

# Save Costs by Refining Your Substrate and Nutrient Program

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VirginiaTech  
*Invent the Future*





# WATER



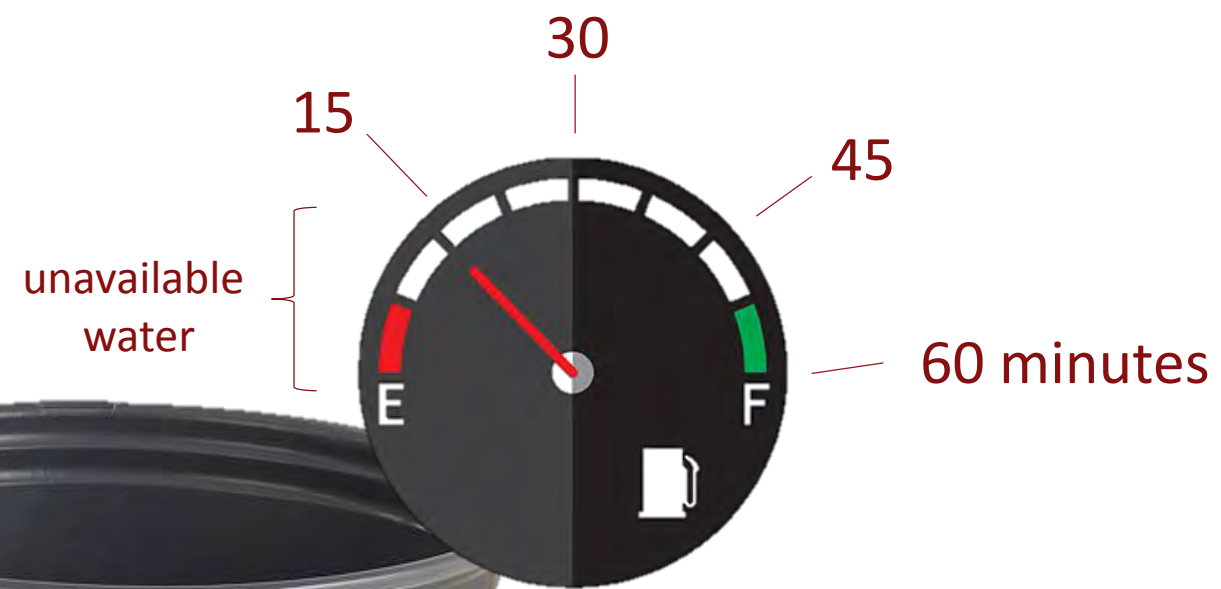
*Maximum water holding capacity  
(approx. 60% by vol.)*

*Available water  
(25% to 30% by vol.)*





# WATER



*Maximum water holding capacity  
(approx. 60% by vol.)*

*Available water  
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# WATER

**Leaching Fraction = leached / applied**

**LEACHED**

**APPLIED**



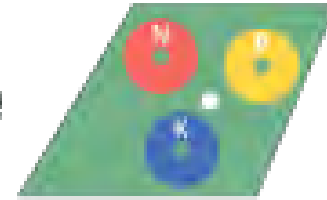
# FERTILIZER

**Agronomic  
Crops**

10-30%

Efficiency increases can be achieved from the precise management of fertilizer use

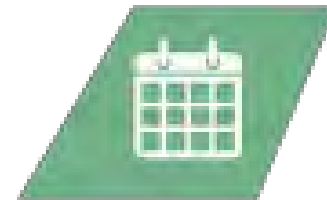
Right Source



Right Rate



Right Time



Right Place



# FERTILIZER



## THE POUR-THROUGH EXTRACTION PROCEDURE:

### A Nutrient Management Tool for Nursery Crops

*By routinely measuring the electrical conductivity (EC) and pH of growing media and irrigation water for container-grown nursery crops, growers can monitor nutrient availability and scout for problems. This does not have to be time-consuming, complicated, or difficult. Learn how to use the pour-through extraction procedure as part of your nursery's quality control program.*

The nutrients available to container-grown plants can be estimated by measuring how well the leachate (the solution that drains from containers) conducts electricity. Pure water does not conduct electricity. Electrical conductivity increases proportionally, however, with the dissolved salts (nutrients from fertilizers) present in the solution. Therefore, measuring electrical conductivity (EC) indicates the nutrient concentrations available to container-grown plants.

#### POUR-THROUGH EXTRACTION PROCEDURE

The pour-through extraction procedure does not disturb plant roots as do other procedures that require removing potting media from containers or sending samples to a laboratory. When plants are watered to container capacity, fertilizer nutrients are dissolved in the water available for plant uptake. As additional water is gently "poured through" the container substrate (the growing media), it displaces the water in the perched water table at the container bottom, and this water can be collected as it leaches from the drainage holes. Because any dissolved nutrients available to the plant are in

this leachate, its EC and pH become good diagnostics for nutrient levels and availability.

The goal is to collect approximately 50 ml (1.7 oz) of leachate from each container. To collect leachate, wait 30 minutes to 2 hours after a thorough irrigation (preferably, the substrate in the container would have reached container capacity). Next pour approximately 120 ml (4 oz) of irrigation water over the surface of a 4-liter (1 gal) container or growing bag. More water is required for larger containers, for substrates with high water-holding capacities, and for containers that may not have been irrigated thoroughly (Table 1).

Leachate solutions can also be obtained by tipping a container slightly sideways to collect the drainage from holes in the container's bottom. Tipping is usually successful for obtaining leachate 30 to 60 minutes after irrigation; it does not require a "pour-through" of water because it forces the water out of the perched water table by tipping rather than displacing.

The tipping and pour-through techniques both provide accurate but average readings of the EC and pH values of the

Table 1. Amount of pour-through required for various sizes of containers to collect 1.7 oz (50 ml) of leachate

Container gal (liters) <sup>2</sup>	Pour-Through oz (ml) <sup>2</sup>	Collect oz (ml) <sup>2</sup>
1 (4)	4 (120)	1.7
3 (12)	12 (350)	1.7
5 (10)	20 (600)	1.7
7 (27)	30 (825)	1.7
10 (38)	40 (1,200)	1.7
15 (57)	60 (1,775)	1.7
25 (95)	100 (3,000)	1.7

<sup>2</sup>Gallons, ounces, and their conversions to liters and milliliters are rounded.

## HOW TO CONDUCT A POUR-THROUGH ON CONTAINERS

### Tools and Supplies

- Electrical conductivity (EC) meter
- pH pen or meter (or a measurement tool that monitors both variables)
- Calibration standards for EC
- Calibration buffers pH 4 and pH 7
- Tray or saucer to collect leachate from containers
- Small vial or tall, narrow jar that can hold 50 ml (1.7 oz.) of leachate and cover the measurement probe (such as an old medicine bottle)
- Large container for pouring water through container plant
- Liquid measuring device (such as a Pyrex measuring cup, soda bottle with known liquid amount, graduated cylinder or beaker)
- Notebook and pencil
- Coffee filter or paper towels to filter leachate before measuring (optional)
- Flags

### Procedure

**1** Sample blocks of plants by collecting leachate in a diagonal or "X" pattern depending on the size of the block. Larger blocks will require more plants sampled. To produce a trend over time, sample the same containers (or near them) at each collection date. Denote sample plants with flags. Alternatively, choose a few plants randomly for spot checks.

**2** Irrigate nursery containers to container capacity (expect 10 to 20 percent leaching). Wait until after a normal irrigation event is completed rather than hand watering. This provides a sample based on the actual amount of irrigation received by plants.



Elevate each container ½-inch above the saucer.



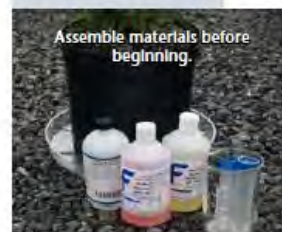
**3** Wait 30 minutes to 2 hours for equilibration of nutrients in the container solution.

**4** Before pouring water through containers, place containers to be tested in a shallow saucer to collect leachate. Try to elevate the container above the saucer (½-inch) for best results. Saucers used for house plants contain ridges to keep plants elevated slightly.



Pour the proper amount of water over the surface.

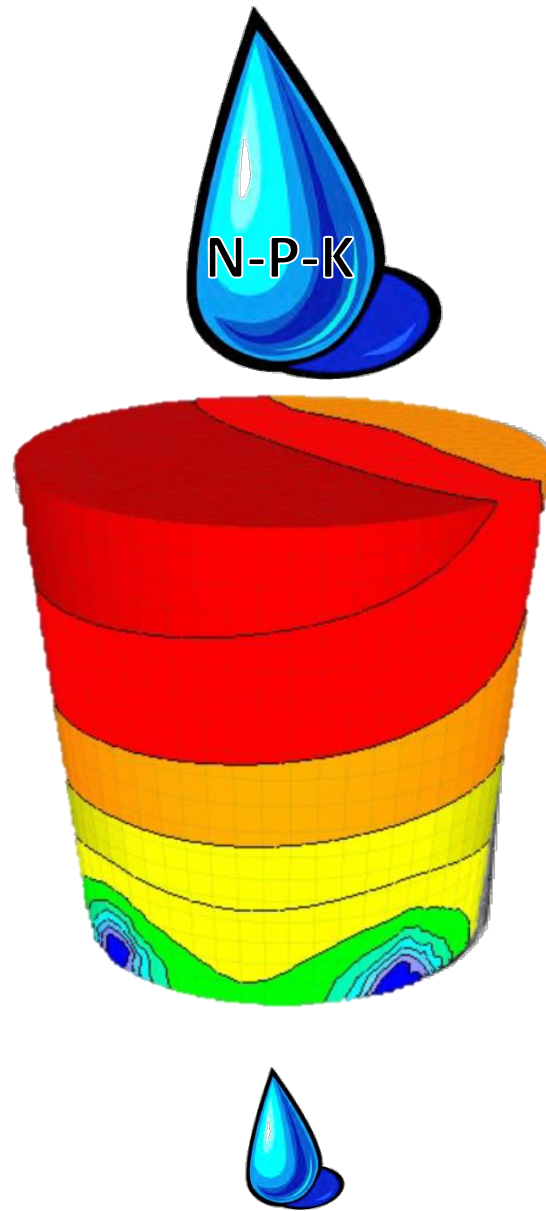
**5** Gently pour 120 milliliters (4 oz) of water over the surface of a 4-liter (1 gallon) container or grow bag. Pour 350 milliliters (12 oz) over the surface of a 12-liter (3 gallon) container or bag. For larger container sizes, see Table 1.



Assemble materials before beginning.























Hydraulic conductivity  
How readily water  
moves in the substrate

# WATER

## Particle Size Fractionation

>6 mm

4-6 mm

2-4 mm

<2 mm





# Fiber Addition

## **Peat Moss**

- Hydrophobic when dry
- Higher readily available water



## **Coco Coir**

- Hydrophilic when dry
- Lower readily available water

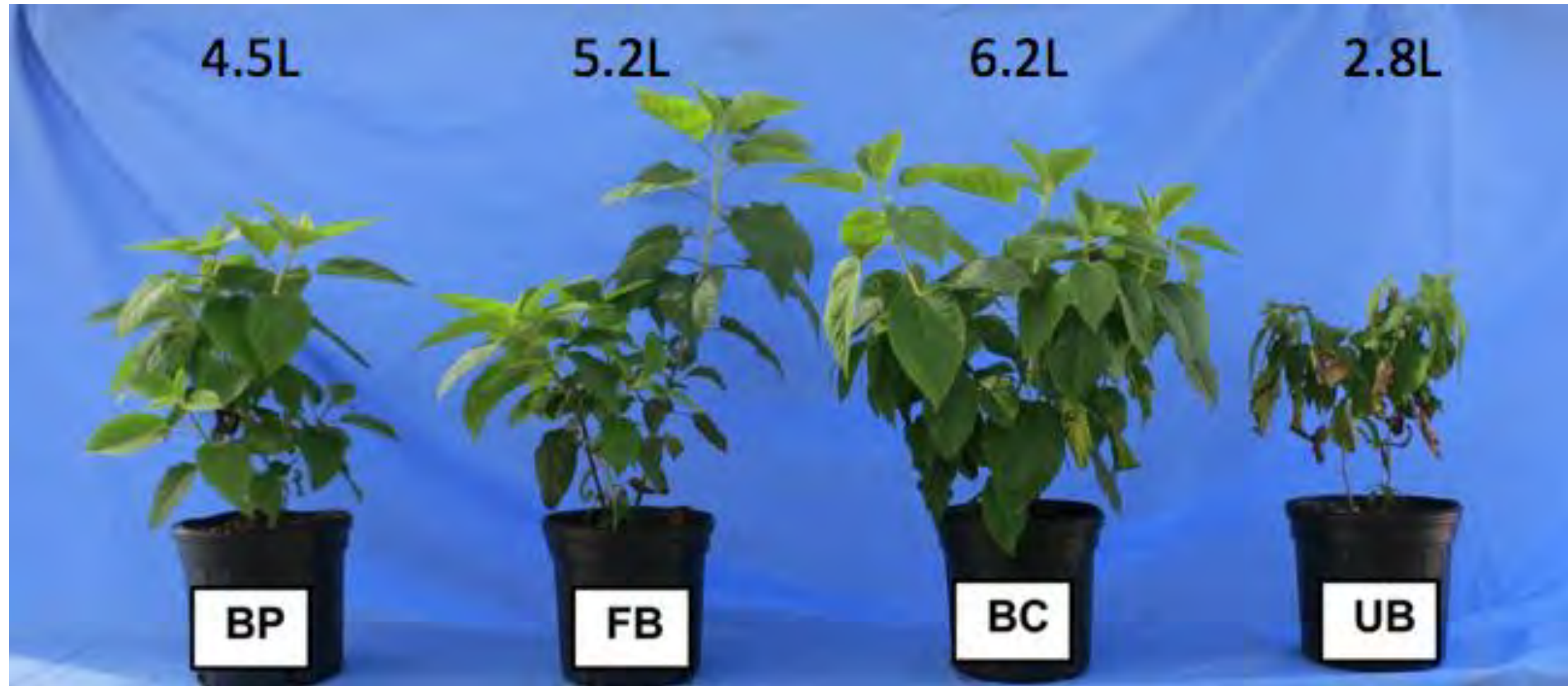










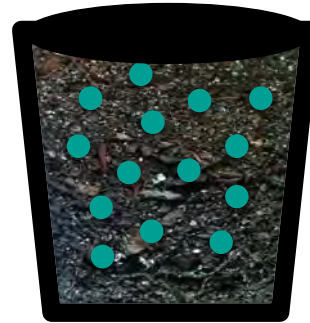


# FERTILIZER

Can we change CRF placement to increase efficiency?



Topdressed



Incorporated



Top-Half Inc.

Application  
Rate {  
0.50x  
0.75x  
1.00x

0.50x  
0.75x  
1.00x

0.50x  
0.75x  
1.00x

# FERTILIZER

Can we change CRF placement to increase efficiency?

Coastal Plain Nursery



VT & NCSU





*Hydrangea paniculata*  
'Little Quick Fire'

0.50x



0.75x



1.00x





*Hydrangea paniculata*  
'Little Quick Fire'

0.50x



1.0x



0.75x



1.00x





Rosa Oso Easy Double Red



Conv. Inc.

0.50x

0.75x

1.00x



TopHalf



*Hydrangea macrophylla* 'Let's Dance'



Conv. Inc.

0.50x

0.75x

1.00x



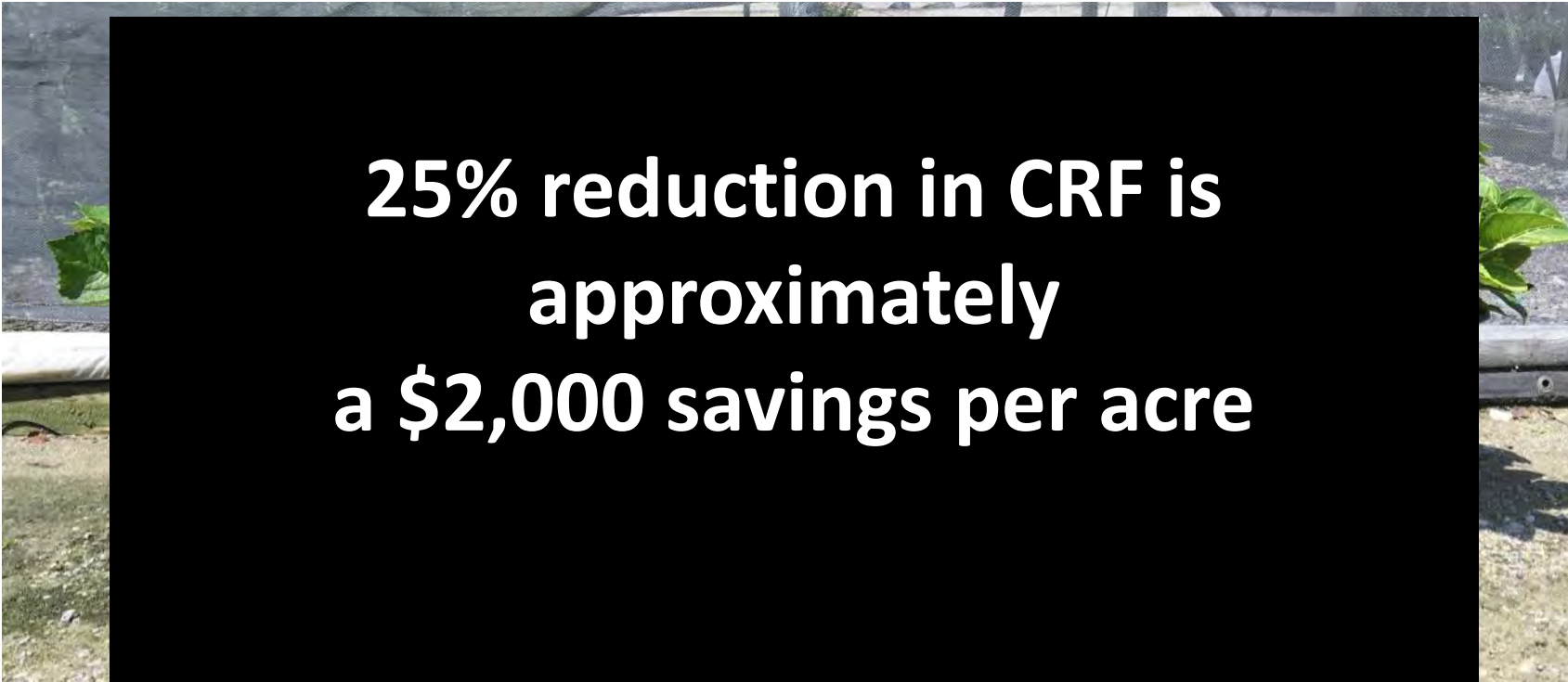
TopHalf



# Coastal Plain Nursery

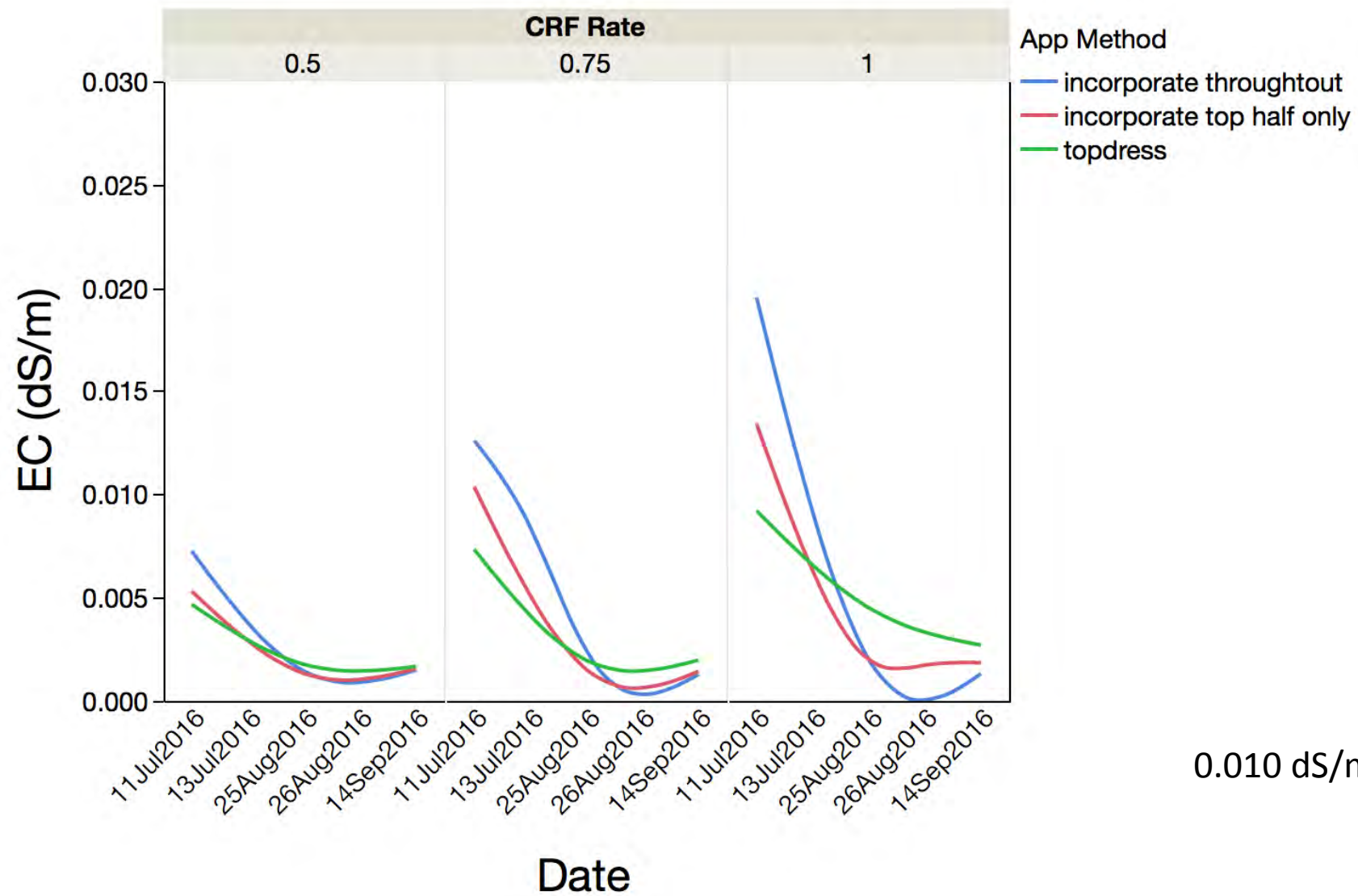


## Coastal Plain Nursery



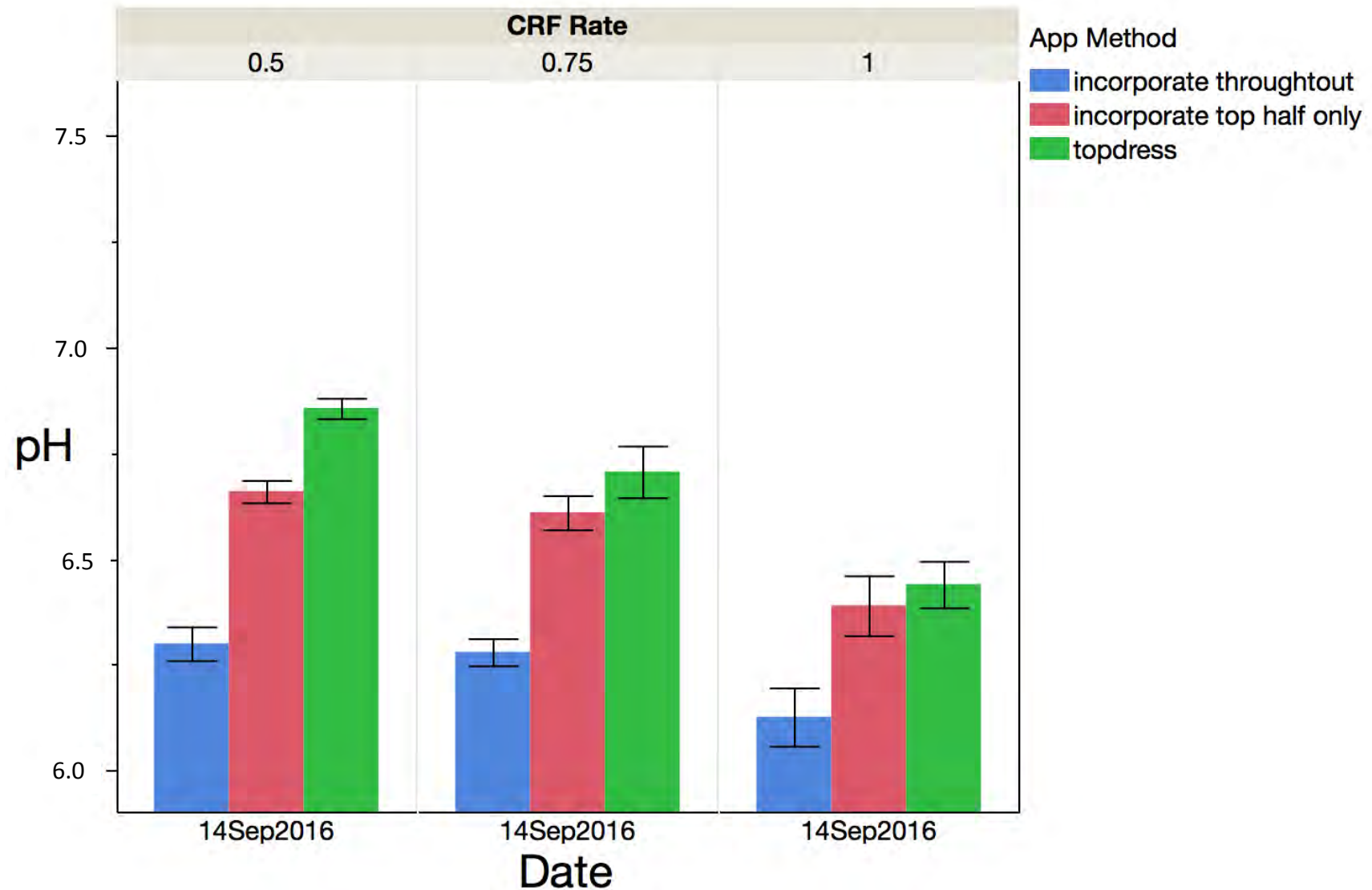
**25% reduction in CRF is  
approximately  
a \$2,000 savings per acre**





0.010 dS/m = 1.0 dS/cm

## End of season pour-through





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