Poll Question #5

What is the "x" variable in the basic formula for calibration?:

$$\textbf{GPA} = \frac{\textbf{x}}{\textbf{Land Rate}}$$

a. Fan air speed rate
b. Nozzle flow rate
c. Pesticide label rate
d. Pressure increase rate
e. Row width in feet

The Basic Formula-

$$GPA = \frac{\text{Flow rate (gal/min)}}{\text{Land rate (ac/min)}}$$

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The Basic Formula-

Estimated based on canopy size

SOLVE for it!

$$\text{GPA} = \frac{\text{Flow rate (gal/min)}}{\text{Land rate (ac/min)}}$$

Speed selected based on canopy, fan, and speed interaction.
Speed (ft./min.)* Row width (ft.)= ft.^{2}/min converted to acres/min

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How to use the basic calibration formula for spraying

GPA (gal/acre) = Flow rate-GPM (gal/min) / Land rate (ac/min)

200 gal/acre= x gal/min / **.11 acre/min**

X= 200 gal/acre * .11 acre/min= **22 gallons/minute (entire sprayer)**

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Choose nozzle positions, number of nozzles, based on canopy. Line up the sprayer adjacent to the canopy and turn on the air.

Choose nozzle positions and number of nozzles, based on canopy.

Say 16 nozzles per side:

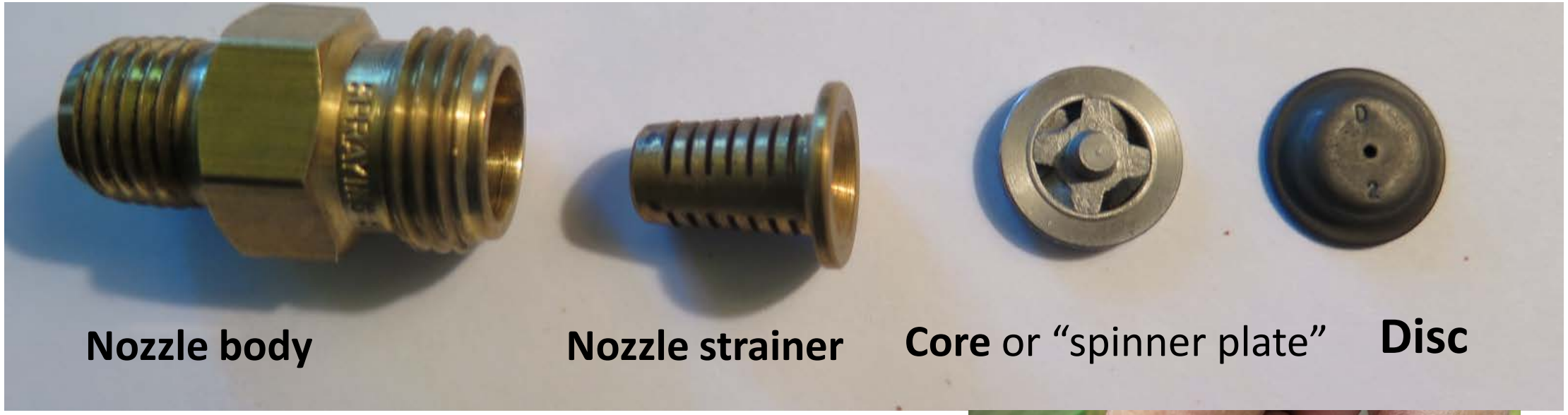
22 GPM/32 nozzles=0.69 gpm per nozzle

Poll question #6

What type of nozzles do you use on your airblast sprayer?(choose all that apply)

a. disc and core
b. flat fan
c. air induction or low drift
d. “single piece” like TXR conejet
e. air shear (also sometimes referred to as venturi sprayer)

Disc-Core set up. 2 Nozzle choices combine for one flow rate.



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How often should nozzles be changed?

Approximate Abrasion Resistance Ratios

Spray Nozzle Material	Resistance Ratio
Aluminum	1
Brass	1
Polypropylene	1 - 2
Steel	1.5 - 2
Monel®	2 - 3
Stainless Steel	4 - 6
Hastelloy®	4 - 6
Hardened Stainless Steel	10 - 15
Stellite®	10 - 15
Silicon Carbide (Nitride Bonded)	90 - 130
Ceramics	90 - 200
Carbides	180 - 250
Synthetic ruby or sapphire	600 - 2000

“How to Pre-Empt a Significant Profit Drain: Nozzle Wear”. John Barber, Spraying Systems.

What does the nozzle contribute to our spray application?

1. FLOW RATE: Volume/Time (Gallons/Min)

Nozzle flow rate is directly proportional to application rate (Gallons/acre)

Want a larger spray volume? Increase the flow rate by either:

Increase nozzle size (Larger droplets*)

Increase pressure (Smaller droplets)

* Except for VENTURI sprayers, where droplets are always fine.

2. DROPLET SIZE (COVERAGE/DRIFT)

Nozzle type and design, system pressure, and sprayer type all affect.
Weather too!

www.teejet.com

Choose nozzles, based on flow rate and drop size, from catalog.

Say 16 nozzles per side:
22 GPM/32 nozzles=
0.69 gpm per nozzle

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Hollow Cone Type Spray Tips

			GPM												
			10 PSI	20 PSI	30 PSI	40 PSI	60 PSI	80 PSI	100 PSI	150 PSI	200 PSI	300 PSI	20 PSI	40 PSI	80 PSI
D1	DC13	.031″	—	—	.059	.066	.078	.088	.097	.115	.128	.152	—	51°	62°
D1.5	DC13	.036″	—	.057	.067	.075	.088	.098	.110	.127	.142	.167	38°	55°	66°
D2	DC13	.041″	—	.064	.075	.08	.10	.11	.12	.14	.16	.18	49°	67°	72°
D3	DC13	.047″	—	.071	.08	.09	.11	.12	.13	.16	.18	.20	53°	70°	75°
D4	DC13	.063″	.070	.09	.11	.12	.14	.16	.17	.20	.23	.27	69°	79°	83°
D1	DC23	.031″	—	—	.064	.072	.080	.096	.107	.124	.139	.164	—	47°	58°
D1.5	DC23	.036″	—	.064	.076	.086	.103	.117	.130	.155	.175	.210	34°	51°	62°
D2	DC23	.041″	—	.078	.092	.10	.13	.14	.16	.19	.21	.25	51°	63°	70°
D3	DC23	.047″	.065	.087	.10	.12	.14	.16	.18	.21	.24	.28	58°	69°	75°
D4	DC23	.063″	.082	.113	.14	.15	.19	.21	.23	.28	.32	.38	68°	82°	87°
D5	DC23	.078″	.095	.13	.16	.18	.22	.25	.28	.34	.38	.46	79°	89°	94°
D6	DC23	.094″	.112	.15	.19	.21	.26	.29	.32	.39	.45	.54	84°	93°	98°
D1	DC25	.031″	—	—	.088	.101	.122	.138	.156	.185	.210	.255	—	27°	43°
D1.5	DC25	.036″	—	—	.118	.135	.162	.185	.205	.245	.280	.33	—	38°	49°
D2	DC25	.041″	—	.12	.14	.16	.19	.22	.25	.29	.34	.41	39°	51°	58°
D3	DC25	.047″	.10	.14	.17	.19	.23	.26	.29	.35	.40	.48	52°	61°	67°
D4	DC25	.063″	.15	.21	.25	.29	.35	.40	.45	.54	.62	.75	67°	74°	80°
D5	DC25	.078″	.18	.25	.30	.35	.42	.48	.54	.65	.75	.90	73°	79°	84°
D6	DC25	.094″	.23	.32	.39	.44	.54	.62	.70	.85	.97	1.19	79°	85°	89°
D7	DC25	.109″	.26	.37	.45	.52	.63	.73	.81	.98	1.18	1.37	85°	91°	93°
D8	DC25	.125″	.31	.43	.53	.61	.75	.89	.97	1.19	1.36	1.68	91°	96°	97°
D10	DC25	.156″	.38	.54	.65	.76	.93	1.07	1.21	1.48	1.71	2.1	97°	102°	103°
D12	DC25	.188″	.46	.61	.80	.93	1.15	1.32	1.47	1.81	2.09	2.55	103°	109°	112°
D14	DC25	.219″	.51	.72	.88	1.03	1.26	1.47	1.65	2.02	2.34	2.89	108°	113°	114°
D1	DC45	.031″	—	—	—	.125	.148	.170	.190	.225	.257	.310	—	22°	34°
D1.5	DC45	.036″	—	—	.14	.16	.20	.23	.25	.31	.35	.43	—	33°	44°
D2	DC45	.041″	—	.14	.18	.20	.25	.28	.32	.38	.44	.53	32°	46°	55°
D3	DC45	.047″	—	.17	.20	.23	.28	.33	.36	.44	.51	.62	40°	53°	60°
D4	DC45	.063″	.18	.25	.31	.36	.43	.50	.56	.68	.78	.95	62°	69°	72°

Pressure gauge: an essential component

- Make sure it is operating properly and is maintained, is easy to read, and has a range that makes sense for the sprayer.

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L.R. Wunderlich

Teejet.com

Say 16 nozzles per side:
22 GPM/32 nozzles=
0.69 gpm per nozzle

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TXR ConeJet® Hollow Cone Spray Tips

		GPM																				
		30 PSI	40 PSI	50 PSI	60 PSI	70 PSI	80 PSI	90 PSI	100 PSI	120 PSI	140 PSI	160 PSI	180 PSI	200 PSI	220 PSI	240 PSI	260 PSI	280 PSI	300 PSI	320 PSI	340 PSI	360 PSI
TXR800053VK	100	0.046	0.053	0.059	0.064	0.069	0.073	0.077	0.081	0.089	0.095	0.101	0.107	0.113	0.118	0.123	0.127	0.132	0.136	0.140	0.144	0.148
		VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF
TXR800071VK	50	0.062	0.071	0.079	0.086	0.093	0.099	0.105	0.110	0.120	0.129	0.138	0.146	0.153	0.160	0.167	0.174	0.180	0.186	0.192	0.197	0.203
		F	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF
TXR8001VK	50	0.087	0.100	0.111	0.121	0.131	0.139	0.147	0.155	0.169	0.182	0.194	0.205	0.216	0.226	0.235	0.245	0.253	0.262	0.270	0.278	0.286
		F	F	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF
TXR80013VK	50	0.116	0.133	0.148	0.162	0.174	0.186	0.196	0.207	0.225	0.243	0.259	0.274	0.288	0.301	0.314	0.326	0.338	0.349	0.360	0.371	0.381
		F	F	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF
TXR80015VK	50	0.131	0.150	0.167	0.182	0.196	0.209	0.221	0.232	0.254	0.273	0.291	0.308	0.324	0.339	0.353	0.367	0.380	0.393	0.405	0.417	0.429
		F	F	F	F	F	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF
TXR80017VK	50	0.145	0.167	0.185	0.202	0.218	0.232	0.246	0.258	0.282	0.303	0.323	0.342	0.360	0.376	0.392	0.408	0.422	0.437	0.450	0.464	0.476
		F	F	F	F	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF
TXR8002VK	50	0.174	0.200	0.223	0.243	0.261	0.279	0.295	0.310	0.338	0.364	0.388	0.410	0.432	0.452	0.471	0.489	0.507	0.524	0.540	0.556	0.572
		F	F	F	F	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF
TXR80028VK	50	0.240	0.275	0.306	0.334	0.359	0.383	0.405	0.426	0.465	0.500	0.533	0.564	0.594	0.621	0.648	0.673	0.697	0.720	0.743	0.765	0.786
		F	F	F	F	F	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF
TXR8003VK	50	0.260	0.300	0.335	0.367	0.396	0.423	0.449	0.473	0.517	0.558	0.597	0.633	0.667	0.699	0.730	0.759	0.788	0.815	0.841	0.867	0.892
		F	F	F	F	F	F	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF
TXR80036VK	50	0.309	0.356	0.398	0.435	0.470	0.502	0.532	0.561	0.614	0.663	0.708	0.751	0.791	0.829	0.866	0.901	0.935	0.967	0.999	1.03	1.06
		F	F	F	F	F	F	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF
TXR8004VK	50	0.347	0.400	0.447	0.489	0.528	0.564	0.598	0.63	0.690	0.745	0.796	0.843	0.889	0.932	0.973	1.01	1.05	1.09	1.12	1.16	1.19
		F	F	F	F	F	F	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF
TXR80049VK	50	0.423	0.488	0.545	0.597	0.644	0.688	0.730	0.769	0.842	0.909	0.971	1.03	1.09	1.14	1.19	1.24	1.28	1.33	1.37	1.41	1.45
		F	F	F	F	F	F	F	F	F	F	F	VF	VF	VF	VF	VF	VF	VF	VF	VF	VF

Note: Always double check your application rates. Tabulations are based on spraying water at 70°F (21°C).
See pages 136–157 for drop size classification, useful formulas and other information.

CONSIDER DRIFT THE OPPOSITE OF COVERAGE: DROPLET SIZE MATTERS!

Droplet size is measured in MICRONS (um).
1 um is about .00004 inches in diameter.

Table 1. Movement of spray particles.

Droplet diameter (microns)	Size classification (ASAE* equivalent)	Time required to fall 10 feet	Lateral movement in 3 mph wind
5	Fog	66 minutes	3 miles
20	Very fine	4.2 minutes	1,100 feet
100	Very fine	10 seconds	44 feet
240	Fine/medium	6 seconds	28 feet
400	Coarse	2 seconds	8.5 feet
1,000	Extremely coarse	1 second	4.7 feet

*American Society of Agricultural Engineers.
Source: Akesson and Yates, Annual Review of Entomology, 1964.

WEATHER and Drift vs. Coverage:
Smaller Droplets Can Evaporate Temp. and RH affect

Temperature	Greater than 83°F	Caution or Don't spray
% Relative Humidity	Less than 40%	Caution or Don't spray
Foliage wet from dew, rain, or fog		Don't spray

The larger the number (D3-D16) the larger the exit hole, the greater the flow rate and droplet size.


07/08/2016

This chart tells you something about spray "Quality" (DROPLET SIZE)

TeeJet Catalog

How to order:
Specify tip number.
Example:
AITXA8001VK – Ceramic with VisiFlo color-coding

		GPM														
		60 PSI	70 PSI	80 PSI	90 PSI	100 PSI	120 PSI	140 PSI	160 PSI	180 PSI	200 PSI	220 PSI	240 PSI	260 PSI	280 PSI	300 PSI
AITX†8001VK	50	0.121	0.130	0.138	0.146	0.154	0.168	0.181	0.192	0.203	0.214	0.224	0.233	0.242	0.251	0.260
		XC	XC	VC	VC	VC	C	C	C	C	C	C	C	M	M	M
AITX†80015VK	50	0.181	0.195	0.209	0.221	0.233	0.255	0.275	0.294	0.312	0.328	0.344	0.359	0.374	0.388	0.401
		XC	XC	XC	VC	VC	C	C	C	C	C	C	C	M	M	M
AITX†8002VK	50	0.247	0.195	0.286	0.303	0.320	0.351	0.379	0.405	0.430	0.453	0.476	0.497	0.517	0.537	0.556
		XC	XC	XC	XC	XC	VC	VC	VC	VC	C	C	C	C	C	C
AITX†80025VK	50	0.300	0.324	0.347	0.368	0.387	0.424	0.458	0.490	0.519	0.548	0.574	0.600	0.624	0.648	0.670
		UC	UC	XC	XC	XC	XC	XC	XC	VC	VC	VC	VC	VC	VC	C
AITX†8003VK	50	0.360	0.389	0.417	0.443	0.467	0.513	0.554	0.594	0.630	0.665	0.698	0.730	0.760	0.790	0.818
		UC	UC	XC	XC	XC	XC	XC	VC	VC	VC	VC	VC	C	C	C
AITX†8004VK	50	0.480	0.519	0.556	0.590	0.623	0.684	0.740	0.792	0.841	0.887	0.931	0.974	1.01	1.05	1.09
		UC	UC	UC	UC	XC	XC	XC	XC	XC	VC	VC	VC	VC	VC	VC

Say 16 nozzles per side:
22 GPM/32 nozzles=
0.69 gpm per nozzle

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Pneumatic sprayer, i.e. Low volume Venturi.

L.R. Wunderlich

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PHONE (800) 833-3023
FAX (909) 548-4747
E-mail: sales@gearmore.com

GEARMORE INC.

13477 BENSON AVE.
CHINO, CA 91710
Website: www.Gearmore.com

VENTURI AIR SPRAYER CALIBRATION CHART

4 YELLOW *"DIAL-A-RATE"* DISCS

GALLONS PER MINUTE

DISC SETTING	PRESSURE SETTING (PSI)					
	16	22	25	28	33	36
1	0.5	0.5	0.5	0.6	0.6	0.7
2	0.6	0.8	0.9	1.0	1.0	1.0
3	1.0	1.1	1.1	1.2	1.3	1.4
4	1.2	1.4	1.5	1.6	1.7	1.8
5	1.7	1.9	2.0	2.1	2.2	2.3
6	1.9	2.1	2.3	2.4	2.5	2.6
7	3.1	3.3	3.5	3.7	3.8	4.0
8	3.7	3.9	4.1	4.3	4.5	4.7
9	4.5	4.7	5.0	5.3	5.7	6.0
10	5.3	5.5	5.9	6.2	6.5	6.9
11	6.5	6.8	7.3	7.8	8.1	8.6
12	7.9	8.5	9.5	9.9	10.5	11.1
13	9.4	9.8	10.6	11.4	12.0	12.8
14	10.4	10.7	11.7	12.6	13.5	14.3
15	11.0	11.3	12.7	13.5	14.6	15.7

To determine the required pressure setting, you must ***first*** determine how many Gallons Per Minute will be required.

$$\text{Gallons Per Minute} = \frac{2 \times (\text{Miles Per Hour}) \times (\text{Gallons Per Acre}) \times (\text{Width of Area Treated})}{1000}$$

NOTE for 3-Point Hitch Sprayer Users:
The lower the sprayer pressure, the greater the agitation. Use the lowest possible pressure to achieve the desired G.P.M. For example, a Dial-A-Rate disc setting of #4 @ 36 P.S.I. and a disc setting of

Poll Question #7 (choose all that are correct)

Droplet size depends on:

a. Sprayer type

b. The number of nozzles used

c. Temperature

d. Pressure

e. Nozzle type and design

f. Relative humidity

Poll Question #8

Increasing the system pressure

a. Increases the flow rate and increases the droplet size
b. Decreases the flow rate and decreases the droplet size
c. Decreases the flow rate and increases the droplet size
d. Increases the flow rate and decreases the droplet size

Verifying Nozzle Flow Rate: Bucket Method


Fill the tank
with clean
water. Park on
level ground.

Bring up to 540 RPM, spray out while noting pressure and time

Fill tank to known spot

Refill noting volume

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Verifying Flow Rate: Single Nozzles

Requires an adapter that fits over the nozzle without impeding flow. Can be home made or purchased.


02/13/2019

02/13/2019


START
Hold OFF
SpotOn
Sprayer Calibrator

How to use the basic calibration formula for spraying

$$\text{GPA (gal/acre)} = \frac{\text{Flow rate-GPM (gal/min)}}{\text{Land rate (ac/min)}}$$

Steps:

Calculate and verify final GPA.

Actual flow rates of 32 nozzles measured (at 100 psi):

10@ 0.67, 12@ 0.65, 6 @0.69, 1@ 0.61, 3@0.66=

21.23 GPM ACTUAL Flow rate

21.2 GPM/.11 acres/min= 193 ACTUAL GPA

Poll Question #9

Why might the nozzle flow rate be different when measured than compared to the manufacturer's catalog?

a. The nozzle could be worn

b. The pressure may be different

c. The new nozzle could have slight defects

d. The filters could be clogged

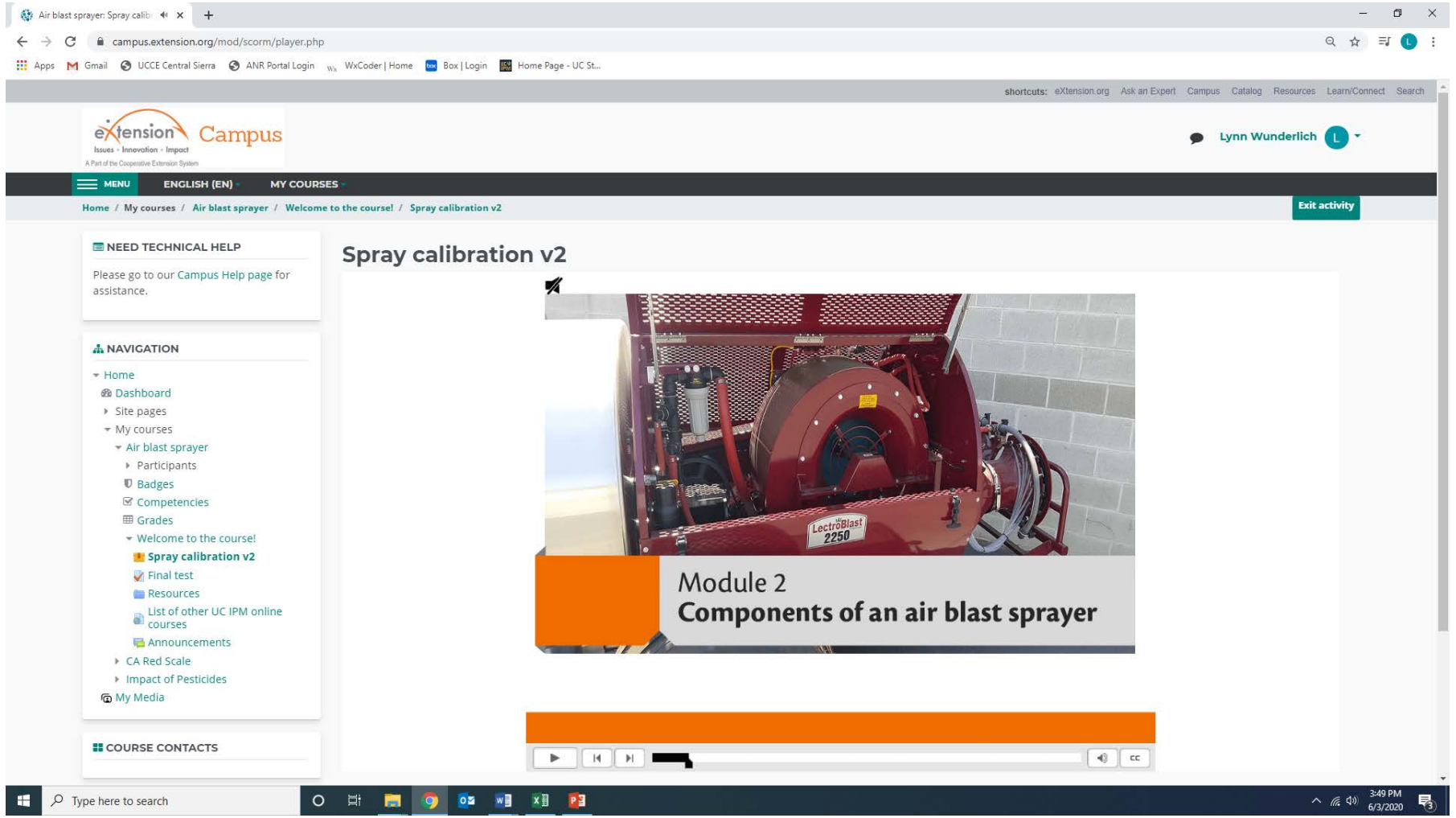
Use Water Sensitive Paper to Check

Poll Question #10

What is land rate?

a. Tractor speed
b. How many square feet in an acre
c. Tractor speed divided by the nozzle flow rate
d. Tractor speed multiplied by the crop row width

ONLINE COURSE COMING SOON!!



Thanks!


Sustainable Sprayer
Calibrated for Coverage-Reduced Drift!