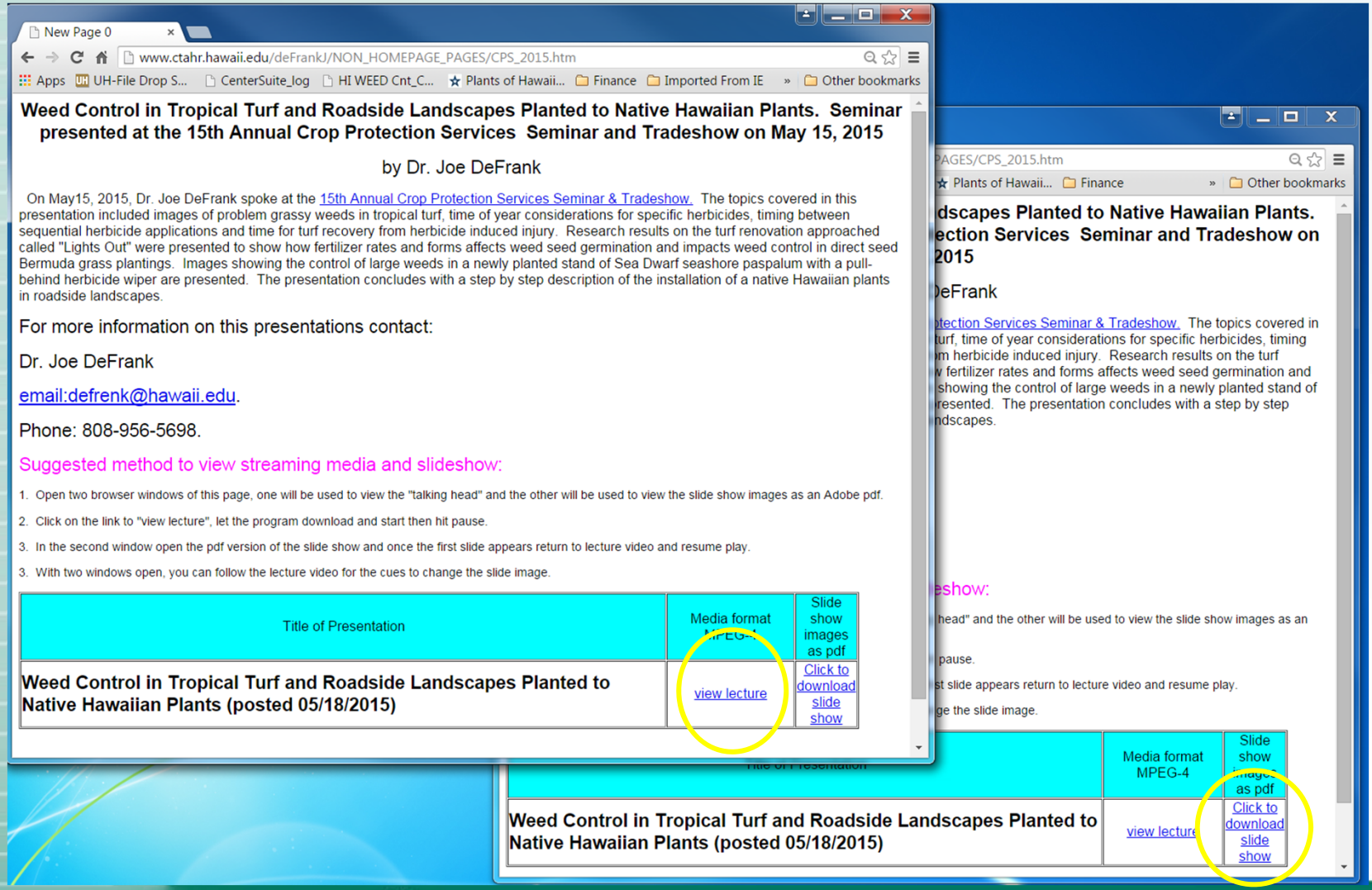
Control of Grassy Weeds in Bermuda Grass Sport Turf at Waipio Soccer Fields, Research Review and Case Study for Summer and Winter Weed Cleanup in Late 2013 and Summer of 2014.

New Developments in Grassy Weed Control in Bermuda and Seashore Paspalum Turf in Hawaii-2014. Seminar presented at the 14th Annual Seminar & Tradeshow held on Friday, May 23, 2014 at the Honolulu Country Club.

Master Gardeners Weed Science Classes for 2014 on Maui, Oahu and Kauai. Dr. DeFrank's weed science short course on weed science concepts provided to the Master Gardener's class of 2014.

For more information on topics covered

Viewing tips for live seminar presentations – Open 2 browser windows 1- for video and 1 – for high resolution slides as pdf



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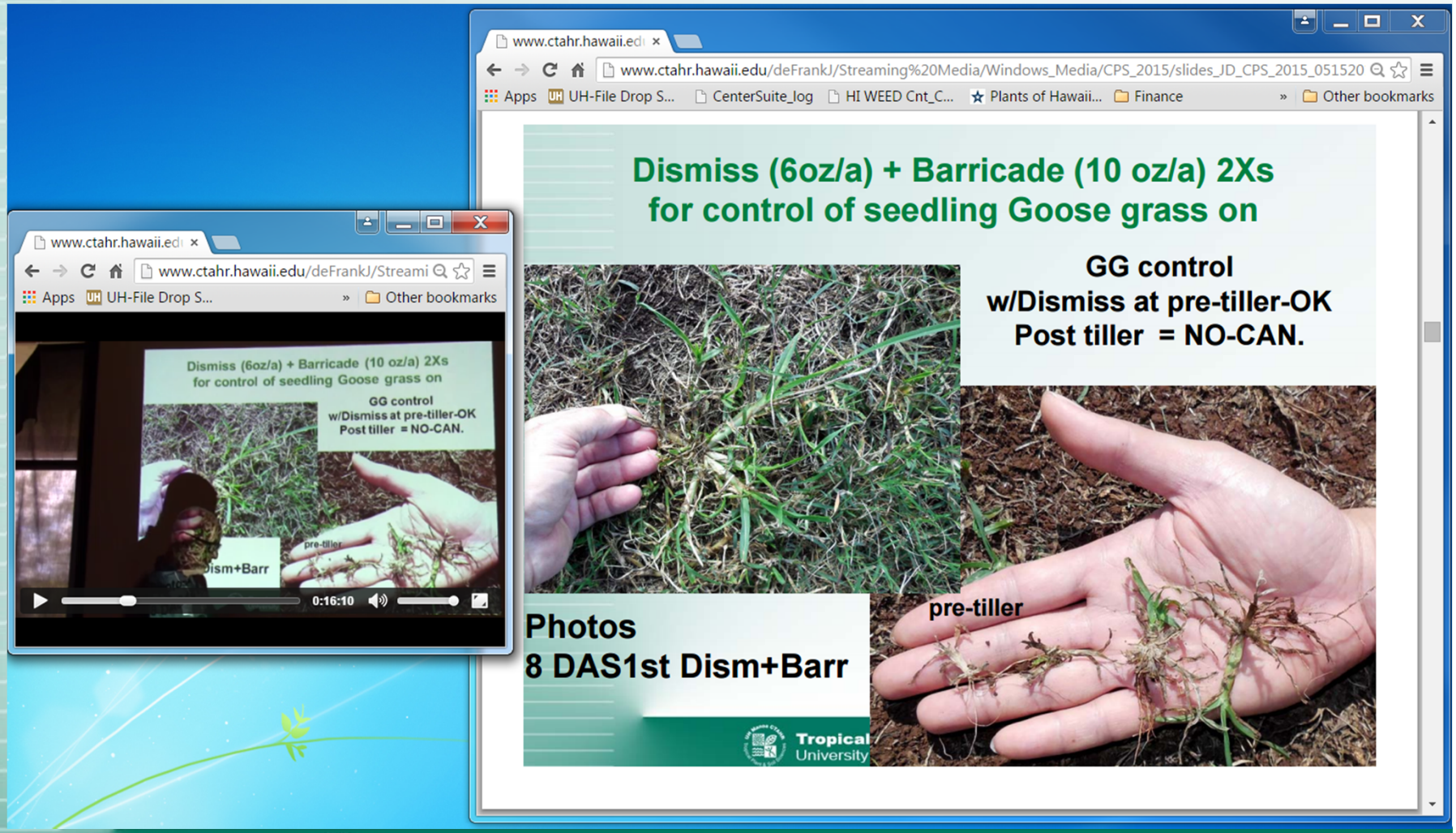

Topics Covered – 2015

1. Grassy Weed ID for turf
2. Time of year and weed control
3. Wipers for applying turf pesticide

Grassy Weeds in Hawaiian Turf

- Australian Carpet Grass
- Hilo Grass
- Goose grass
- Dallisgrass
- Love grass
- Henry's and India CG
- Star Grass
- Smut grass
- Pitted Beardgrass

Forest Starr & Kim Starr

Australian carpet grass

Axonopus compressus

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Hilo grass

Paspalum conjugatum

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Similar looking weedy grasses

Goose grass

Eleusine indica

Dallisgrass

Paspalum dilatatum

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Love grass

Eragrostis amabilis
Eragrostis tenella

Carolina Love grass

Eragrostis pectinacea

Forest & Kim Starr

Henry's Crabgrass

Digitaria ciliaris

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India Crabgrass

Digitaria longiflora

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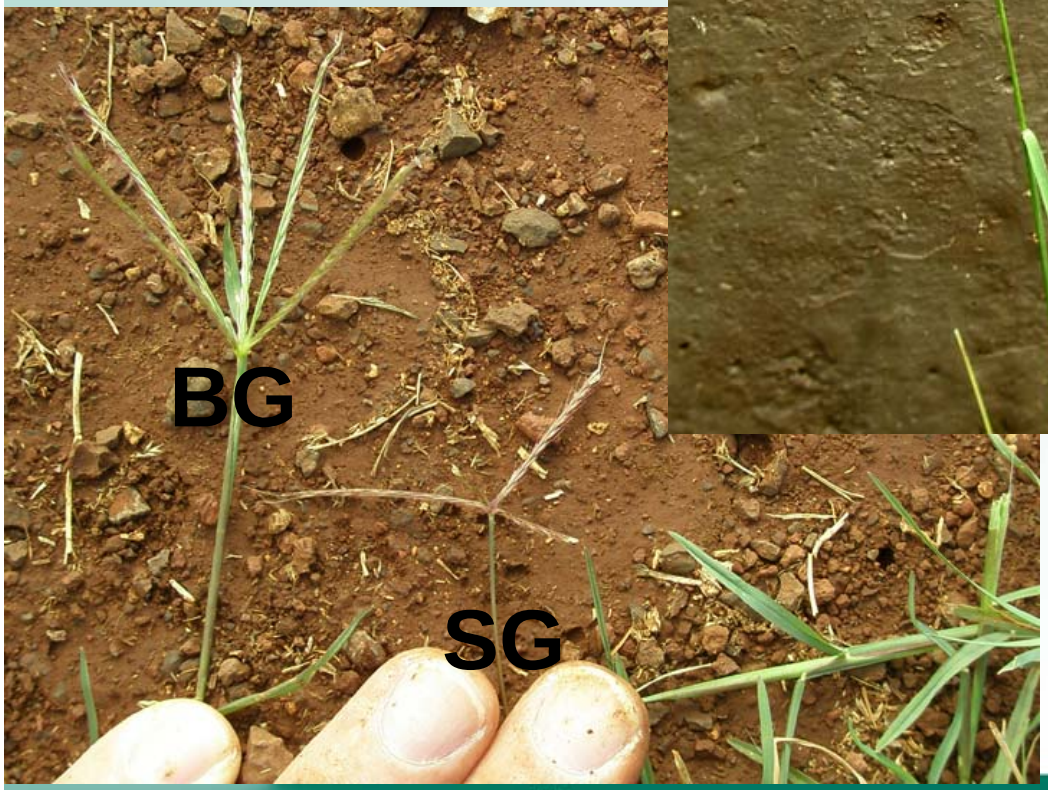
Star Grass

Chloris divaricata



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Star Grass

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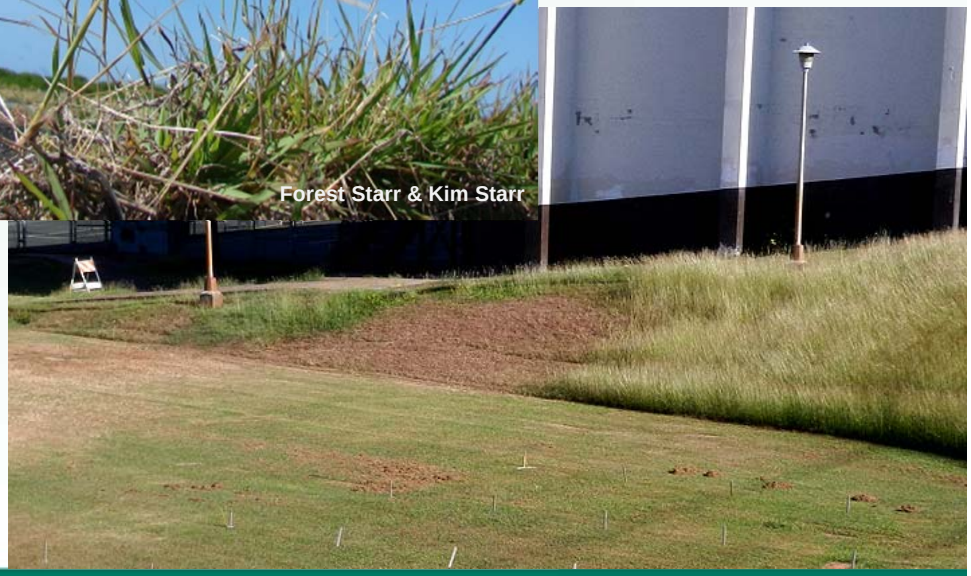
Smutgrass

Sporobolus indicus

Pitted beardgrass

Bothriochloa pertusa

Forest Starr & Kim Starr



What is selective weed control in ornamental turf?

In the summer of 2013, field research in HI, demonstrated the effectiveness of Tenacity + Sencor tank mix for the control of Goose grass and Love grass.

Prior to this time, a good "selective" chemical control in Bermuda grass was not available for these two large well established grassy weeds in Hawaii.

"Selective" weed control has new meaning:

"Selective" used to mean good weed control with little to no noticeable turf injury.

Now, "selective" control means: "**is the turf injury, that is very noticeable, worth the weed control obtained"?**

Assumptions for **TIME OF YEAR** considerations for selective weed control based on case studies at the Waipio Soccer field (winter 2013 to summer 2014).

Municipal sport turf is the case study model

Winter season protocol

1. **Nov.-March in Hawaii, Bermuda grass slow growing = semi dormant.**
2. **Weedy grass growth favored allowing for wider spread.**
3. **Cool wet weather reduces the effectiveness of certain herbicide with mode of action is based on "growing the weeds to death".** All of the herbicides within this mode of action act upon specific enzymes to prevent production of amino acids. Amino acids are the "building blocks" for proteins for plant growth and development of a plant.
4. **Nov.-Dec.-Jan. slow time for sport turf use by community.**
5. **More tolerance of significant turf injury = yellowing and turf burn out.**

Tank mix of 5 oz/a Tenacity + 8 oz/a Sencor + 1% v/v MSO applied 2Xs Provided near complete cleanup of Goose grass and Love grass with common Bermuda grass recovery in 75-80 days Dec.-Feb. period in Hawaii.

Waipio Winter Season Case Study

2013-Dec. Honolulu City and County treats

8 acres at Waipio

4 oz Tenacity + 8 oz Sencor + 1% MSO - 2X's

12/10 & 12/23/2013 = Start of Winter Program

22 DAS02 Ten(4 oz/a)+Sen (8 oz/a) – 01/06/14

42 DAS02 Ten(4 oz/a)+Sen (8 oz/a) – 01/26/14

22 DAS02 Ten(4 oz/a)+Sen (8 oz/a) – 01/06/14

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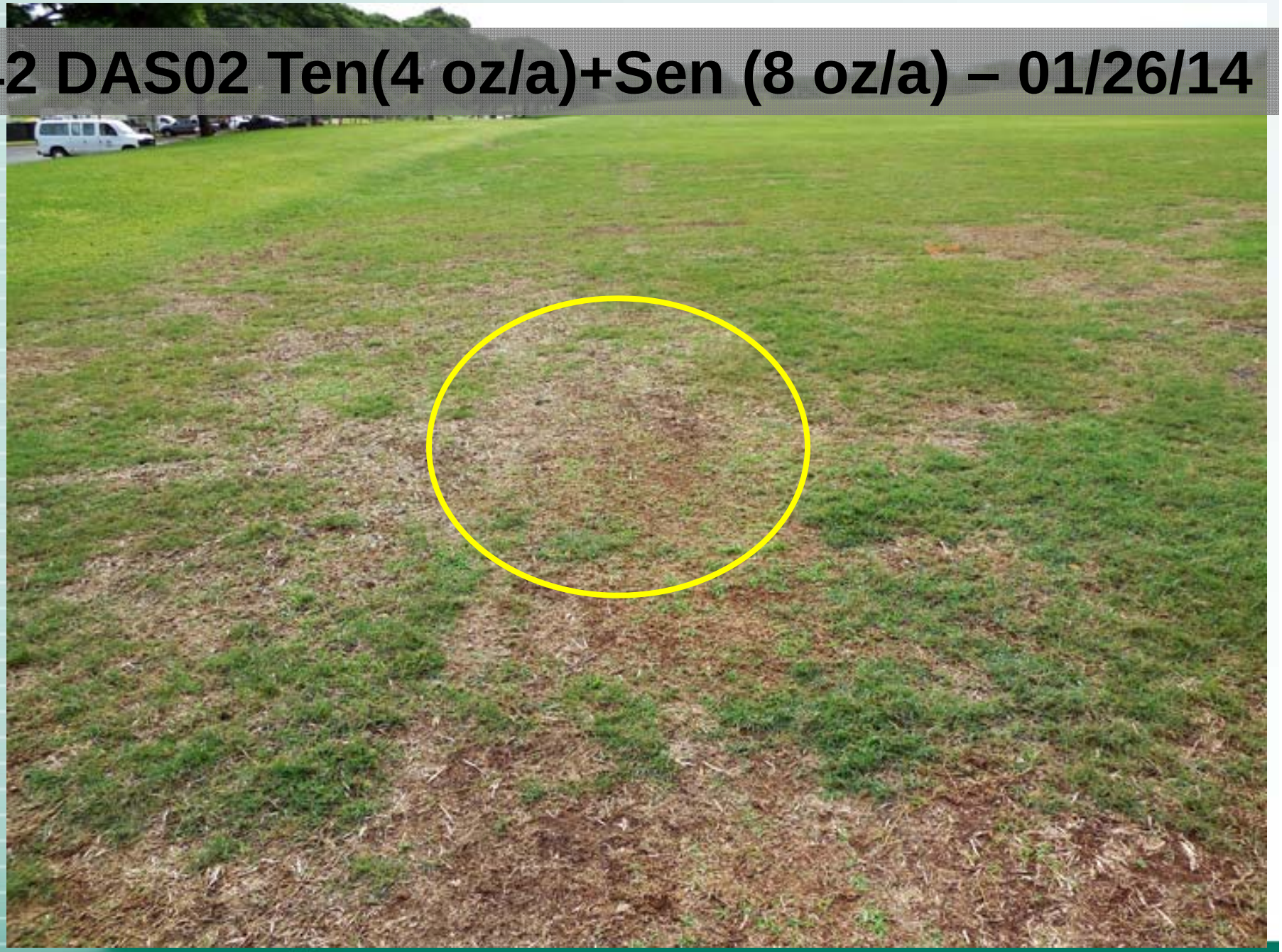

42 DAS02 Ten(4 oz/a)+Sen (8 oz/a) – 01/26/14

Dismiss (6 oz/a) + Barricade (10 oz/a) 2Xs for control of seedling Goose grass on

GG control w/Dismiss:
pre-tiller = OK
Post tiller = NOT CONTROLLED.

Photos
8 DAS1st Dism+Barr

Tropical University

Optimum Goose grass size for Dismiss activity is “pre-tiller” stage

6-leaf pre-tiller

3-tiller goose grass

Timing isn’t everything, it’s the only thing!

Winter Protocol
70 Days after T+S 2X's
Common Bermuda grass turf has filled in


22 DAS02 Ten(4 oz/a)+Sen (8 oz/a) – 01/06/14

Seedling goose grass control needed soon after larger weeds die and leave openings for weed seed germination.


70 DAS 2nd Ten+Sen - Photos on 03/03/14

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Assumptions for TIME OF YEAR consideration for selective weed control based on case studies at the Waipio Soccer field (winter 2013 to summer 2014).

Municipal sport turf is the case study model

Summer season protocol

1. **May-Aug. in Hawaii, Bermuda grass fast growing, fast recovery.**
2. **Weed growth faster too.**
3. **Hot sunny weather improves the effectiveness of certain herbicide who's mode of action is based on "growing the weeds to death".**
4. **June-Aug. main soccer tournament season, sport tourism an important economic consideration.**
5. **Less tolerance of significant turf injury due to high use pattern.**

To reduce turf injury with lower use rate of T+S tank mix and get good weed control
*weeds must be **setup** to enhance kill with post herbicides.*

HC& C summer 2014 Waipio clean up
Experimental setup to evaluate reduced rates
Tenacity + Sencor Tank mix experiment.

Summer 2014 protocol

- May 8, 2014: apply CN9 (10 gal/a) + Specticle (3.5 dry-oz/a).
- Enhances T+S herbicide mode of action by:

1. Activating weed growth
2. Prevent re-rooting of grassy weeds = improved kill w/post herbicides
3. Priming turf growth to reduce recovery time and rapid fill in of gaps in turf.

Fertilizer Analysis	Product Description	Nitrogen Form	Weight per Gallon	Nutrients Supplied/Gal	Gallons to Apply/1000 ft²*	Gallons to Apply/Acre
		Nitrogen Products				
9-0-0 11Ca (CN-9)	Contains nitrogen in fast, available form with calcium	9.0% Nitrate	12.20	1.10 lbs. N 1.34 lbs. Ca	.91 gallons	39.6 gallons

Root pruning of seedlings

Pre emergence for Broadleaf & certain grass weed control

Specticle

- Use on Bermuda with preemergence activity only
- Control of important broadleaf weed HI: horseweed, broadleaf plantain, prostrate spurge and oxalis.
- Control of grassy weeds include: Henry's crab grass, Goose grass, Guinegrass, Green Kyllinga.
- 4-5 months of Goose grass control with 3.7 oz/a.
- Irrigation required for activation.
- Pruning of new roots of weeds and spreading turf to be expected.

HC& C summer 2014 Waipio clean up
Experimental setup to evaluate reduced rates
Tenacity + Sencor Tank mix experiment.

Summer 2014 protocol

- May 8, 2014 apply CN9 (10 gal/a) + Specticle (3.5 dry-oz/a)
- **26 DAYS**
- June 3, 2014 apply Revolver 26 liq-oz/a + Celsius 3 dry-oz/a + Liberate surfactant .25%.
- 17 DAYS
- June 20, 2014, 2nd app Rev. + Cel.
- Visual cue for 2nd R+C application is 1-2 nodes of new growth on Goose grass

Commonly used post emergence for Goose grass weed control

Revolver

- Single AI product , post in turf.
- Use on Bermuda
- Control for Goose grass in HI,
- Systemic uptake, plant grows without essential components and dies. = ALS inhibitor
- Active plant growth needed for uptake and activation

Herbicides that inhibit acetolactate synthase (ALS), the enzyme common to the biosynthesis of the branch-chain amino acids (valine, leucine, and isoleucine)

Commonly used Post emergence for Broadleaf & certain grass weed control

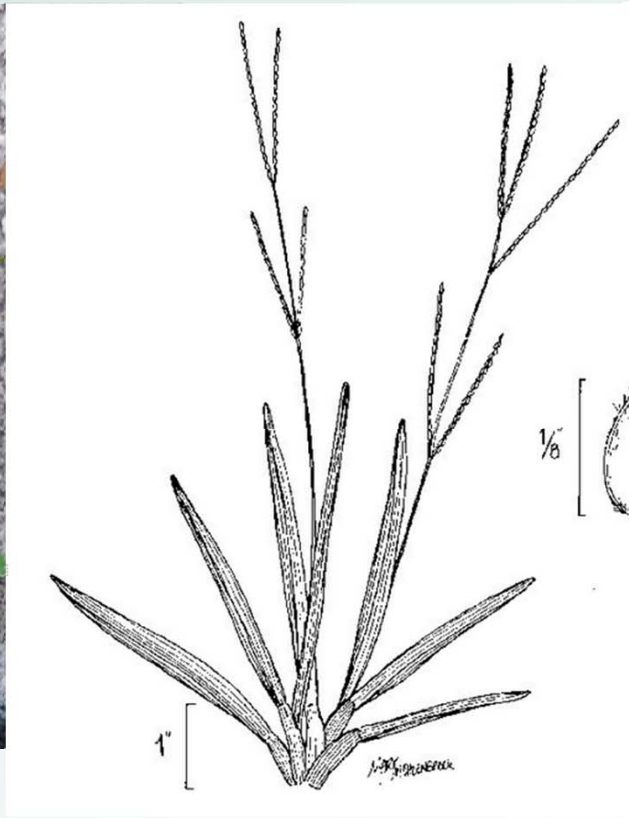
Celsius

- 3 AI mix, includes: thiencarbazone-m, iodosulfuron (ALS) & dicamba
- Use on Bermuda, zoysia & centipede
- Control of important broadleaf weeds in HI: creeping beggars tic, broadleaf plantain, prostrate spurge, horse weed and oxalis.
- Control of grassy weeds include Love grass relative, Sandbur, Australian Carpet grass.
- Systemic uptake, multiple modes of actions.
- Active plant growth needed for uptake and activation.

Celsius: Control of important broadleaf weed in HI: creeping beggars tic, horse weed, broadleaf plantain, prostrate spurge, and oxalis.

Celsius: Control of important grassy weeds: Sandbur, carpet grass & Love Grass relative = Eragrostis ciliaris

Sandbur-*C. echinatus*



Carpet grass-*A. affinis*

Gopher LG-*E. ciliaris*

HC& C summer 2014 Waipio clean up
Experimental setup to evaluate reduced rates
Tenacity + Sencor Tank mix experiment.

Summer 2014 protocol

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- **26 DAYS**
- June 3, 2014 apply Revolver 26 liq-oz/a + Celsius 3 dry-oz/a + Liberate surfactant .25%.

- **17 DAYS**
- June 20, 2014, 2nd app Rev. + Cel.
- Visual cue for 2nd R+C application is 1-2 nodes of **new growth** on Goose grass

See 2-nodes of new GG stem growth as visual cue for Revolver/Celsius 2nd app.

HC& C summer 2014 Waipio clean up
Experimental setup to low dose Tenacity + Sencor Tank mix experiment.

Summer 2014 protocol

- May 8, 2014 apply CN9 (10 gal/a) + Specticle (3.5 dry-oz/a)
- **26 DAYS**
- June 3, 2014 apply Revolver 26 liq-oz/a + Celsius 3 dry-oz/a + Liberate surfactant .25%.
- **17 DAYS**
- June 20, 2014, 2nd app Rev. + Cel.
- **40 DAYS**
- Old roots dead & New root growth from Goose and Love grass stem nodes, **CUE** to start next spray with different mode of action, **83 DA-Spec.**

Weedy grasses survive Rev/Cel Injury by rooting at stem node.

Specticle stops roots from entering soil and makes the easier to kill.

Weed pressure in foreground = area not sprayed with Revolver & Celsius shows large Goose grass

Weed pressure in foreground = not sprayed with Revolver & Celsius shows large Goose grass

40 DAS2 Rev. & Cel. mostly Love grass some GG at start of low dose T+S on 08/01/14

40 DAS2 Rev+Cel = Easy extraction of **NORMAL** looking Love grass

Compromised main roots allows flush of new roots.
Specticle in place to prevent root penetration into soil, provides wider window for post herbicide application and preemergence control of weed seed germination.
Low dose Tenacity + Sencor to complete weed control process after **setup** with Rev + Cel.

Low dose Tenacity + Sencor Tank mix study
42 Days after 2nd Rev. + Cel. Application
Started 08/01/2014, 2nd app 11 days later.

Treatment # 2Xs	Herbicides	Amount/a
1	Tenacity + **Sencor +** NIS (Excel 90) 0.25%	5 liq-oz/a + **1 dry-oz/a**
2	Tenacity + **Sencor +** NIS (Excel 90) 0.25%	5 liq-oz/a + **2 dry-oz/a**
3	Tenacity + **Sencor +** NIS (Excel 90) 0.25%	5 liq-oz/a + **4 dry-oz/a**
4	NIS (Excel 90) 0.25%	

7 days after 1st spray application 08/08/14

203

204

103

104

102

101

01= T-5 oz/a + S-1 oz/a
02 = T-5 oz/a + S-2 oz/a
03 = T-5 oz/a + S-4 oz/a
04 = NIS 0.25% v/v


7 DAS1
Trt-01
5 OZ/A-T
1 OZ/A-S


7DAS1
Trt -02
5 OZ/A-T
2 OZ/A-S


Pre-spray LG roots
7DAS1
Trt 03
5 OZ/A-T
4 OZ/A-S

8 days after 2nd spray application 08/20/14

Note frosting in areas where turf was scalped

203

204

103

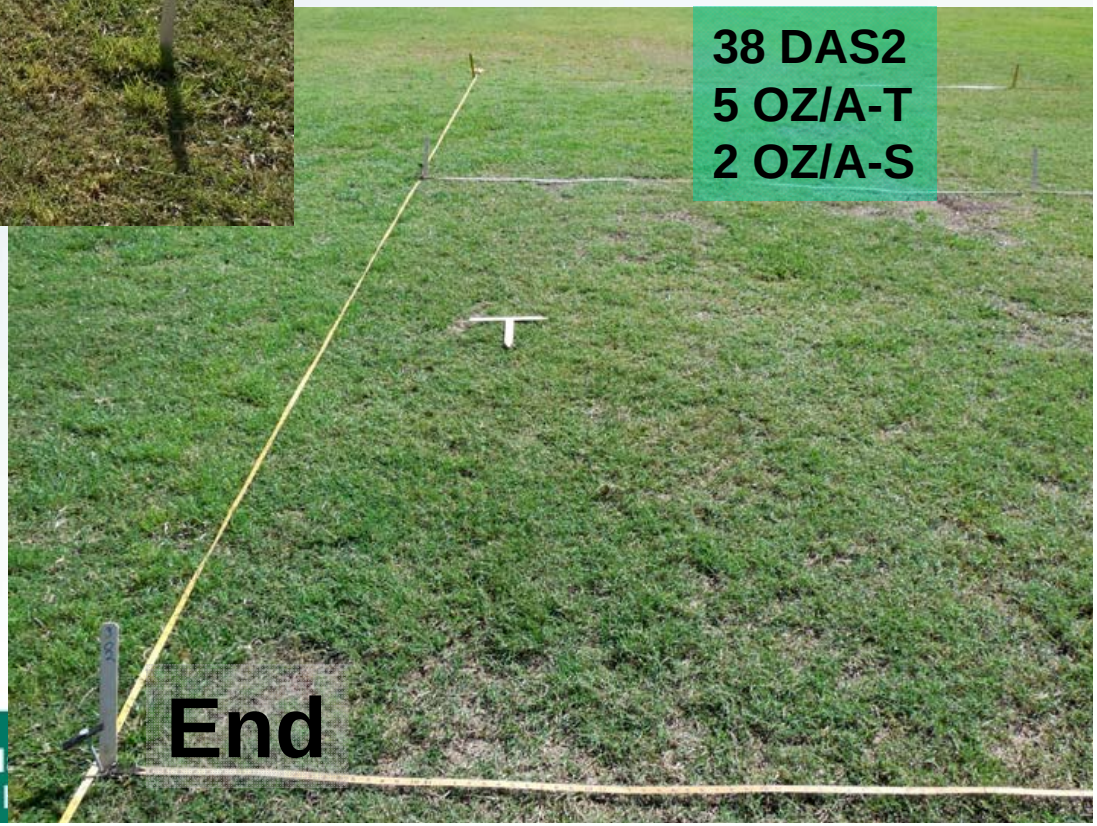
104

102

101

01= T-5 oz/a + S-1 oz/a
02 = T-5 oz/a + S-2 oz/a
03 = T-5 oz/a + S-4 oz/a
04 = NIS 0.25% v/v

54 days from start of T+S spray



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Comparison of time of year *impact on:*

Herbicide type, sequence and rates for Love and Goose grass control in Bermuda Grass sport turf in Hawaii

Spray treatment	Winter* Dec.-Jan 2013	# of Apps W	Summer June-Aug 2014	# of Apps S
Specticle	-	-	3.5 oz/a	1
Rev. + Cel.	-	-	26 L-oz R + 3 D-oz/a Cel.	2
Tenacity +	4 L-oz/a	2	5 L-oz/ for LG only +	2
Sencor	8 D-oz/a	2	4 D-oz/a-GG & 2 D oz/a-LG	2
Surfactant	1% MSO	2	.25% NIS	2
Days to recover After 2nd app. T+S	75-80		14-20	

For more information

Dr. Joe DeFrank
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Ph: 808.956.5698

On line video and slideshow:
http://www.ctahr.hawaii.edu/deFrankJ/index.htm

Improved weed wick for fast growing weeds in new turf plantings

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Factors for wiper applications

1. Pre application growth activation of weeds and turf.
2. Sufficient height difference between weeds & turf.
3. Glyphosate at 15-20% (20-25 oz/gal) for wiping weeds.
4. 2-3 day delay mowing and irrigation after app.



Hoakalei wiper cleanup of 8 acres

Hoakalei wiper cleanup of 8 acres

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