SOP 15 Distribution uniformity evaluation for solid set sprinklers

Updated 9/20/10

Estimated completion time: field: 16 person hours, data analysis: 4 person hours

Materials needed:

- 1. GPS or measuring wheel
- 2. Clip board
- 3. Data sheets
- 4. Sharpie pen
- 5. 12 ft tape measure
- 6. Flags
- 7. 2 of each: 250 ml , 1000 ml, 2000 ml graduated cylinders
- 8. 2 funnels
- 9. 24 clothes pins
- 10. Drill bits ranging from 5/64 " 5/32" diameter
- 11. Pitot tube and adapter for pressure gauge (measure nozzle pressure)
- 12. 120, 1- gallon plastic buckets
- 13. 8 Schrader valves on 3-inch diameter aluminum pipe inserts
- 14. 6 Schrader valves and bushing adapters
- 15. 5 gallon plastic carboy and ¾" diameter hose (3 feet length)
- 16. Stop watch
- 17. Calibrated pressure gauge with Schrader adapter
- 18. Wind speed indicator and datalogger
- 19. Rain coat and rain pants.

Procedures:

Preparations before irrigating (recommend completing the day before irrigating) Description of field and sprinkler system (Skip if also doing SOP 23):

- 1. Determine crop
- 2. Measure longest and shortest row of field (irrigation block).
- 3. Determine width of field (irrigation block)
- 4. Determine area of field (irrigation block)
- 5. Determine bed width (center to center)
- 6. Determine rows of plants per bed
- 7. Determine in row spacing of plants
- 8. Determine lateral pipe diameter
- 9. Determine lateral pipe spacing
- 10. Determine sprinkler head model and brand
- 11. Determine nozzle diameter
- 12. Determine riser height
- 13. Sprinkler head offset (feet)
- 14. Determine diameter of main line
- 15. Map block to be evaluated and location of measurements

Before irrigating:

- 1. Install 3-4 Schrader valves at head of field along mainline and 3-4 valves at the tail of the field (end of lateral lines).
- 2. Set up wind speed indicator
- 3. Identify 4 areas to measure distribution uniformity in the irrigation block. The areas should be representative of the irrigation block (head, middle, and tail of field, as well as near field edges). Identify each evaluation area on map by codes A,B,C, etc. Estimate distances between the areas and a reference point. Place at least 30 buckets on a grid pattern between 2 adjacent lateral lines in each area. There should be at least 1 additional sprinkler line on either side of the lateral lines that are being evaluated and an additional sprinkler head on each side of the grid (see figure below). The buckets should be spaced on a grid between sprinkler heads on one of the lateral lines (For example for a 40 ft spacing between heads and 30 foot spacing between pipes, space buckets at an 8 foot spacing between heads and 5 foot spacing between pipes). Record spacing of buckets . Leave buckets upside down if they are placed in the field the day before irrigating. Buckets should be placed in locations free of obstructions (crop canopy).



Just before irrigating:

- 1. Turn buckets right side up.
- 2. Sprinkler heads should be turned so that they are pointed away from the buckets. If necessary, use clothes pins to secure nozzles away from buckets until after start up.
- 3. Record starting gallons on flow meter

After the irrigation system is turned on and fully pressurized:

- 1. Record flow rate of the system and start time of irrigation.
- 2. Measure pressure on Schrader valves at head and tail of field
- 3. Measure nozzle pressure on 4 heads near the areas being evaluated (but not on the actual heads near the grid of buckets)
- 4. On the same heads in step 3, measure the time to fill a 5-gallon carboy.
- 5. Repeat steps 3 and 4 for all evaluation areas.

After the irrigation system is turned off:

- 1. Record the ending gallons on the flow meter and the ending irrigation time.
- 2. Record volume of water (nearest ml) in each bucket. Identify the location of the buckets relative to sprinkler lines on map.
- 3. Repeat for each evaluation area.
- 4. Remove all Schrader valves and buckets

Calculations: Enter data into DU sprinkler spreadsheet

- 1. Calculate overall sprinkler discharge rate (gal/minute/head)
- 2. Calculate regional sprinkler discharge rate (each area or groups of areas)
- 3. Calculate field application rate (overall and regional) (inches/hour)
- 4. Evaluate pressure vs sprinkler discharge rate
- 5. Calculate overall DUlq (Distribution uniformity of lowest quarter) for the irrigation block
- 6. Calculate regional DU lowest quarter (group of at least 30 buckets)
- 7. Calculate 10% scheduling coefficient for the irrigation block
- 8. Calculate regional micro-sprinkler discharge rate 10% scheduling coefficient (group of at least 30 buckets)
- 9. Calculate overall sprinkler CU for the irrigation block
- 10. Calculate regional sprinkler pattern CU (group of at least 30 buckets)

Comments:

Notes:

Growe Ranch	r	Date Block				
	Flowmeter 1	Flow	vmeter 2			
Time	Reading (gal/acre-ft)	Time	Reading (gal/acre-ft)			

Map:

Grower	Date	
Ranch	Block	

crop and field dimensions

crop	
plant rows per bed	
between row spacing (feet)	
In row plant spacing (feet)	
bed width or spacing (feet)	
shortest bed length (feet)	
longest bed length (feet)	
field width (feet)	
field area (acres)	
slope of field (%)	

irrigation system characteristics

lateral spacing or hand move spacing (feet)	
sprinkler spacing along lateral(feet)	
total length of lateral pipe lines (feet)	
number of lateral lines on main line	
diameter of lateral pipe (inches)	
submain pipe diameter (inches)	
submain length (feet)	
main diameter (inches)	
sprinkler pattern (eg. 270°)	
sprinkler head model and brand	
nozzle diam. (inch/mm)	
Riser height or head height above ground (feet)	
Sprinkler head offset (feet)	

Grower_____

Ranch _____

Date_____

Block _____

Carboy Vol. (gallons)

	Area	Flow rate (seconds)	Nozzle pressure (psi)
head 1			
head 2			
head 3			
head 4			
head 5			
head 6			
head 7			
head 8			
head 9			
head 10			
head 11			
head 12			
head 13			
head 14			
head 15			
head 16			
head 17			
head 18			
head 19			
head 20			
head 21			
head 22			
head 23			
head 24			
head 25			
head 26			
head 27			
head 28			
head 29			
head 30			

SOP 15 Overhead Sprinkler DU and system evaluation

Grower			Date				Row Spacing (feet)				
Ranch			Block				Col. Spacing (feet)				
start time (min)		en	end time (min)			bucket diam. (inches)					
Area A			Area B			Area C					
obs.	Row	<u>Col</u>		obs.	Row	<u>Col</u>		obs.	Row	<u>Col</u>	
						collecti	on volume (ml)				
1				1				1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
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30				30				30			
31				31				31			
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33				33				33			
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35				35				35			
36				36				36			
37				37				37			
38		·		38				38			
39				39		·		39			
40				40				40			

Grower		 Date					Row Spacing (feet)			
Ranch		 Block				Col. Spacing (feet)				
start time (min)		end time (min)			bucket diam. (inches)					
									-	
Area D		Area F				Area F				
obs.	Row	Col	obs.	Row	Col		obs.	Row	Col	
0.001	<u></u>	<u></u>	 		collec	tion volume (ml)		<u></u>	<u></u>	
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2			 2			·	2			
3		·	 3				3			
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6			 6				6			
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