CLEAN WATER³
REDUCE, REMEDIATE, RECYCLE

WATER WISE

EFFICIENT NURSERY WATER USE

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CLEMSON
PLANT AND ENVIRONMENTAL SCIENCES

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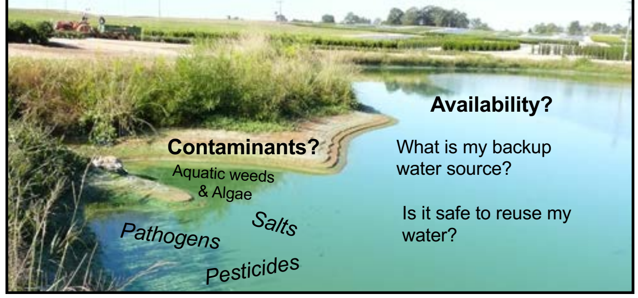
Water challenges & concerns



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Water + fertilizer = saleable crops

Input (in)efficiencies
- Water - 30% to 80%
- N & P - 30% to 60%

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Clean WateR³ Reduce, Remediate, Recycle

Enhancing Alternative Water Resource Availability & Use to Increase Profitability in Specialty Crops

$8.26M 2014 – 2019
NIFA – USDA 2014-51181-22372

USDA NIFA United States Department of Agriculture National Institute of Food and Agriculture

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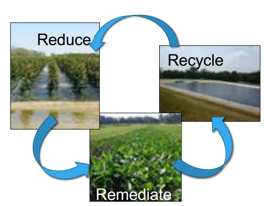
Purpose of the Clean WateR³ project

Ensure water does not limit grower economic sustainability



- conservative use of water resources
- mitigate environmental impact
- use viable alternative water resources

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REDUCE

Irrigation

University of Maryland · Michigan State University · VT

Disease pressure?

Oregon State University OSU · University of Maryland · UC Davis University of California

Pesticide residuals?

Michigan State University · UF University of Florida

Nutrient losses?

VT · Michigan State University

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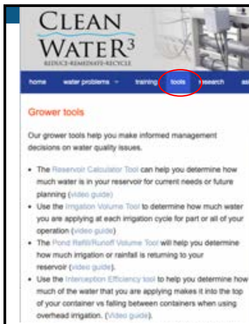

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Calculators available:

- Irrigation
  - Coefficient of uniformity
  - Interception efficiency
  - Irrigation volume
- Reservoir sizing (volume needed)
- Reservoir refill
- Leaching fraction (based on salinity)
- Chlorine contact time
- Dilution - chemical dosage
- Slow sand filter sizing
- Pathogen hazard analysis

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Resources

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Resources – irrigation management

- Design to supply adequate and uniform application
- Manage to minimize excessive nutrient leaching

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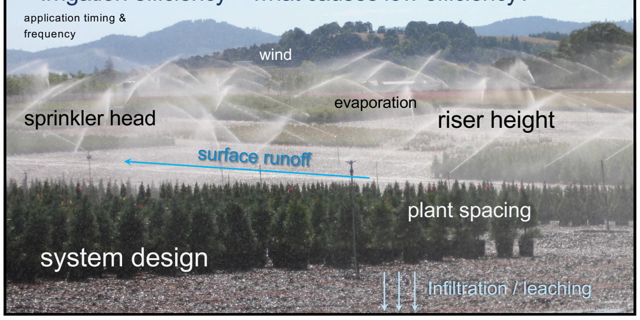
Irrigation efficiency – what causes low efficiency?



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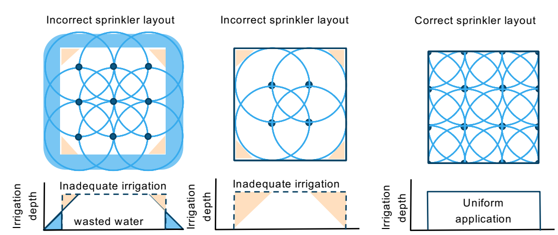
http://lateraloffice.com/SPRAY-PATTERN-2005

Irrigation design: sprinkler layout & angle

90, 180, & 360 degrees



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Irrigation Efficiency

The ratio of the volume of water taken up by plants to the volume pumped or delivered for use.

Pressurized irrigation system application efficiencies		
System type	Range (%)	Average (%)
Sprinkler irrigation systems		
Solid set systems - field production	70 - 80	75
For container nurseries	15 - 50	20
Micro-irrigation systems		
Surface	70 - 90	85
Spray systems	70 - 85	80

Slide adapted from Matt Chappell, UGA

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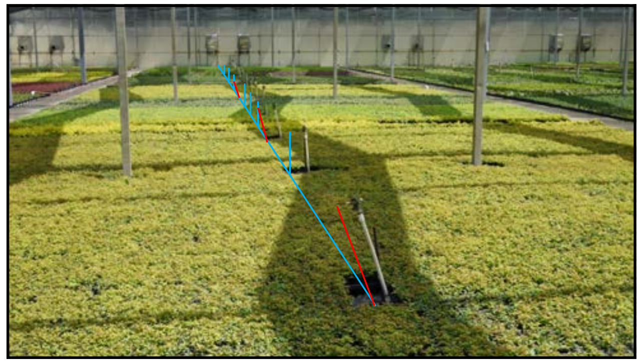

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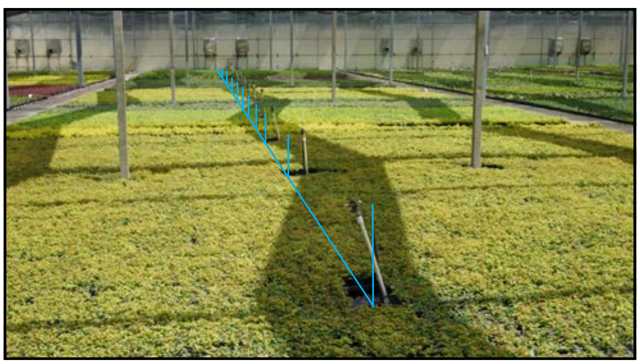

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Irrigation uniformity & rate

Use straight-sided cups of uniform size on grid pattern in a container area to determine irrigation distribution uniformity.

Periodically place rain gauges in a container area to measure irrigation amount.

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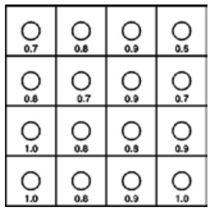
Irrigation uniformity & rate



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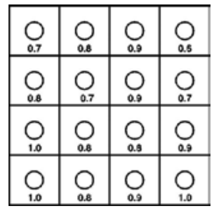
Irrigation uniformity & rate – measuring example



- Catch cans spaced between 4 sprinklers in a square grid pattern
- Value below each circle = depth / volume captured per unit time (hour) at that location

(0.7 + 0.8 + 0.9 + 0.6 + ... + 0.9 + 1.0 + 0.8 + 0.9 + 1.0) / 16 = 0.83 in/hr

Slide adapted from Matt Chappell, UGA

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Irrigation uniformity & rate – automatic calculations

https://www.cleanwater3.org/growertools.asp

- The Coefficient of Uniformity tool can help you determine if your irrigation is being applied uniformly in a given block. (Video guide).

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Irrigation uniformity & rate – automatic calculations

English Español

John Majsztrik, Bruno Pitton, Lorence Oki, and Saurav Kumar (2019). Coefficient of Uniformity. https://occviz.com/CW3/CU/CU.html [access date: 2020-08-18]

Coefficient of Uniformity

Enter the water volume of at least 24 containers. Values should be separated by commas. Make sure that the units (cups, ounces, etc.) to the right are correct

7,8,9,6,8,7,9,7,10,8,6,9,10,8,9,10,8,8,6,9,10,6,9,7

✓ ounces
ml
liters
cups
pints
quarts

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Coefficient of Uniformity

Enter the water volume of at l[24 containers]es should be separated by commas. Make sure that th[…]etc.) to the right are correct

7,8,9,6,8,7,9,7,10,8,6,9,10,8,9,10,8,8,6,9,10,6,9,7

✓ ounces
ml
liters
cups
pints
quarts

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Irrigation uniformity & rate – automatic calculations

To determine your irrigation application rate enter either the diameter of your container (circular containers) or length and width (for square or rectangular containers)

Diameter 4 in

Length in Width in

Enter Irrigation Time

Time (minutes) 45

Recompute

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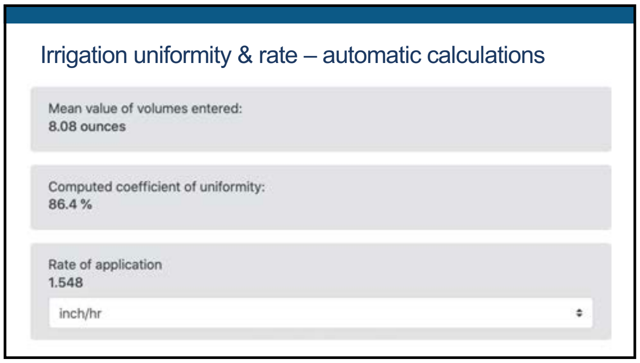

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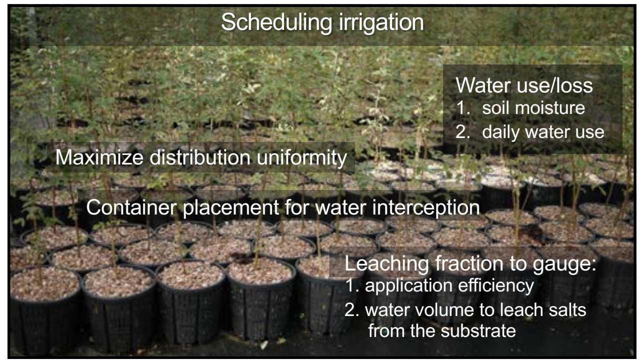

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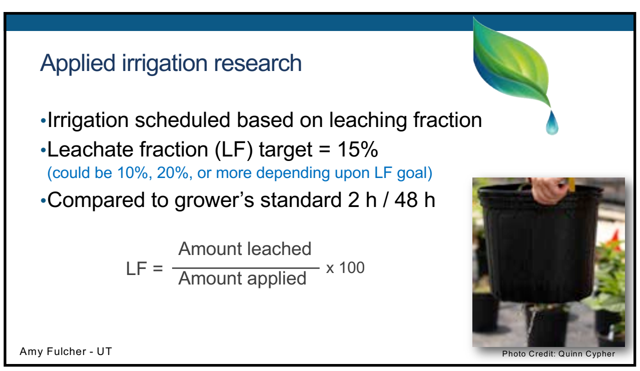

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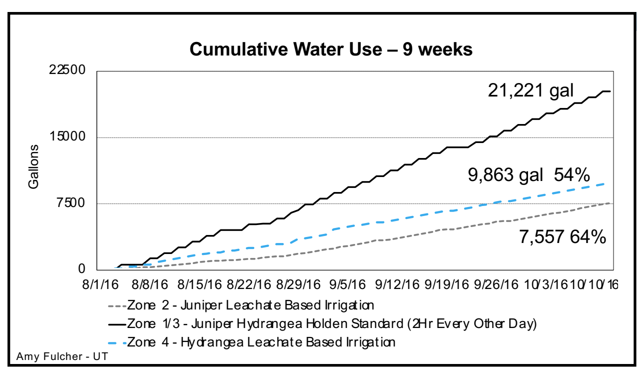

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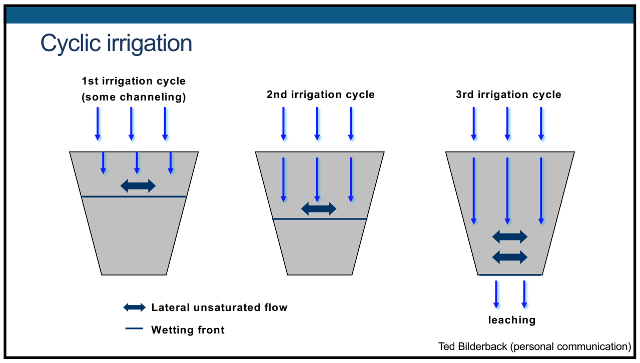

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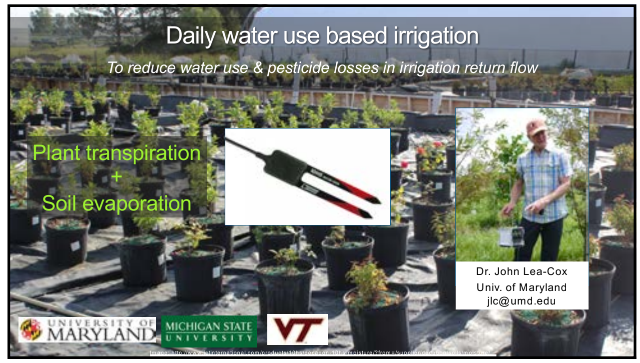

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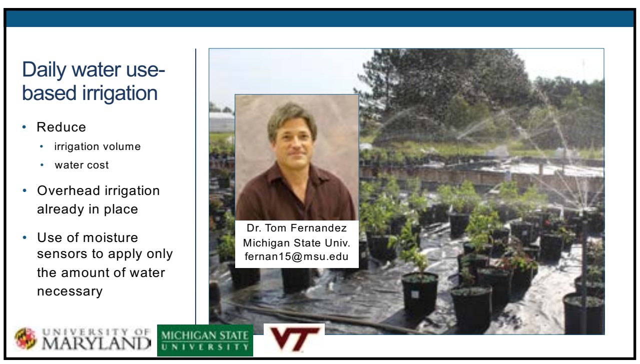

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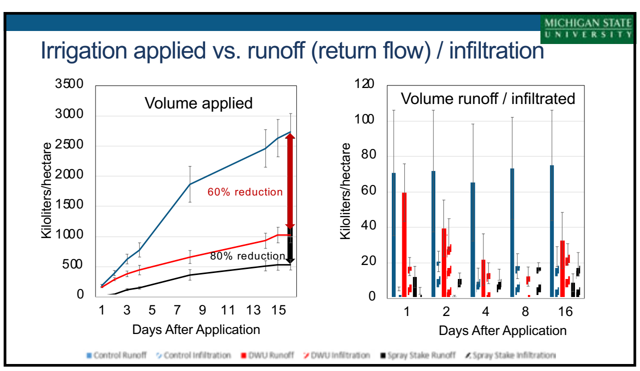

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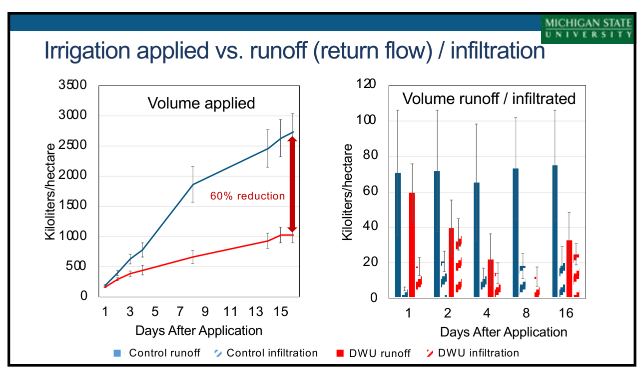

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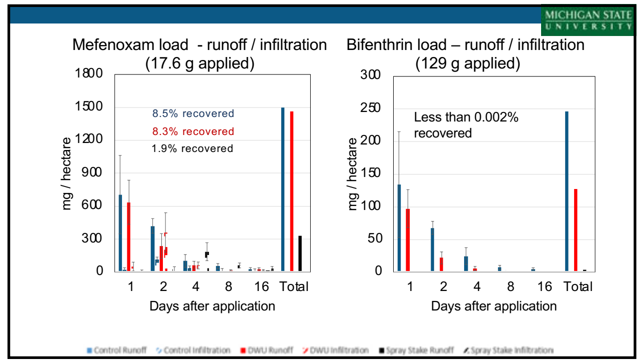

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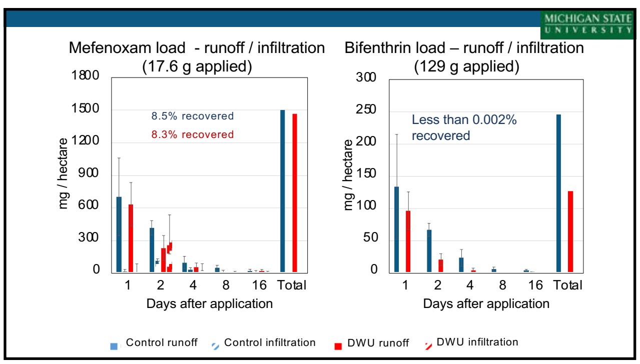

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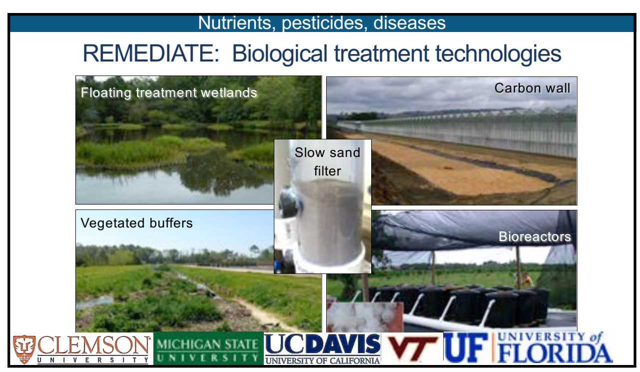

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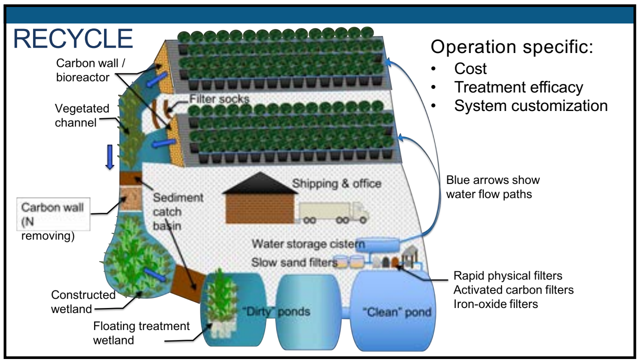

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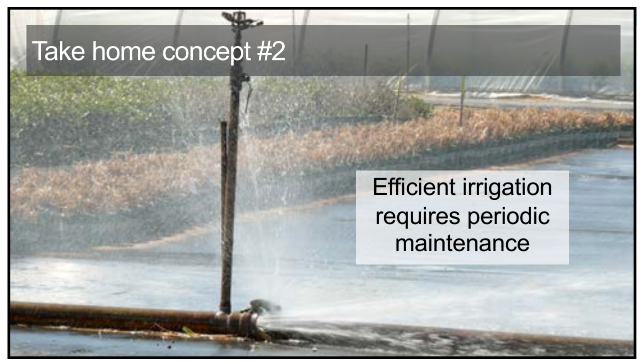

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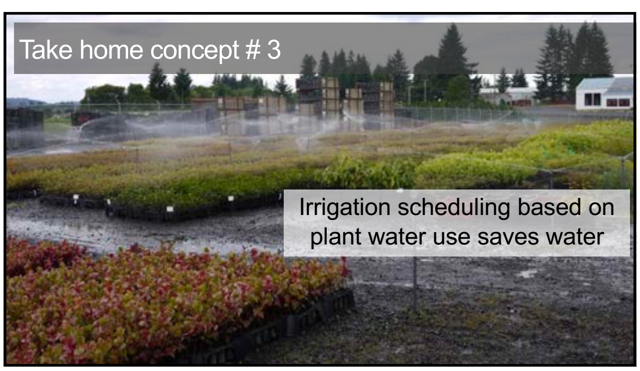

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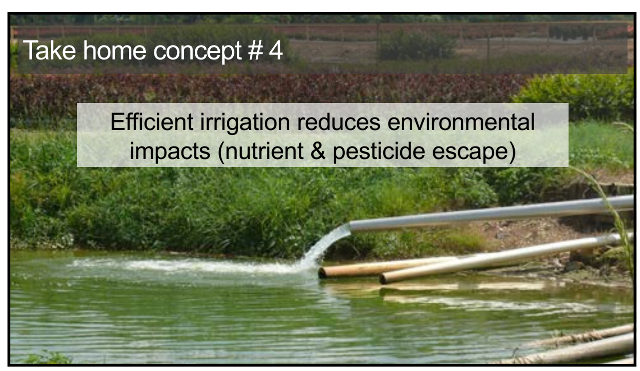

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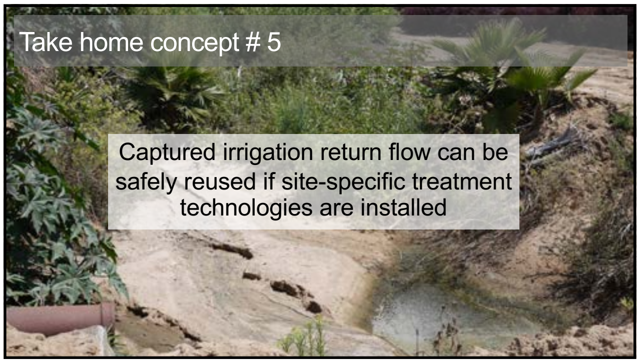
Take home concept # 5
Captured irrigation return flow can be safely reused if site-specific treatment technologies are installed

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Questions?
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