Considerations for Selecting Optimal Application Parameters for Spray Drones

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Spray Drones

Spray Drones

- *How many gallons per acre can it spray? How many acres per hour it can do?*
- *How does application compare to a ground sprayer? Coverage and efficacy?*
- *How wide can it spray? What is the spray swath/width?*

Our goal as Extension specialists:

- To answer some of the common grower questions regarding selection of application parameters
- Provide information on best management practices for safe and effective application of pesticides

HYLIO AG-230

DJI AGRAS MG-1

DJI AGRAS T30

DJI AGRAS T40

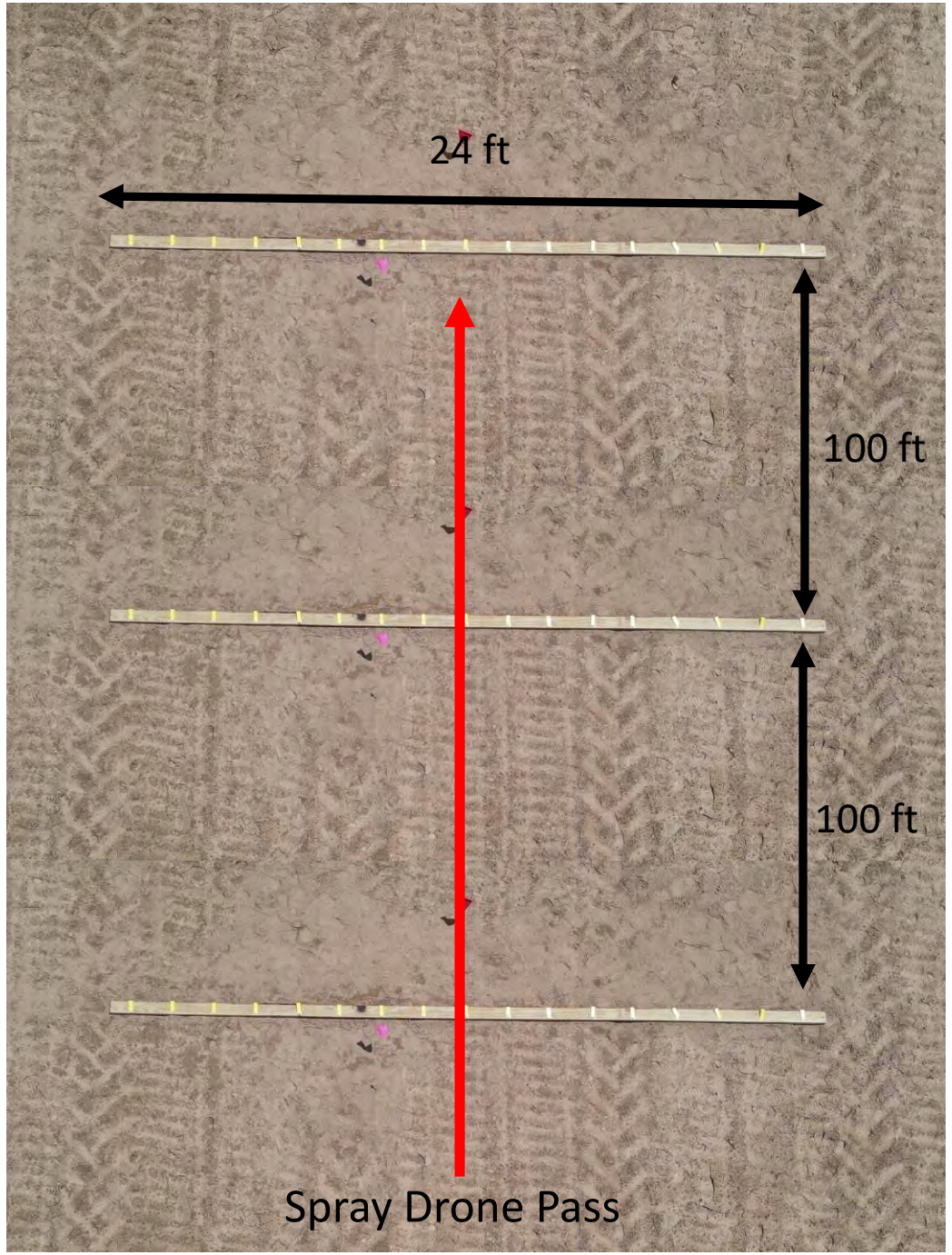
Spray Performance Testing

- **Five Spray Volumes**
  - 5.0 GPA
  - 4.0 GPA
  - 3.0 GPA
  - 2.0 GPA
  - 1.3 GPA
- **Three Heights**
  - 6.5 ft
  - 8.0 ft
  - 10.0 ft
- **Three Droplet sizes**
  - Medium (XR)
  - Very Coarse (AIXR)
  - Ultra Coarse (TTI)

- 5 rates X 3 heights X 3 nozzles = 45 treatments
- Three replications for each combination (speed x height x nozzle) = 135 spray drone passes

Testing & Data Collection

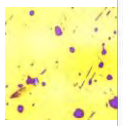
- Three swaths setup in the field (100 ft apart)
- Water sensitive paper placed along the swath at 1 ft increments starting from the center up to 12 ft (each side)
- Weather station collected data at 30-s intervals during each pass
- WSP collected after each pass and analyzed for spray deposition/coverage.



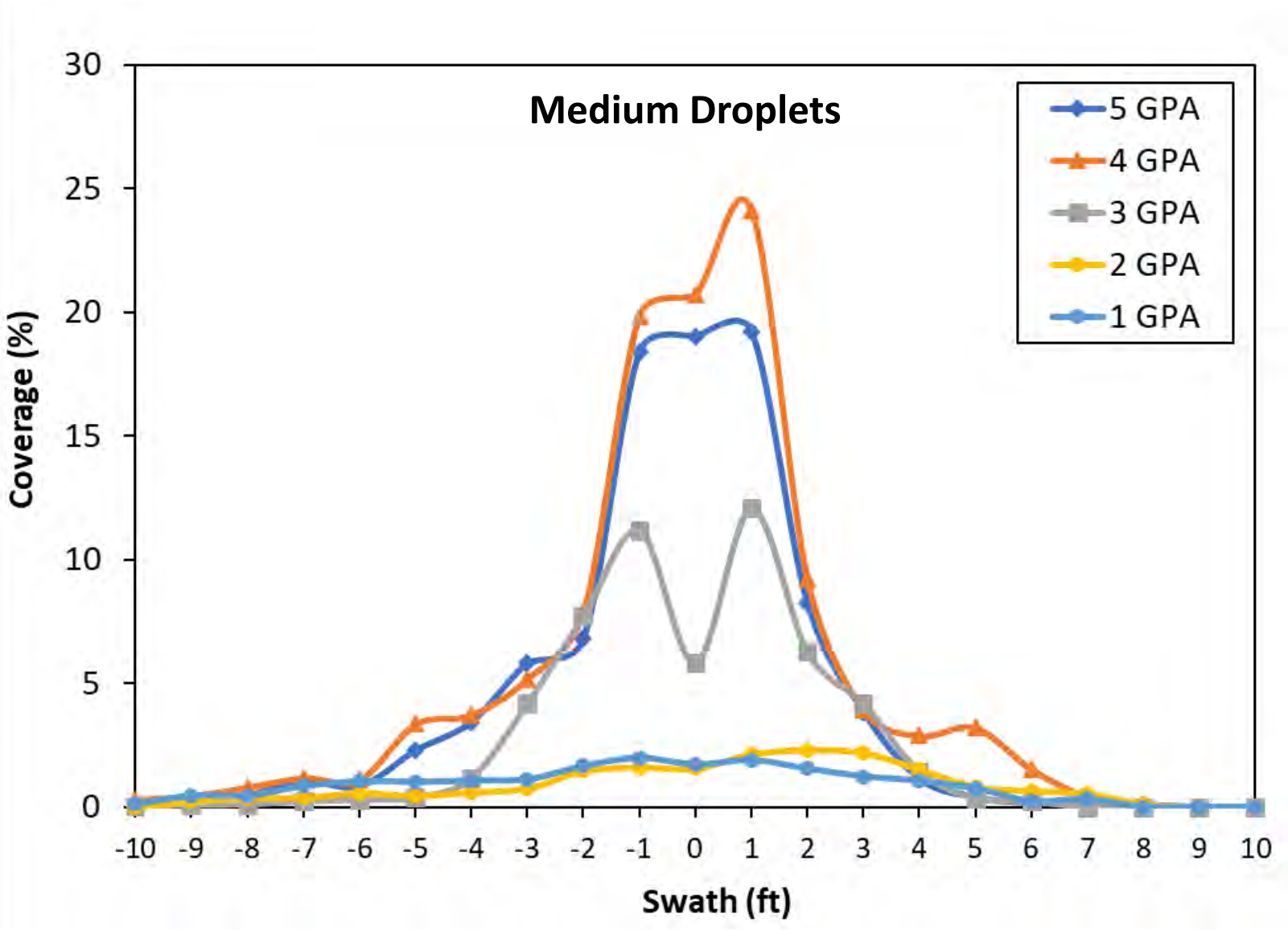
Effect of Spray Volume

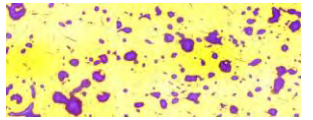
5 GPA

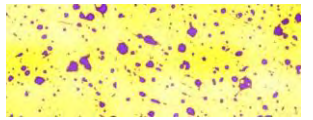
3 GPA

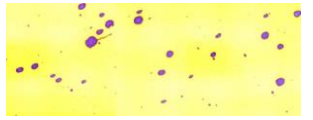


1 GPA



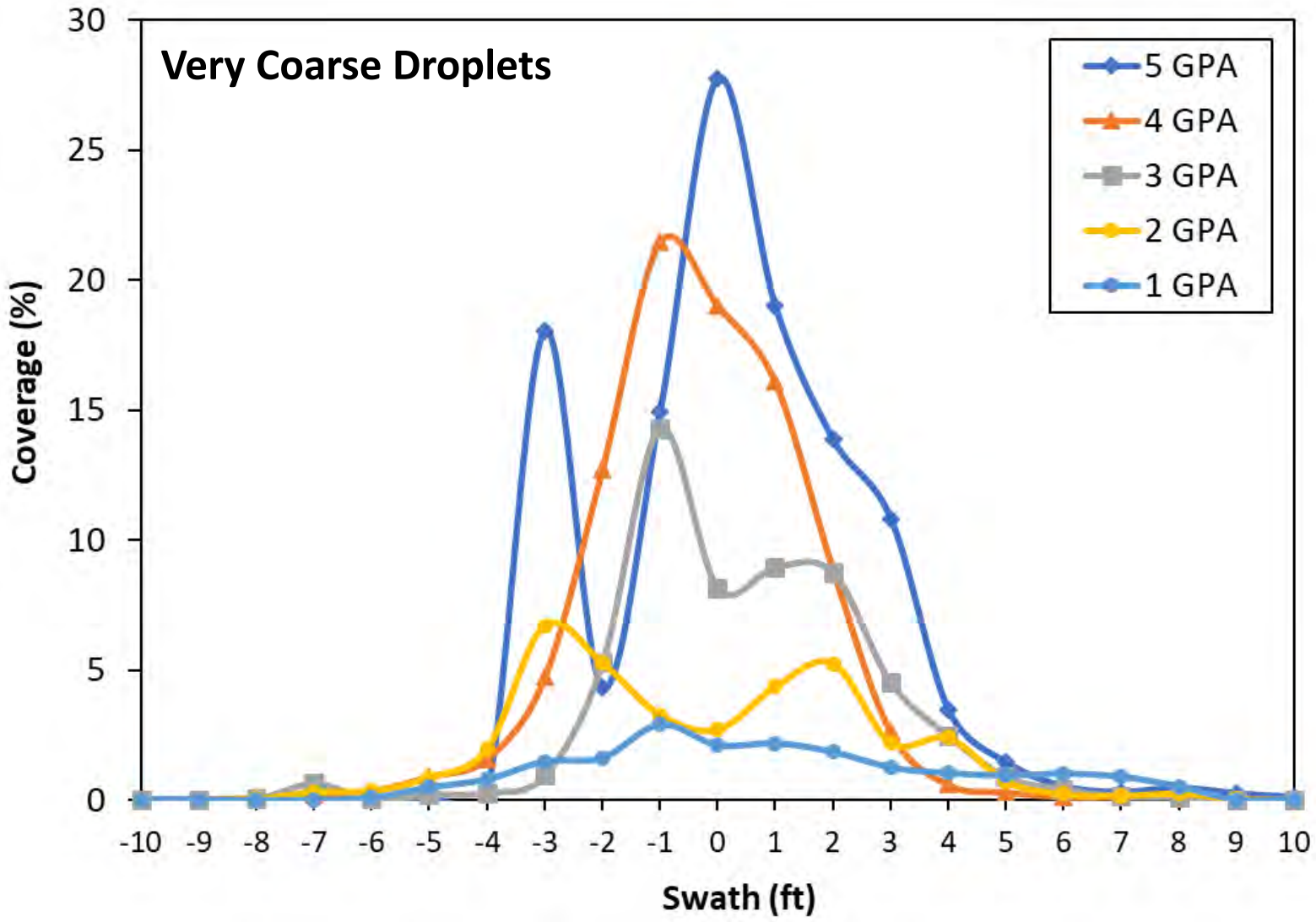




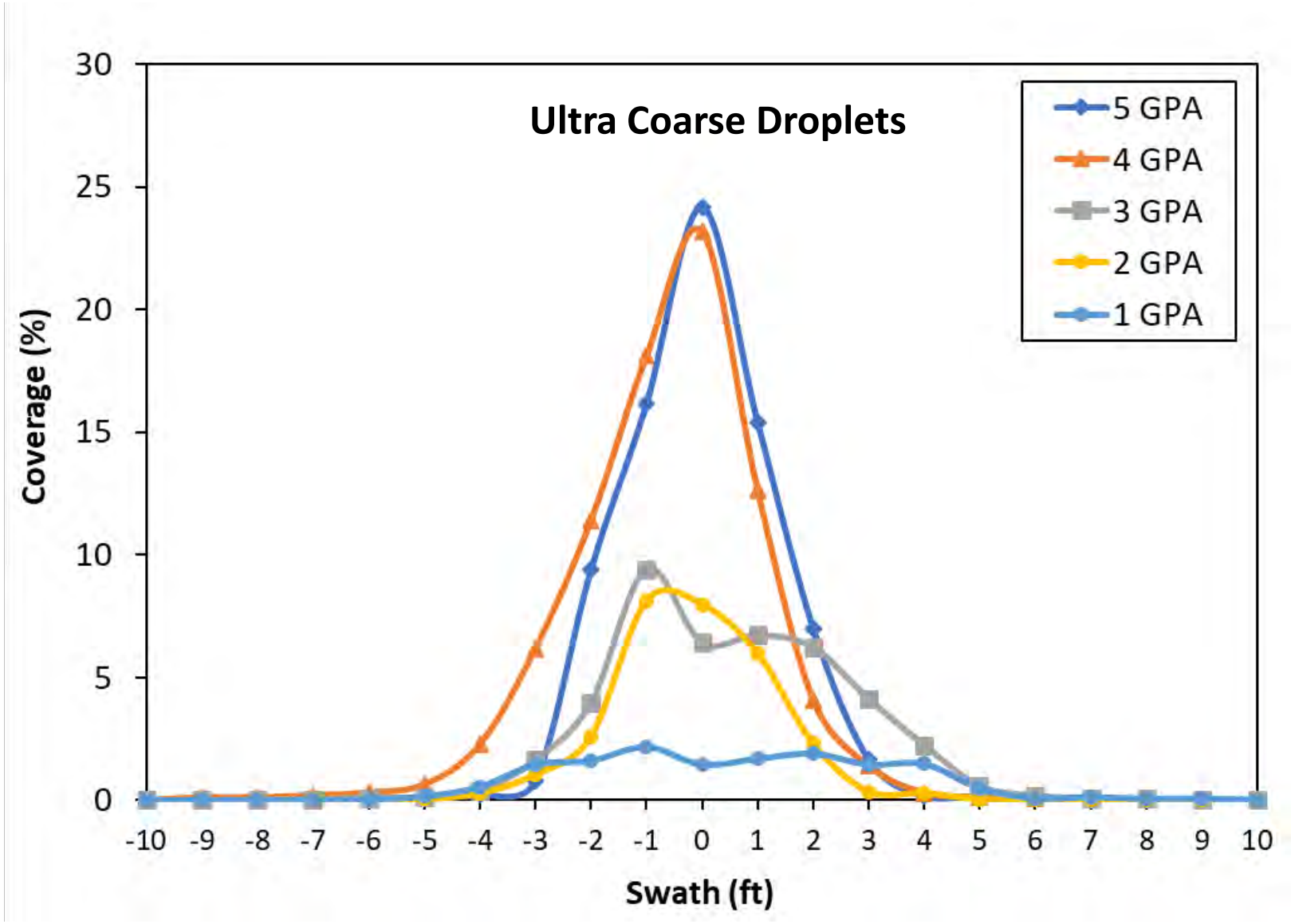


2

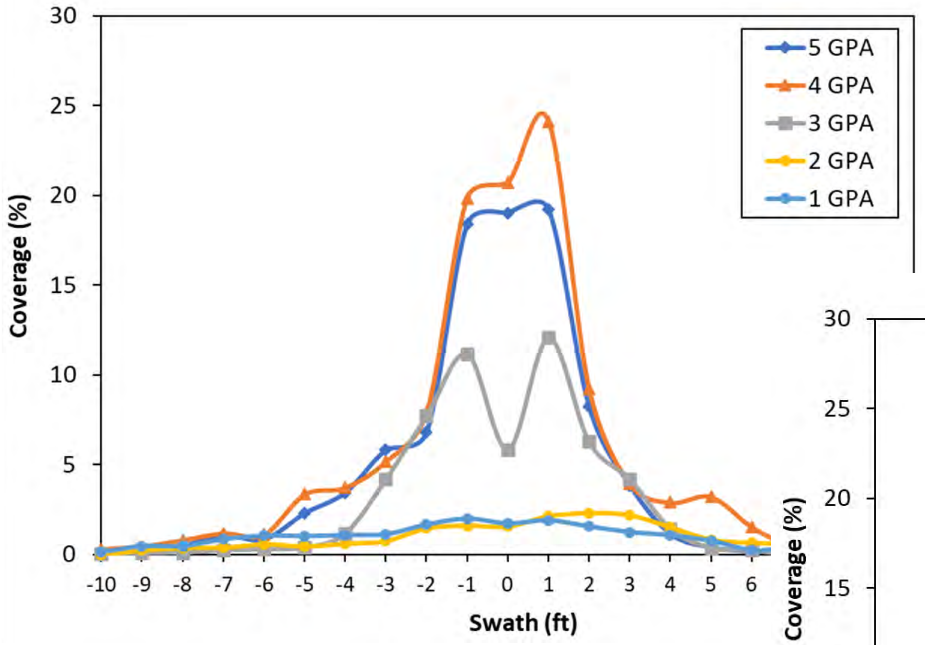
Spray Height: 6.5 ft

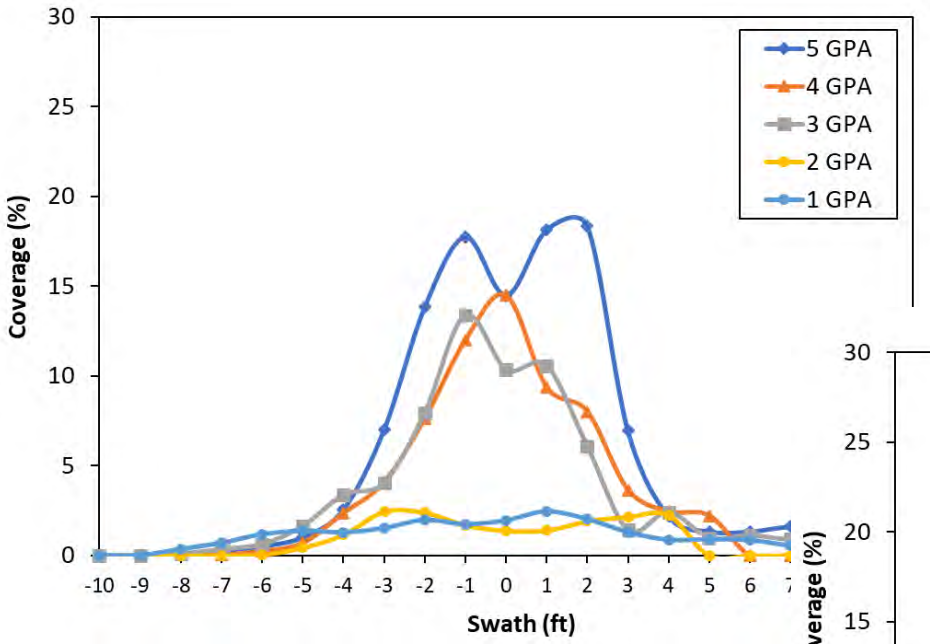


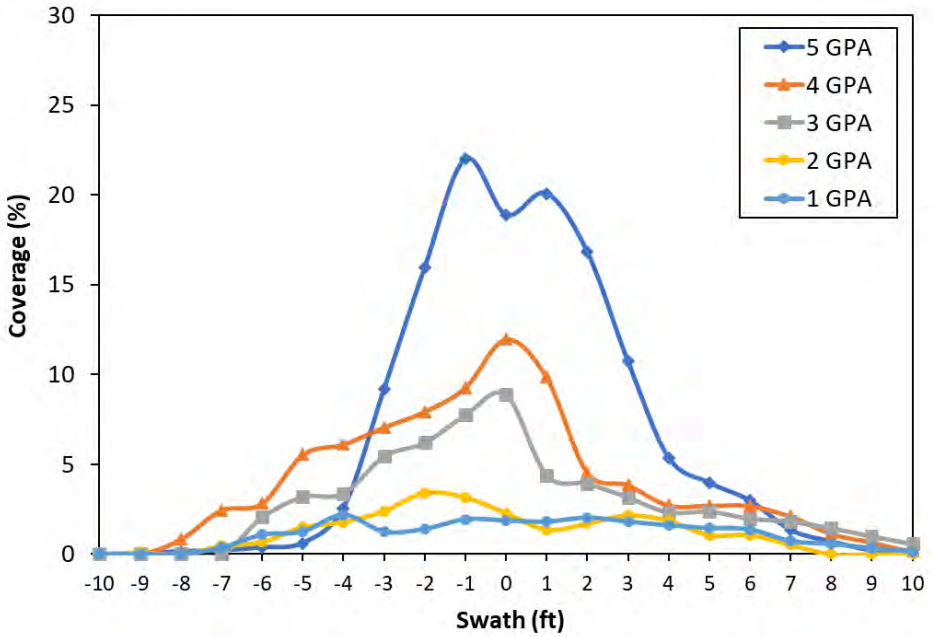
Spray Height: 6.5 ft



Effect of Spray Height

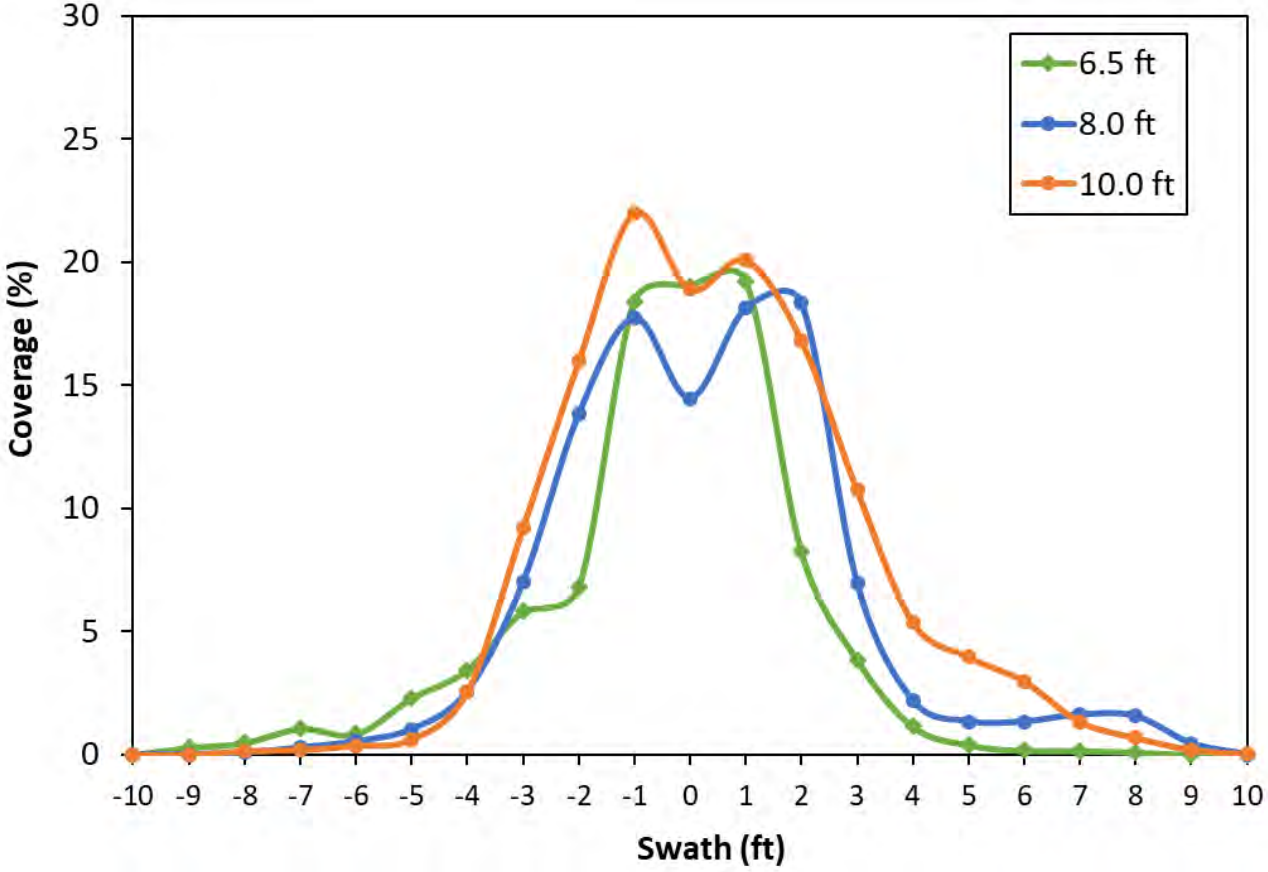




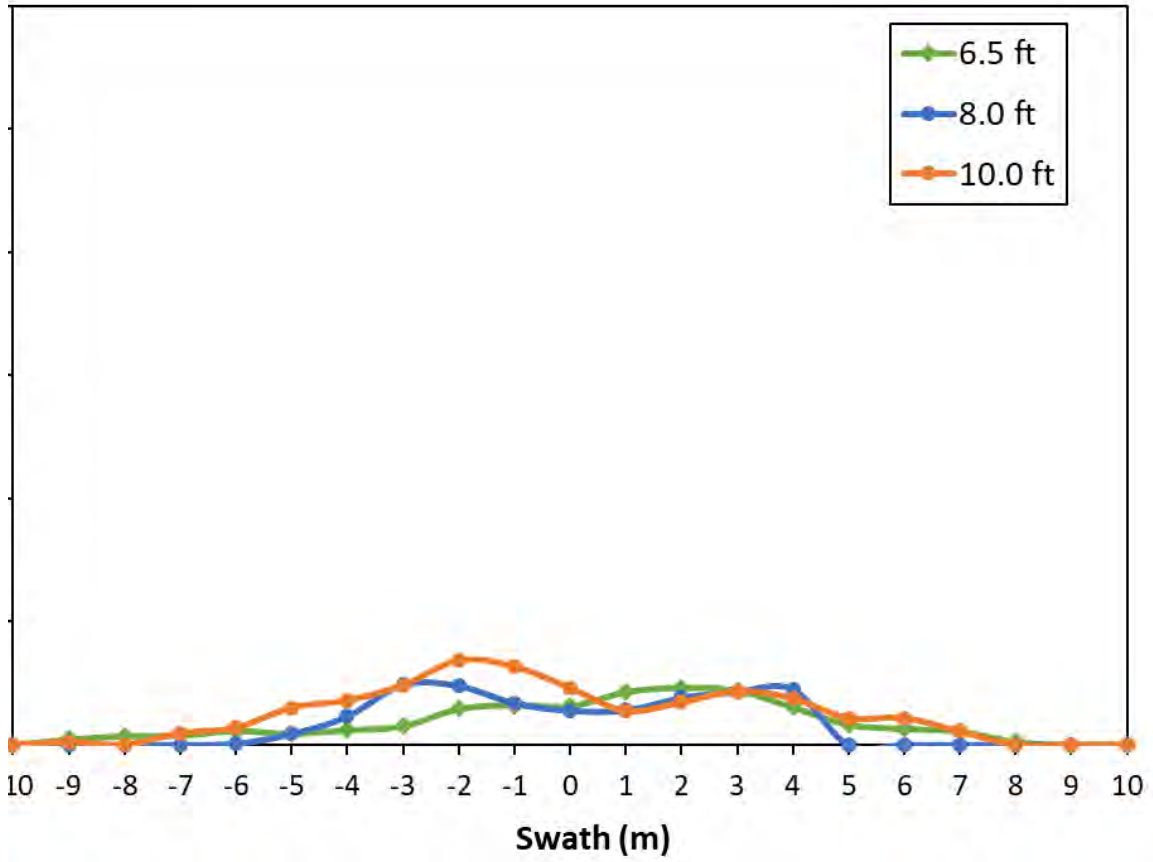


Medium Droplets

5 GPA

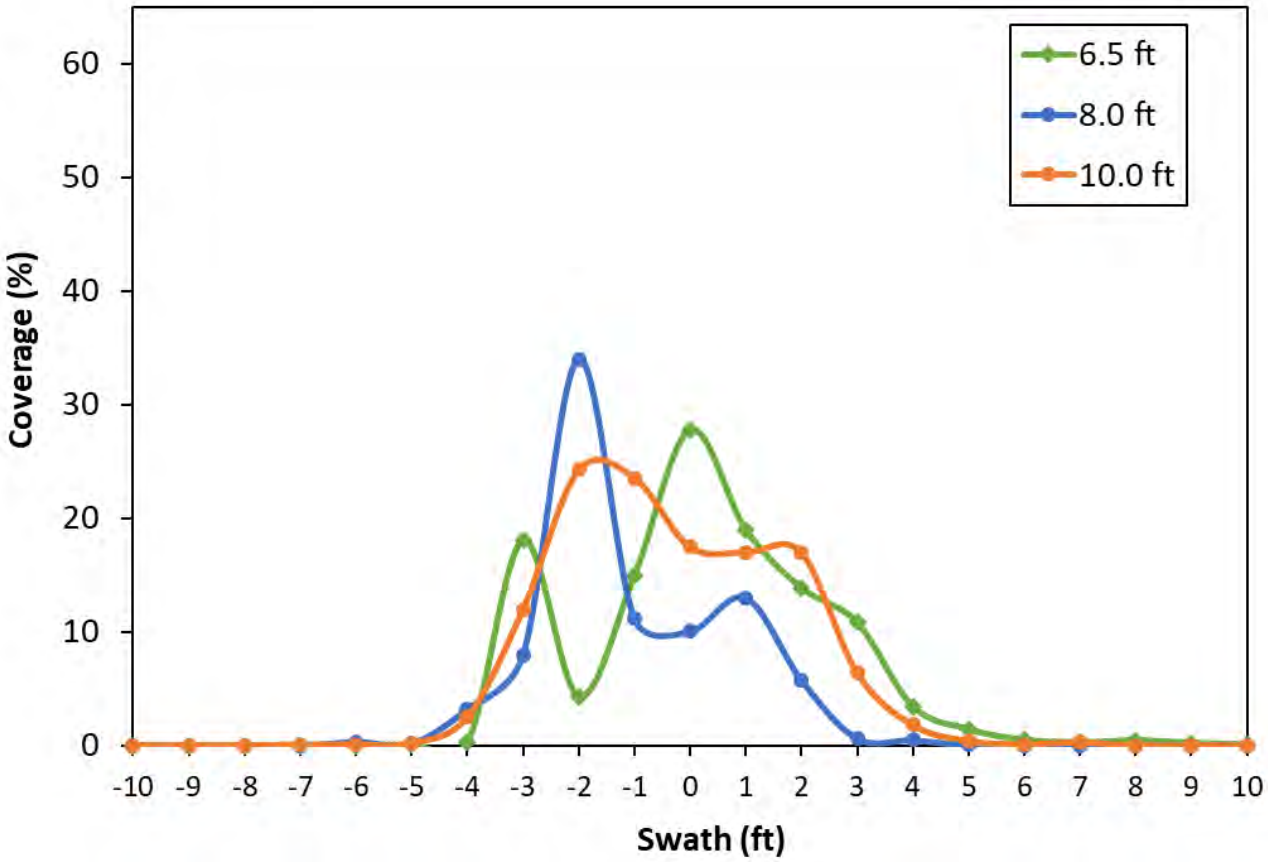


2 GPA

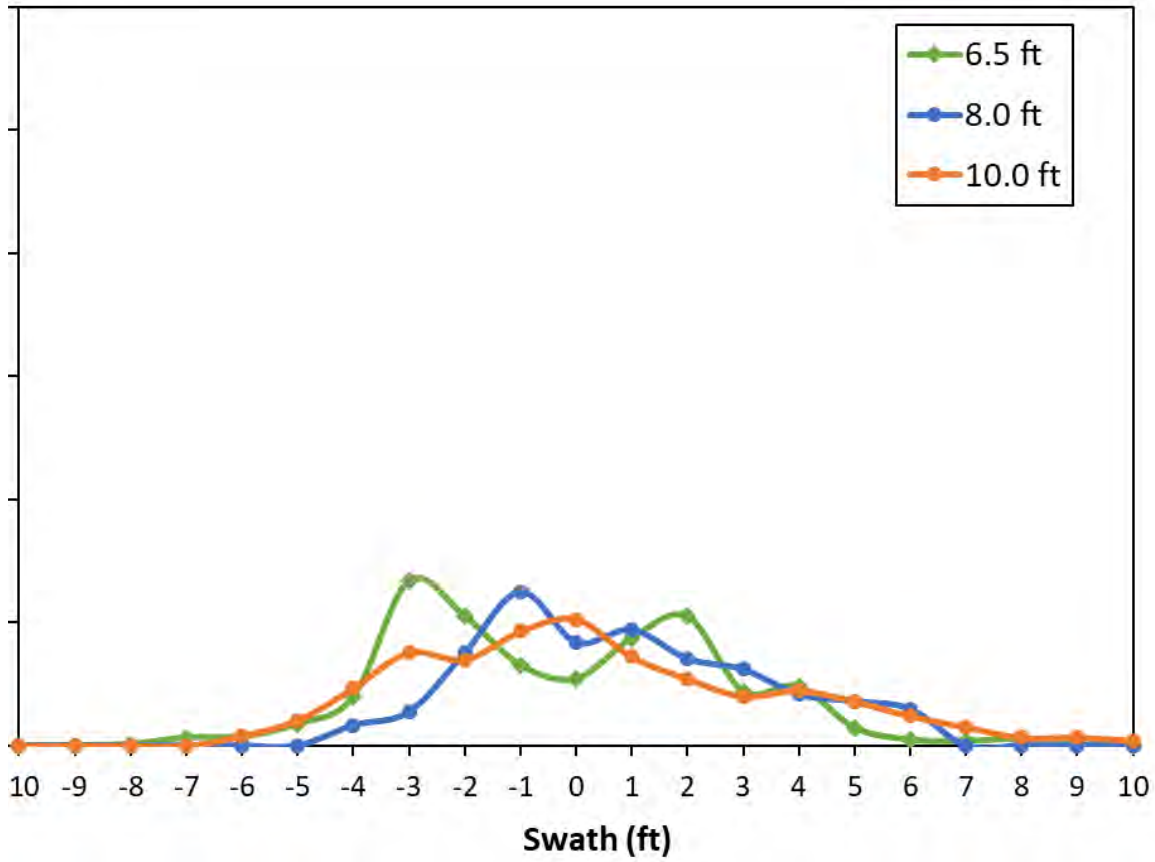


Very Coarse Droplets

5 GPA

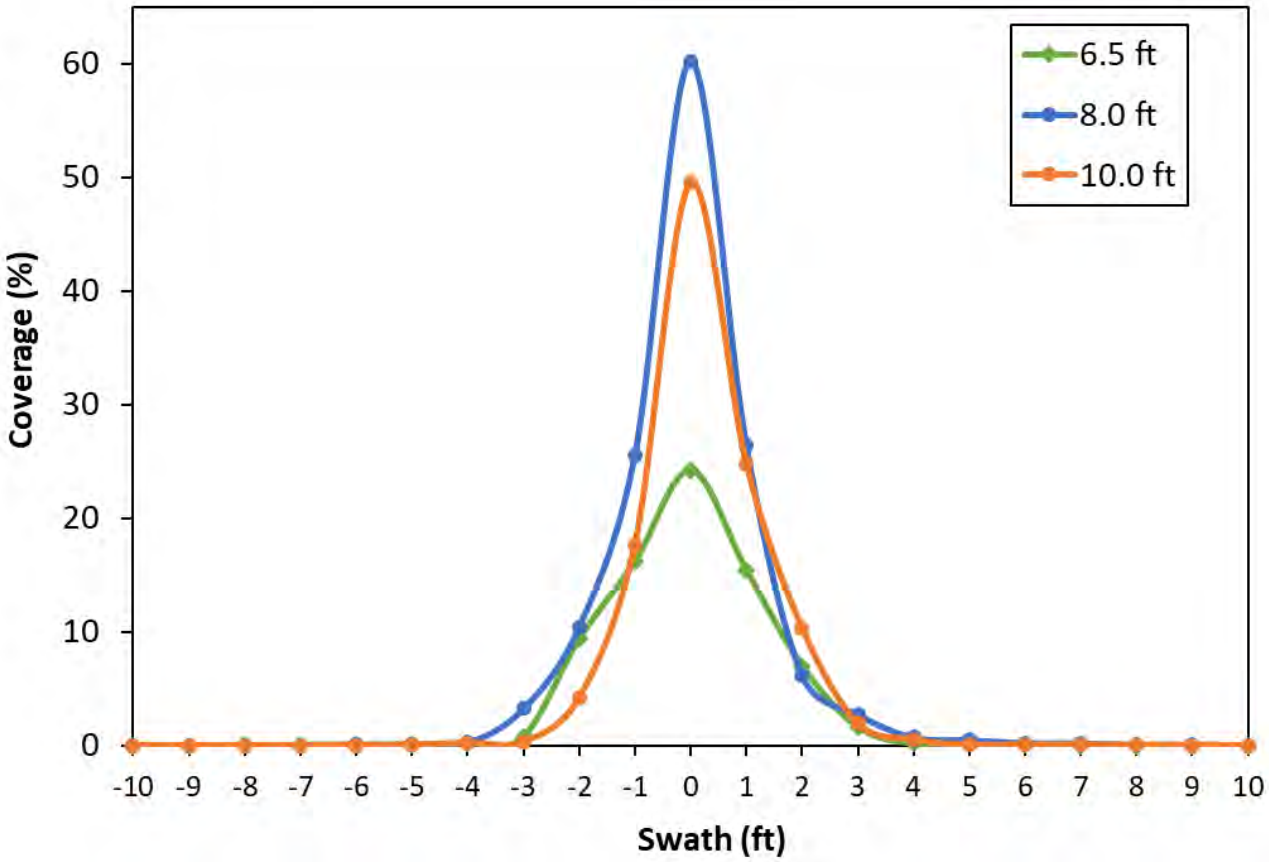


2 GPA

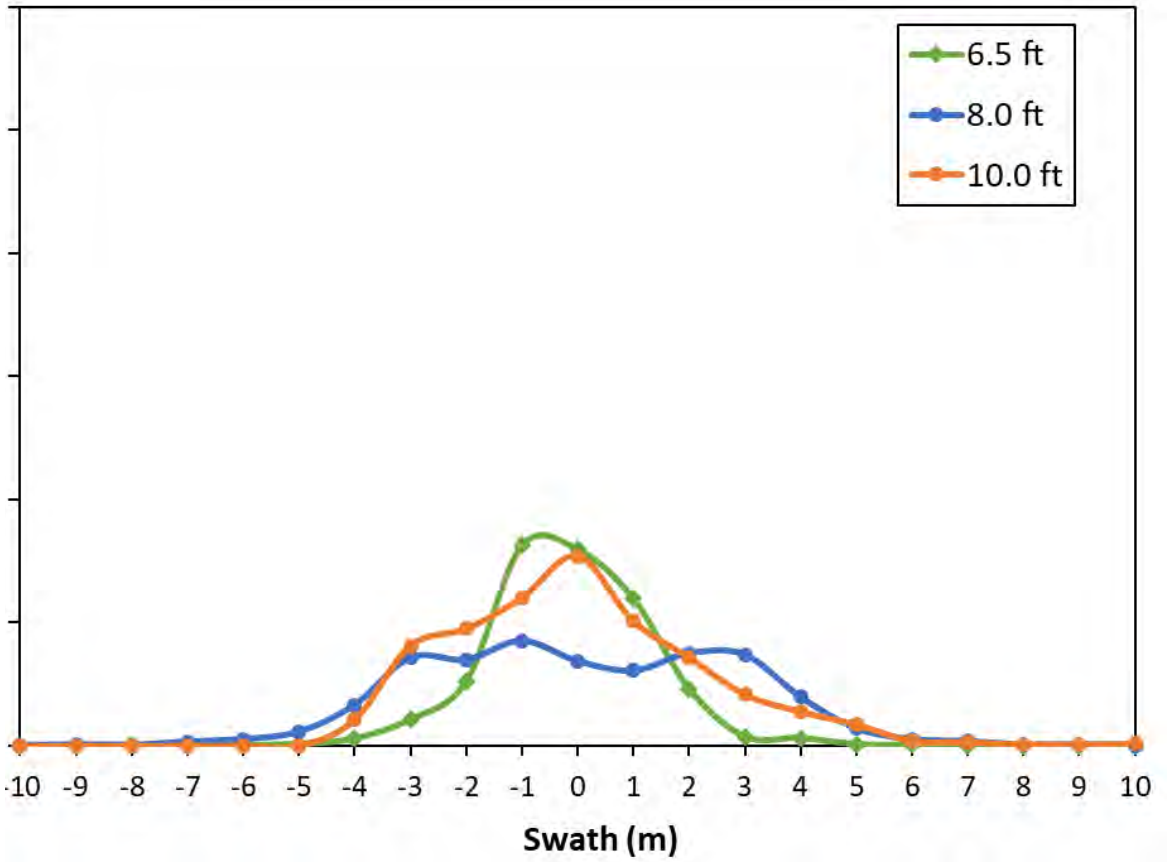


Ultra Coarse Droplets

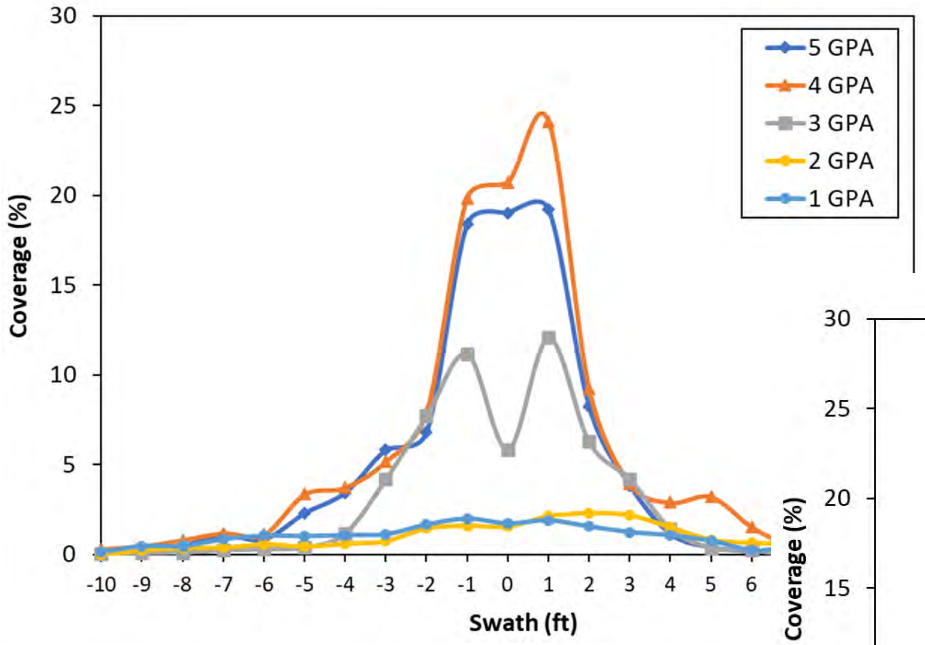
5 GPA

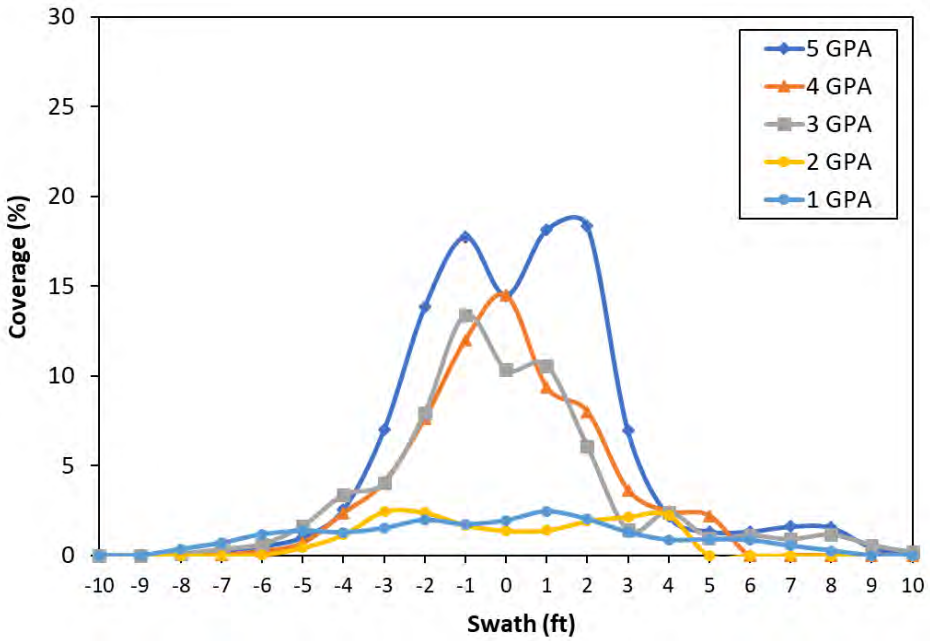


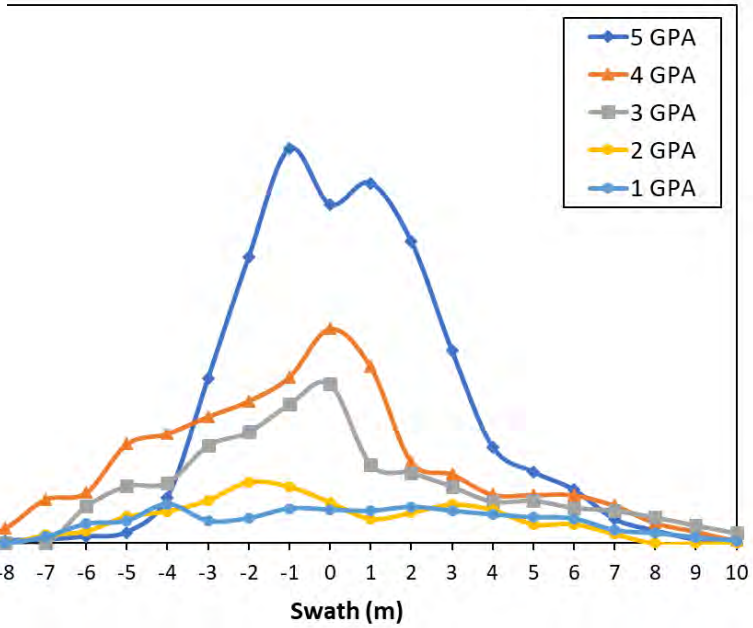
2 GPA



Effect of Droplet Size

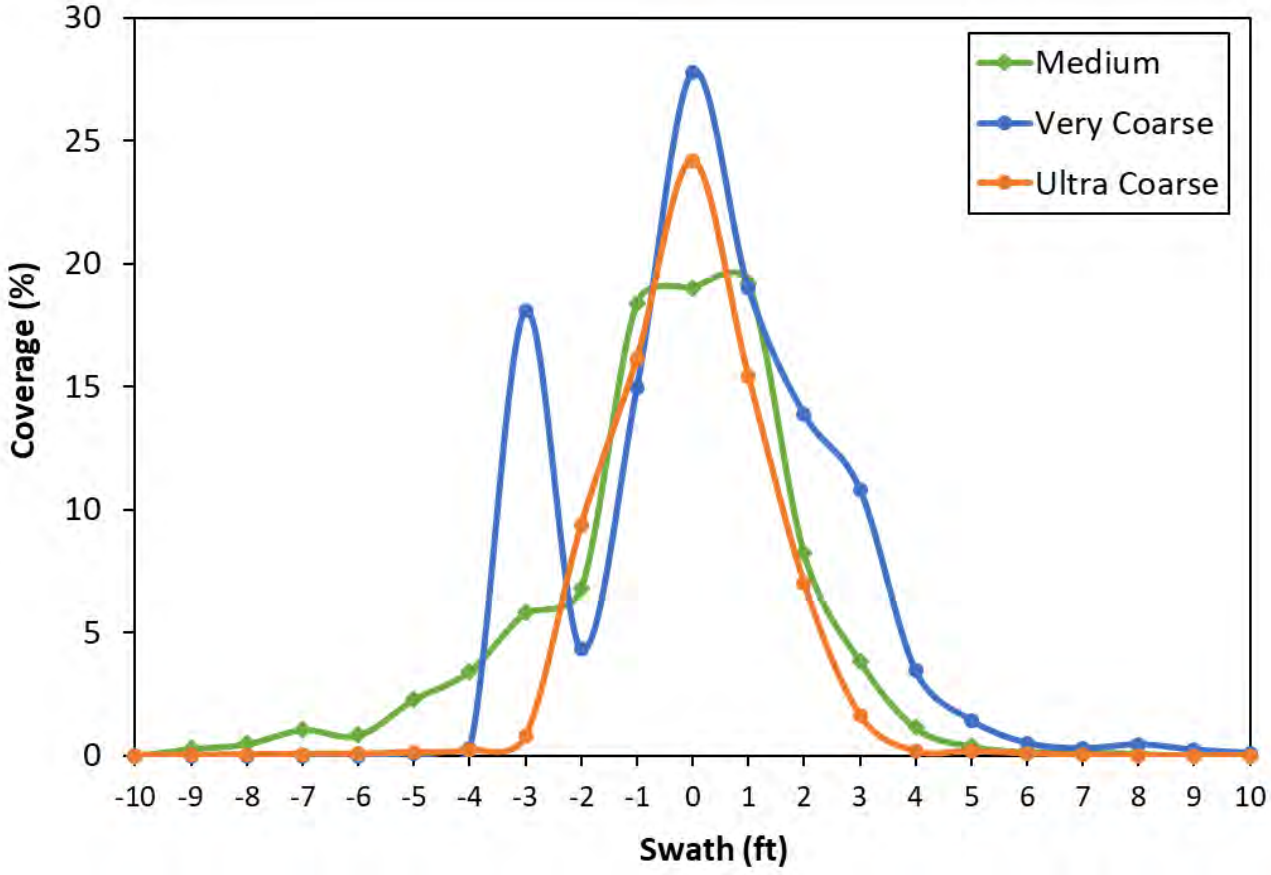




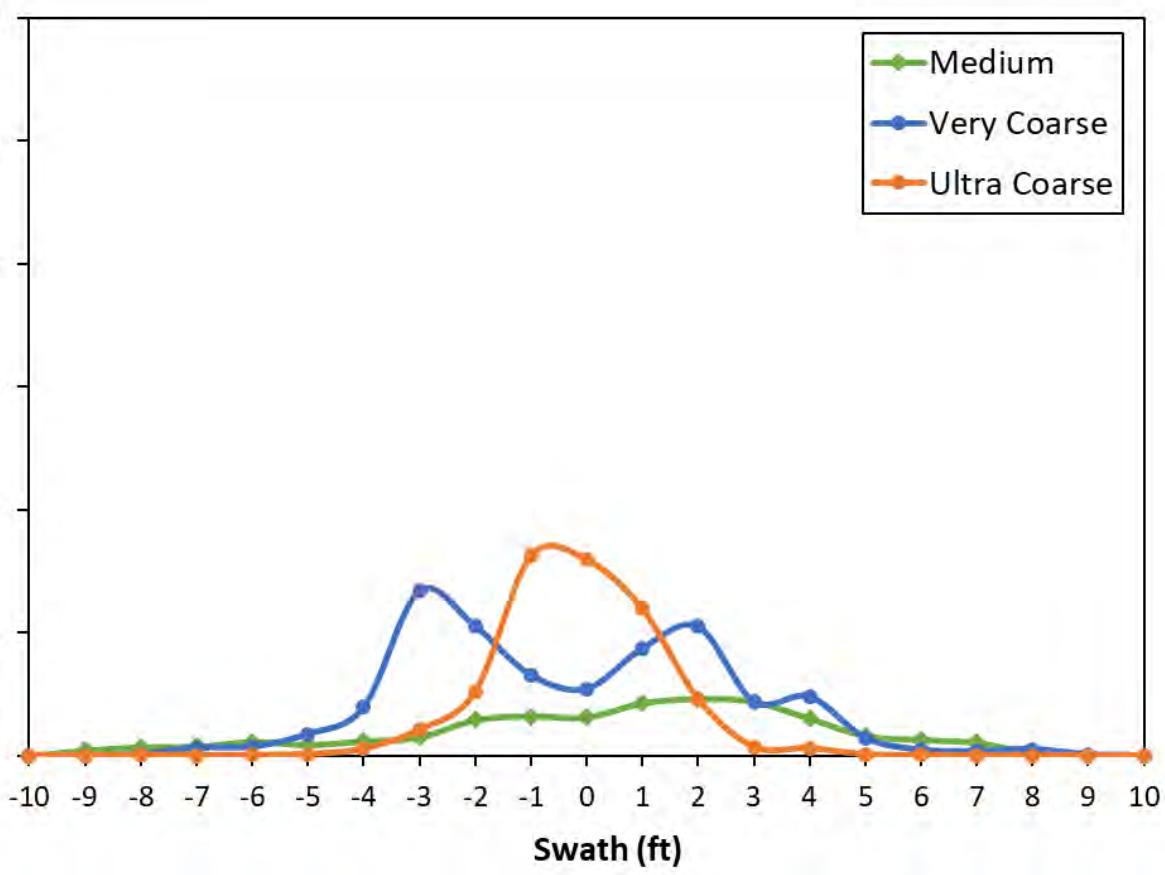


Spray Height – 6.5 ft

5 GPA

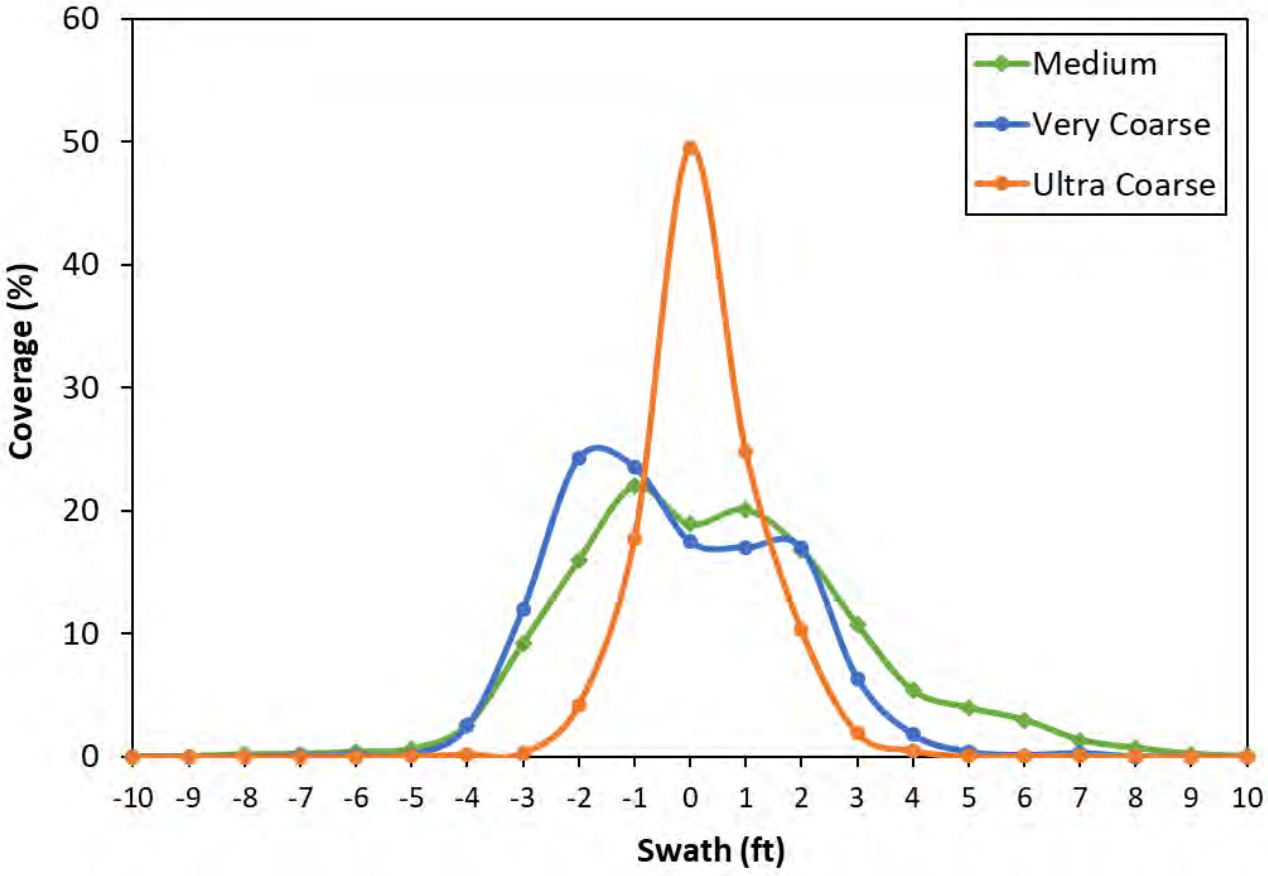


2 GPA

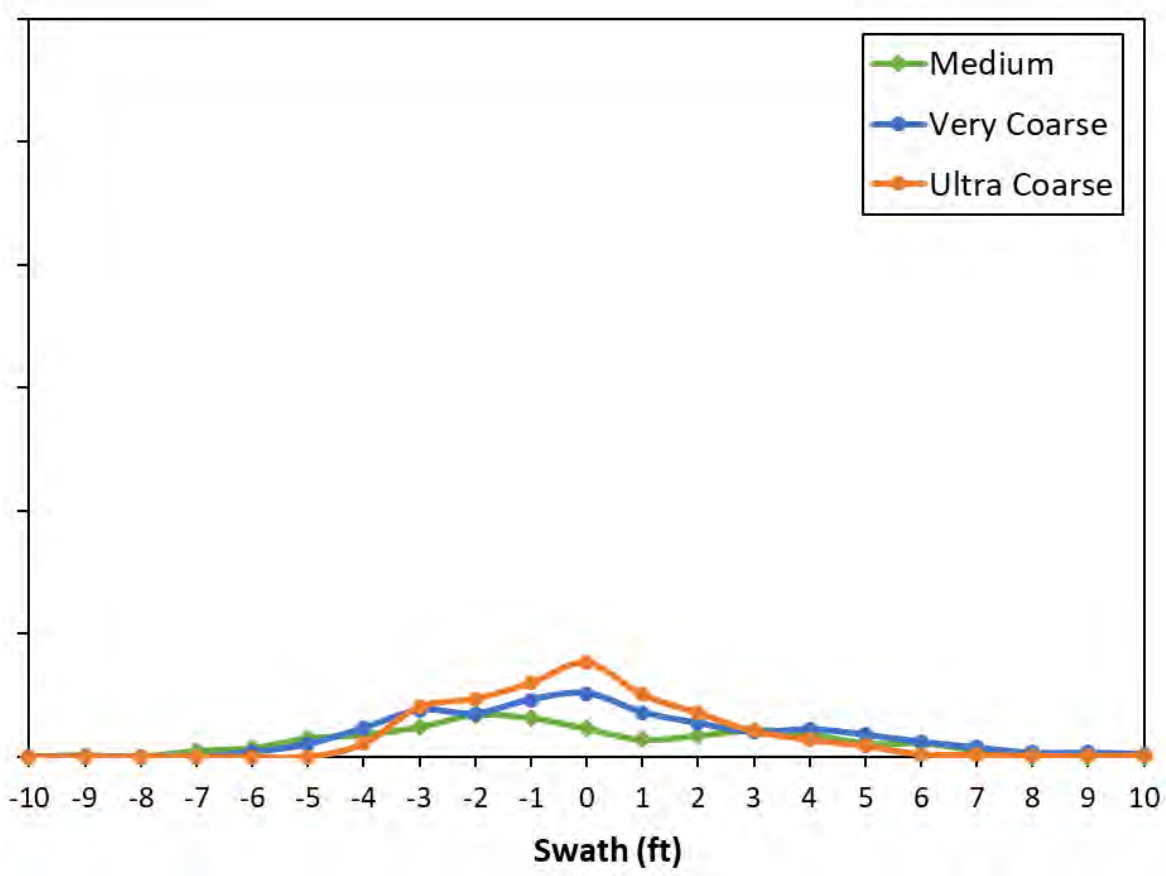


Spray Height – 10.0 ft

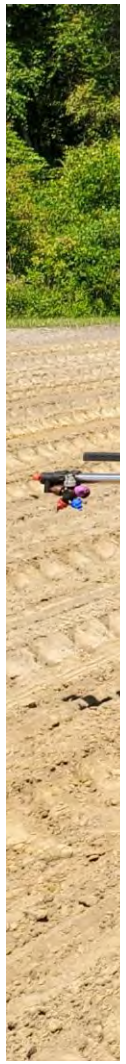
5 GPA

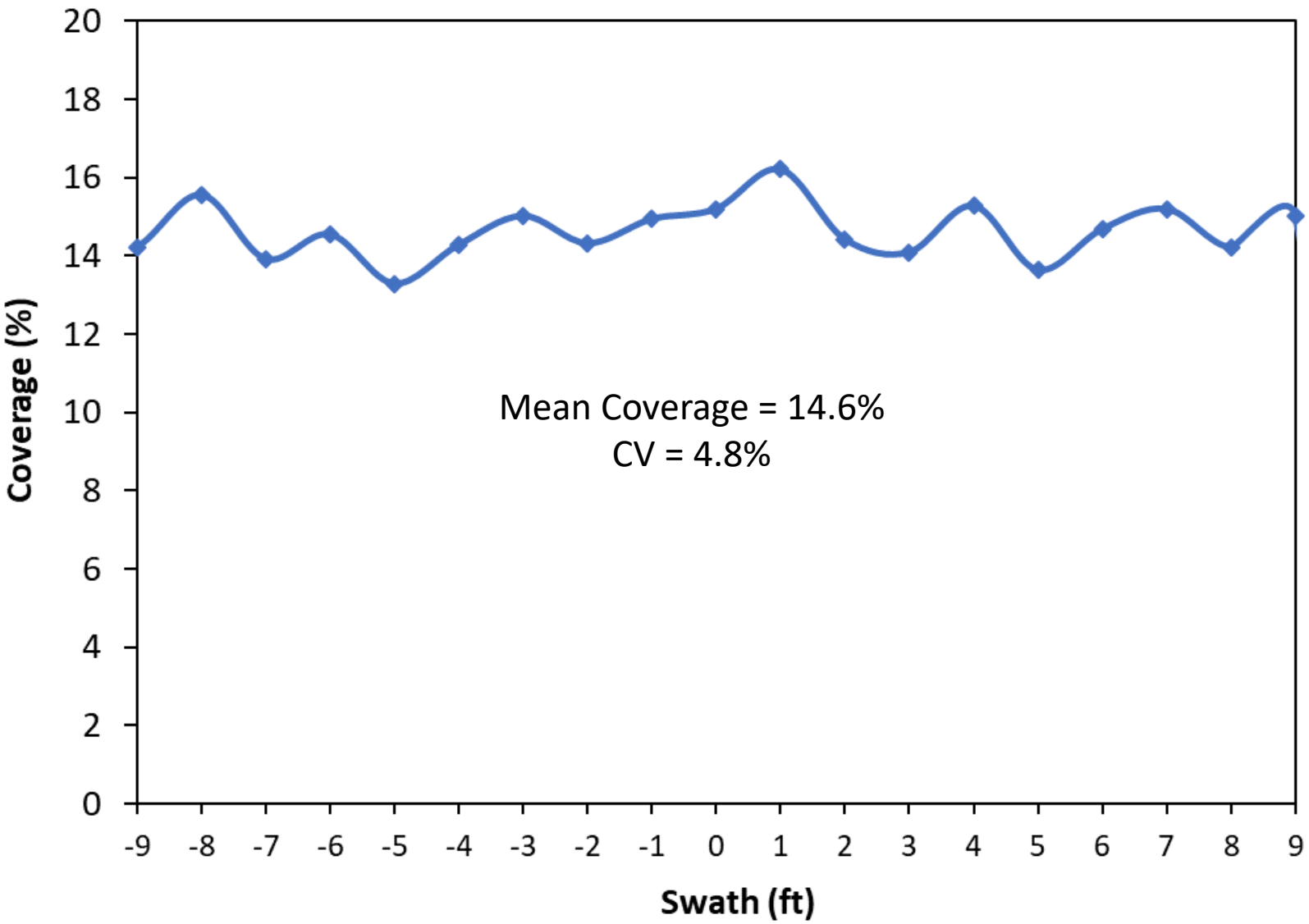


2 GPA

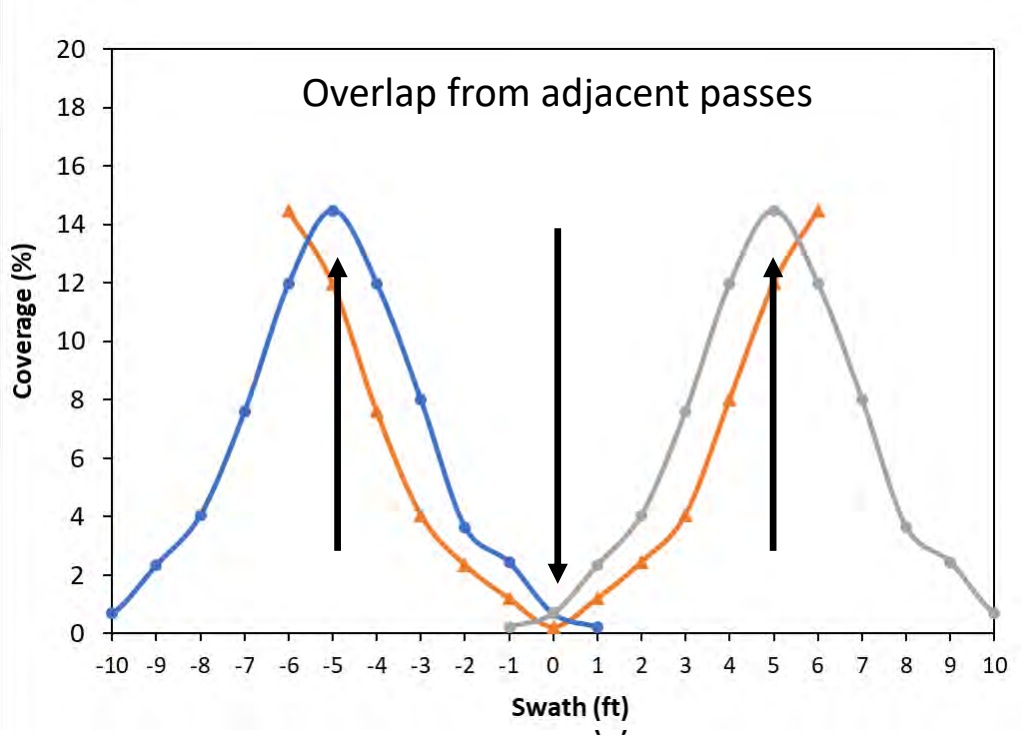


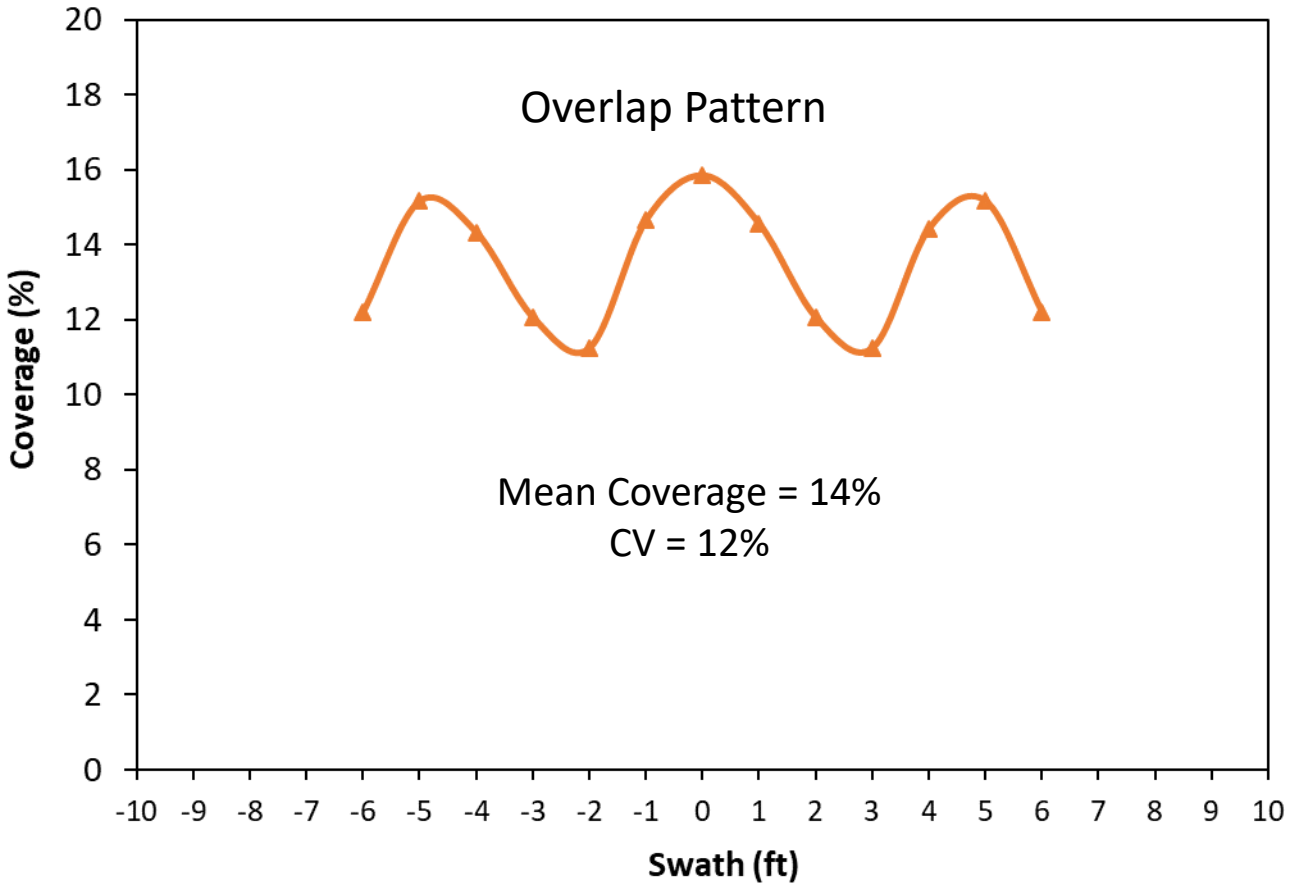
Boom Sprayer Performance





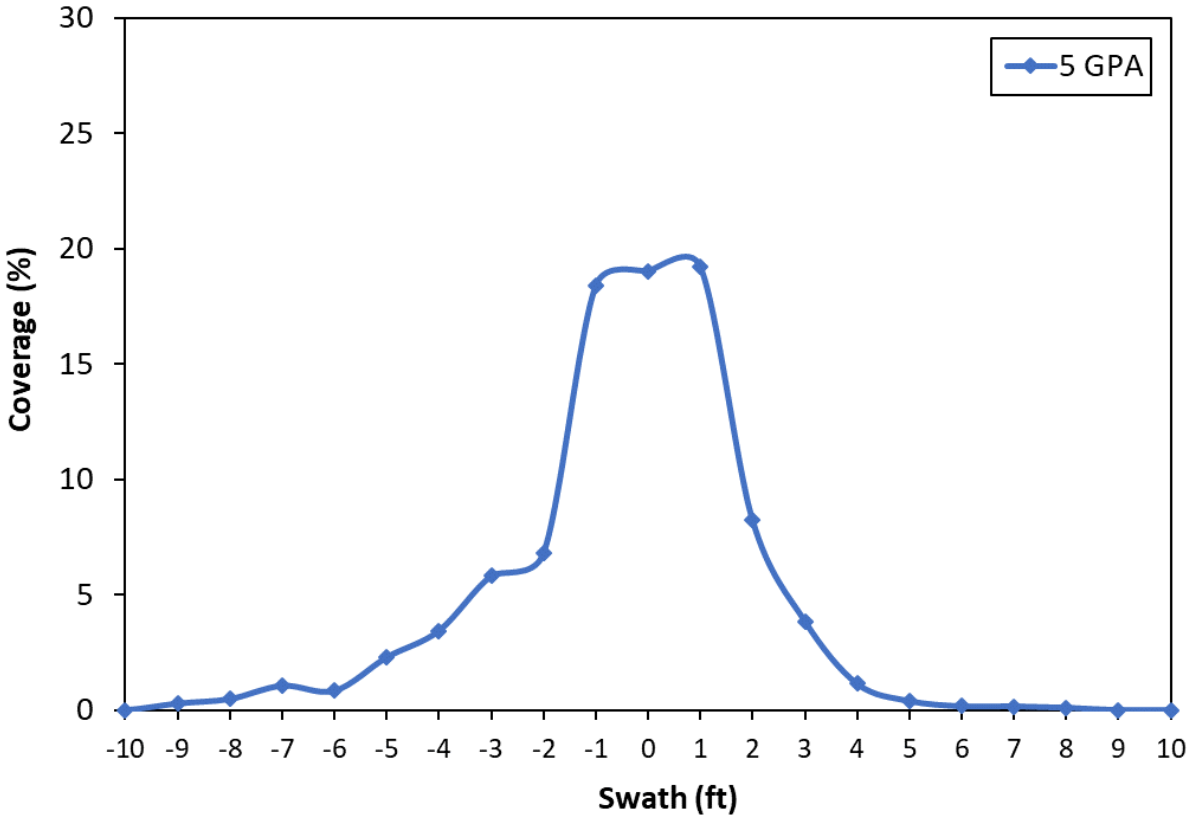
Single vs Overlap Pattern



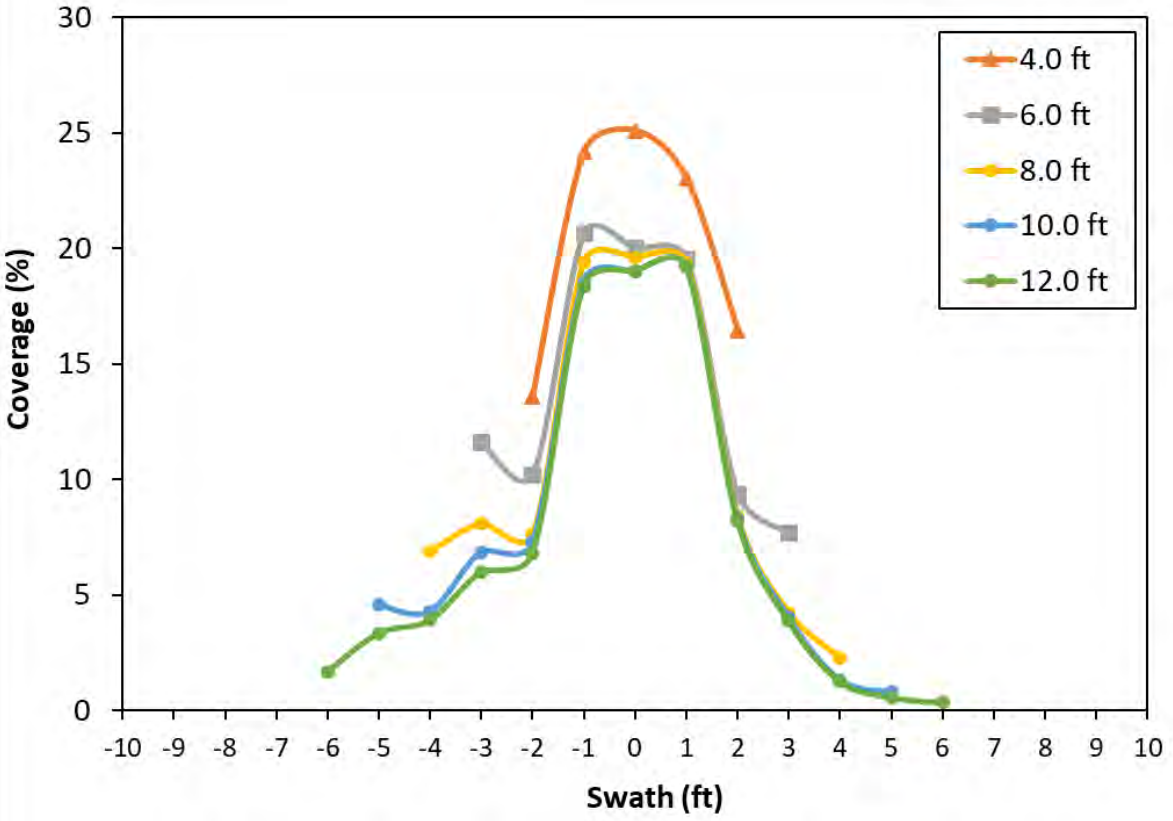


Overlap Pattern

Single Pass Pattern
Height = 6.5 ft; Volume = 5 GPA
Medium Droplets

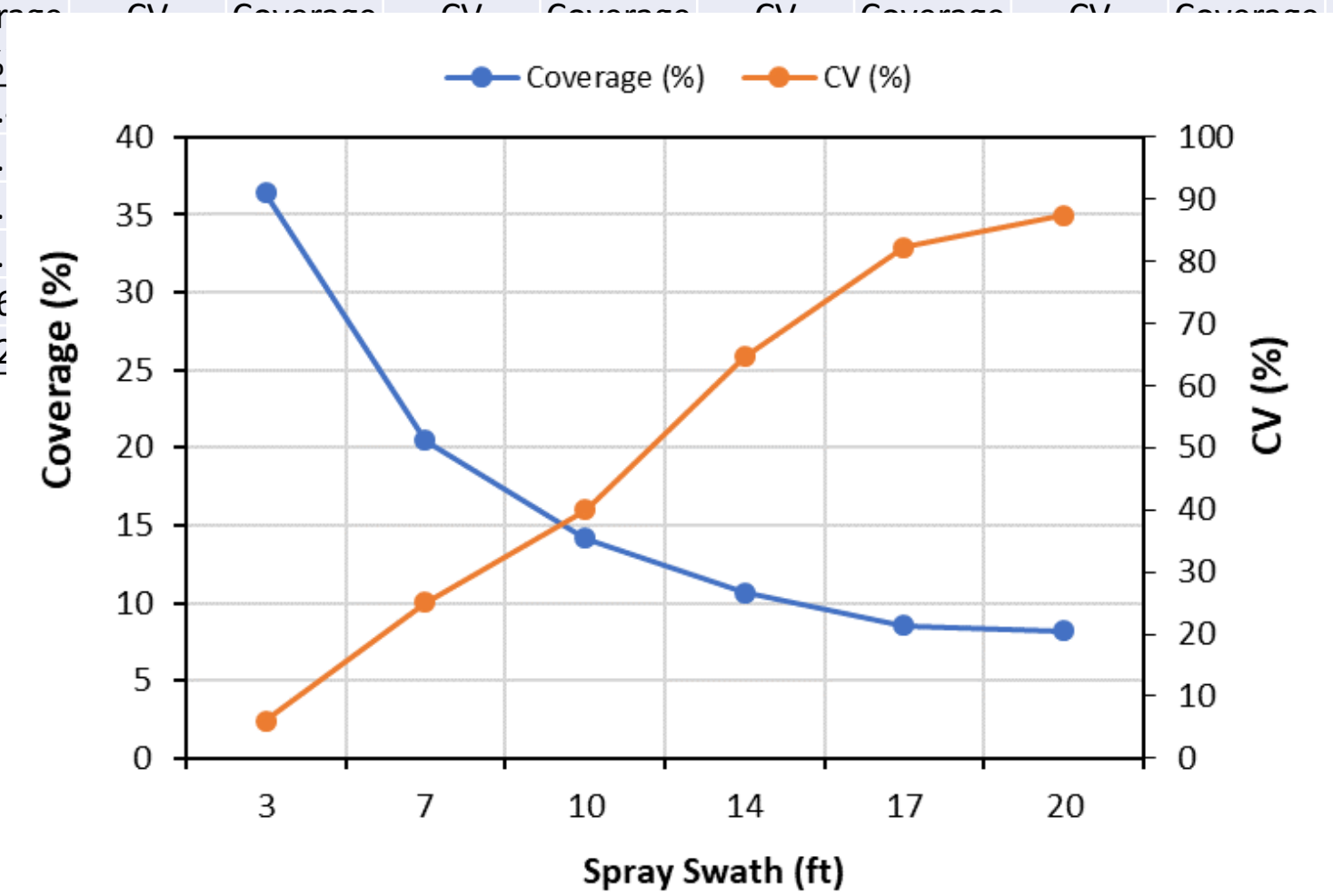


Overlap Pattern
Height = 6.5 ft; Volume = 5 GPA
Medium Droplets



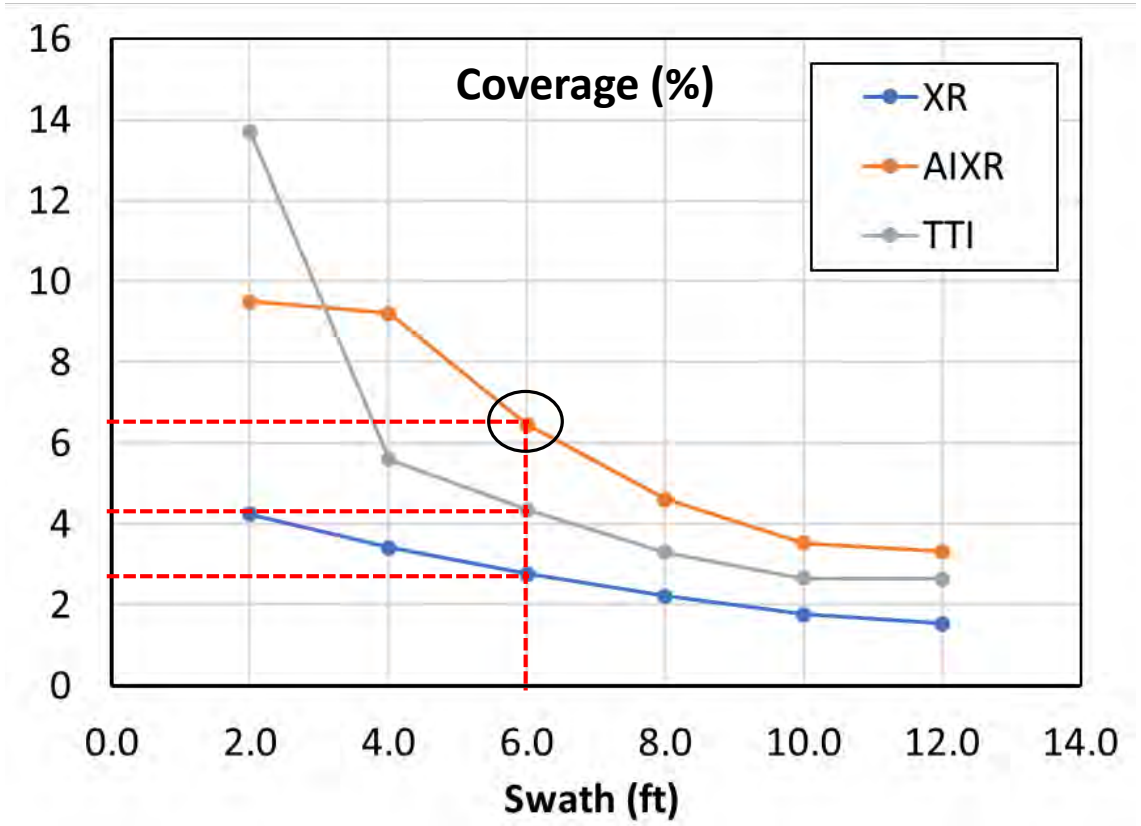
Overlap Pattern, Height = 6.5 ft; Volume = 5 GPA, Medium Droplets

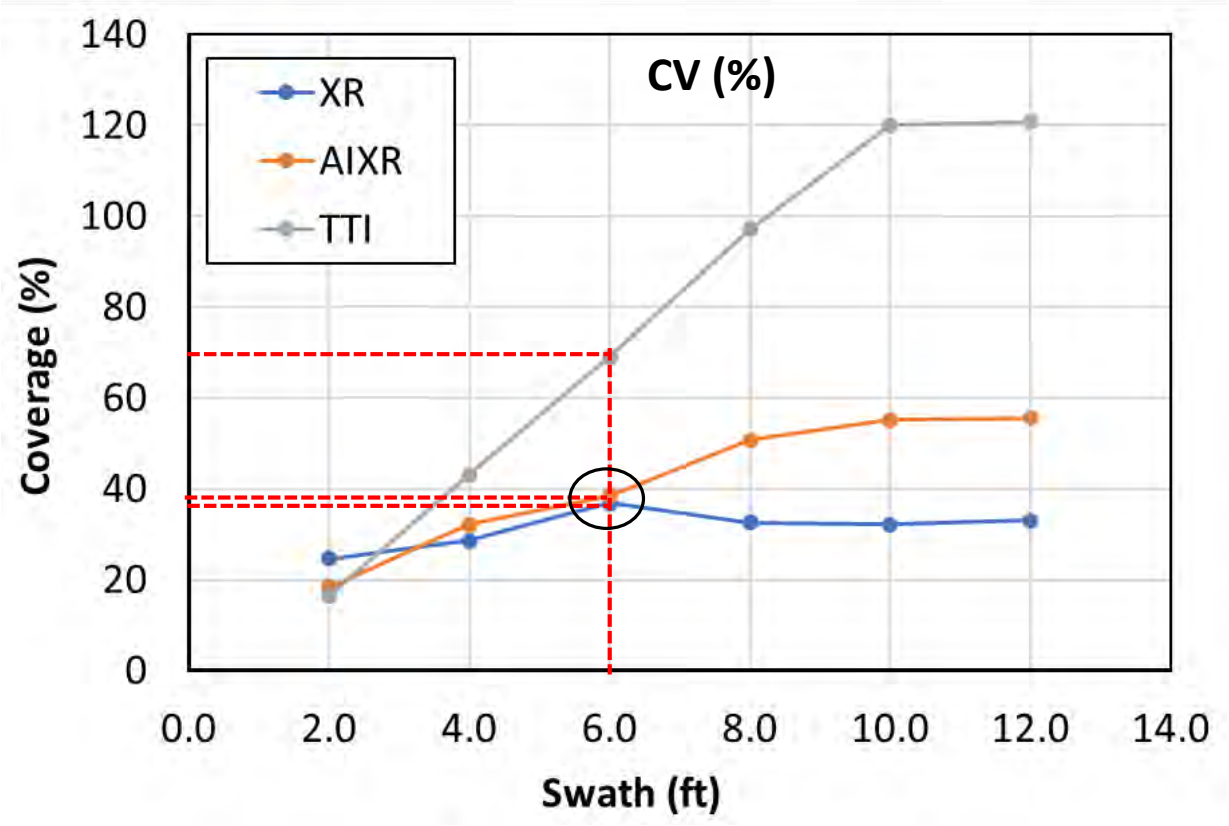
	5 GPA		4 GPA		3 GPA		2 GPA		1 GPA	
Swath (ft)	Coverage (%)	CV (%)	Coverage (%)	CV (%)	Coverage (%)	CV (%)	Coverage (%)	CV (%)	Coverage (%)	CV (%)
2.0	36.									14.4
4.0	20.									4.8
6.0	14.									10.2
8.0	10.									14.8
10.0	8.6									18.2
12.0	8.2									23.0



Example Grower Question: I want to apply 2 GPA to spray X chemical?

Using data to help with nozzle, swath and speed selection





Application Considerations

- Perform swath testing to determine your effective swath and uniformity (depends on spray volume, nozzle type and height)
- Spray performance varies from one drone model to another (same manufacturer) and from one manufacturer to another.
- **Spray Volume**: Check product label first, determine type of application and pesticide mode of action. (ideally ≥2 GPA).
- **Nozzle Type:** Type of application – coverage and tolerance to drift. Prefer coarser droplet nozzles over finer/medium droplet nozzles (current nozzles create too many fines).
- **Spray Height:** Both too low and too high are not good for optimizing coverage and uniformity. (height changes swath but not flow on current models).

Thanks!

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