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USING AUTONOMOUS TECHNOLOGY TO IMPROVE WORKER AND ENVIRONMENTAL SAFETY IN THE RECLAMATION INDUSTRY

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OVERVIEW

- Company Background

RPAAS

- RPAAS Field Day
- Recent Partnerships
- Worker Safety
- Environmental Impact

WEED-it

- Environmental Pesticide Loading
- How It Works
- Cost Savings

- Conclusion

BACKGROUND

- Founded in 2006
- Primarily industrial reclamation and vegetation management
- Began looking into drone platforms to improve worker safety and operational efficiency
- Invited to join USDA for spray drone research trials
- Partnered with TTA to add these platforms to our equipment line
- First field demo day Sept. 3, 2019

2019 FIELD DAY

- Sept. 3, 2019
- Information session with Dr. Dan Martin, USDA Research Engineer
- Live demonstration of spray drones

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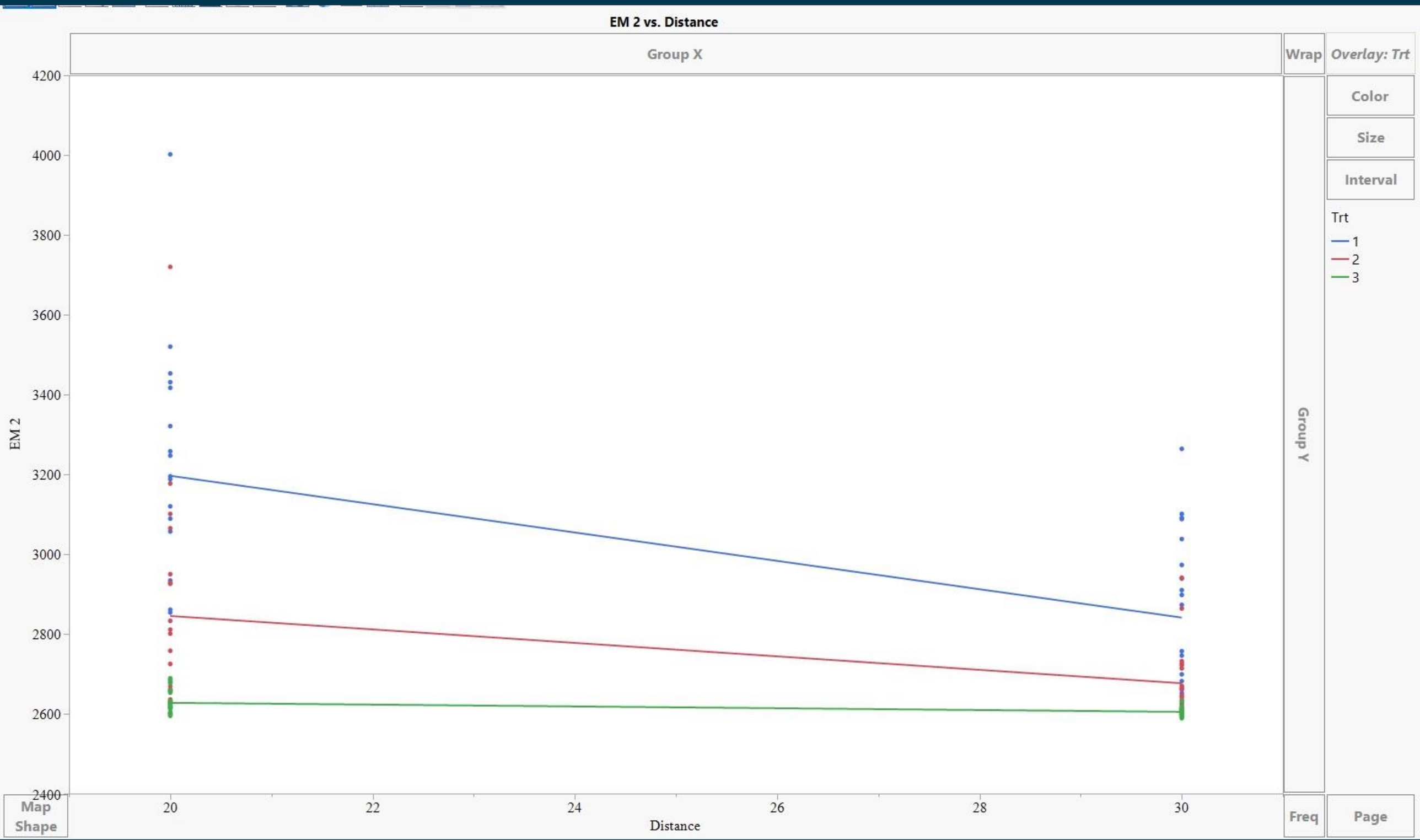
DOWNWIND DRIFT



PLATFORMS

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PARTNERSHIPS

- Health Canada/PMRA
- United States Department of Agriculture
- Agriculture & Agri-Food Canada
- 6 major chemical companies
- Partnerships led to formation of RPAAS Working Group

RPAAS WORKING GROUP

- Over 40 members
- Health Canada/PMRA, United States Department of Agriculture, Transport Canada, Agriculture and Agri-Food Canada, Provincial Government Officials, 6 Major Chemical Companies, UAV Manufacturers, Industry Representatives
- Monthly meetings addressing regulatory concerns
- Pooling of resources to tackle research needs
- Goal of establishing necessary regulations to permit drone spraying in Canada

WORKER SAFETY

- Single biggest concern
- Areas too difficult or dangerous to get a vehicle into are accessed on foot
- Uneven terrain
- Slips/trips/falls
- Exposure to pesticides


FIMCO
GRIZZLY

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OPERATOR EXPOSURE

- Full-body dosimeter suit study (Malaysia, 2017)

vs

- Herbicide application in rice 6 separate plots
- 3 replications per application method
- Dermal exposure determined by whole body dosimetry

Backpack (mg a.i./person) RPAAS

Replicate 1	10	Replicate 1	0.22
Replicate 2	23	Replicate 2	0.11
Replicate 3	12	Replicate 3	0.10
Mean	***15***	***Mean***	***0.14***

>100x

Operator exposure from a backpack sprayer ranges from **45-230x** greater than that of the RPAAS spray application.

ENVIRONMENTAL IMPACT

- Difficult to access areas
- Wet areas
- Damage caused by vehicle traffic
- Spreading weeds
- Soil fungus
- Spills
- Reduced water volumes

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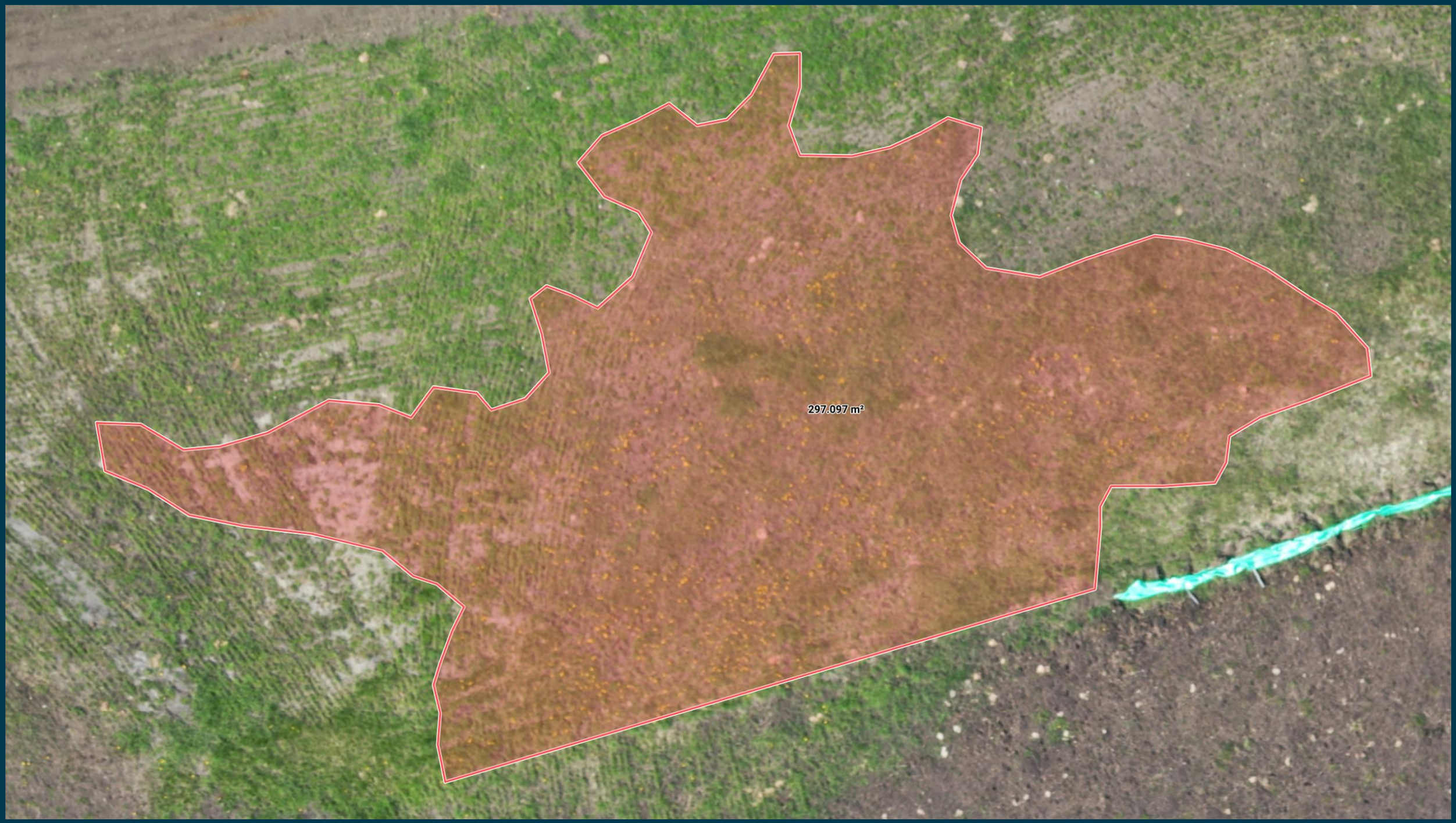
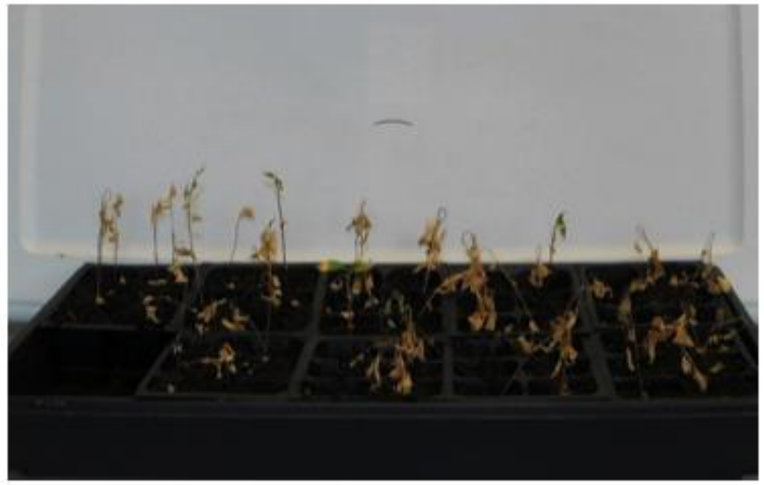
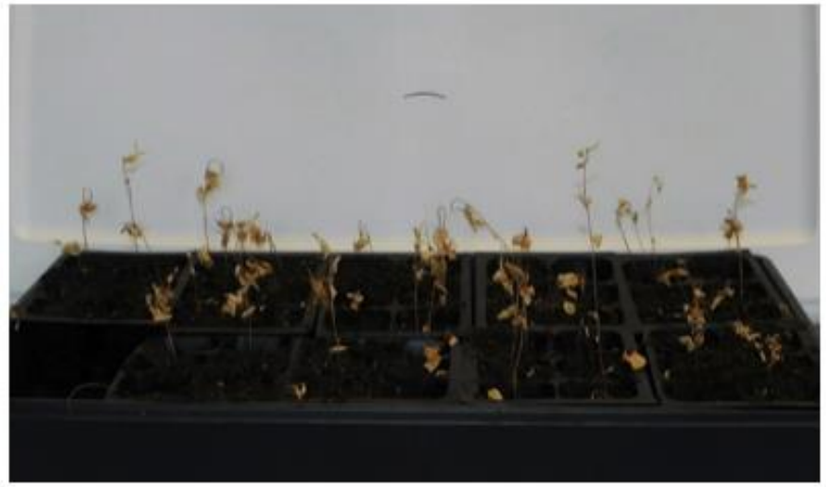
SHAPEFILE INTEGRATION



REDUCED WATER VOLUME

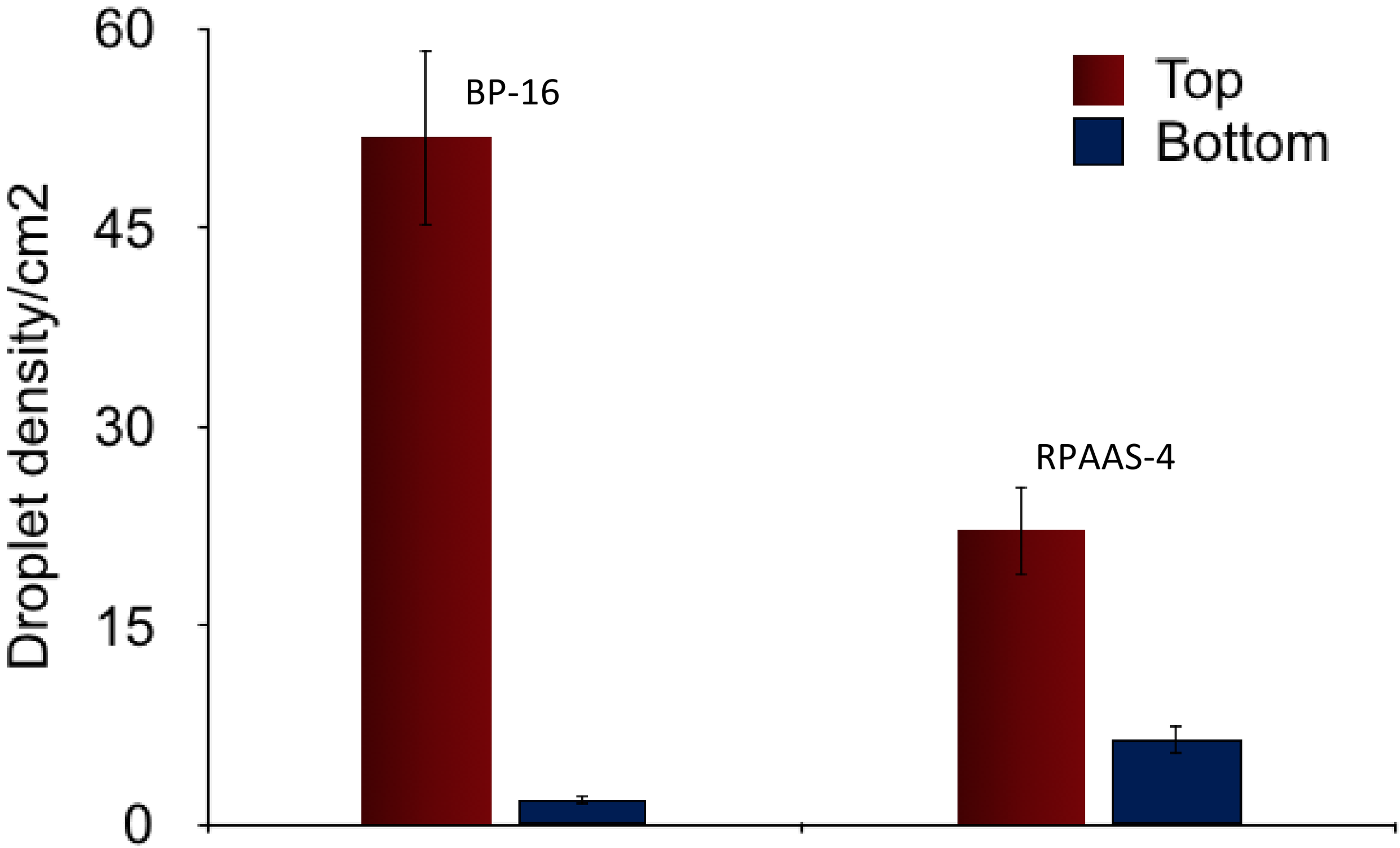
- Typical rate from ground-based equipment (ATV, UTV, backpack, etc.) 227-454L/Ha
- Tested RPAAS rates of 19 & 38L/Ha
- Glufosinate efficacy trial (Texas A&M University, 2019)

Spray Chamber Results

19L/Ha	38L/Ha	152L/Ha
		
85% Survivors	30% Survivors	<5% Survivors

REDUCED WATER VOLUME

ROTORWASH TURBULENCE



ENVIRONMENTAL PESTICIDE LOADING

WEED·IT
precision spraying

- Autonomous technology can help
- Optical spot spraying
- Chlorophyll-sensing technology

- Each sensor controls up to 5 nozzles
- Can identify plants as small as your thumbnail
- Once detected, control unit triggers specific nozzles required to apply herbicide to identified plants
- Herbicide applied only to precise areas where plants are detected

HOW IT WORKS

WEED·IT
precision spraying

CHEMICAL SAVINGS

WEED·IT
precision spraying

Total Area Treated: 1 Acre

UTV Application:

Ground Speed: 10km/h
Effective Swath: 30ft
Solution Sprayed: 60L

WEEDit Application:

Ground Speed: 12km/h
Effective Swath: 12ft
Solution Sprayed: 7L

Chemical Savings: 88%

WEEDIT COST SAVINGS

WEED·IT
precision spraying

Kingslake Farms 2018 Preseed burnoff savings

Field#	Acres	Dual mode setting	Sensitivity preset	Gallons used	WEEDit savings per acre	WEEDit savings per field
1	320	30%	1	2325	$ 1.20	$ 384.00
2	315	0%	1	335	$ 5.63	$ 1,773.45
3	470	30%	1	4025	$ 1.34	$ 629.80
4	960	30%	1	8544	$ 0.97	$ 931.20
5	480	30%	1	4272	$ 0.97	$ 465.60
6	320	0%	1	920	$ 5.99	$ 1,916.80
7	640	30%	1	5696	$ 0.97	$ 620.80
8	320	30%	1	1425	$ 3.49	$ 1,116.80
9	220	30%	1	1958	$ 0.92	$ 202.40
10	630	0%	1	1275	$ 6.83	$ 4,302.90
11	320	30%	1	1525	$ 3.30	$ 1,056.00
12	188	40%	1	1195	$ 0.91	$ 171.08
13	600	30%	1	3645	$ 3.21	$ 1,926.00
14	633	30%	1	3050	$ 2.62	$ 1,658.46
15	480	30%	1	2375	$ 2.99	$ 1,435.20
16	430	40%	1	1830	$ 2.90	$ 1,247.00
17	618	30%	1	3492	$ 3.02	$ 1,866.36
18	320	30%	1	2400	$ 1.07	$ 342.40
19	114	30%	1	653	$ 2.99	$ 340.86
20	145	40%	1	1145	$ 0.53	$ 76.85
21	100	40%	1	685	$ 0.79	$ 79.00
22	570	0%	1	667	$ 2.21	$ 1,259.70
23	580	30%	1	2965	$ 1.68	$ 974.40
24	640	30%	1	4195	$ 0.90	$ 576.00
25	640	30%	1	5775	$ 0.27	$ 172.80
26	530	40%	1	2909	$ 2.28	$ 1,208.40
27	630	30%	1	3370	$ 2.43	$ 1,530.90
28	620	30%	1	2955	$ 2.64	$ 1,636.80
29	640	0%	1	1625	$ 5.15	$ 3,296.00
30	640	30%	1	3335	$ 3.30	$ 2,112.00
31	567	30%	1	4710	$ 1.39	$ 788.13
32	592	30%	1	3305	$ 2.23	$ 1,320.16
33	320	30%	1	2030	$ 1.85	$ 592.00
34	320	30%	1	1498	$ 1.33	$ 425.60

Total Acres			Total Gallons Used	Average Savings per acre	Total Savings
15912			92109	$ 2.36	$ 38,435.85

Shamrock Farms 2018 Preseed burnoff savings

Field#	Acres	Dual mode setting	Sensitivity preset	Gallons used	WEEDit savings per acre	WEEDit savings per field
1	84	0%	3	765	$ 1.13	$ 94.92
2	290	0%	2	1947	$ 4.14	$ 1,200.60
3	50	0%	2	202	$ 7.51	$ 375.50
4	160	0%	2	1097	$ 3.96	$ 633.60
5	480	0%	2	1600	$ 8.40	$ 4,032.00
6	320	0%	2	891	$ 8.15	$ 2,608.00
7	320	0%	2	943	$ 7.97	$ 2,550.40
8	320	0%	2	128	$ 10.85	$ 3,472.00
9	480	30%	2	2366	$ 5.73	$ 2,750.40
10	320	0%	2	645	$ 9.02	$ 2,886.40
11	320	0%	2	945	$ 7.96	$ 2,547.20
12	640	0%	2	3590	$ 4.96	$ 3,174.40
13	150	0%	2	1022	$ 3.60	$ 540.00
14	160	0%	2	344	$ 8.87	$ 1,419.20
15	620	0%	2	5140	$ 1.93	$ 1,196.60
16	960	0%	2	4800	$ 5.65	$ 5,424.00
18	300	0%	2	633	$ 8.92	$ 2,676.00
19	590	0%	2	4383	$ 2.91	$ 1,716.90

Total Acres	Total Gallons Used	Average Savings per acre	Total Savings
6564	31441	$ 6.20	$ 39,298.12

Average savings per acre per year	$ 8.56
Based on Roundup Transorb and Optica trio mixture	

CONCLUSION

- Work is underway on Canadian RPAAS spraying regulations
- We are conducting spray quality assessment and drift trials this year for Health Canada/PMRA
- 2nd Annual RPAAS Field Day May 21, 2020
- Operator exposure >100x with backpack compared to drone
- 19 & 38L/Ha water volumes possible with certain products
- WEED-it only applies chemical to identified weeds
- Average chemical/water savings of 75%
- Will have UTV-equipped units in the field this year

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QUESTIONS