LESA Irrigation and Weed Updates

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Lassen, Modoc, Sierra, and Plumas Counties

University of California
Agriculture and Natural Resources

Outline

- LESA Irrigation
  - Background
  - Previous research
  - Local case studies
- Brief Weed Control Updates
  - Chicory
  - Alfalfa

Irrigation

- Meeting the water demand of the crop
- ET - Evapotranspiration
  - Crop stage
  - Weather
- Soil Storage
  - Texture
  - Organic matter
  - Rooting depth
- Efficiency
  - Water applied is water used
  - Losses

In 1969, the original patent for Frank Zybach's first center pivot system ran out.

Troy Peters - Alfalfa Symposium 2016

Troy Peters - Alfalfa Symposium 2016

Troy Peters - Alfalfa Symposium 2016

Troy Peters - Alfalfa Symposium 2016
LEPA

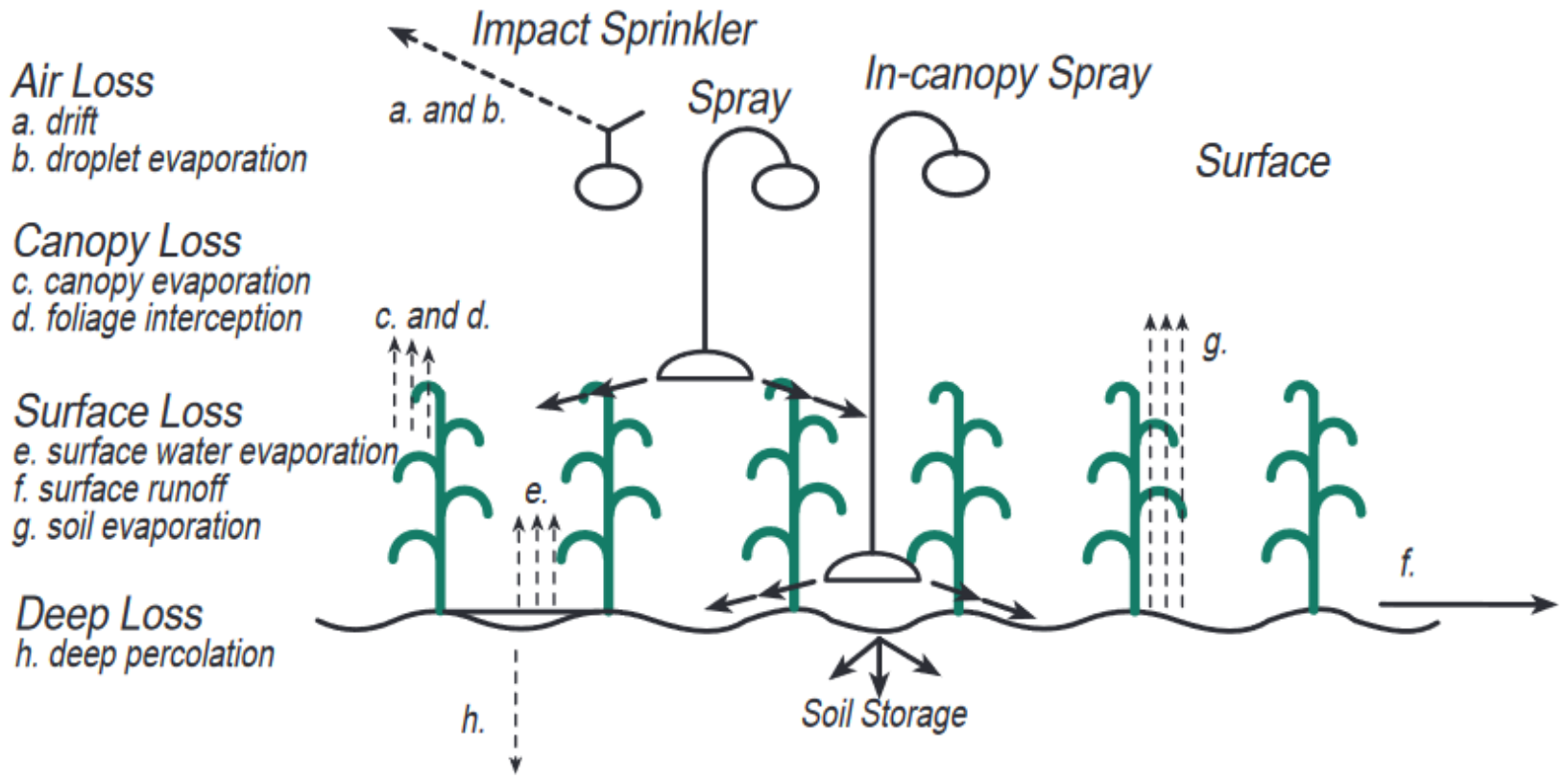
Troy Peters - 2017 Mobile Drip Irrigation Fact Sheet

Not New

- Testing began early 70s’ to late 80’s
  - LESA
  - LEPA
  - Mobile drip

Rodgers et. al. 1997

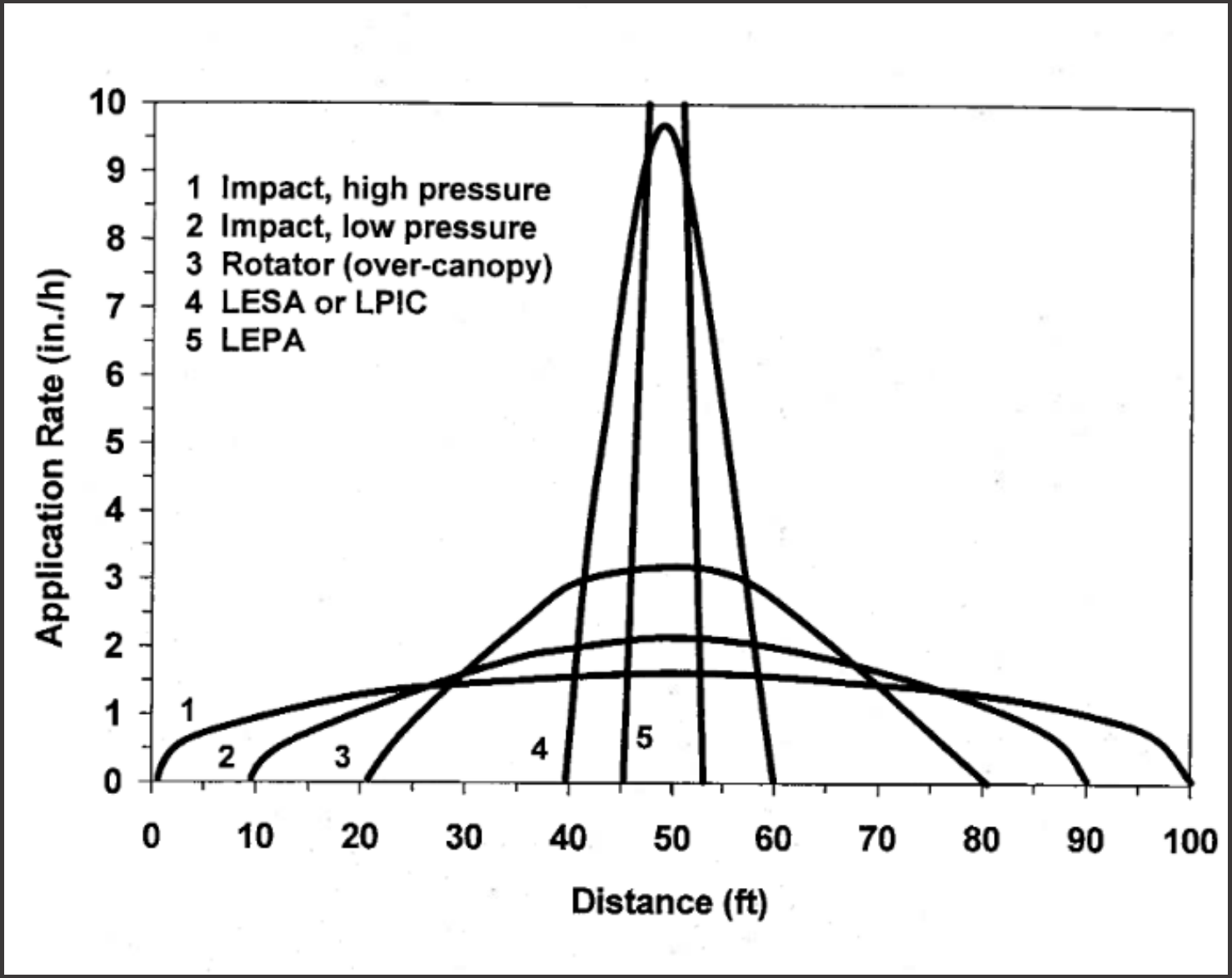
Figure 3. Irrigation water loss and storage locations.



Peters et. al. 2017

Pivot Configuration	Wind Drift and Evaporation Losses	Emitter Height From Soil Surface	Sprinkler or Drop Spacing	Wetted Length (Infiltration Time)
Impact Sprinklers on Top of Pivot	40%	15 ft	20 ft	50 - 60 ft
Mid Elevation Spray Application (MESA)	20%	5-10 ft	10 ft	30 ft
Low Elevation Spray Application (LESA)	3%	1 - 2 ft	< 5 ft	15 ft
Low Energy Precision Application (LEPA)	0%	0 ft	< 5 ft	1 ft
Mobile Drip Irrigation (MDI)	0%	0 ft	1.5 ft	Up to 65 ft

(Howell, T.A., 2003)



LESA/LESA

- Cons
  - Infiltration limited
  - Slope limited
  - Runoff/erosion
  - Deep loss? (below rootzone)
  - Cost
- Pros
  - Reduced pressure
  - Pumping cost
  - Decreased evaporation/interception
  - In canopy chemigation
  - Less wheel track wetting

Case Studies
Lassen and Plumas 2017

- Orloff 2016- Scott Valley
- Follow Up/Demonstration

- North of Doyle - Honey Lake Valley
  - Orchard grass/fescue
  - Sandy loam (Coarse sand 3 ft.)
- Sierra Valley (Loyalton)
  - Alfalfa
  - Silt loam
    - Higher water table (saturated soil in spring)

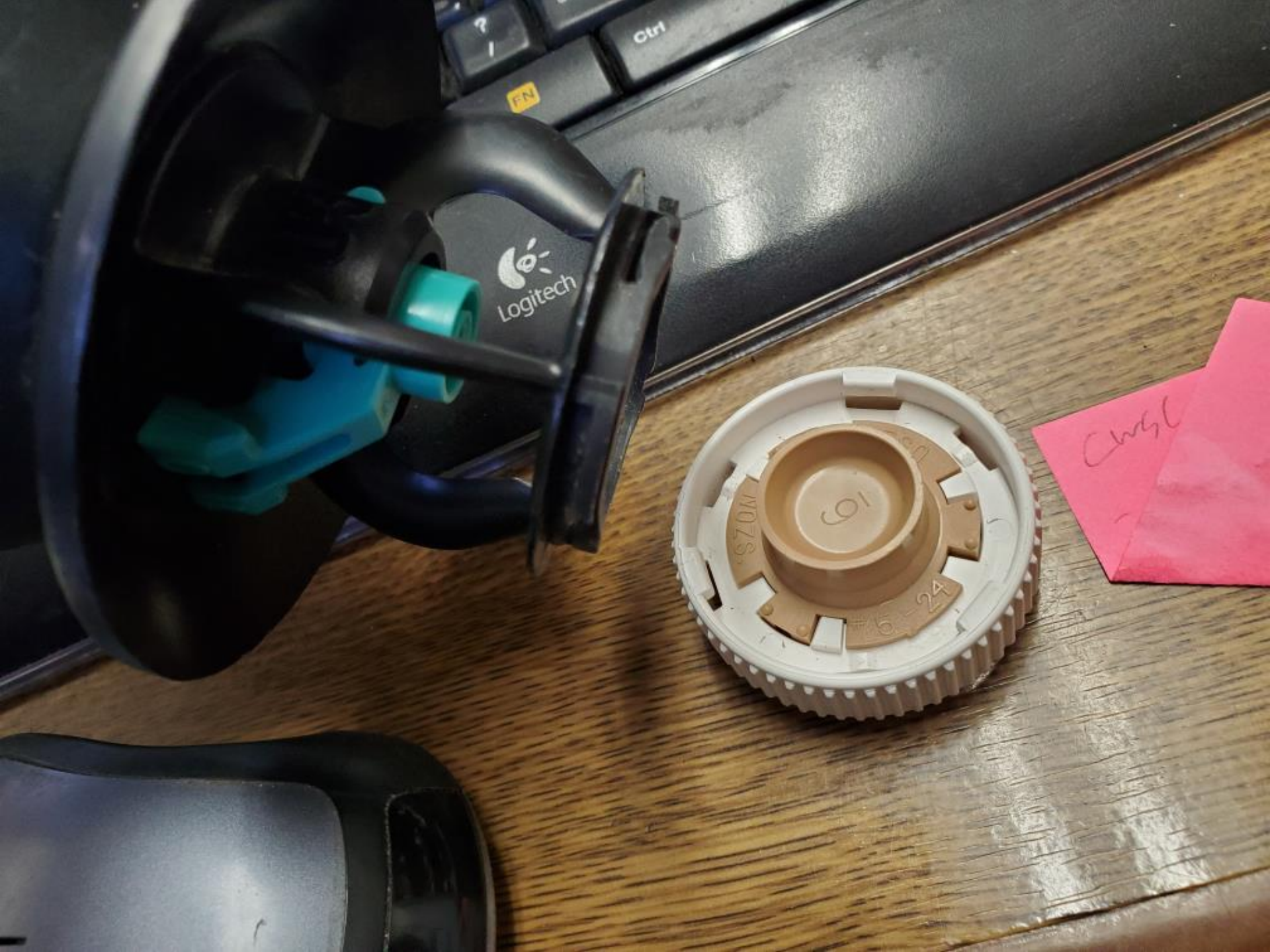
Installation

30-40 inches apart
18 inches high

Senninger Irrigation

Donated sprinklers

- Photo courtesy of Hunter Industries Incorporated.


Logitech
Ctrl
FN


Alt
FN

Soil Moisture Sensors

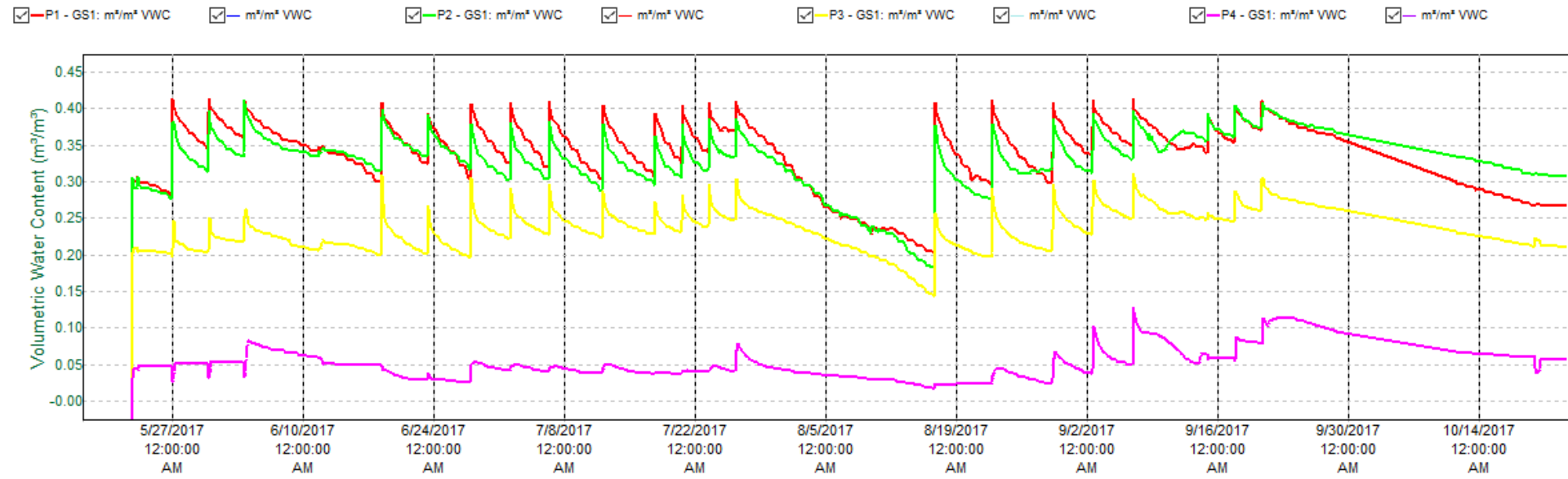
- Volumetric Water Content
  - 1, 1.5, 2, and 3 ft. deep
  - LESA and standard
  - Center of span
- Installed Early Summer 2017

Soil Moisture Sensors

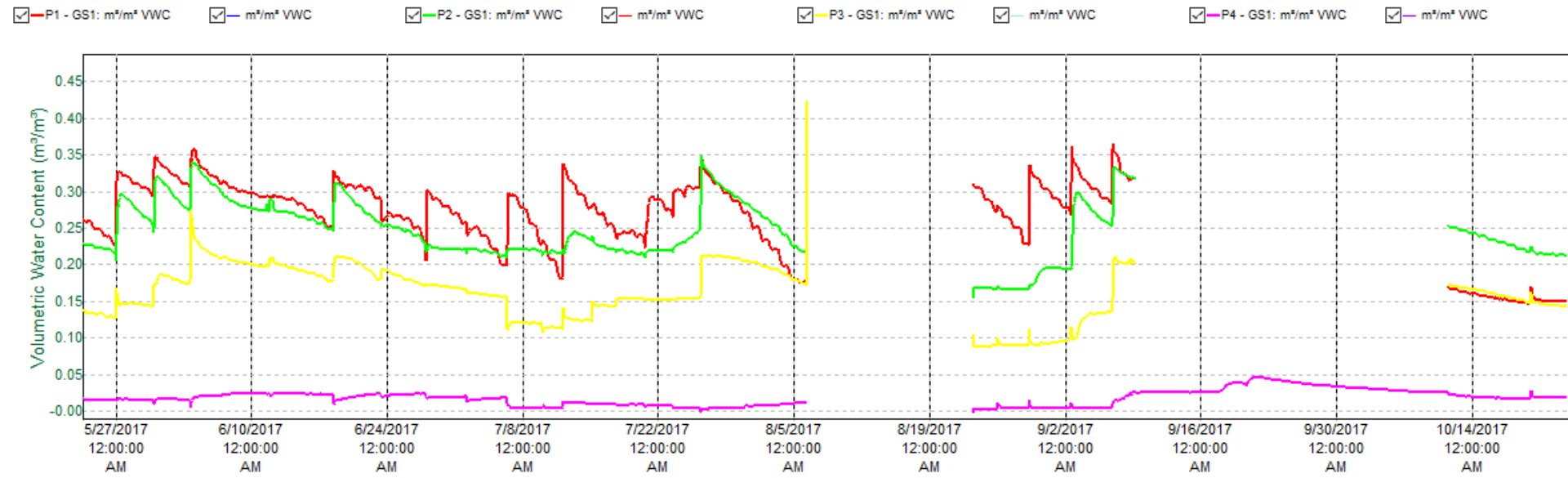
- Trouble!!
- Doyle
  - 2017 - Hit by machinery
  - 2019 - Malfunction
- Loyalton
  - 2017 - Placement error
  - 2018 - Battery
  - 2019 - Cows…

2017 Doyle

LESA

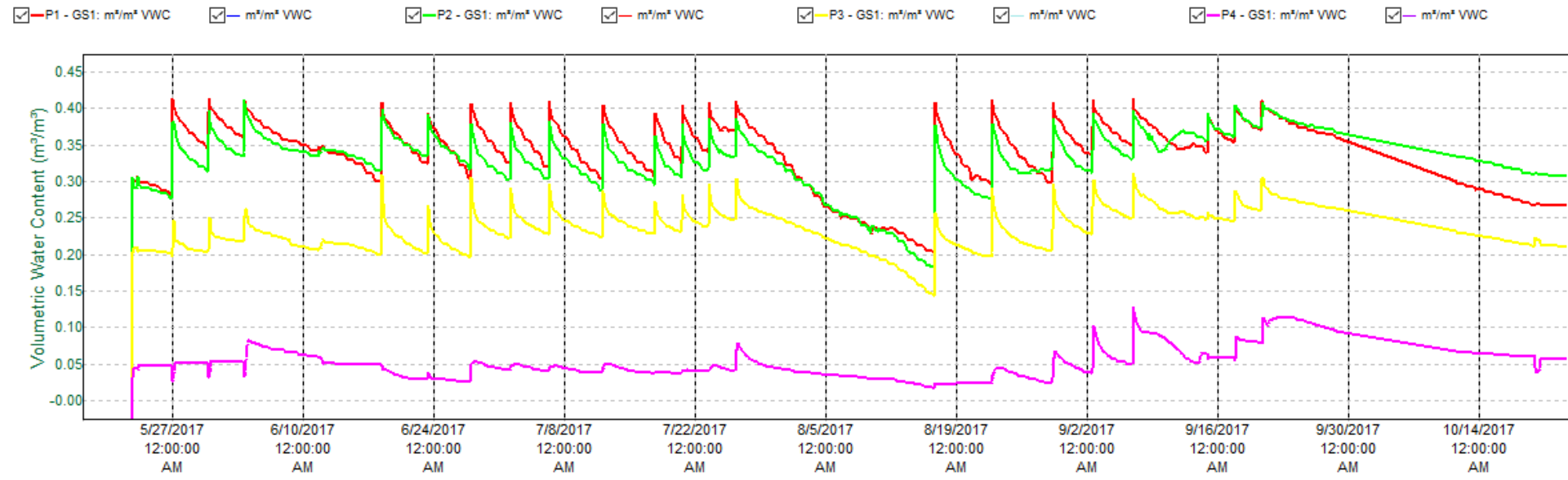


Standard



2017 Doyle

LESA



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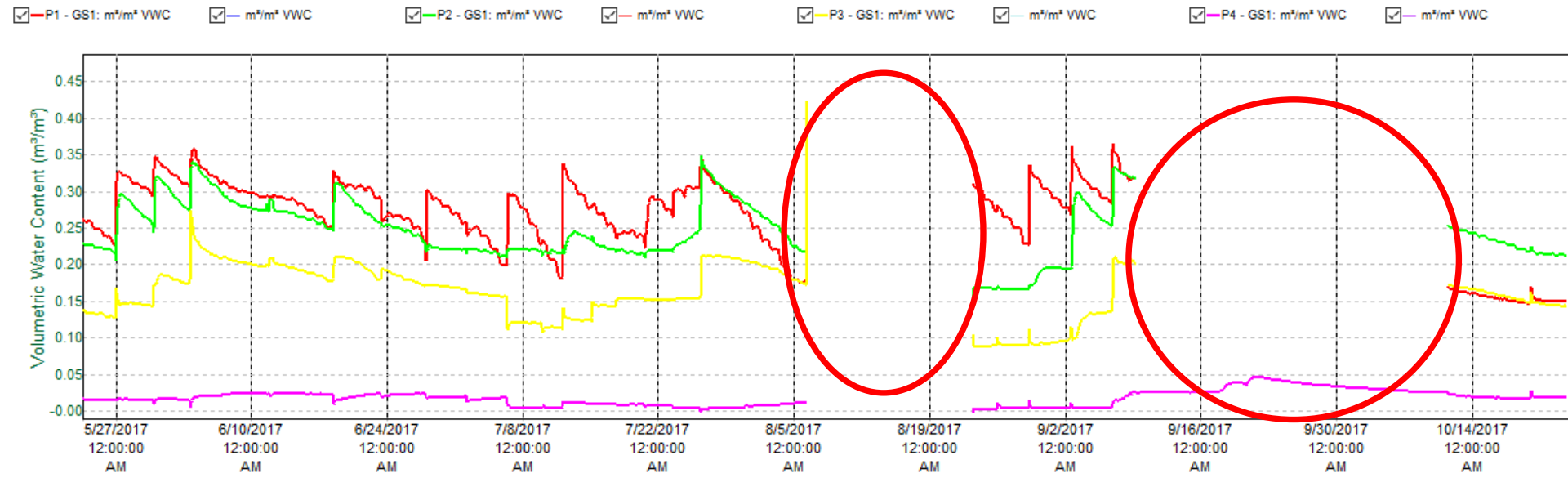
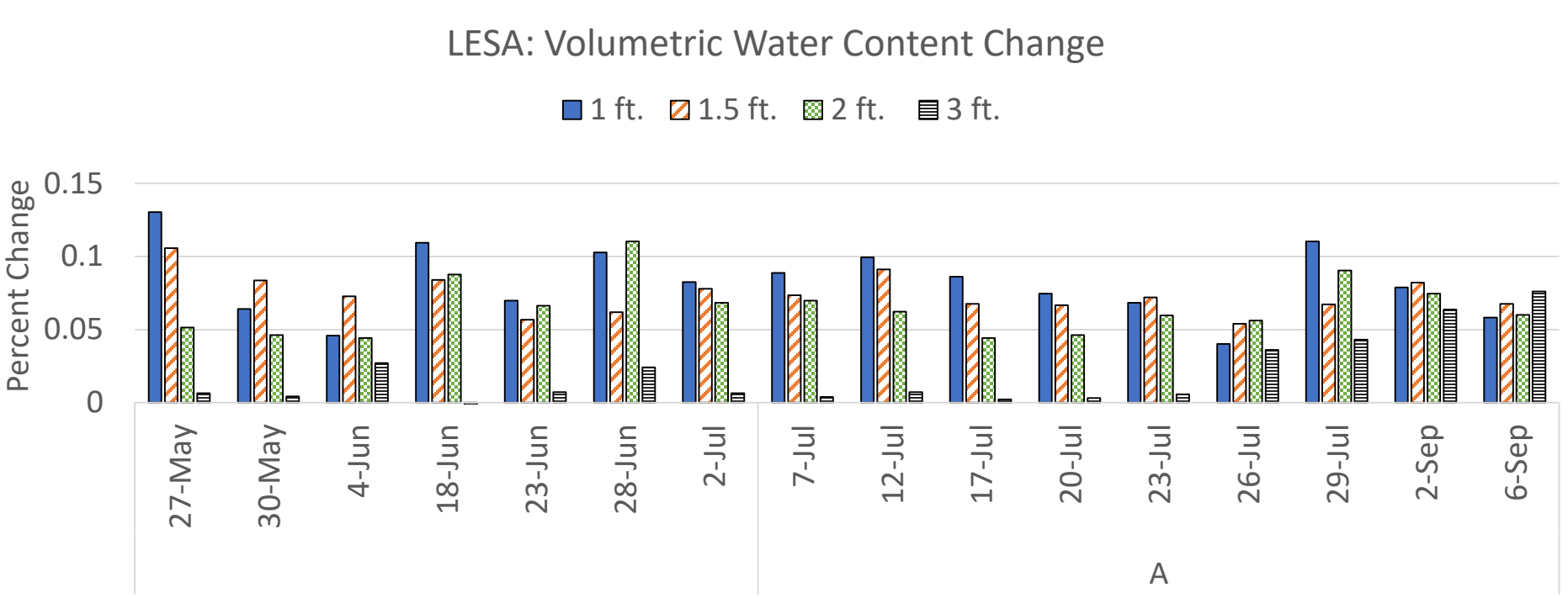
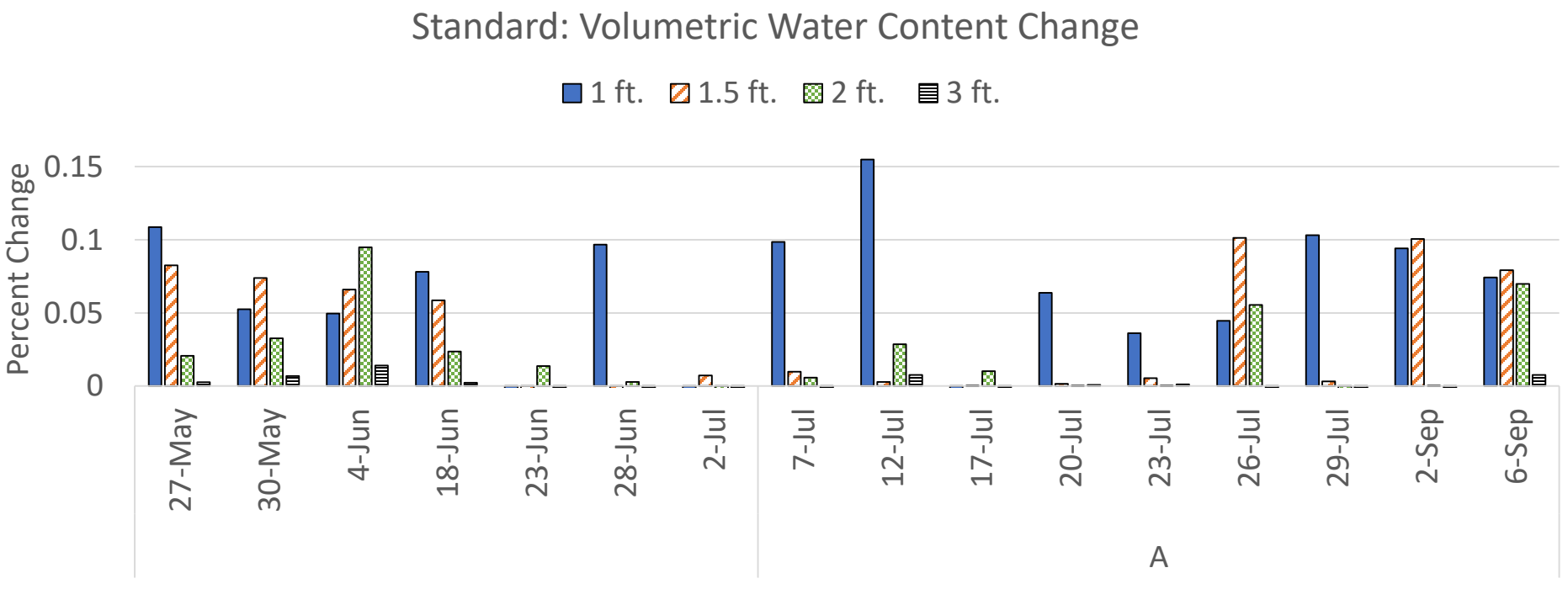



LESA: Volumetric Water Content Change
1 ft.
1.5 ft.
2 ft.
3 ft.
Percent Change
0.15
0.1
0.05
0
27-May
30-May
4-Jun
18-Jun
23-Jun
28-Jun
2-Jul
7-Jul
12-Jul
17-Jul
20-Jul
23-Jul
26-Jul
29-Jul
2-Sep
6-Sep
A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Percent Change
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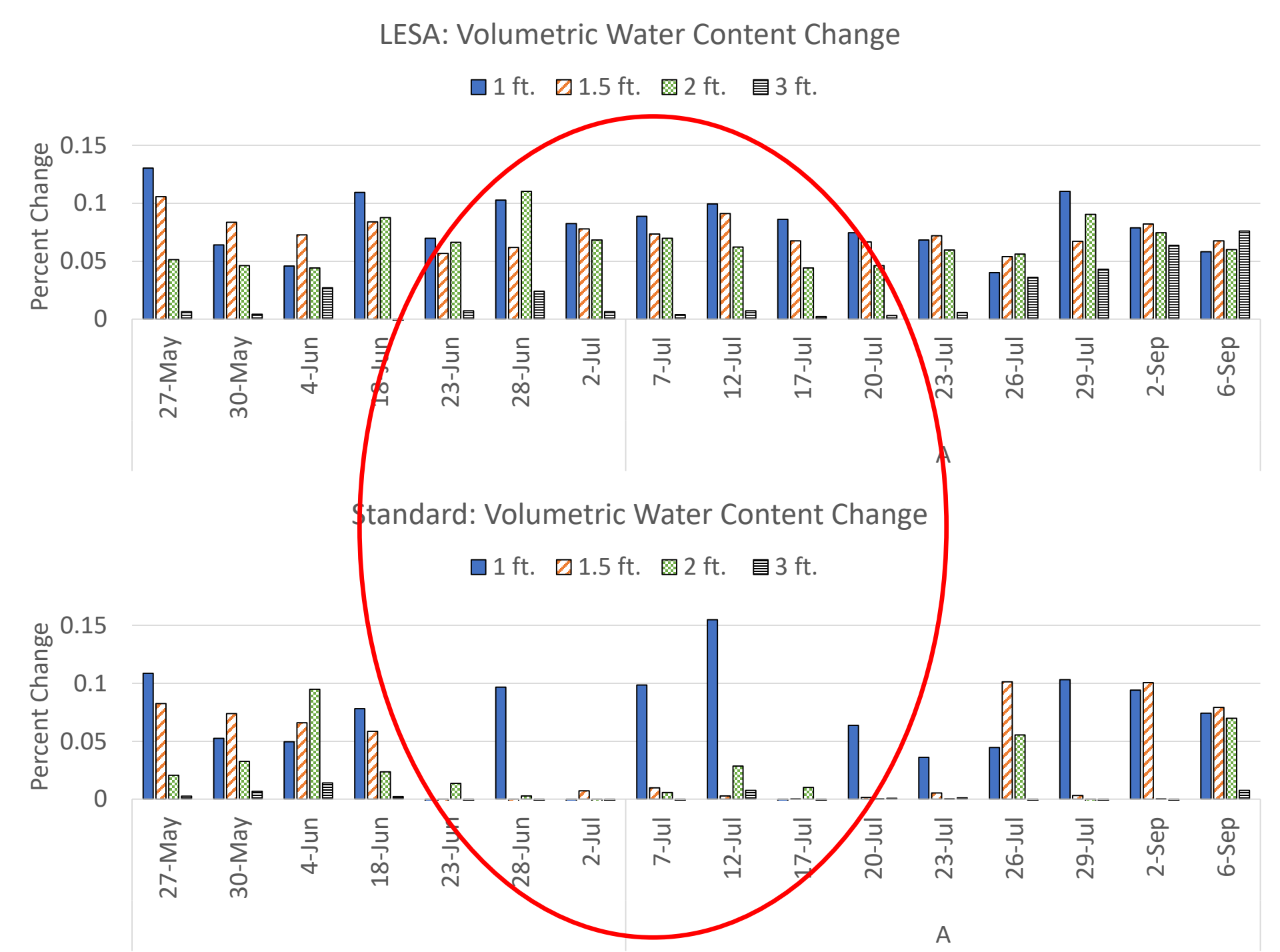
0.1
0.05
0
27-May
30-May
4-Jun
18-Jun
23-Jun
28-Jun
2-Jul
7-Jul
12-Jul
17-Jul
20-Jul
23-Jul
26-Jul
29-Jul
2-Sep
6-Sep
A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3 ft.
Percent Change
0.15
0.1
0.05
0
27-May
30-May
4-Jun
18-Jun
23-Jun
28-Jun
2-Jul
7-Jul
12-Jul
17-Jul
20-Jul
23-Jul
26-Jul
29-Jul
2-Sep
6-Sep
A
Standard: Volumetric Water Content Change
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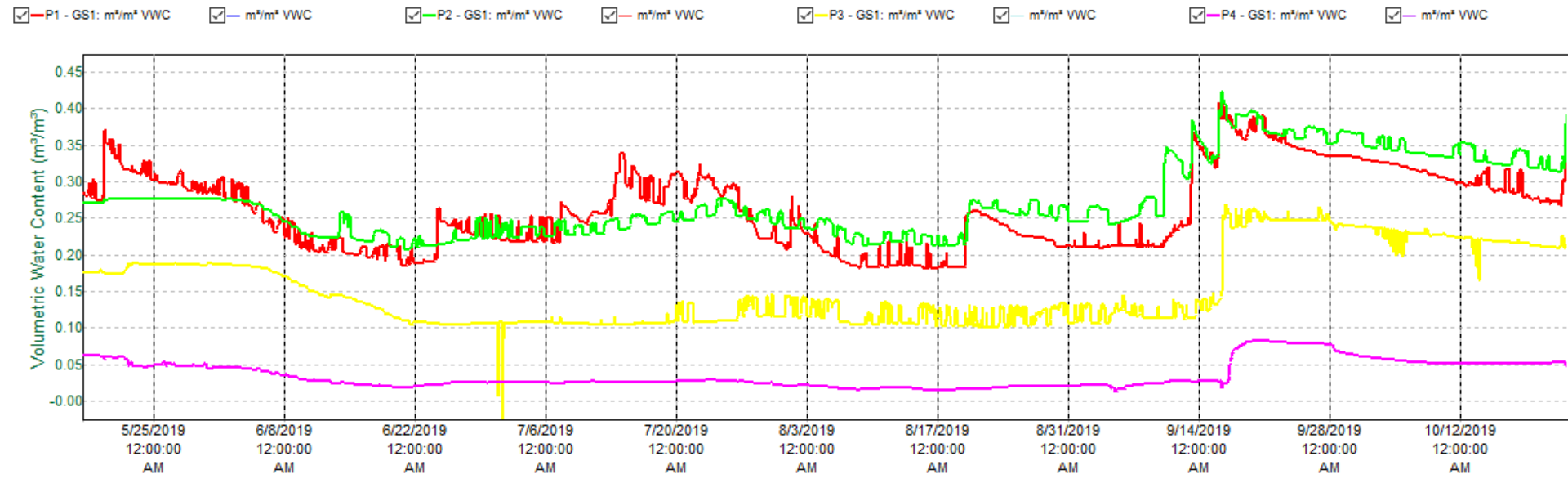
2 ft.
3 ft.
Percent Change
0.15
0.1
0.05
0
27-May
30-May
4-Jun
18-Jun
23-Jun
28-Jun
2-Jul
7-Jul
12-Jul
17-Jul
20-Jul
23-Jul
26-Jul
29-Jul
2-Sep
6-Sep
A

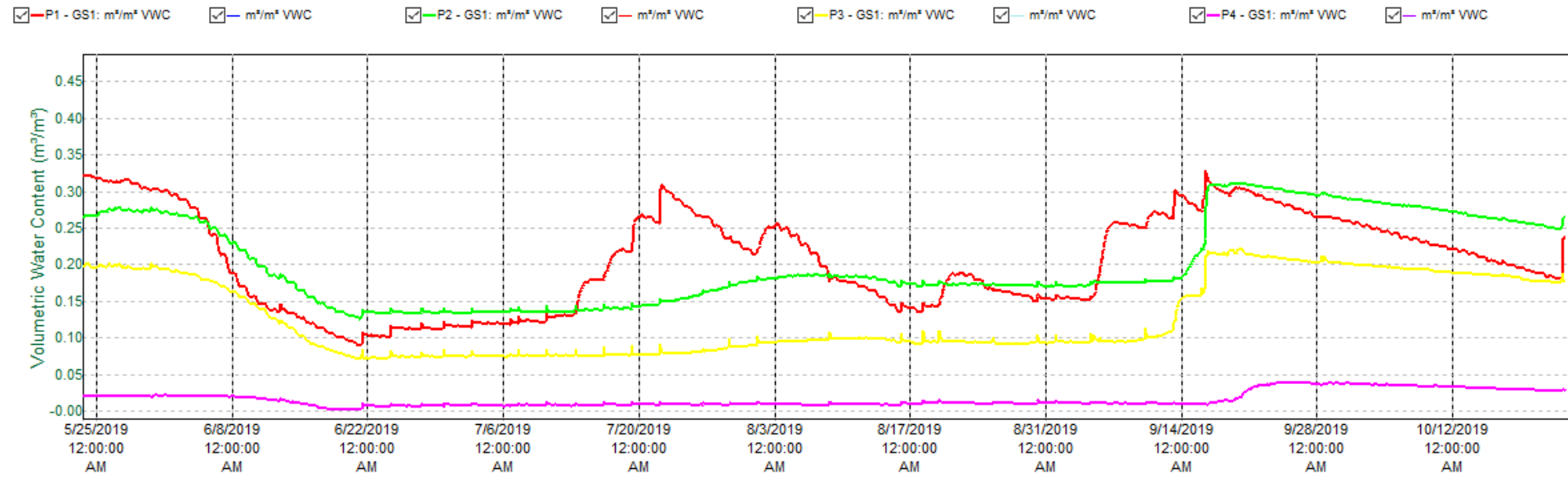
2018-Winter Cages

2019 Doyle

LESA

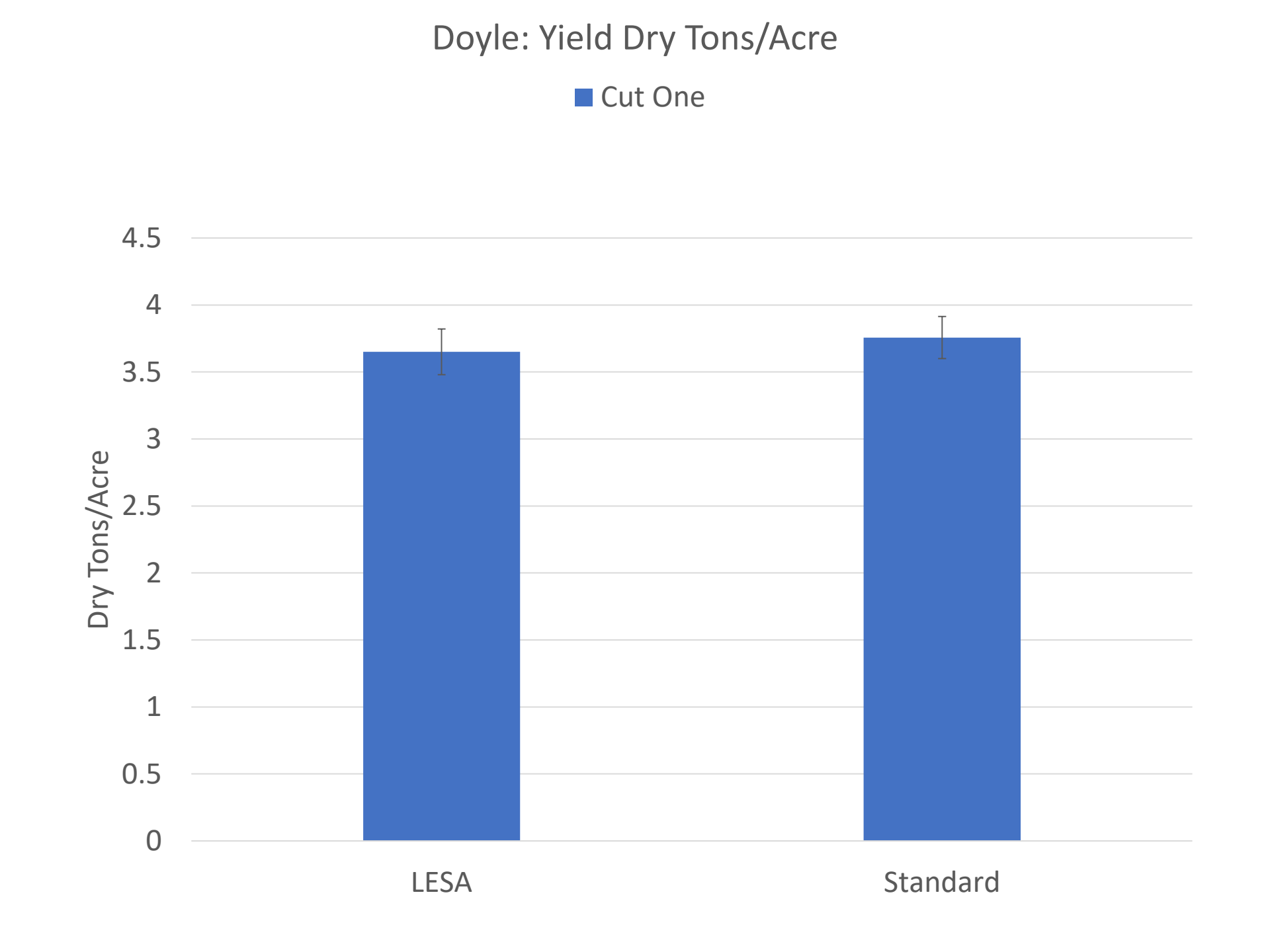


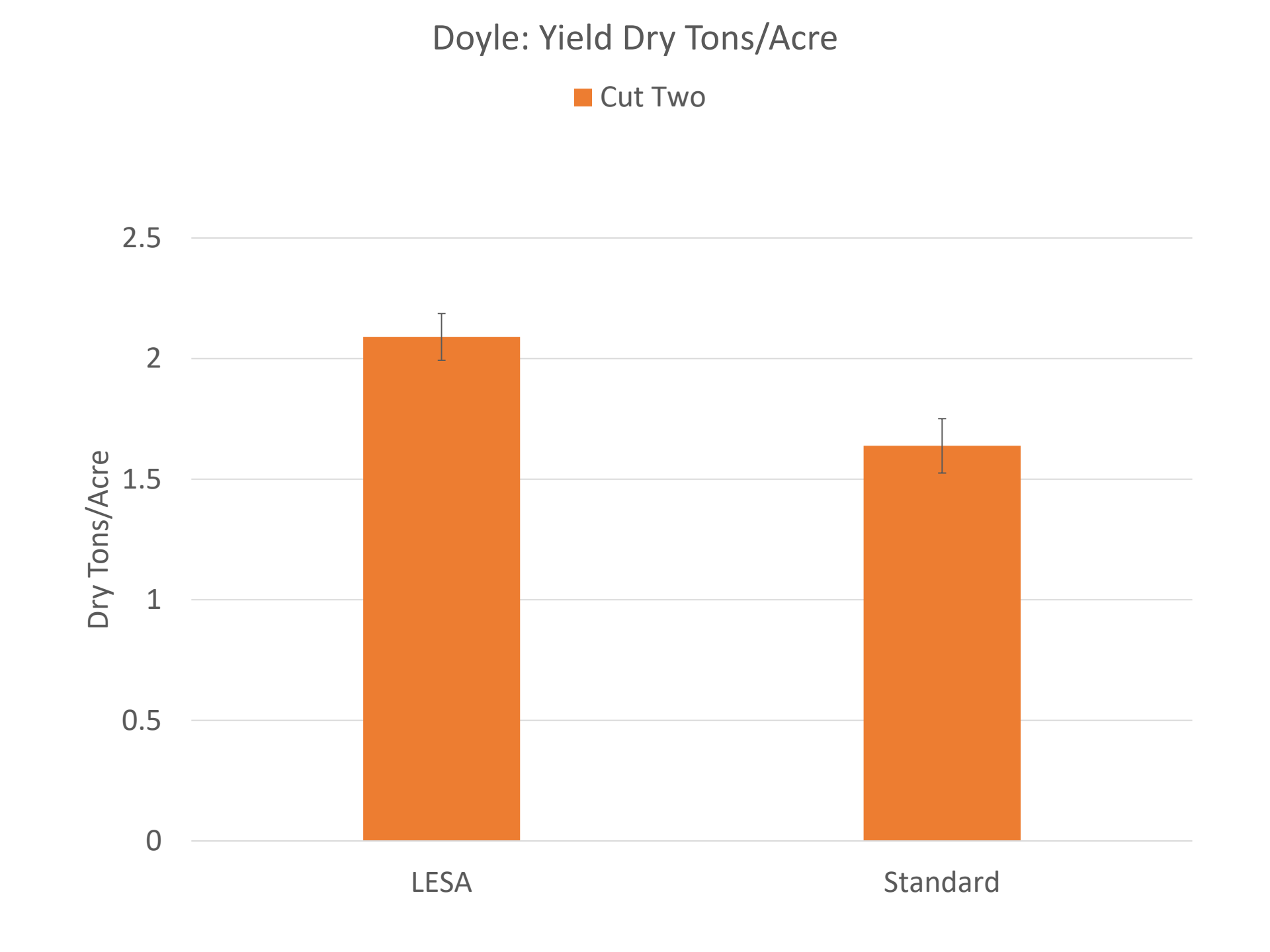
Standard

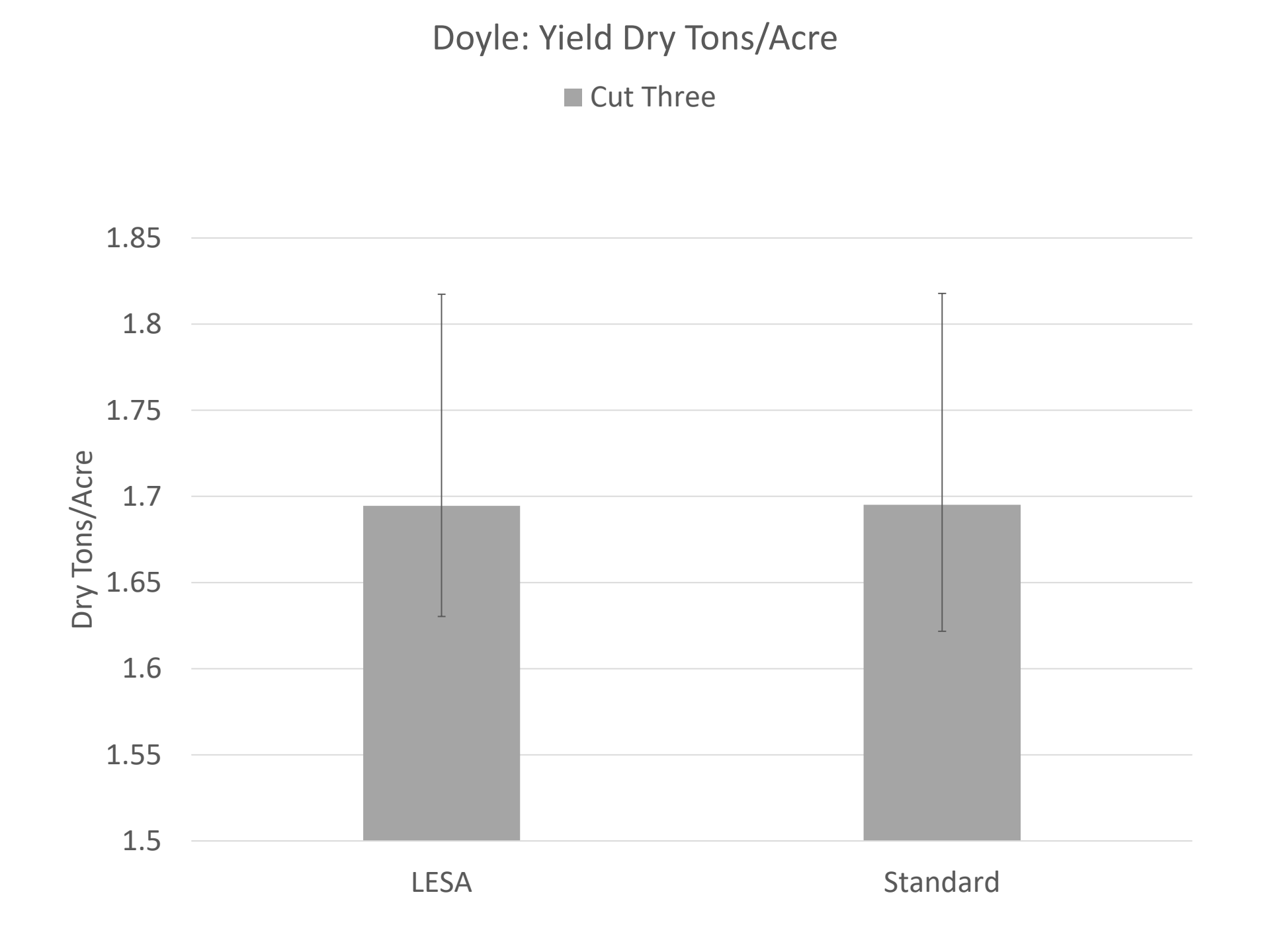


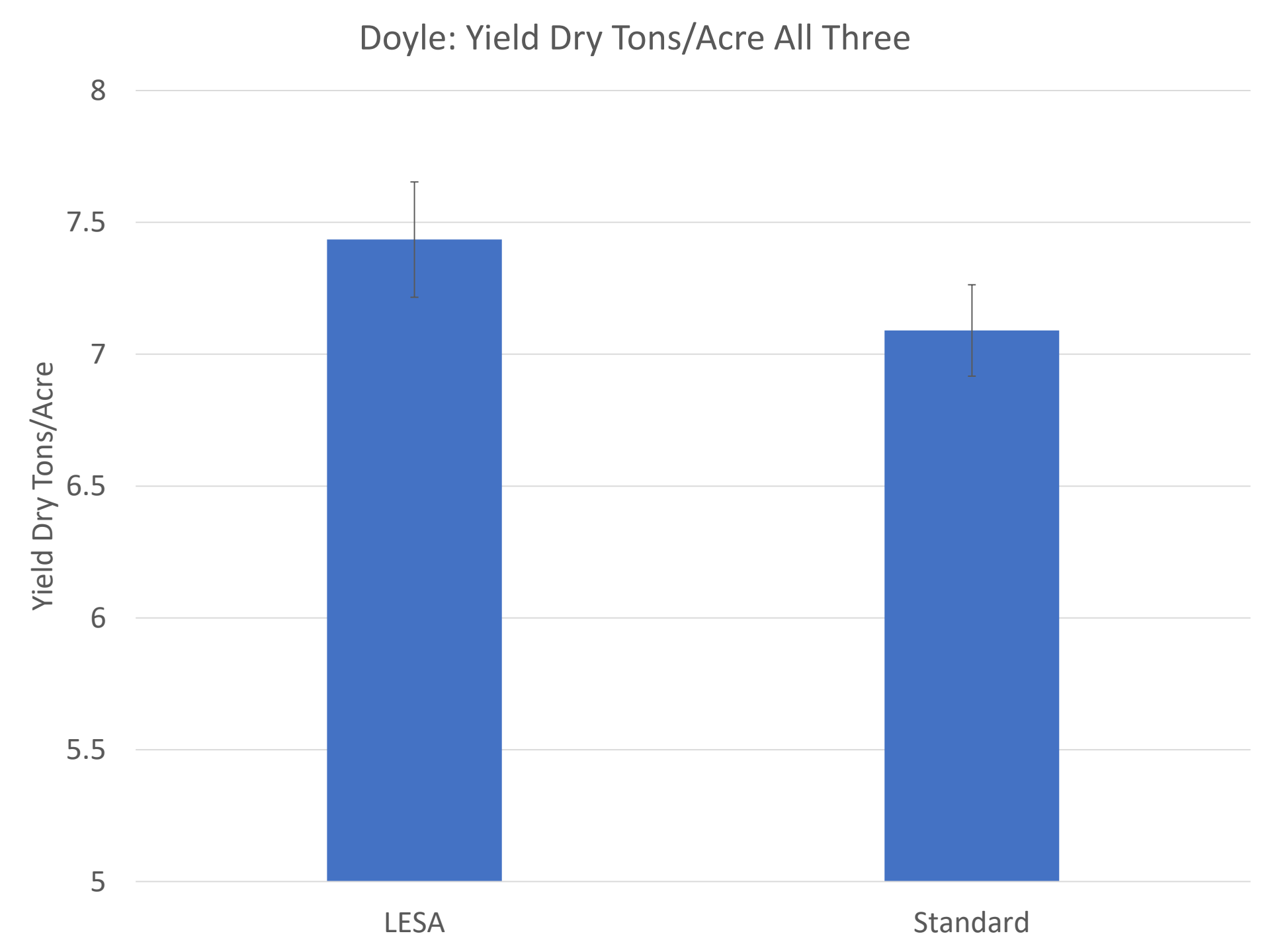
Yields - Doyle 2019

- Six sites in field
  - Three 0.5 meter quadrats - Orchard grass/alfalfa
  - Three 0.5 meter quadrats - Fescue
- Three cuttings


Doyle: Yield Dry Tons/Acre
Cut One
Dry Tons/Acre
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
LESA
Standard

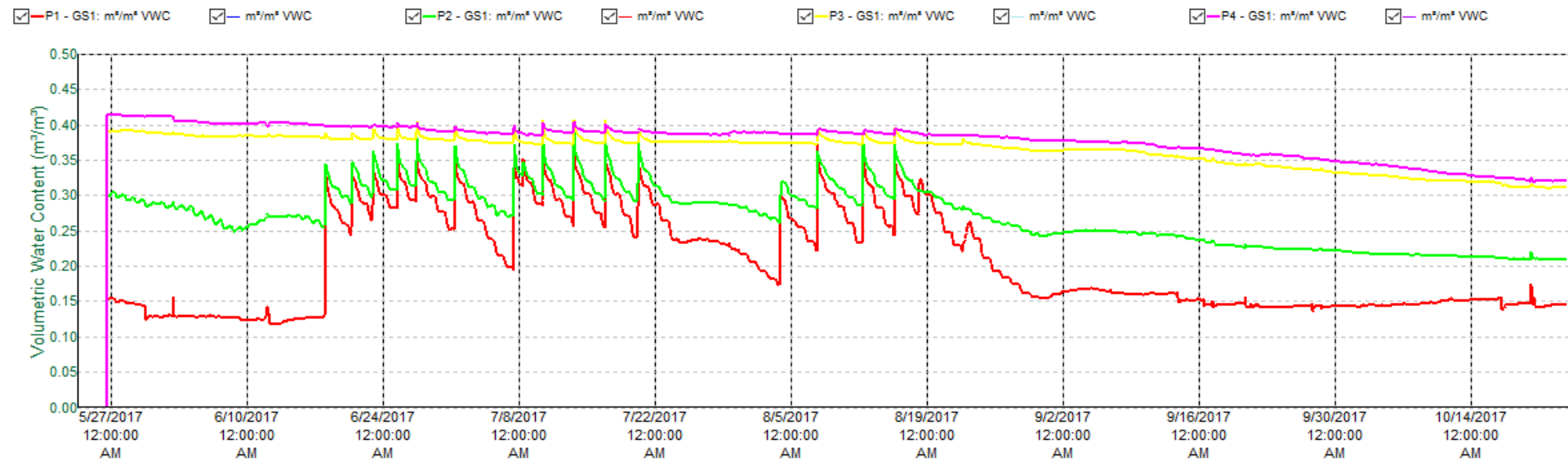

Doyle: Yield Dry Tons/Acre
Cut Two
Dry Tons/Acre
2.5
2
1.5
1
0.5
0
LESA
Standard


Doyle: Yield Dry Tons/Acre
Cut Three
Dry Tons/Acre
1.85
1.8
1.75
1.7
1.65
1.6
1.55
1.5
LESA
Standard


Doyle: Yield Dry Tons/Acre All Three
Yield Dry Tons/Acre
8
7.5
7
6.5
6
5.5
5
LESA
Standard

2017 Loyalton

LESA



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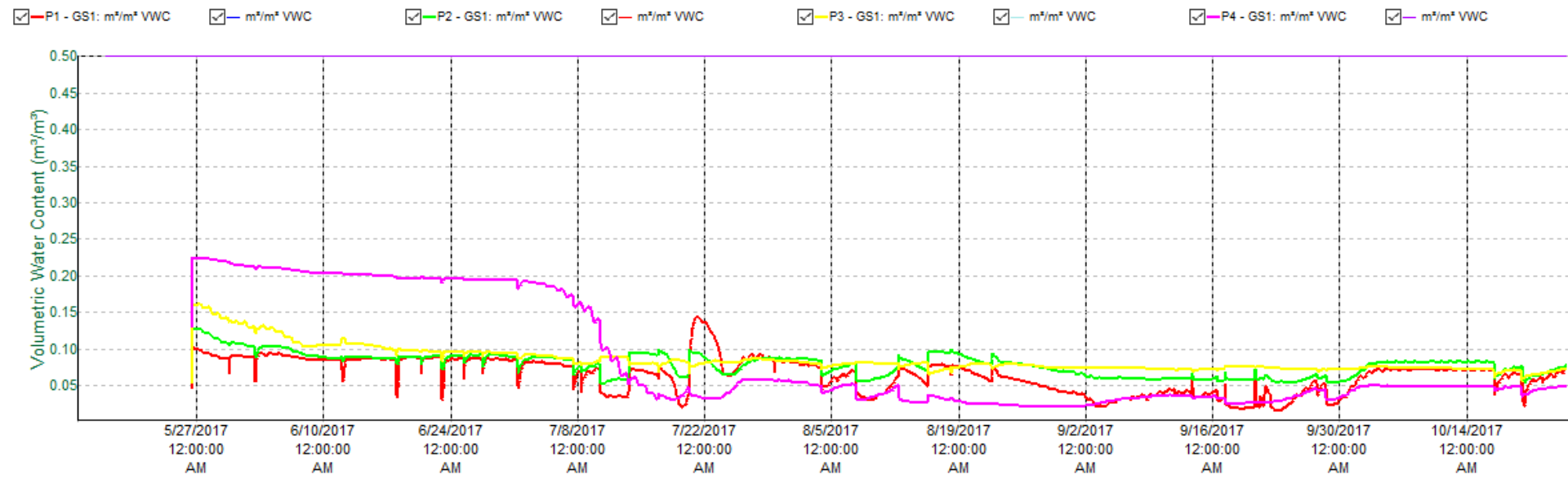
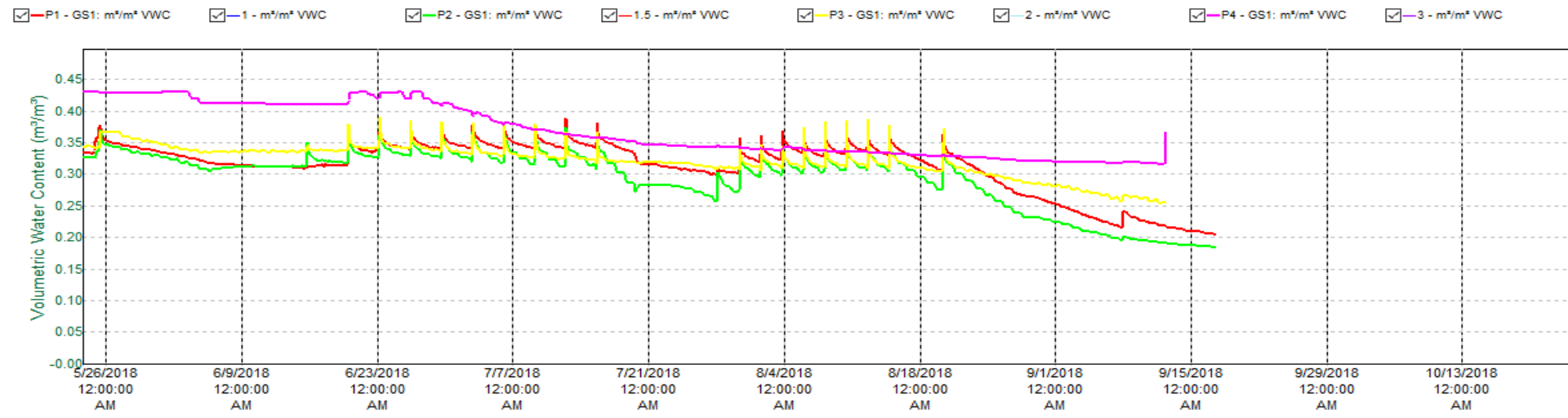


2018 Loyalton 2nd Site LESA



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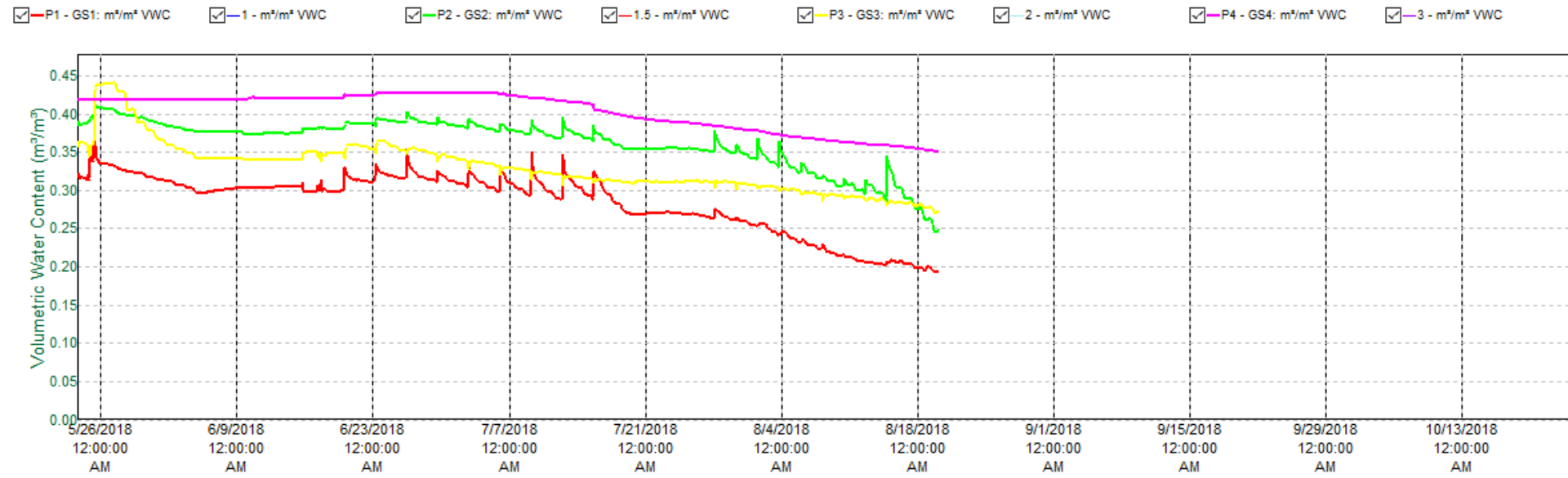
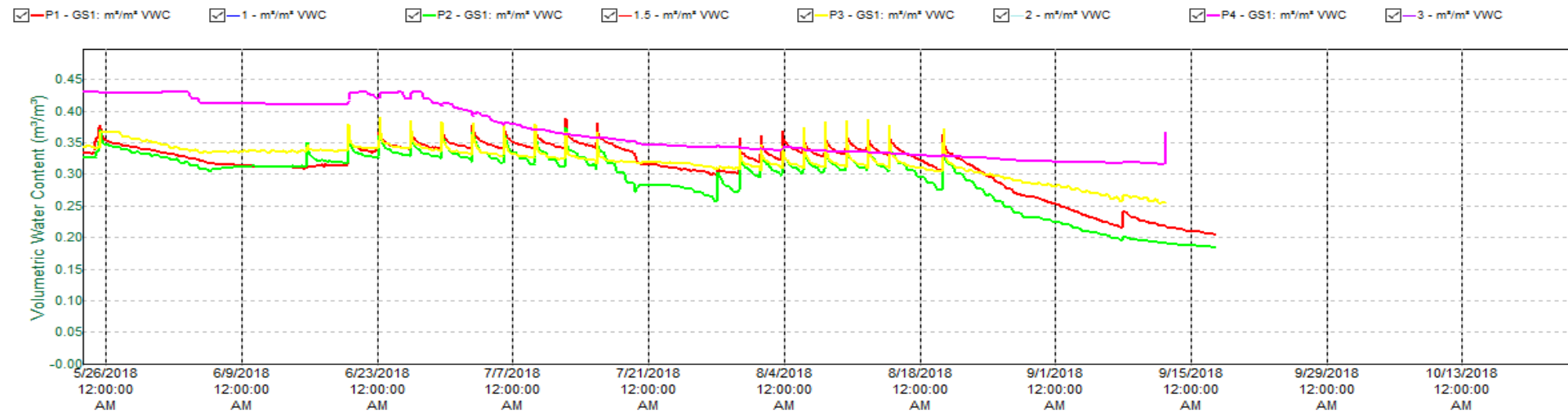
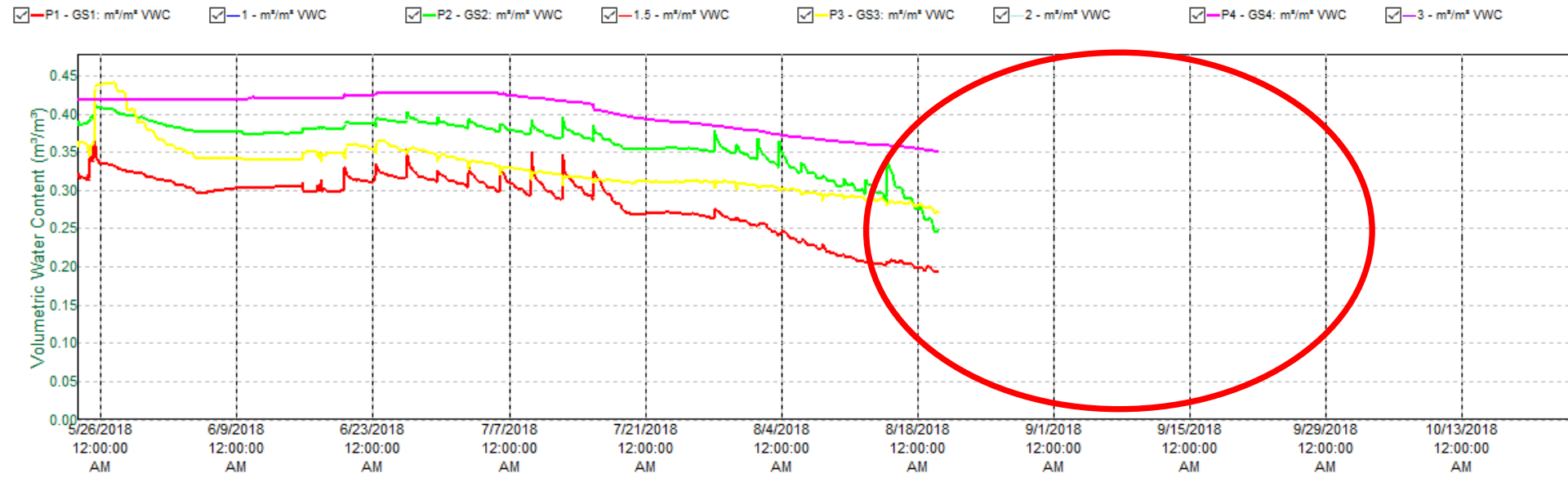
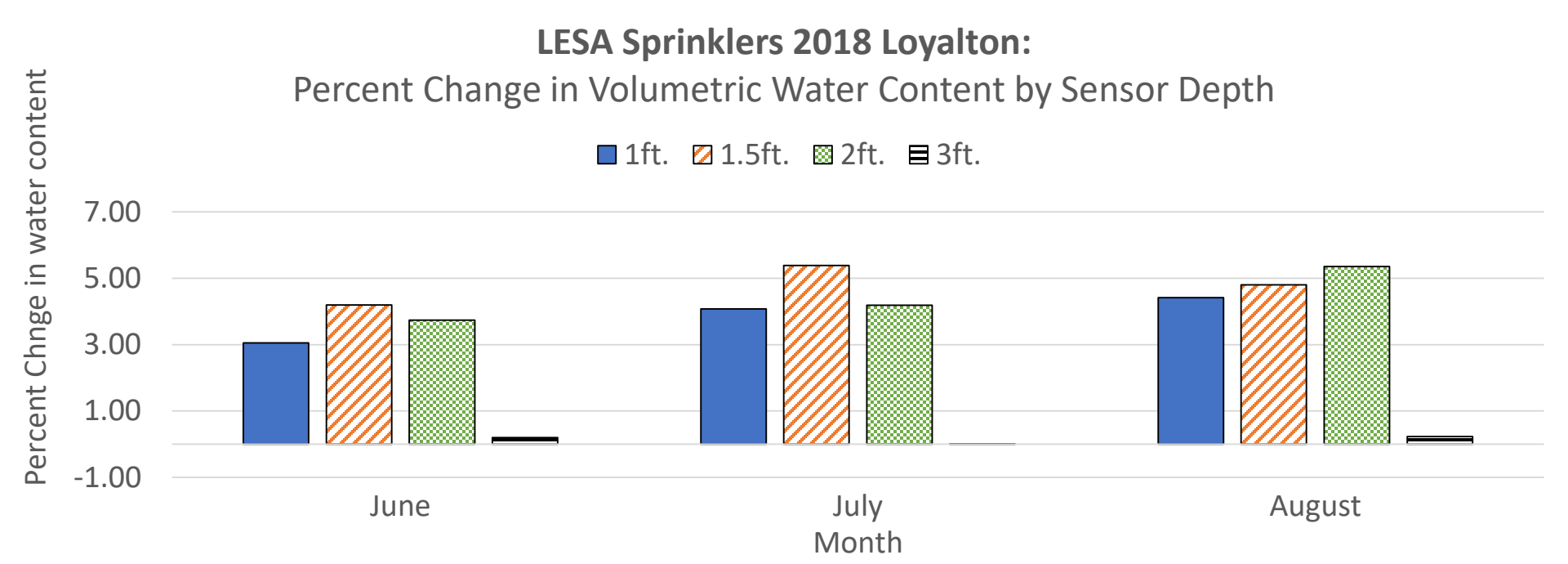


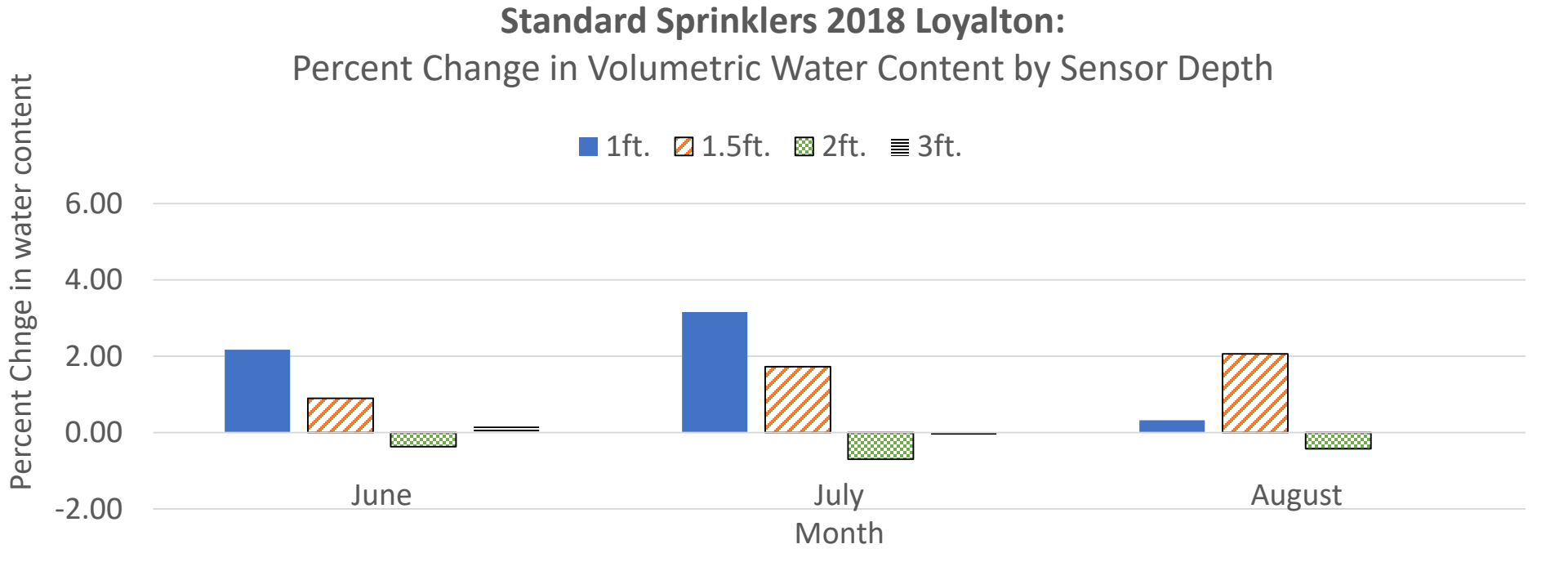
2018 Loyalton 2nd Site LESA



Standard




LESA Sprinklers 2018 Loyalton:
Percent Change in Volumetric Water Content by Sensor Depth
1ft.
1.5ft.
2ft.
3ft.
Percent Chnge in water content
7.00
5.00
3.00
1.00
-1.00
June
July
August
Month

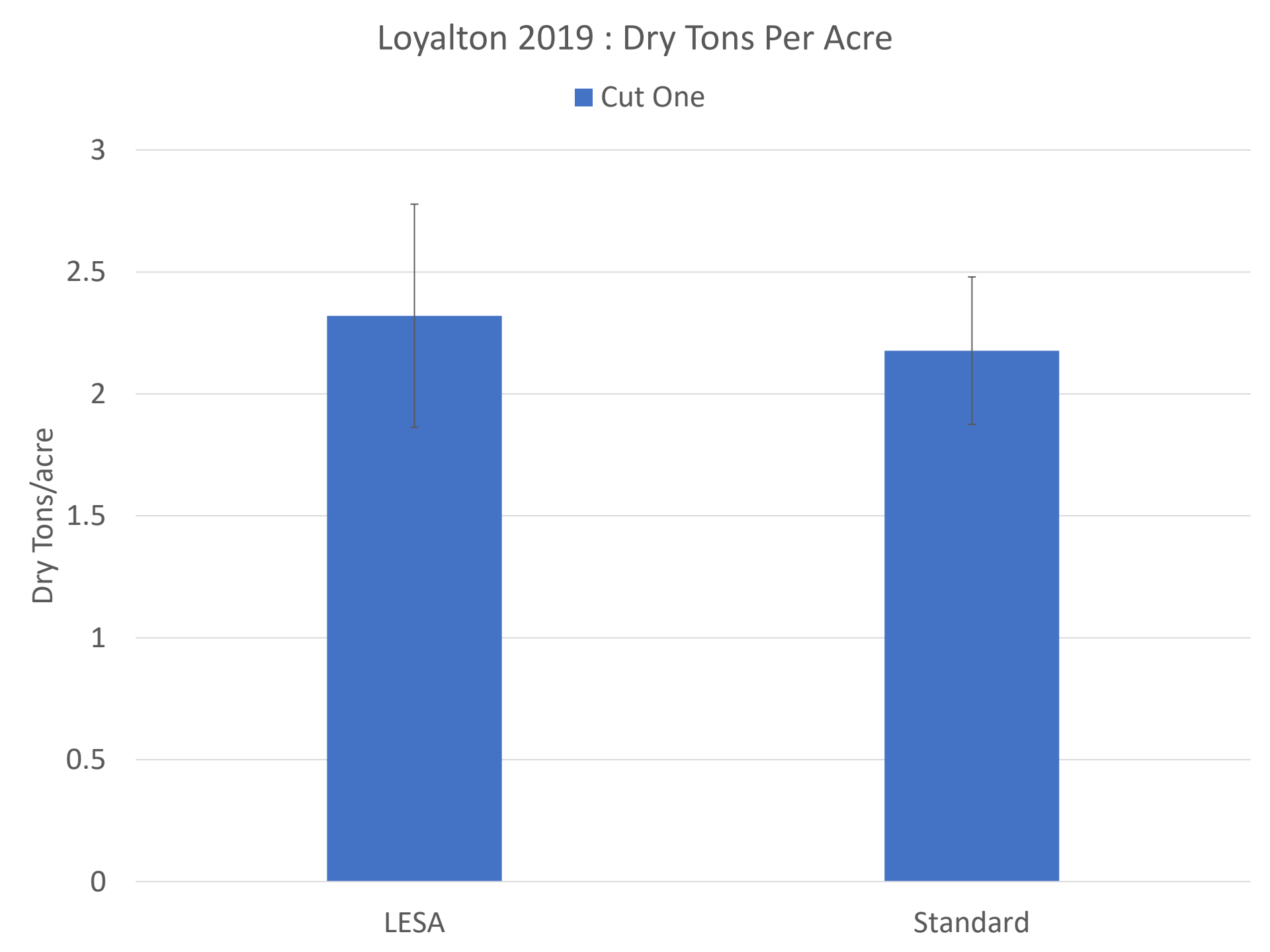

Standard Sprinklers 2018 Loyalton:
Percent Change in Volumetric Water Content by Sensor Depth
1ft.
1.5ft.
2ft.
3ft.
Percent Chnge in water content
6.00
4.00
2.00
0.00
-2.00
June
July
August
Month

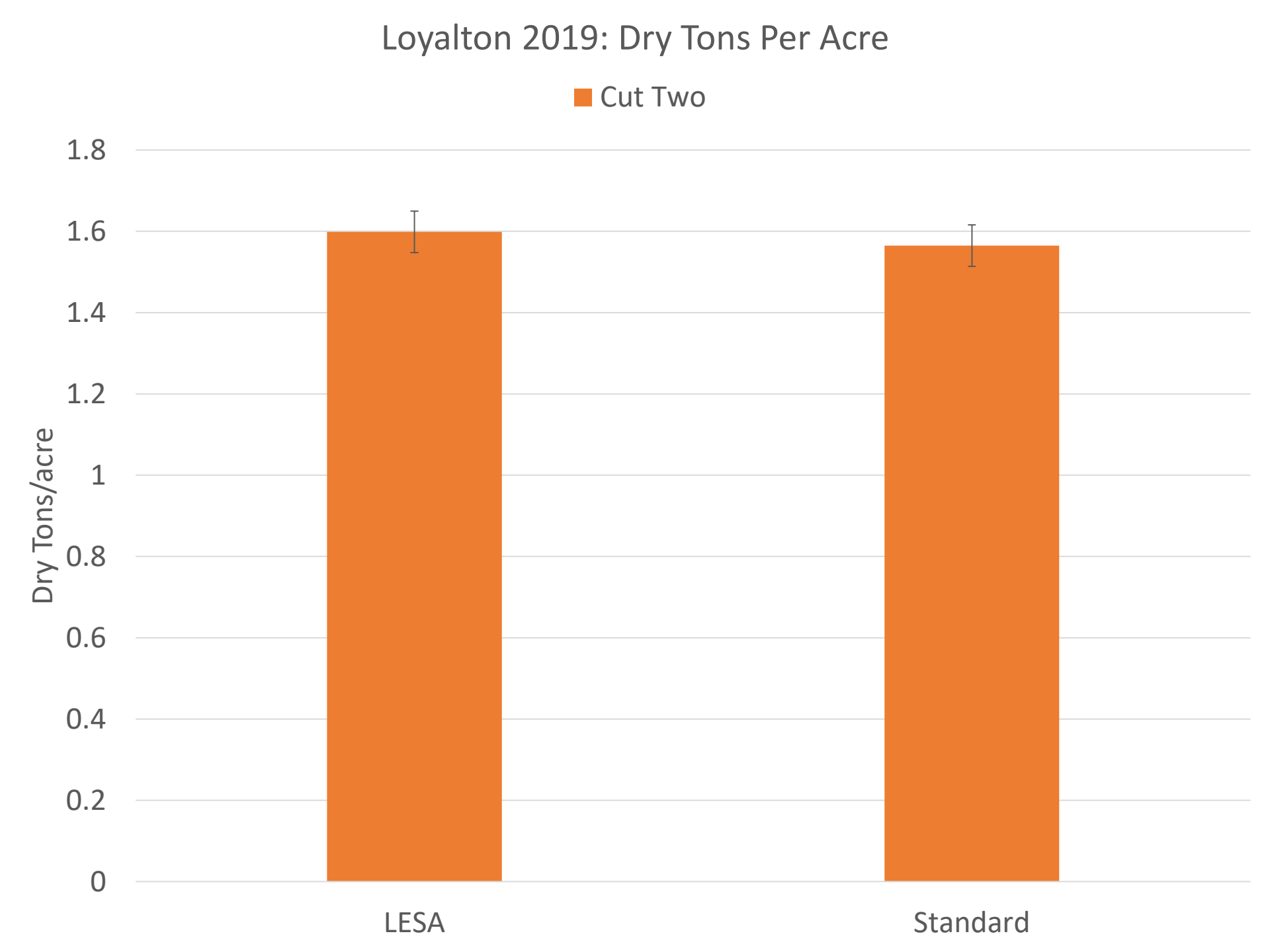
2019 Loyalton - Cows.....

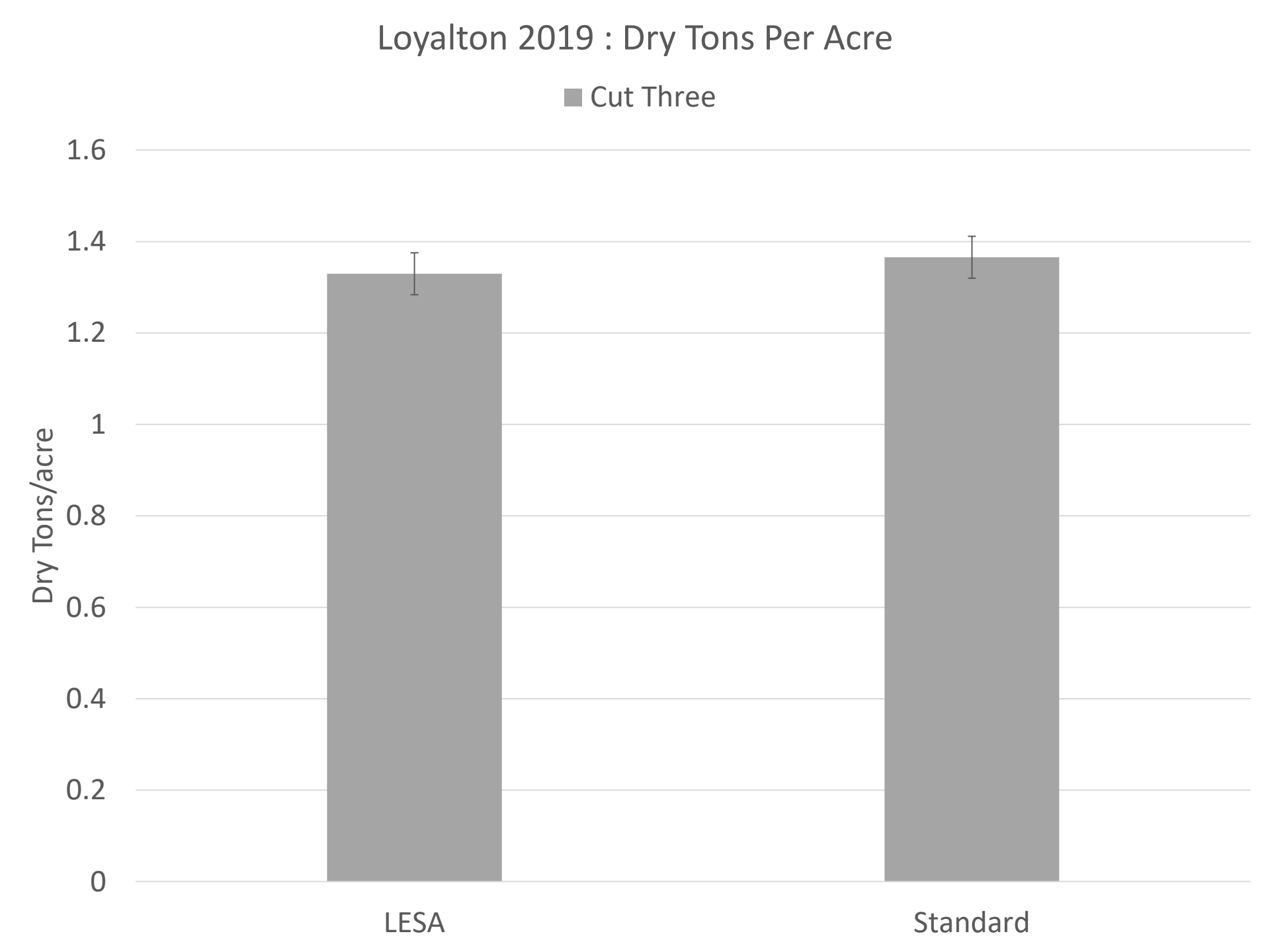
- Installed new moisture sensors
  - Results were inconclusive

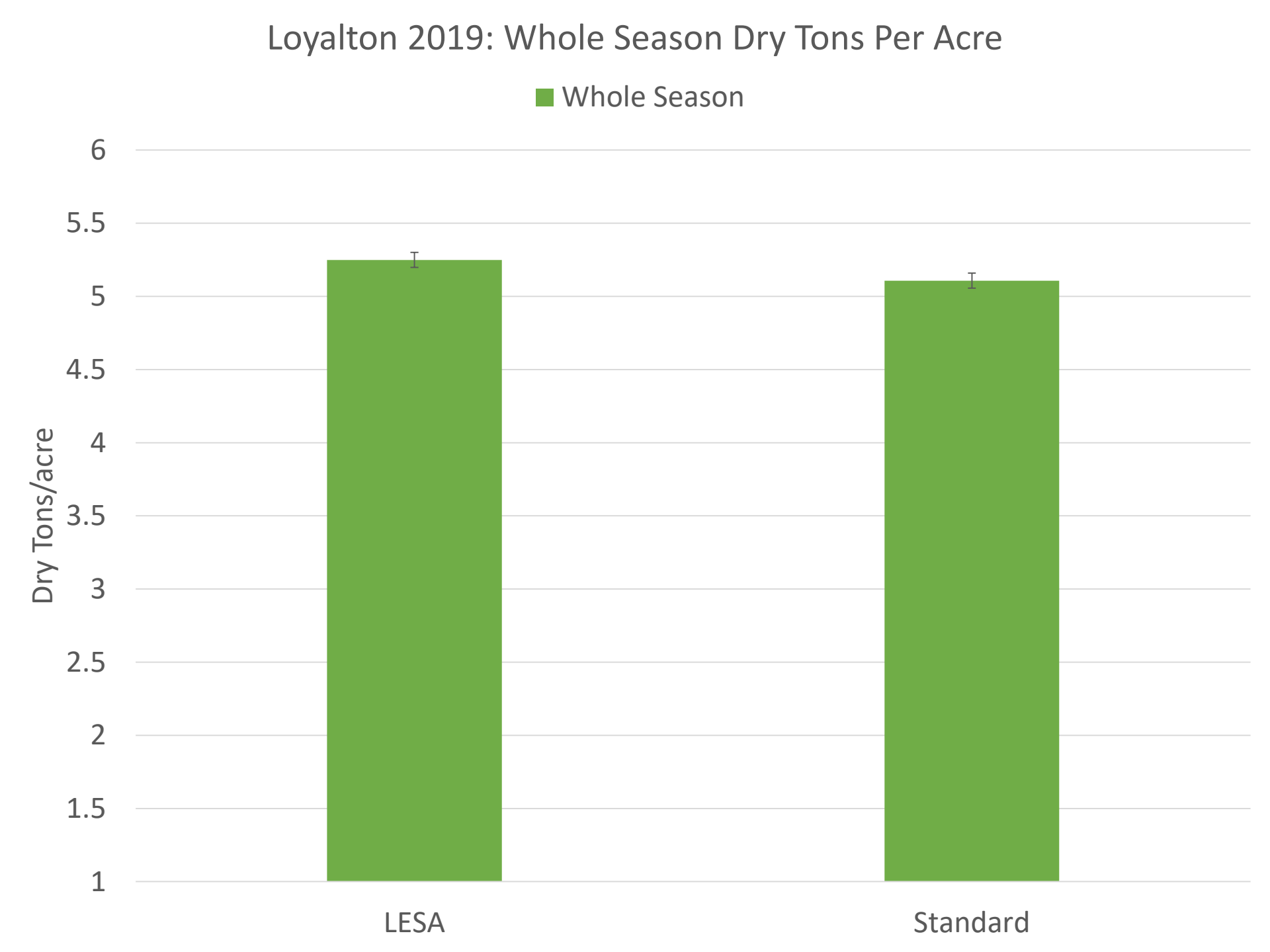
Biomass/Yield- 2019

- Loyalton
  - Five locations per irrigation type
  - Five 0.5 meter quadrats/location


Loyalton 2019 : Dry Tons Per Acre
Cut One
3
2.5
2
1.5
1
0.5
0
Dry Tons/acre
LESA
Standard


Loyalton 2019: Dry Tons Per Acre
Cut Two
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Dry Tons/acre
LESA
Standard


Loyalton 2019 : Dry Tons Per Acre
Cut Three
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Dry Tons/acre
LESA
Standard


Loyalton 2019: Whole Season Dry Tons Per Acre
Whole Season
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
Dry Tons/acre
LESA
Standard

Conclusions

- Inconclusive results: case studies
  - Moisture Sensors
    - Needed more sensors….
  - Yields?

- Previous Research
  - Lower pressure
  - Higher efficiency

- Peters et. al. 2016
  - 4-year payback on pressure reduction alone

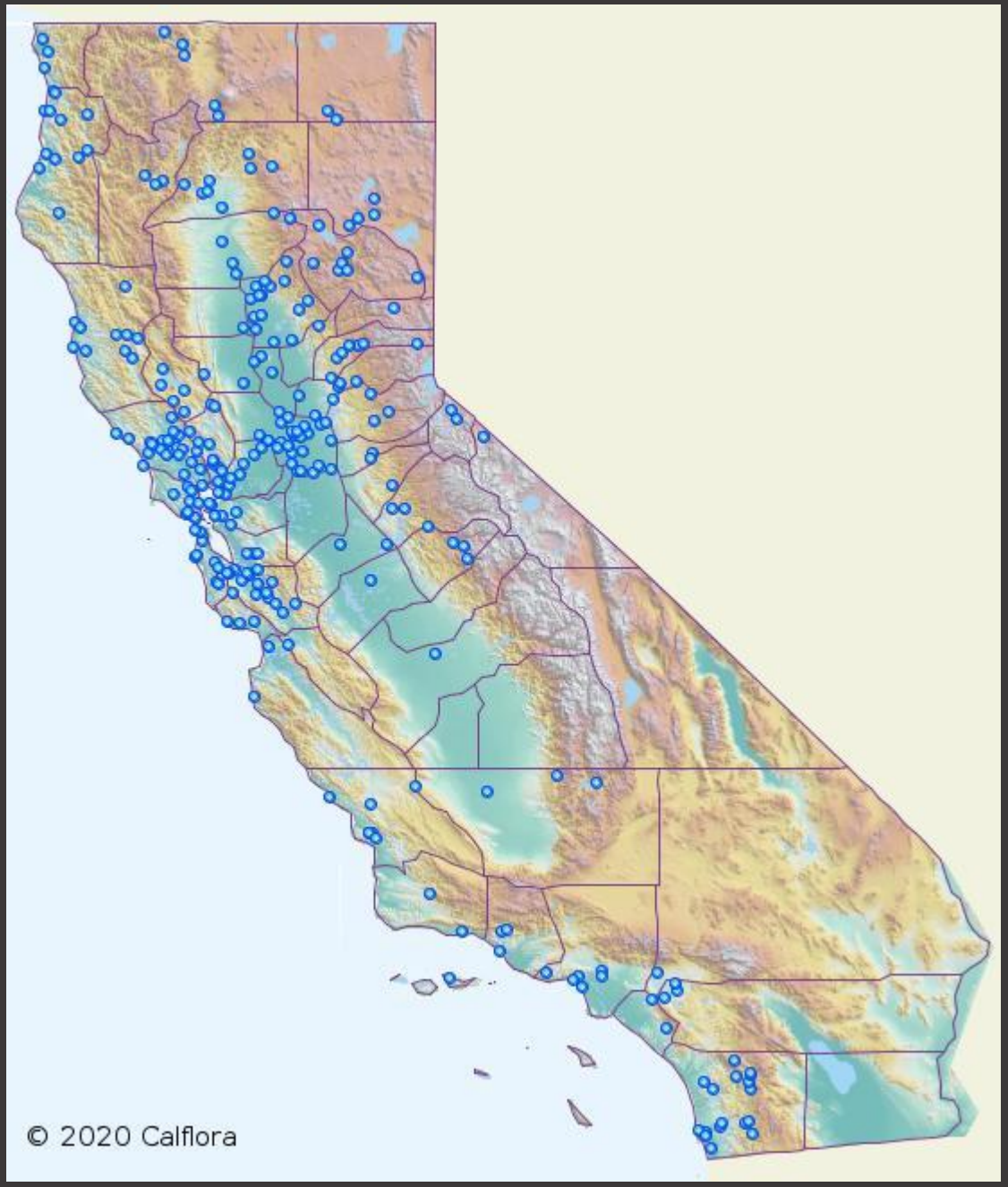
Weeds

Chicory

Photo Courtesy of: Peter M Dziuk

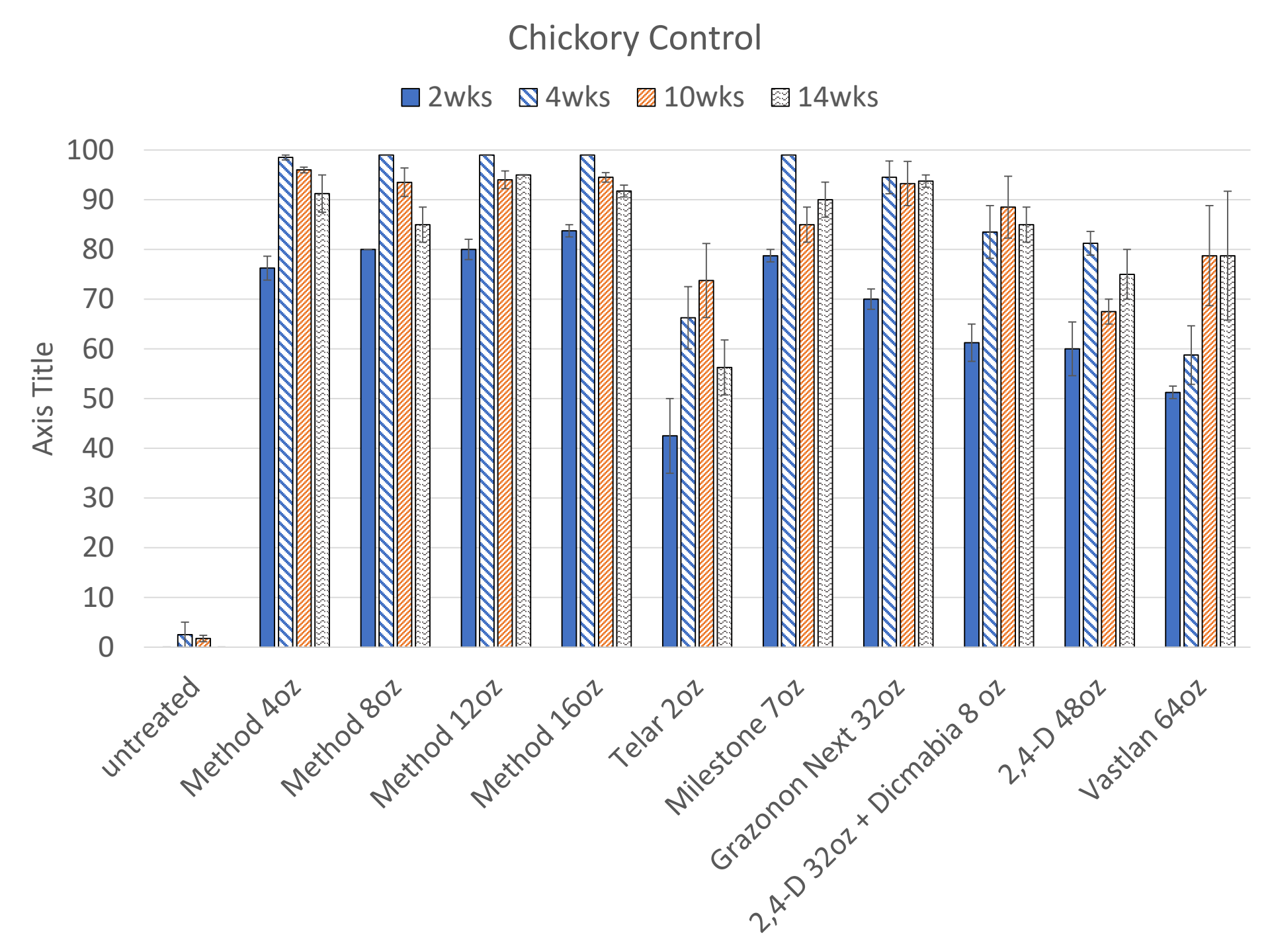
Chicory

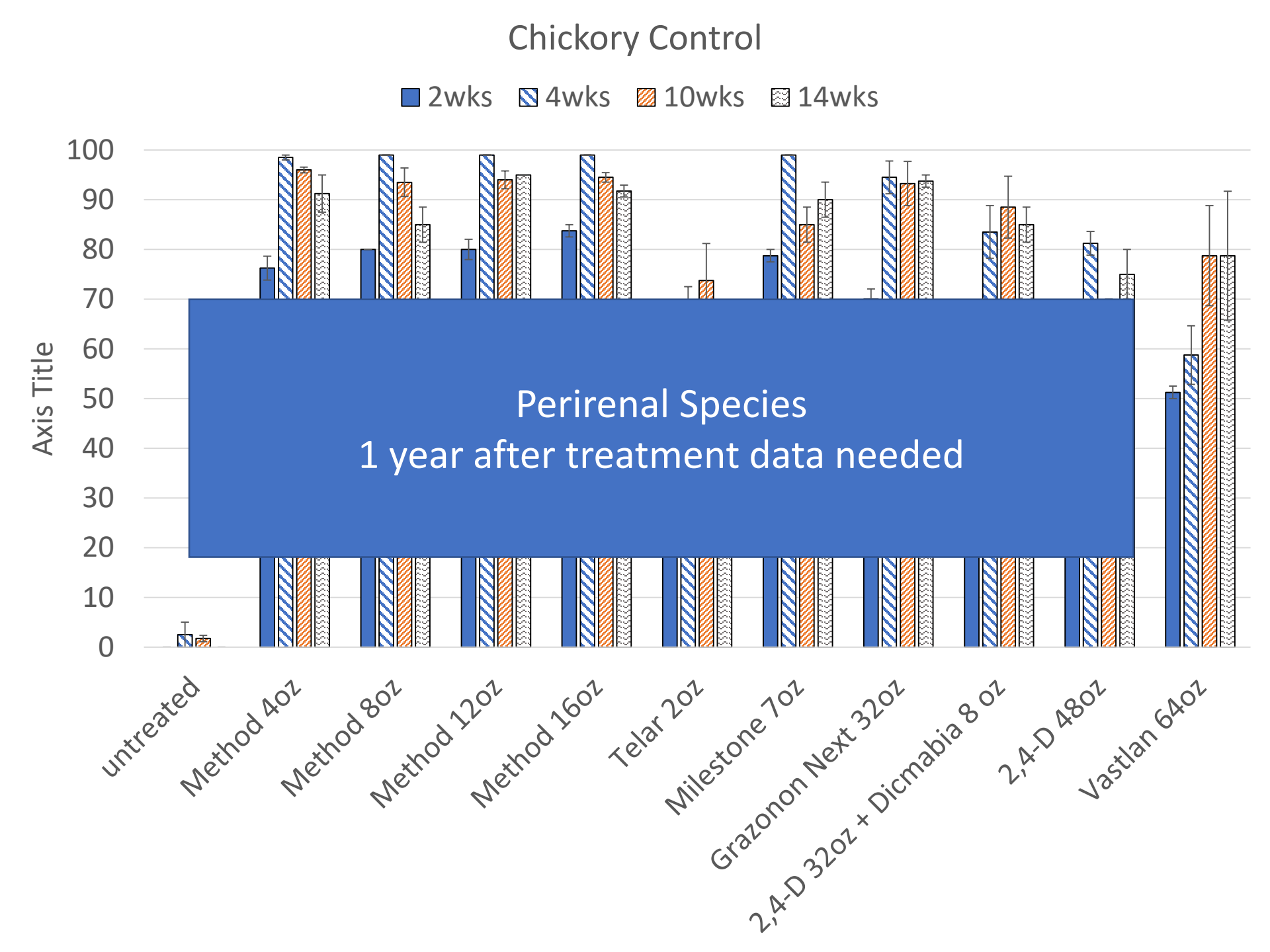
- Can be desirable
- Can displace forage
- Often considered a weed
- Not Native

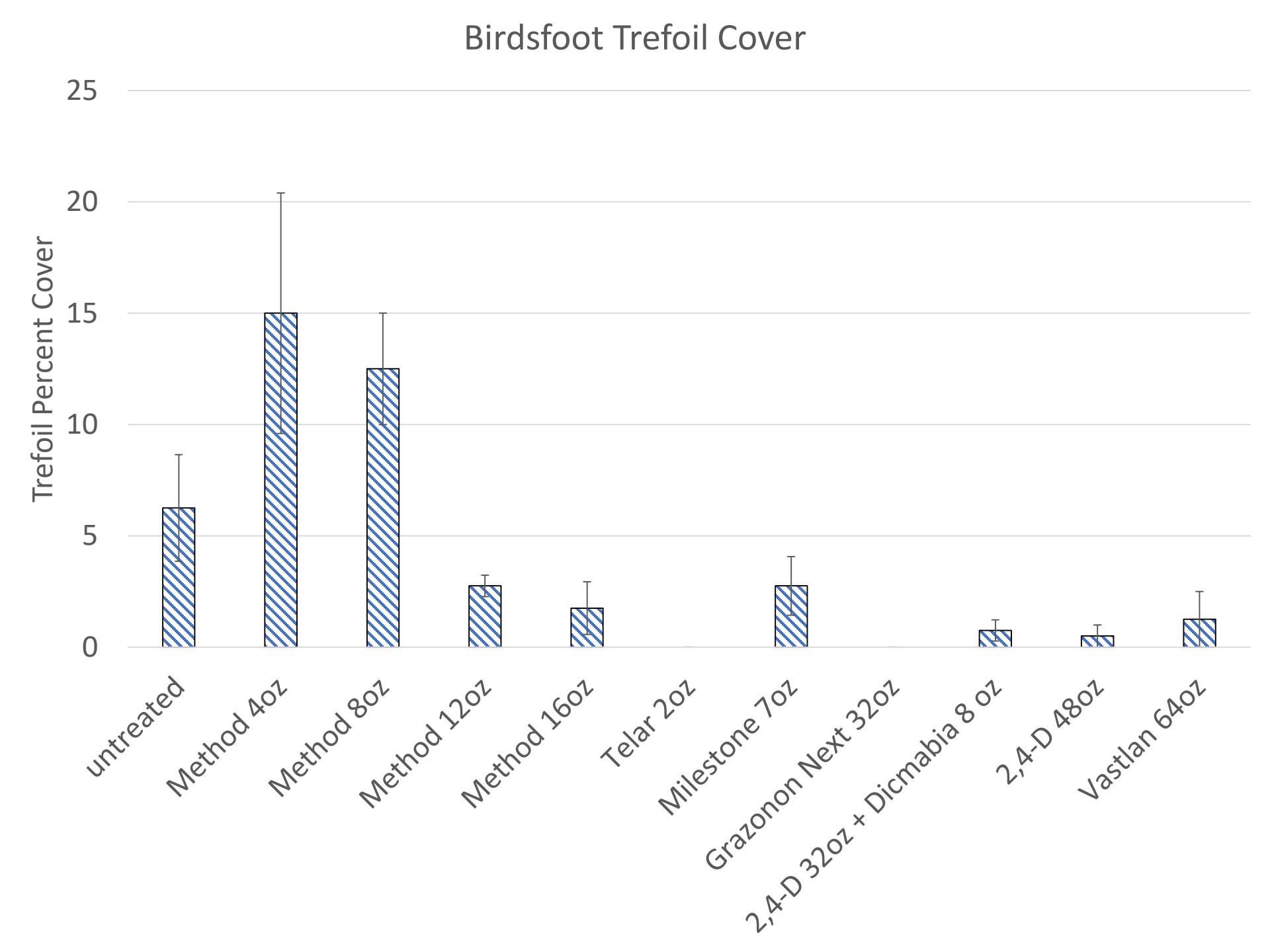


2019 Trial

- Honey Lake Valley
  - Pasture, lots Chicory
- CO2 Backpack Sprayer
- 20/gal acre
- 4 replications 10*20 ft. plots
- Sprayed 5-29-19


Chickory Control
2wks
4wks
10wks
14wks
Axis Title
100
90
80
70
60
50
40
30
20
10
0
untreated
Method 4oz
Method 8oz
Method 12oz
Method 16oz
Telar 2oz
Milestone 7oz
Grazonon Next 32oz
2,4-D 32oz + Dicmabia 8 oz
2,4-D 48oz
Vastlan 64oz


Chickory Control
2wks
4wks
10wks
14wks
Axis Title
100
90
80
70
60
50
40
30
20
10
0
Perirenal Species
1 year after treatment data needed
untreated
Method 4oz
Method 8oz
Method 12oz
Method 16oz
Telar 2oz
Milestone 7oz
Grazonon Next 32oz
2,4-D 32oz + Dicmabia 8 oz
2,4-D 48oz
Vastlan 64oz


Birdsfoot Trefoil Cover
Trefoil Percent Cover
25
20
15
10
5
0
untreated
Method 4oz
Method 8oz
Method 12oz
Method 16oz
Telar 2oz
Milestone 7oz
Grazonon Next 32oz
2,4-D 32oz + Dicmabia 8 oz
2,4-D 48oz
Vastlan 64oz

2,4-D 32oz + Dicamba 8oz

Method 8 oz

Method 4 oz

Untreated

Method

- No Grazing Label!
  - Maybe someday
  - Company pursuing
- Kills Trees…
- Interesting Selectivity

Non/Less Volatile Synthetic Auxins

- Unison- 2,4-D
- Vastlan- Triclopyr

On the Horizon (Not yet CA)

- Freelexx -2,4-D
- Esplanade- Indaziflam
  - Preemergent product (long residual)
  - Grazing label being sought
  - Expected by Bayer in 2020
- Arelex Active
  - New Mode of Action
  - Arylpicolinates Group 0
  - First New Range/pasture mode of action in 10 years
  - Looking for research sites in 2020

Russian Knapweed Gall Wasp *Aulacidea acroptilonica*

- Mike Pitcairn and Viola Popescu CDFA
- Three release sites 2017
  - Karlo Rd.
  - Hwy. 395
  - Lambert Lane
- Two release sites 2019
  - Lambert Lane
  - Ash Creek Wildlife Area

Courtesy of Pitcairn 2019

Table 2. Plant and gall abundance at two Russian knapweed locations where the gall wasp, *Aulacidea acroptilonica* was released.

Lassen County Karlo Road	**# quadrats (# of plants sampled)**	**Mean plants per sq meter**	**Mean plant height**	**Mean flw hds per sq meter**	**Mean galls per sq meter**	**Mean seeds per sq meter**	**Mean galls per plant**
2017	14 (52)	92.9	40.4	953.6	25.0	4728.6	0.27
2018	24 (51)	106.2	65.0	316.7	660.4	1325.0	6.22
Siskiyou County Indian Point Rd	**# quadrats (# of plants sampled)**	**Mean plants per sq meter**	**Mean plant height**	**Mean flw hds per sq meter**	**Mean galls per sq meter**	**Mean seeds per sq meter**	**Mean galls per plant**
2017	31 (50)	80.6	38.0	1245.2	27.4	5758.1	0.34
2018	24 (50)	104.2	50.2	0.0	491.7	0.0	4.72

[1]Department of Land Resources and Environmental Sciences, Montana State University, Bozeman, Montana
[2]Weed Ecology and Cropping Systems Advisor, University of California Cooperative Extension, Susanville, CA
[3]Siskiyou County Agricultural Commissioner's Office, Yreka, California

Courtesy of Pitcairn 2019

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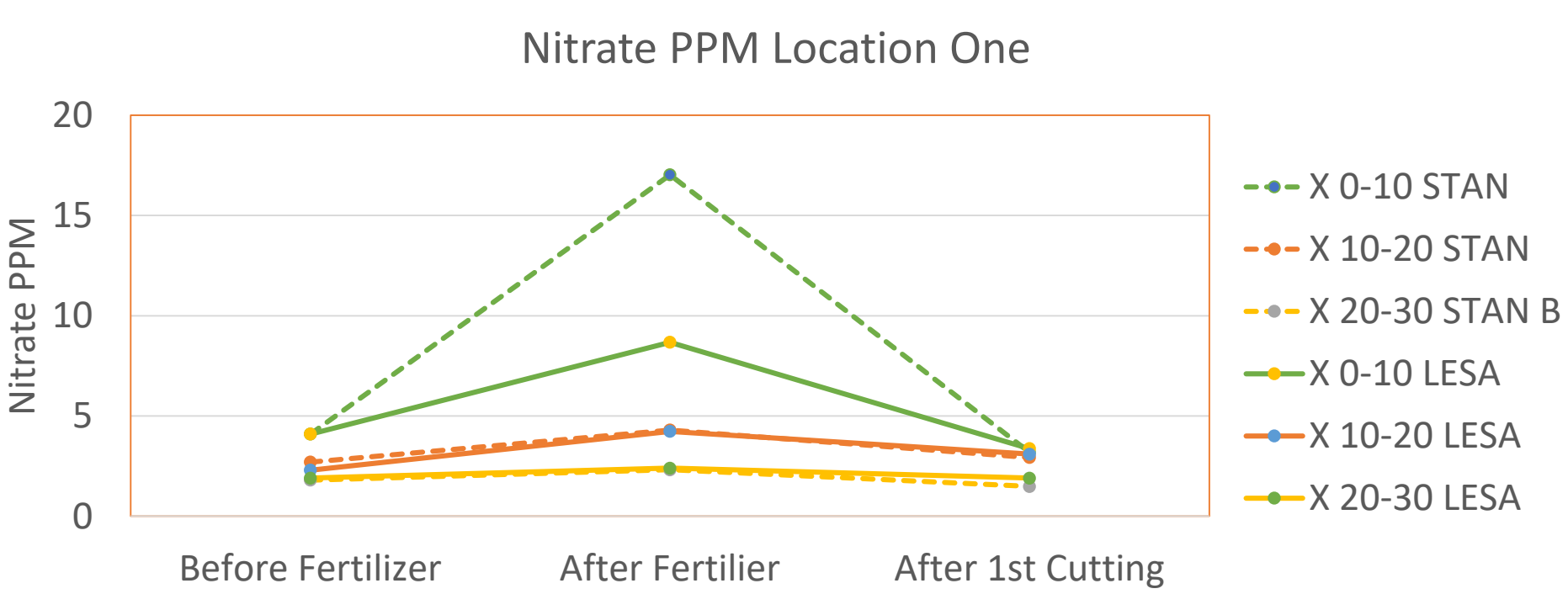
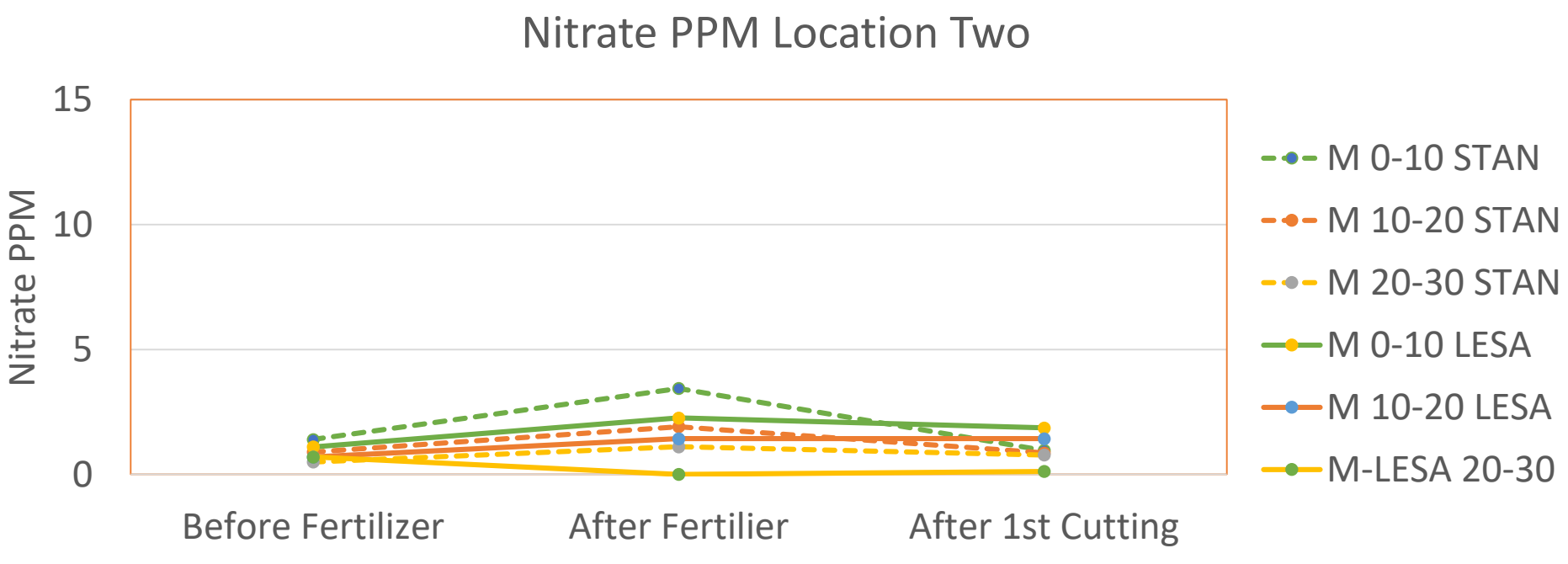
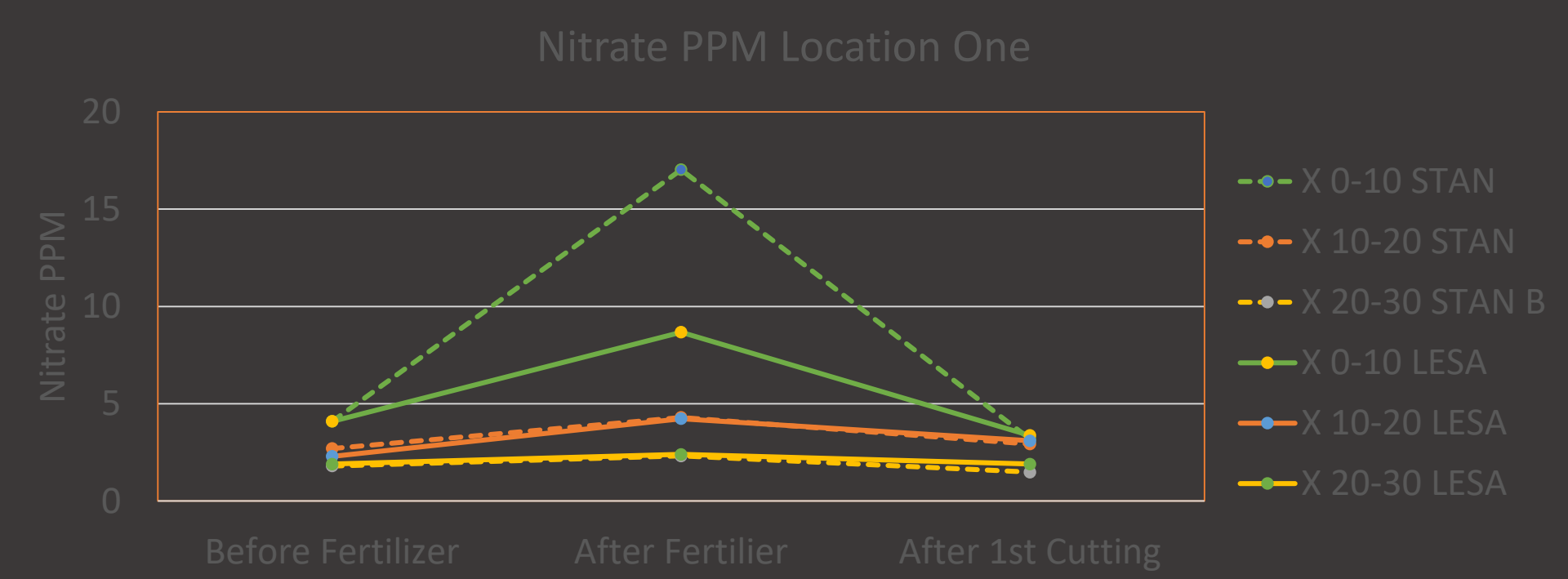
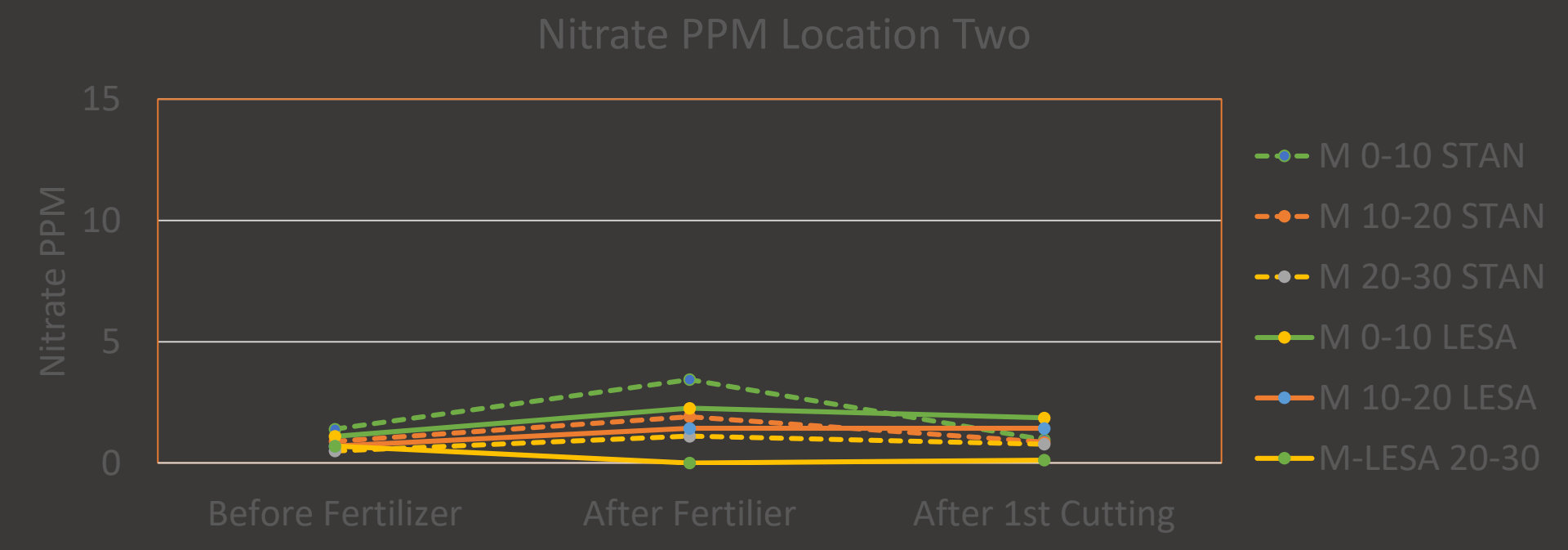
Questions/Comments

- Tom Getts
- tjgetts@ucanr.edu
- 530-251-2560


Nitrate PPM Location One
Nitrate PPM
20
15
10
5
0
Before Fertilizer
After Fertilier
After 1st Cutting
X 0-10 STAN
X 10-20 STAN
X 20-30 STAN B
X 0-10 LESA
X 10-20 LESA
X 20-30 LESA


Nitrate PPM Location Two
Nitrate PPM
15
10
5
0
Before Fertilizer
After Fertilier
After 1st Cutting
M 0-10 STAN
M 10-20 STAN
M 20-30 STAN
M 0-10 LESA
M 10-20 LESA
M-LESA 20-30


Nitrate PPM Location One
Nitrate PPM
20
15
10
5
0
Before Fertilizer
After Fertilier
After 1st Cutting
X 0-10 STAN
X 10-20 STAN
X 20-30 STAN B
X 0-10 LESA
X 10-20 LESA
X 20-30 LESA


Nitrate PPM Location Two
Nitrate PPM
15
10
5
0
Before Fertilizer
After Fertilier
After 1st Cutting
M 0-10 STAN
M 10-20 STAN
M 20-30 STAN
M 0-10 LESA
M 10-20 LESA
M-LESA 20-30

Spring Weed Control Trial Alfalfa

- ***Not all treatments labeled uses
- Applied March 16, 2019
- Four replications
- Honey Lake Valley
- Alfalfa just breaking dormancy
- Weeds 1-3 inch rosettes

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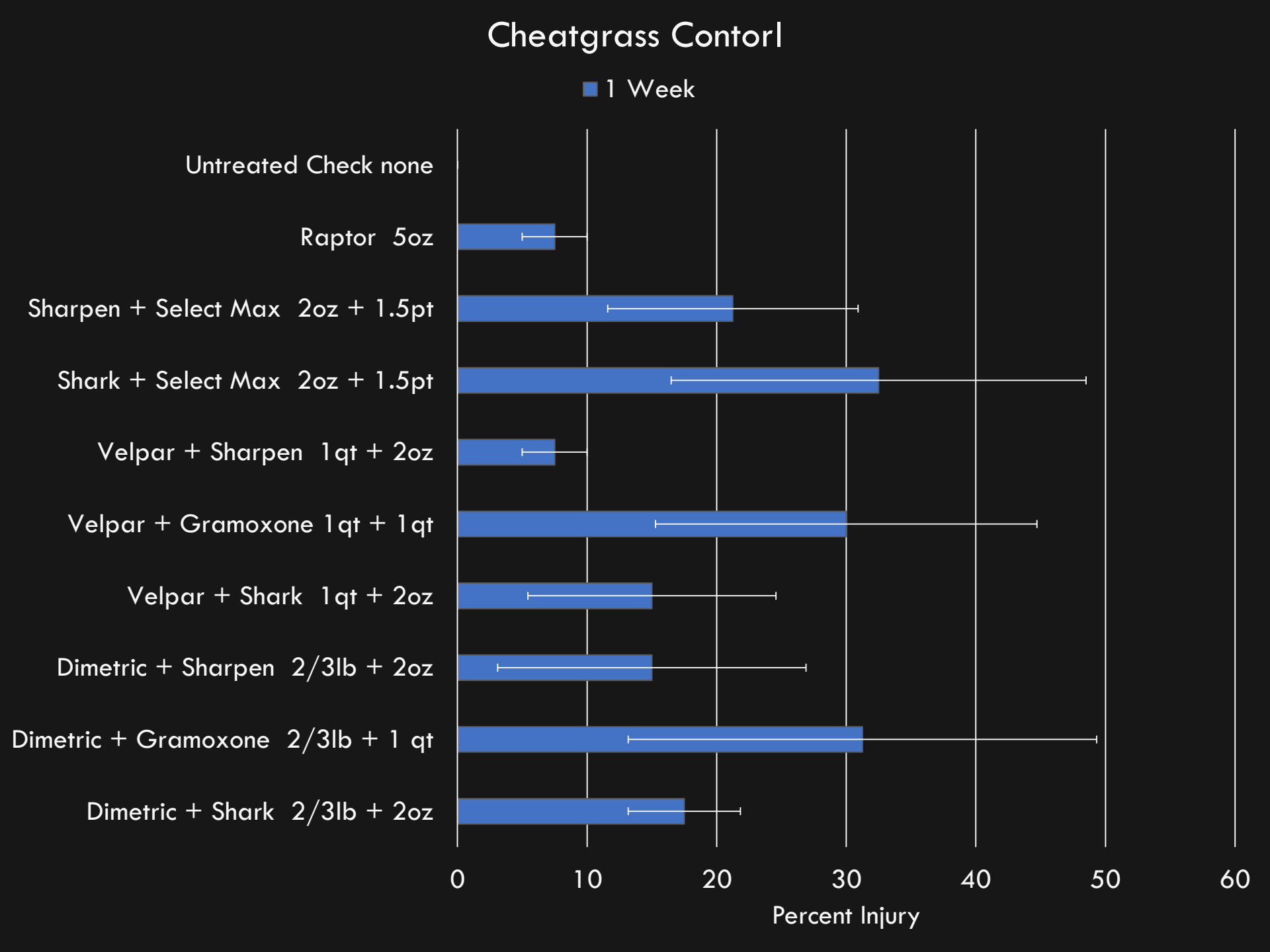
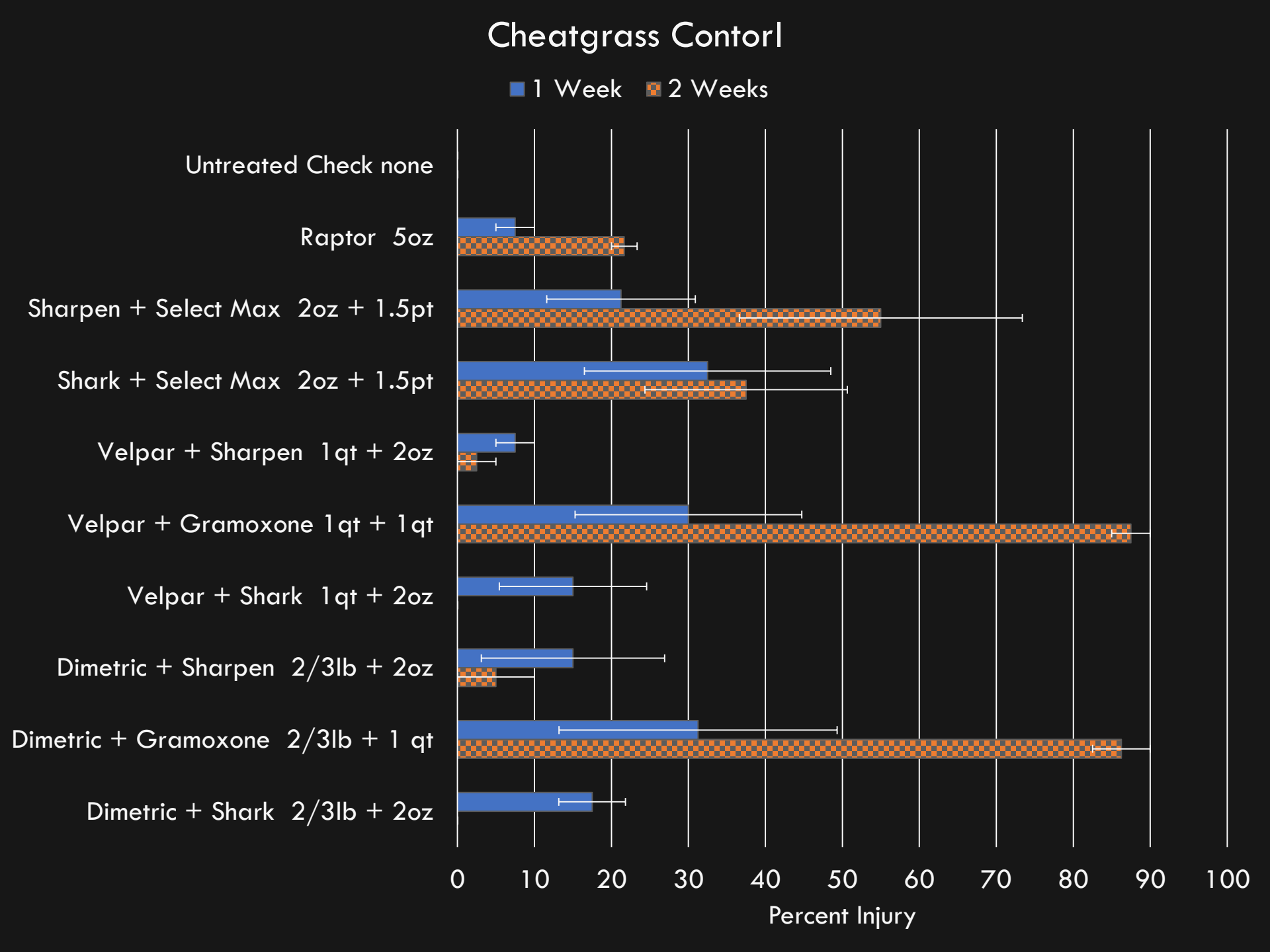
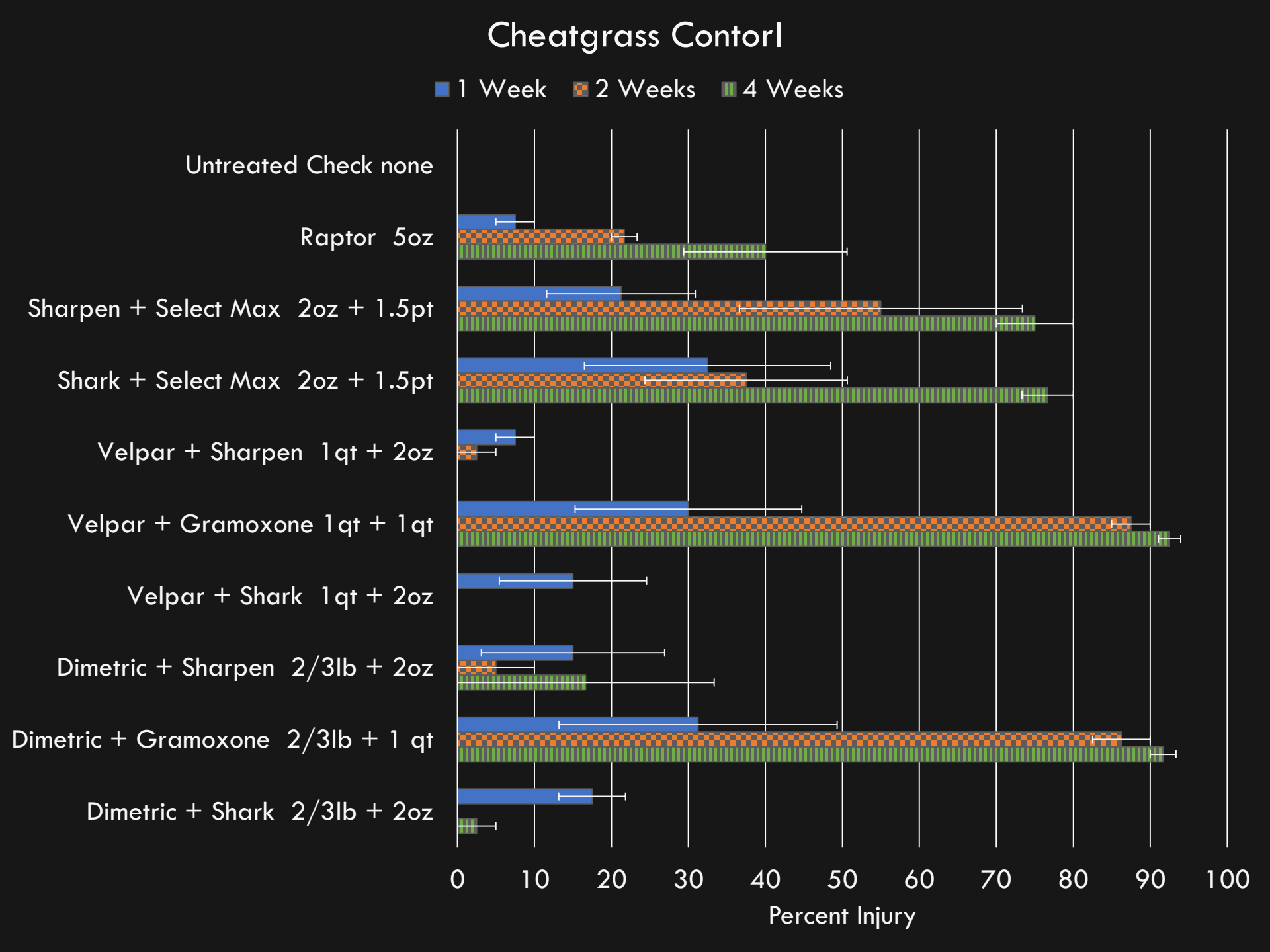
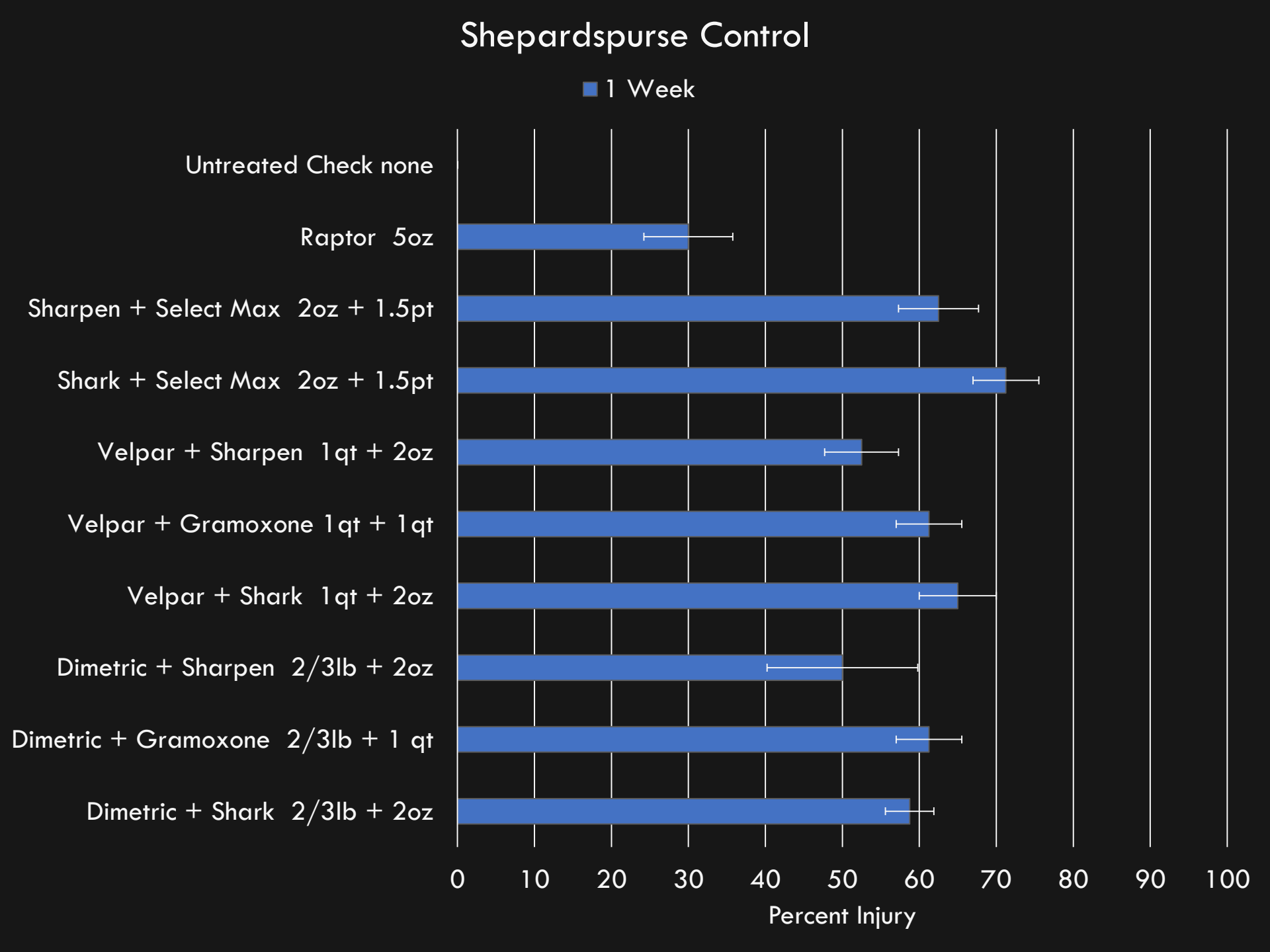
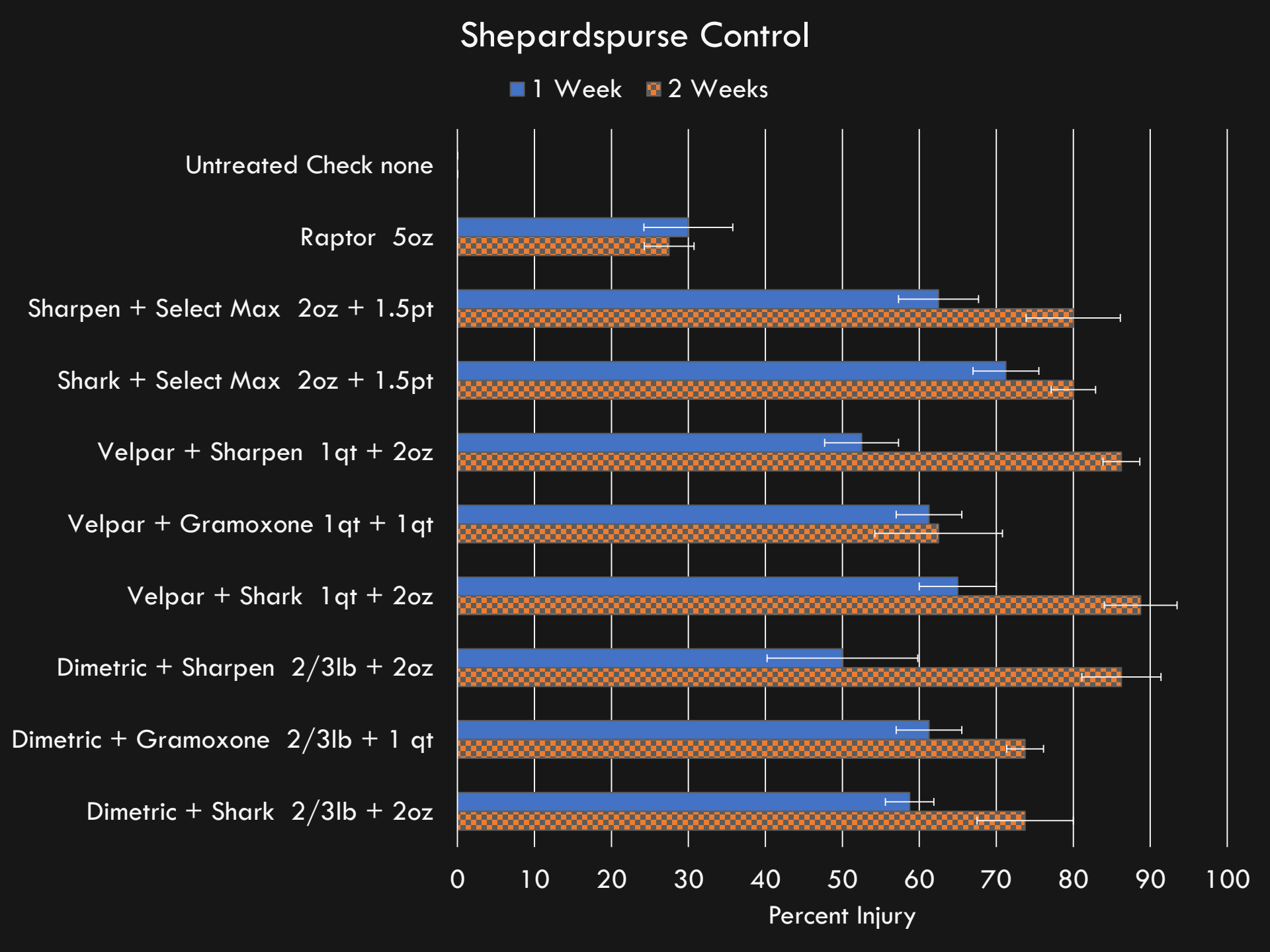
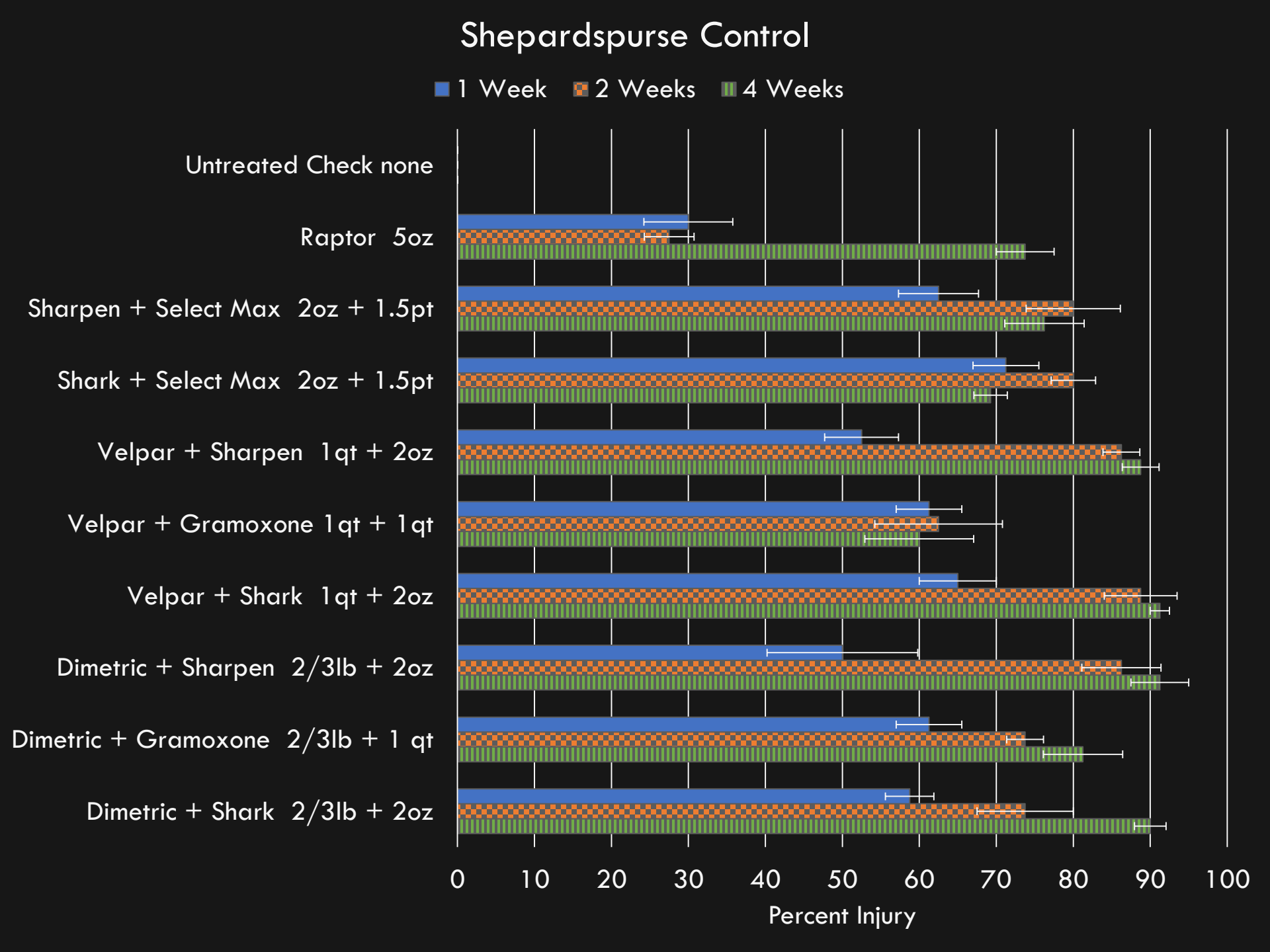

Cheatgrass Contorl
1 Week
Untreated Check none
Raptor 5oz
Sharpen + Select Max 2oz + 1.5pt
Shark + Select Max 2oz + 1.5pt
Velpar + Sharpen 1qt + 2oz
Velpar + Gramoxone 1qt + 1qt
Velpar + Shark 1qt + 2oz
Dimetric + Sharpen 2/3lb + 2oz
Dimetric + Gramoxone 2/3lb + 1 qt
Dimetric + Shark 2/3lb + 2oz
0
10
20
30
40
50
60
Percent Injury

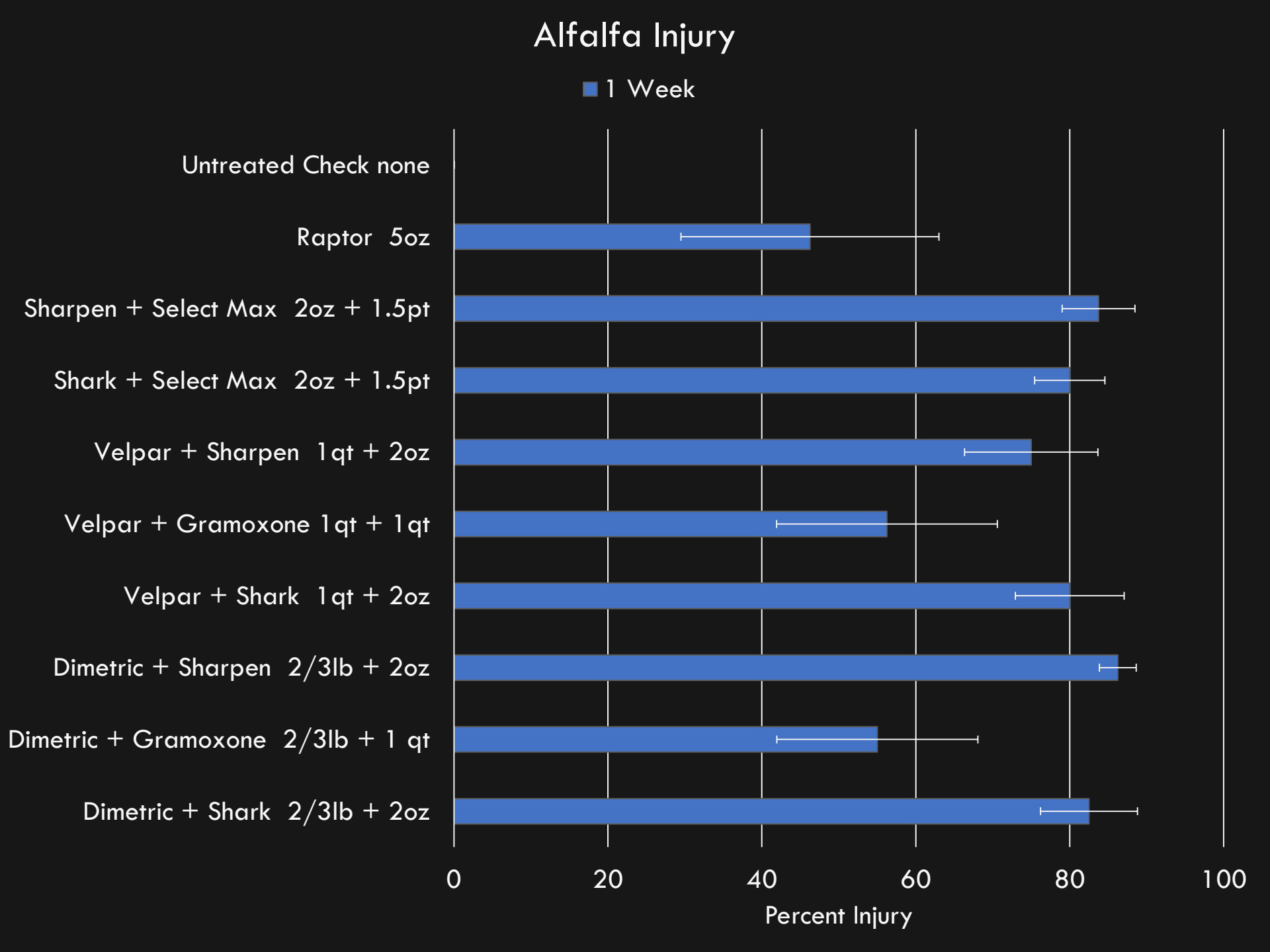

Cheatgrass Contorl
1 Week
2 Weeks
Untreated Check none
Raptor 5oz
Sharpen + Select Max 2oz + 1.5pt
Shark + Select Max 2oz + 1.5pt
Velpar + Sharpen 1qt + 2oz
Velpar + Gramoxone 1qt + 1qt
Velpar + Shark 1qt + 2oz
Dimetric + Sharpen 2/3lb + 2oz
Dimetric + Gramoxone 2/3lb + 1 qt
Dimetric + Shark 2/3lb + 2oz
0
10
20
30
40
50
60
70
80
90
100
Percent Injury

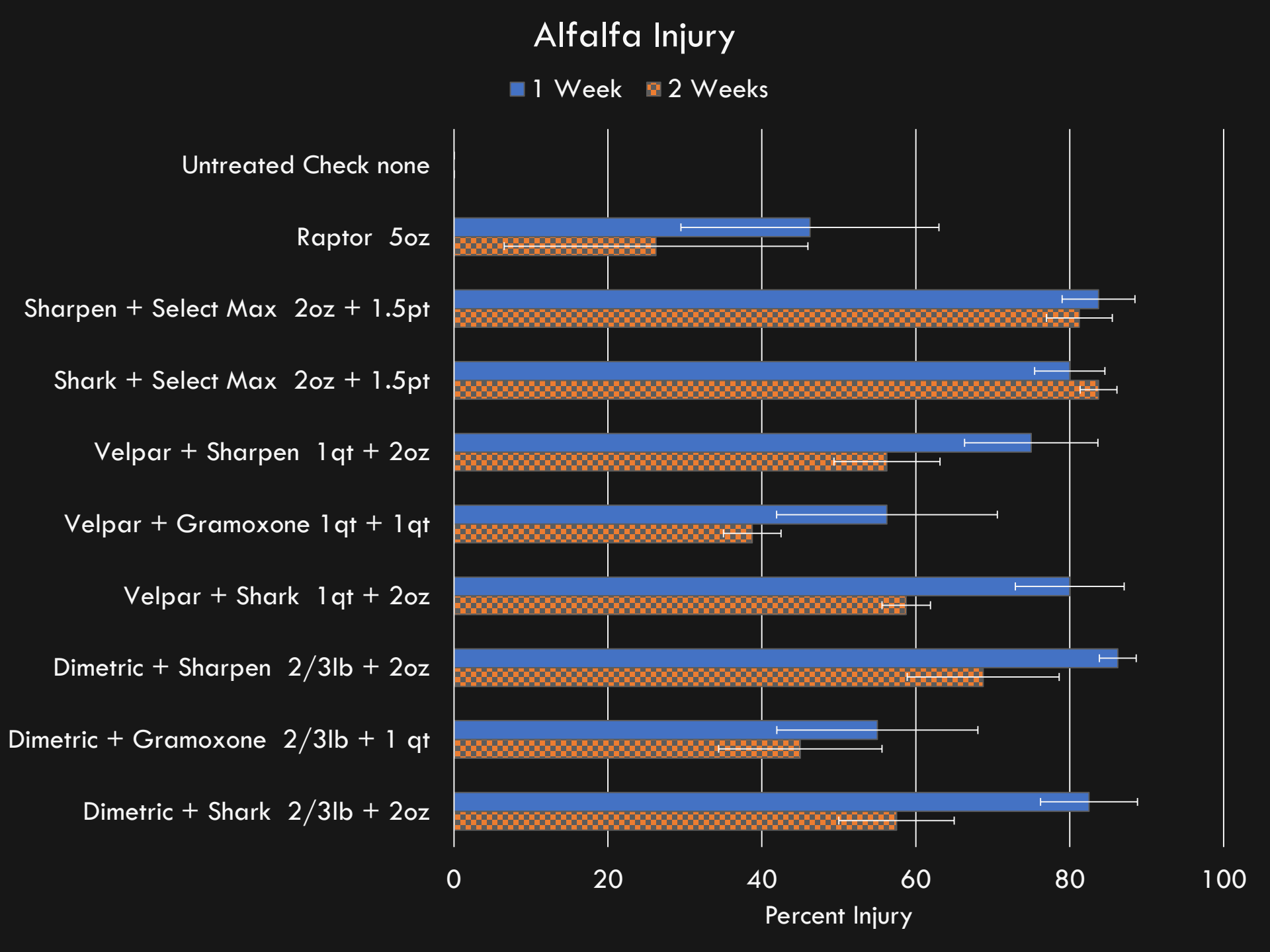

Cheatgrass Contorl
1 Week
2 Weeks
4 Weeks
Untreated Check none
Raptor 5oz
Sharpen + Select Max 2oz + 1.5pt
Shark + Select Max 2oz + 1.5pt
Velpar + Sharpen 1qt + 2oz
Velpar + Gramoxone 1qt + 1qt
Velpar + Shark 1qt + 2oz
Dimetric + Sharpen 2/3lb + 2oz
Dimetric + Gramoxone 2/3lb + 1 qt
Dimetric + Shark 2/3lb + 2oz
0
10
20
30
40
50
60
70
80
90
100
Percent Injury

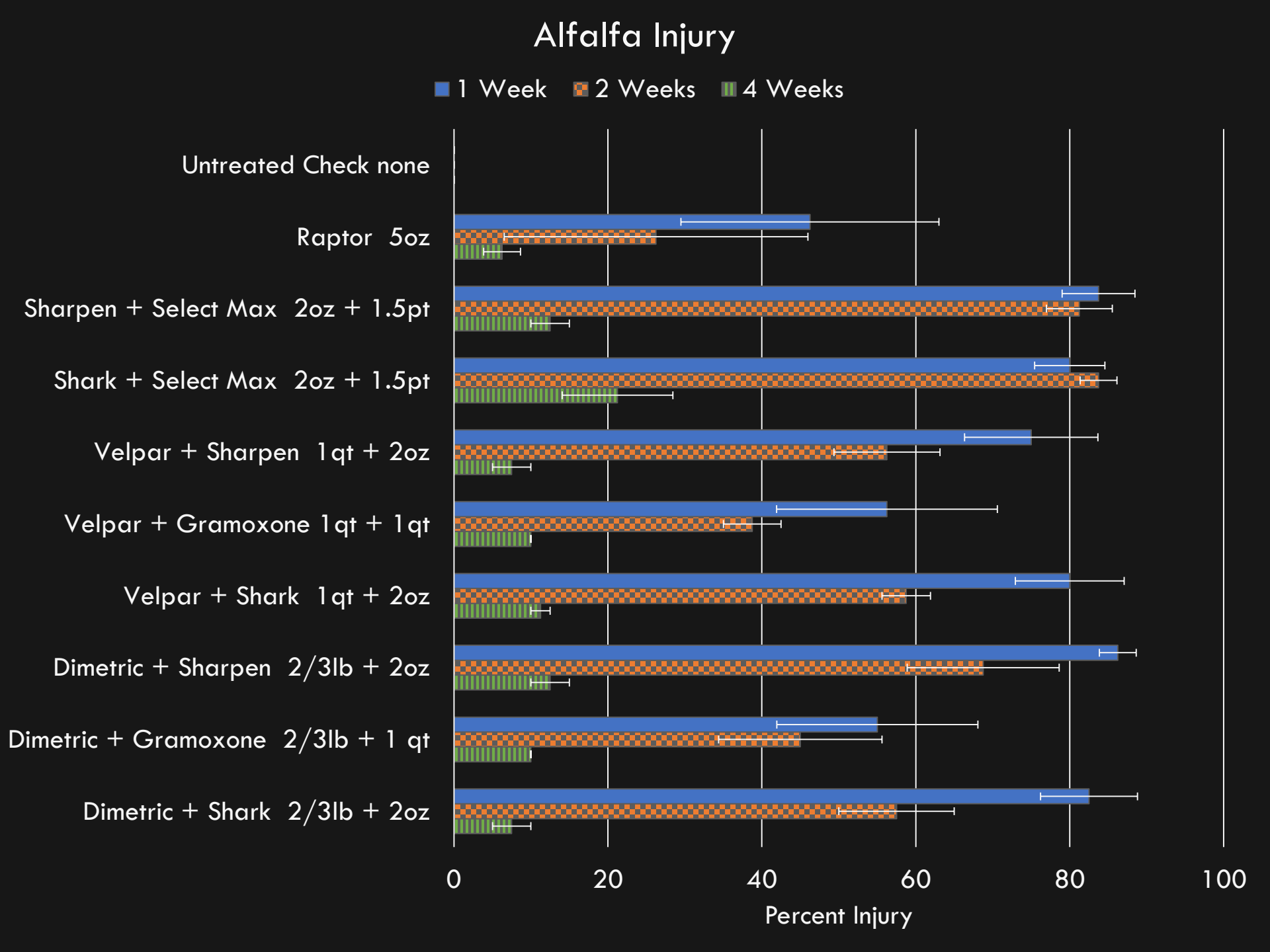

Shepardspurse Control
1 Week
Untreated Check none
Raptor 5oz
Sharpen + Select Max 2oz + 1.5pt
Shark + Select Max 2oz + 1.5pt
Velpar + Sharpen 1qt + 2oz
Velpar + Gramoxone 1qt + 1qt
Velpar + Shark 1qt + 2oz
Dimetric + Sharpen 2/3lb + 2oz
Dimetric + Gramoxone 2/3lb + 1 qt
Dimetric + Shark 2/3lb + 2oz
0
10
20
30
40
50
60
70
80
90
100
Percent Injury


Shepardspurse Control
1 Week
2 Weeks
Untreated Check none
Raptor 5oz
Sharpen + Select Max 2oz + 1.5pt
Shark + Select Max 2oz + 1.5pt
Velpar + Sharpen 1qt + 2oz
Velpar + Gramoxone 1qt + 1qt
Velpar + Shark 1qt + 2oz
Dimetric + Sharpen 2/3lb + 2oz
Dimetric + Gramoxone 2/3lb + 1 qt
Dimetric + Shark 2/3lb + 2oz
0
10
20
30
40
50
60
70
80
90
100
Percent Injury


Shepardspurse Control
1 Week
2 Weeks
4 Weeks
Untreated Check none
Raptor 5oz
Sharpen + Select Max 2oz + 1.5pt
Shark + Select Max 2oz + 1.5pt
Velpar + Sharpen 1qt + 2oz
Velpar + Gramoxone 1qt + 1qt
Velpar + Shark 1qt + 2oz
Dimetric + Sharpen 2/3lb + 2oz
Dimetric + Gramoxone 2/3lb + 1 qt
Dimetric + Shark 2/3lb + 2oz
0
10
20
30
40
50
60
70
80
90
100
Percent Injury


Alfalfa Injury
1 Week
Untreated Check none
Raptor 5oz
Sharpen + Select Max 2oz + 1.5pt
Shark + Select Max 2oz + 1.5pt
Velpar + Sharpen 1qt + 2oz
Velpar + Gramoxone 1qt + 1qt
Velpar + Shark 1qt + 2oz
Dimetric + Sharpen 2/3lb + 2oz
Dimetric + Gramoxone 2/3lb + 1 qt
Dimetric + Shark 2/3lb + 2oz
0
20
40
60
80
100
Percent Injury

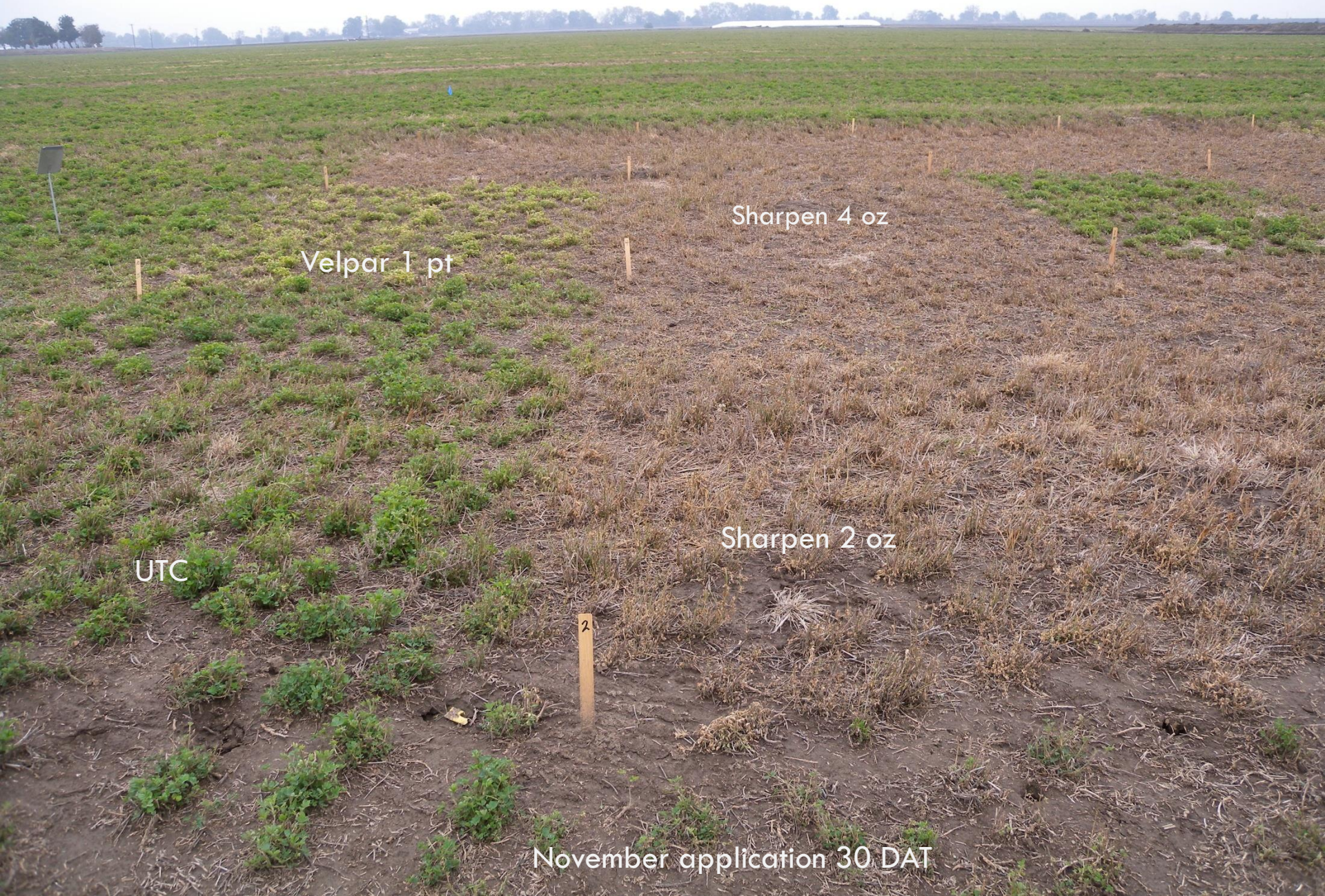

Alfalfa Injury
1 Week
2 Weeks
Untreated Check none
Raptor 5oz
Sharpen + Select Max 2oz + 1.5pt
Shark + Select Max 2oz + 1.5pt
Velpar + Sharpen 1qt + 2oz
Velpar + Gramoxone 1qt + 1qt
Velpar + Shark 1qt + 2oz
Dimetric + Sharpen 2/3lb + 2oz
Dimetric + Gramoxone 2/3lb + 1 qt
Dimetric + Shark 2/3lb + 2oz
0
20
40
60
80
100
Percent Injury


Alfalfa Injury
1 Week
2 Weeks
4 Weeks
Untreated Check none
Raptor 5oz
Sharpen + Select Max 2oz + 1.5pt
Shark + Select Max 2oz + 1.5pt
Velpar + Sharpen 1qt + 2oz
Velpar + Gramoxone 1qt + 1qt
Velpar + Shark 1qt + 2oz
Dimetric + Sharpen 2/3lb + 2oz
Dimetric + Gramoxone 2/3lb + 1 qt
Dimetric + Shark 2/3lb + 2oz
0
20
40
60
80
100
Percent Injury

Week 1

Week 11

Slide Courtesy of Mick Canevari



In-Season Herbicide Treatments

- ***Not all treatments labeled uses
- In between cutting treatments
- Experimental herbicide
  - Crop Injury?
  - “Rescue Treatment”
  - Evaluate labeled options and unlabeled options
- Tulelake
- Applied 6-21-19
- Four replications
- Crop injury trial

Between Cutting Weed Control Trial: Alfalfa Phyto

Treatment	Week One	Week Two	Week Three
Untreated check			
CNV2243 16 oz			
Metribuzin 2/3 lb			
Gramoxone 1 pt.			
Shark 2 oz			
Raptor 6 oz			
Pursuit 6 oz			
Gramoxone + Prowl + Select 1 pt. + 2 qt. + 22oz			
Shark + Prowl + Select 2 oz + 2 qt. + 22oz			
Raptor + Prowl + Select 6 oz + 2 qt. + 22oz			

Between Cutting Weed Control Trial: Alfalfa Phyto

	Week One		Week Two	Week Three
Treatment	Mean	Letter Report		
Untreated check	0	E		
CNV2243 16 oz	15	C D		
Metribuzin 2/3 lb	20	C D		
Gramoxone 1 pt.	40	B		
Shark 2 oz	87.5	A		
Raptor 6 oz	18.75	C D		
Pursuit 6 oz	12.5	D		
Gramoxone + Prowl + Select 1 pt. + 2 qt. + 22oz	37.5	B		
Shark + Prowl + Select 2 oz + 2 qt. + 22oz	92.5	A		
Raptor + Prowl + Select 6 oz + 2 qt. + 22oz	17.5	C D		

Between Cutting Weed Control Trial: Alfalfa Phyto

	Week One		Week Two		Week Three
Treatment	Mean	Letter Report	Mean	Letter Report	
Untreated check	0	E	1.25	C	
CNV2243 16 oz	15	C D	11.25	B C	
Metribuzin 2/3 lb	20	C D	11.25	B C	
Gramoxone 1 pt.	40	B	12.5	B C	
Shark 2 oz	87.5	A	61.25	A	
Raptor 6 oz	18.75	C D	6.25	B C	
Pursuit 6 oz	12.5	D	10	B C	
Gramoxone + Prowl + Select 1 pt. + 2 qt. + 22oz	37.5	B	16.25	B	
Shark + Prowl + Select 2 oz + 2 qt. + 22oz	92.5	A	65	A	
Raptor + Prowl + Select 6 oz + 2 qt. + 22oz	17.5	C D	16.25	B	

Between Cutting Trial: Second Cut Yield

	Average Tons/Acre	Letter Report
Untreated check	1.73	A
CNV2243 16 oz	1.61	A B C
Metribuzin 2/3 lb	1.60	A B C
Gramoxone 1 pt.	1.61	A B
Shark 2 oz	1.34	B C
Raptor 6 oz	1.69	A
Pursuit 6 oz	1.81	A
Gramoxone + Prowl + Select 1 pt. + 2 qt. + 22oz	1.68	A
Shark + Prowl + Select 2 oz + 2 qt. + 22oz	1.29	C
Raptor + Prowl + Select 6 oz + 2 qt. + 22oz	1.59	A B C

Sources

- http://irrigation.wsu.edu/Content/Fact-Sheets/MDI.pdf
- https://alfalfa.ucdavis.edu/+symposium/2016/PDFfiles/6%20Peters%20Troy.pdf
- http://pnwpestalert.net/uploads/meetings/Treasure_Valley_Workshop_LESA_14.pdf
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- https://www.ksre.k-state.edu/irrigate/oow/p06/Colaizzi06.pdf
- https://www.ksre.k-state.edu/irrigate/oow/p17/Rogers17.pdf


Questions?

Spring Weed Control Trial

- ***Not all treatments labeled uses
- Applied March 1, 2017
- Four replications
- Honey Lake Valley
- Alfalfa and Orchard grass just breaking dormancy
- Weeds 1-3 inch rosettes

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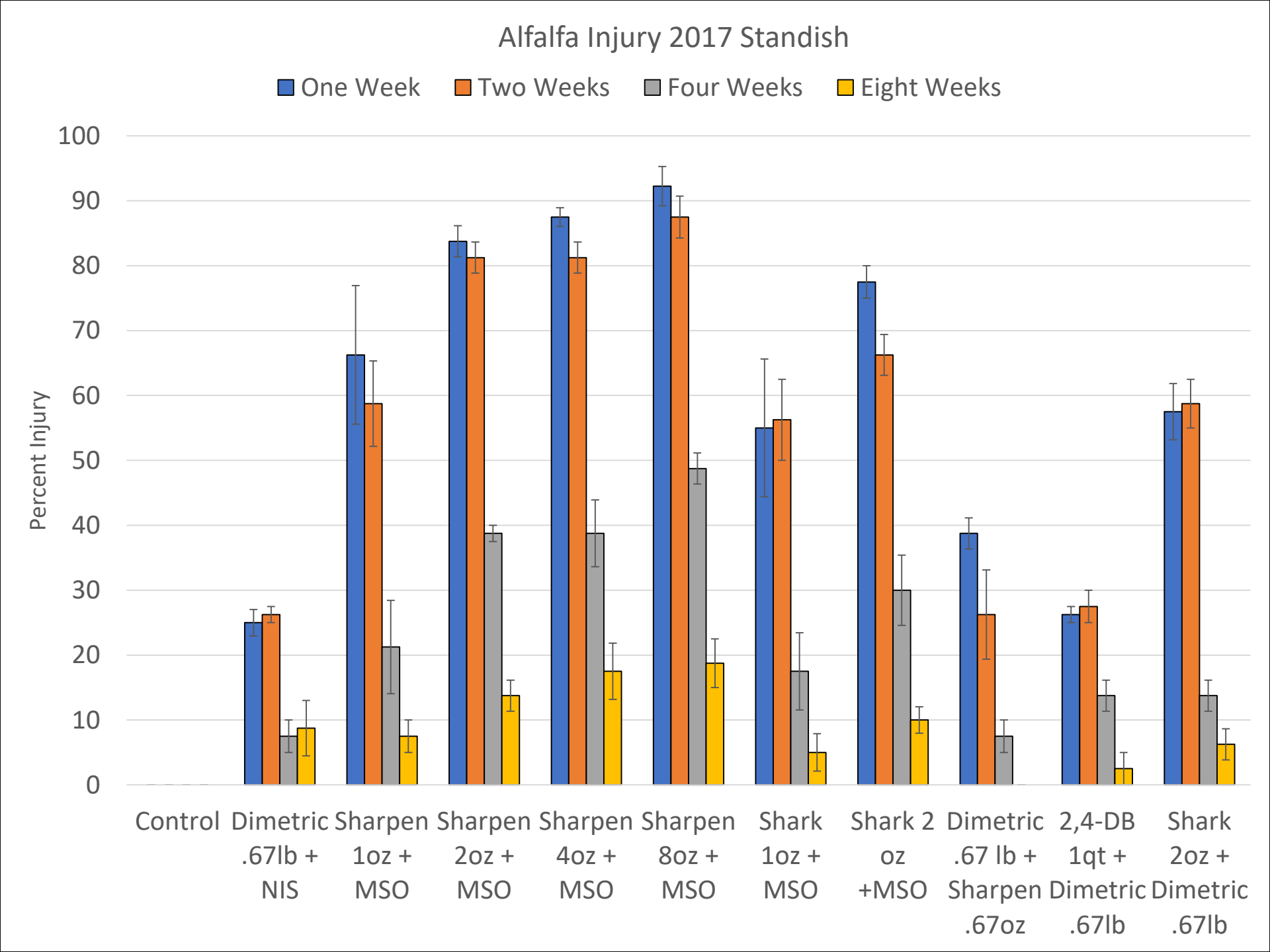
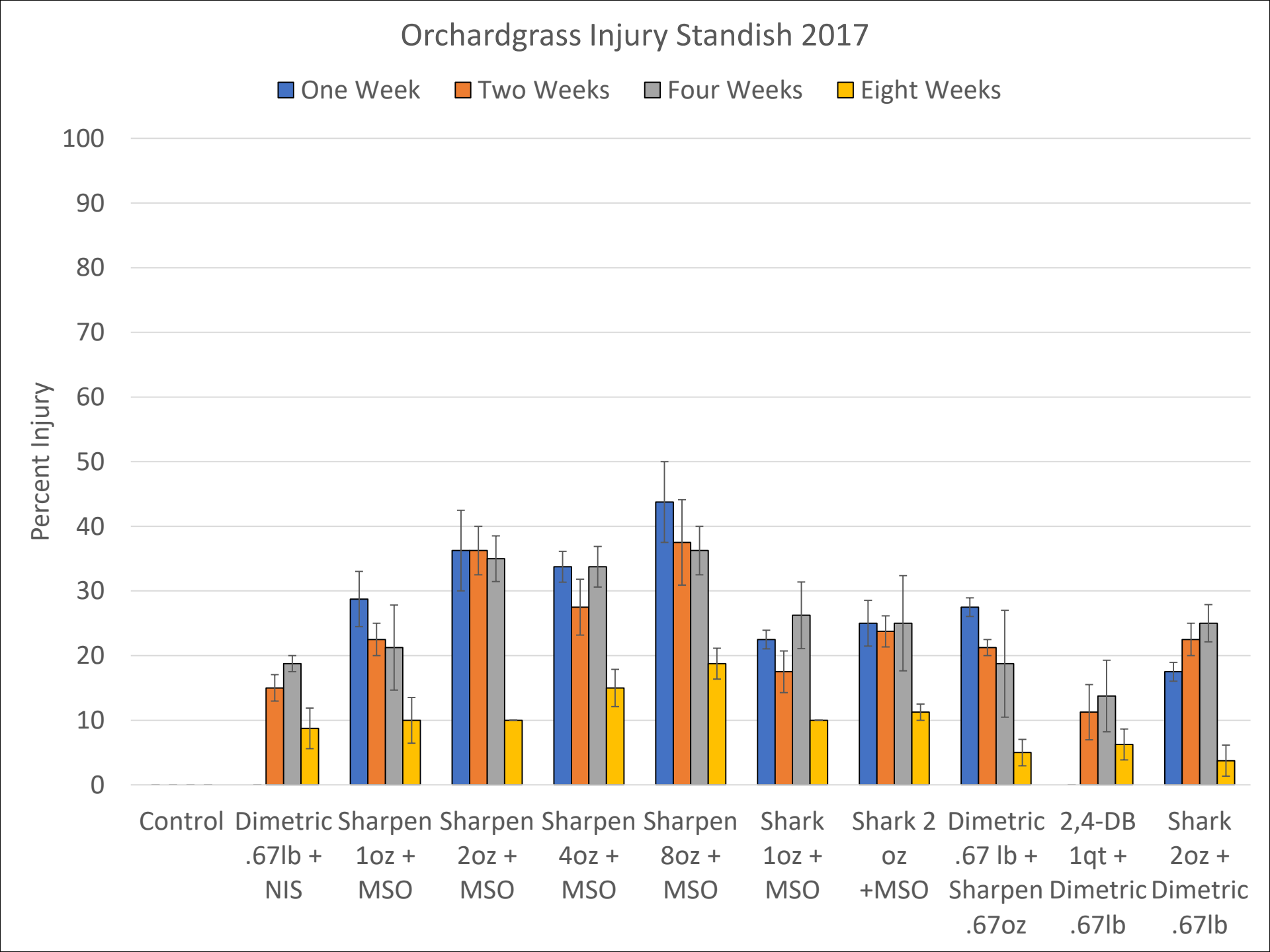
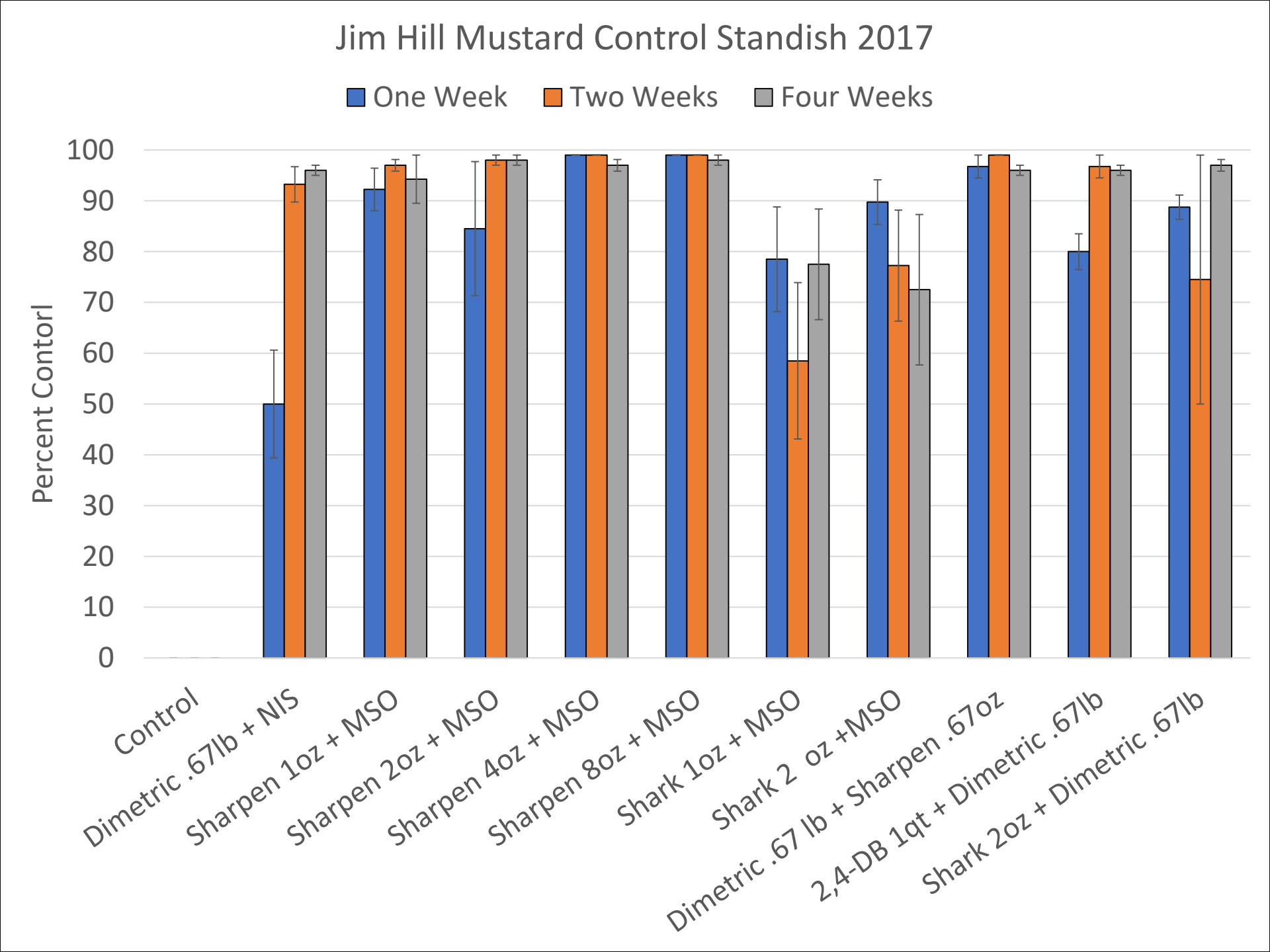
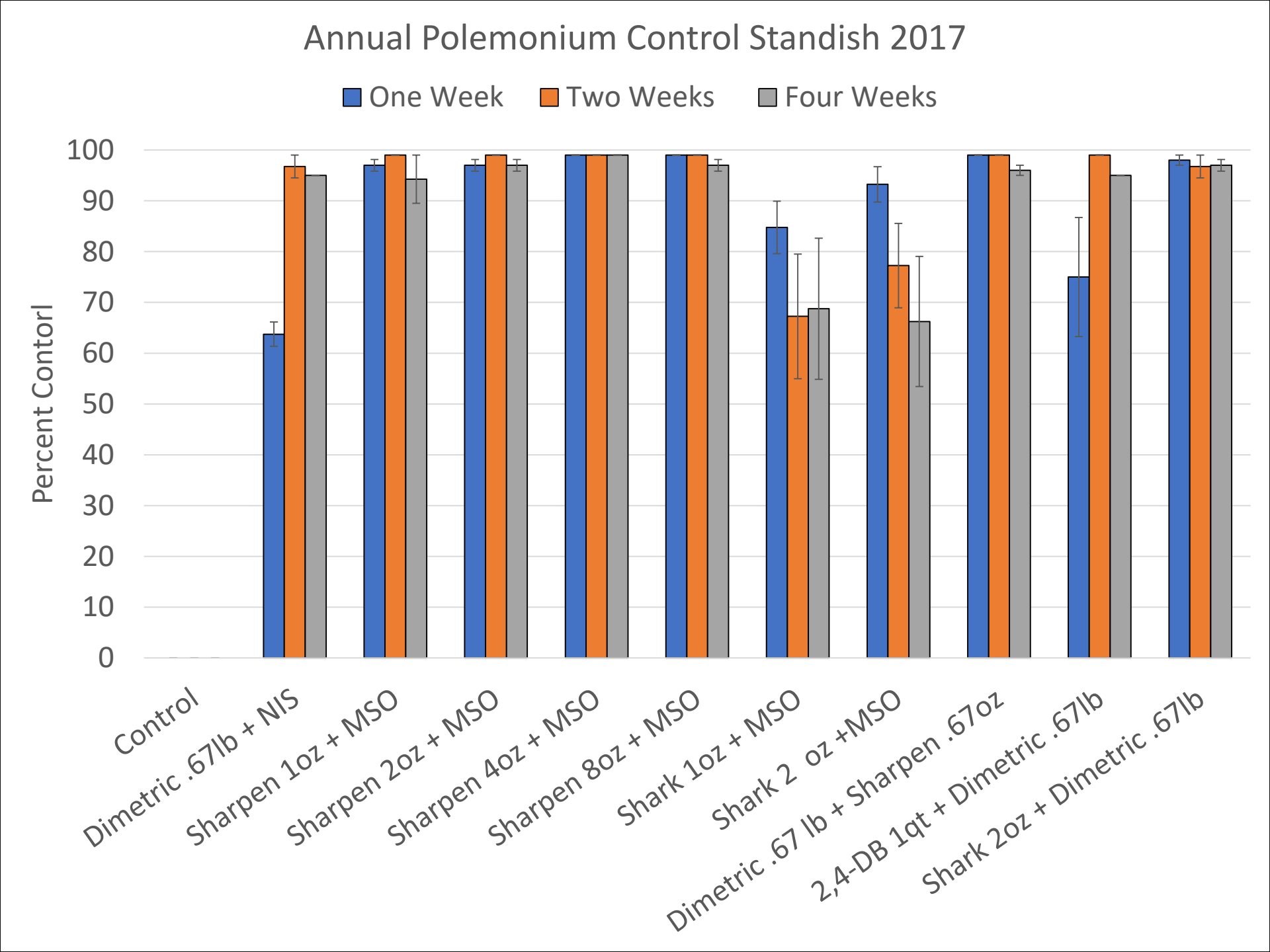
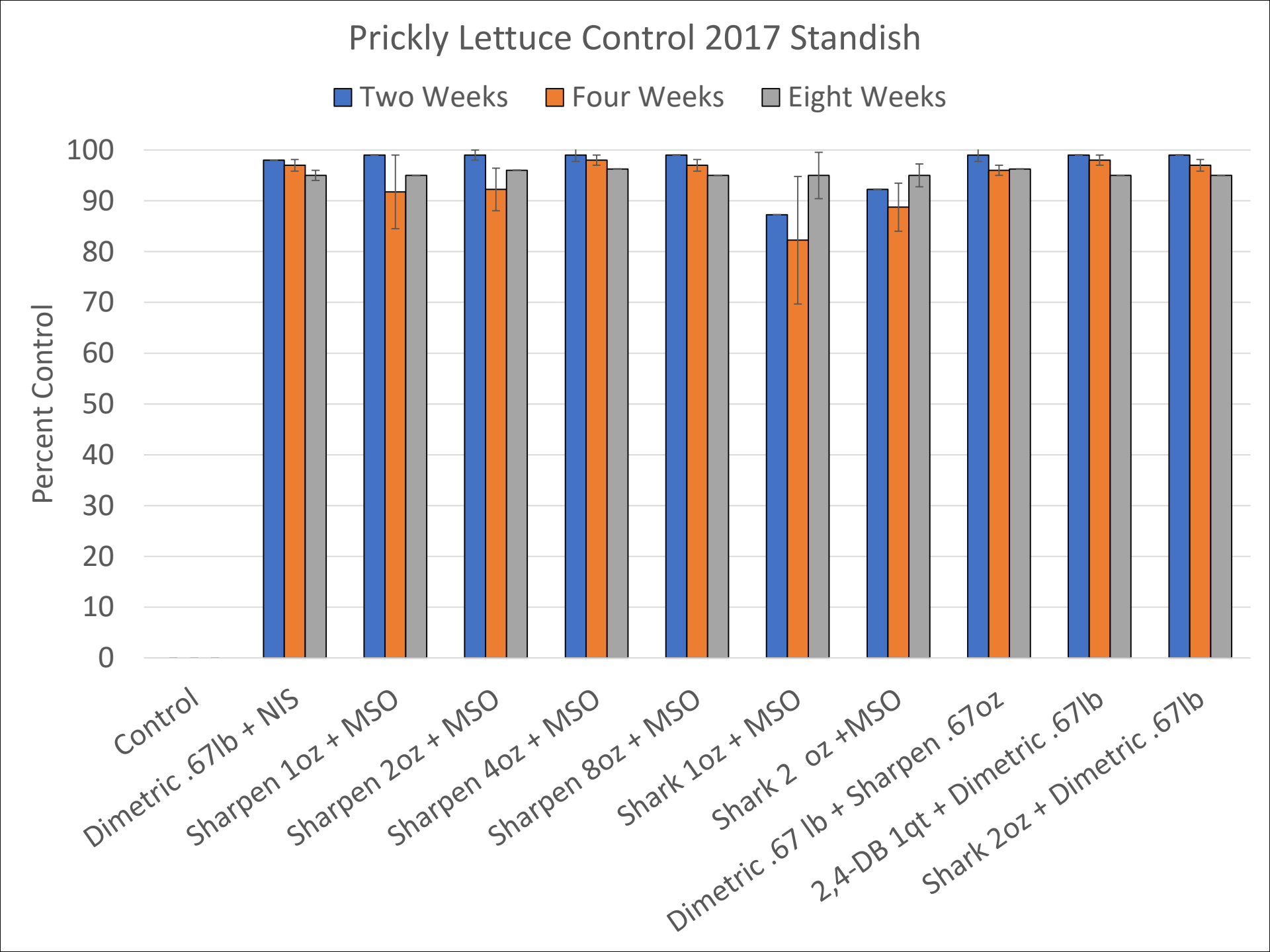
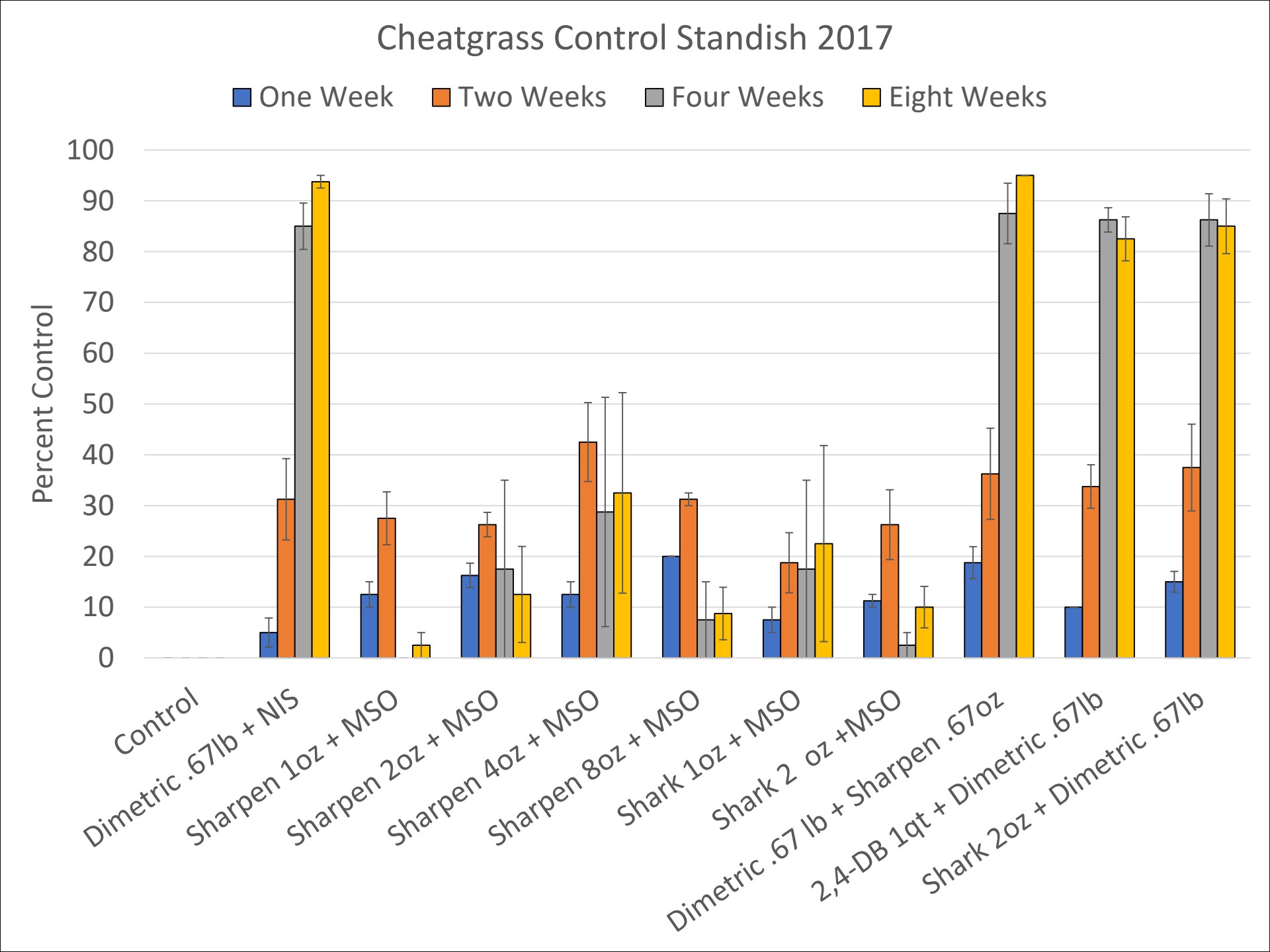

Alfalfa Injury 2017 Standish
One Week
Two Weeks
Four Weeks
Eight Weeks
Percent Injury
100
90
80
70
60
50
40
30
20
10
0
Control
Dimetric .67lb + NIS
Sharpen 1oz + MSO
Sharpen 2oz + MSO
Sharpen 4oz + MSO
Sharpen 8oz + MSO
Shark 1oz + MSO
Shark 2 oz +MSO
Dimetric .67 lb + Sharpen .67oz
2,4-DB 1qt + Dimetric .67lb
Shark 2oz + Dimetric .67lb


Orchardgrass Injury Standish 2017
One Week
Two Weeks
Four Weeks
Eight Weeks
Percent Injury
100
90
80
70
60
50
40
30
20
10
0
Control
Dimetric .67lb + NIS
Sharpen 1oz + MSO
Sharpen 2oz + MSO
Sharpen 4oz + MSO
Sharpen 8oz + MSO
Shark 1oz + MSO
Shark 2 oz +MSO
Dimetric .67 lb + Sharpen .67oz
2,4-DB 1qt + Dimetric .67lb
Shark 2oz + Dimetric .67lb


Jim Hill Mustard Control Standish 2017
One Week
Two Weeks
Four Weeks
Percent Contorl
100
90
80
70
60
50
40
30
20
10
0
Control
Dimetric .67lb + NIS
Sharpen 1oz + MSO
Sharpen 2oz + MSO
Sharpen 4oz + MSO
Sharpen 8oz + MSO
Shark 1oz + MSO
Shark 2 oz +MSO
Dimetric .67 lb + Sharpen .67oz
2,4-DB 1qt + Dimetric .67lb
Shark 2oz + Dimetric .67lb


Annual Polemonium Control Standish 2017
One Week
Two Weeks
Four Weeks
Percent Contorl
100
90
80
70
60
50
40
30
20
10
0
Control
Dimetric .67lb + NIS
Sharpen 1oz + MSO
Sharpen 2oz + MSO
Sharpen 4oz + MSO
Sharpen 8oz + MSO
Shark 1oz + MSO
Shark 2 oz +MSO
Dimetric .67 lb + Sharpen .67oz
2,4-DB 1qt + Dimetric .67lb
Shark 2oz + Dimetric .67lb


Prickly Lettuce Control 2017 Standish
Two Weeks
Four Weeks
Eight Weeks
Percent Control
100
90
80
70
60
50
40
30
20
10
0
Control
Dimetric .67lb + NIS
Sharpen 1oz + MSO
Sharpen 2oz + MSO
Sharpen 4oz + MSO
Sharpen 8oz + MSO
Shark 1oz + MSO
Shark 2 oz +MSO
Dimetric .67 lb + Sharpen .67oz
2,4-DB 1qt + Dimetric .67lb
Shark 2oz + Dimetric .67lb


Cheatgrass Control Standish 2017
One Week
Two Weeks
Four Weeks
Eight Weeks
Percent Control
100
90
80
70
60
50
40
30
20
10
0
Control
Dimetric .67lb + NIS
Sharpen 1oz + MSO
Sharpen 2oz + MSO
Sharpen 4oz + MSO
Sharpen 8oz + MSO
Shark 1oz + MSO
Shark 2 oz +MSO
Dimetric .67 lb + Sharpen .67oz
2,4-DB 1qt + Dimetric .67lb
Shark 2oz + Dimetric .67lb

Bibliography

- http://irrigation.wsu.edu/Content/Fact-Sheets/MDI.pdf