

Results: Visual Inspection

- 53% of cells need maintenance
- Most common issues:
 - 44%: Sediment deposition on mulch surface... pretreatment is critical!
 - 30%: Internal erosion anywhere “sheet flow” enters cell



Results: Soil Profile Inspection

Characteristic	Frequency
Hydric Soil	6% (2)
Redox Features	36% (14)



Results: Soil Profile Inspection

Stripped Matrix



Aerobic Matrix



Depleted Matrix



Results: Soil Media Analysis

In this Study, Particle Size has
No Significant Effect on Mean Permeability
($p=0.147$)

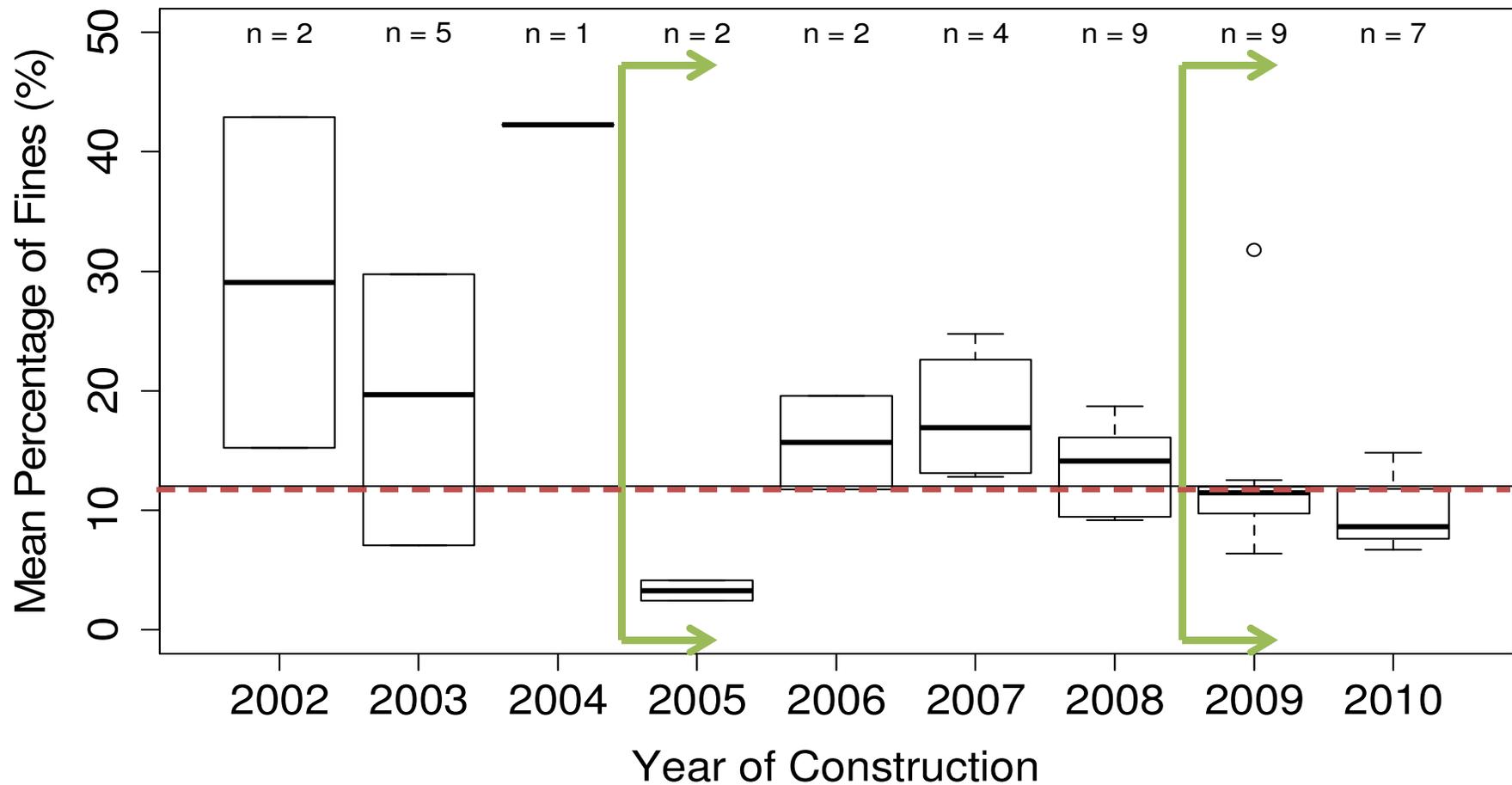
Possible Explanations:

- Biological Activity in Fine Soils Create Macropores
- Compaction of Coarse Sand Restricts Flow
- Conductivity Test Overpredicts for Fine Soil

Results: Factors Effecting % of Fines

Factor	P-value	Significant Effect? ($\alpha=0.05$)
Year of Construction	0.004	✓
Jurisdiction	0.246	
Intra-Site Location	0.746	
Sample Depth	0.921	

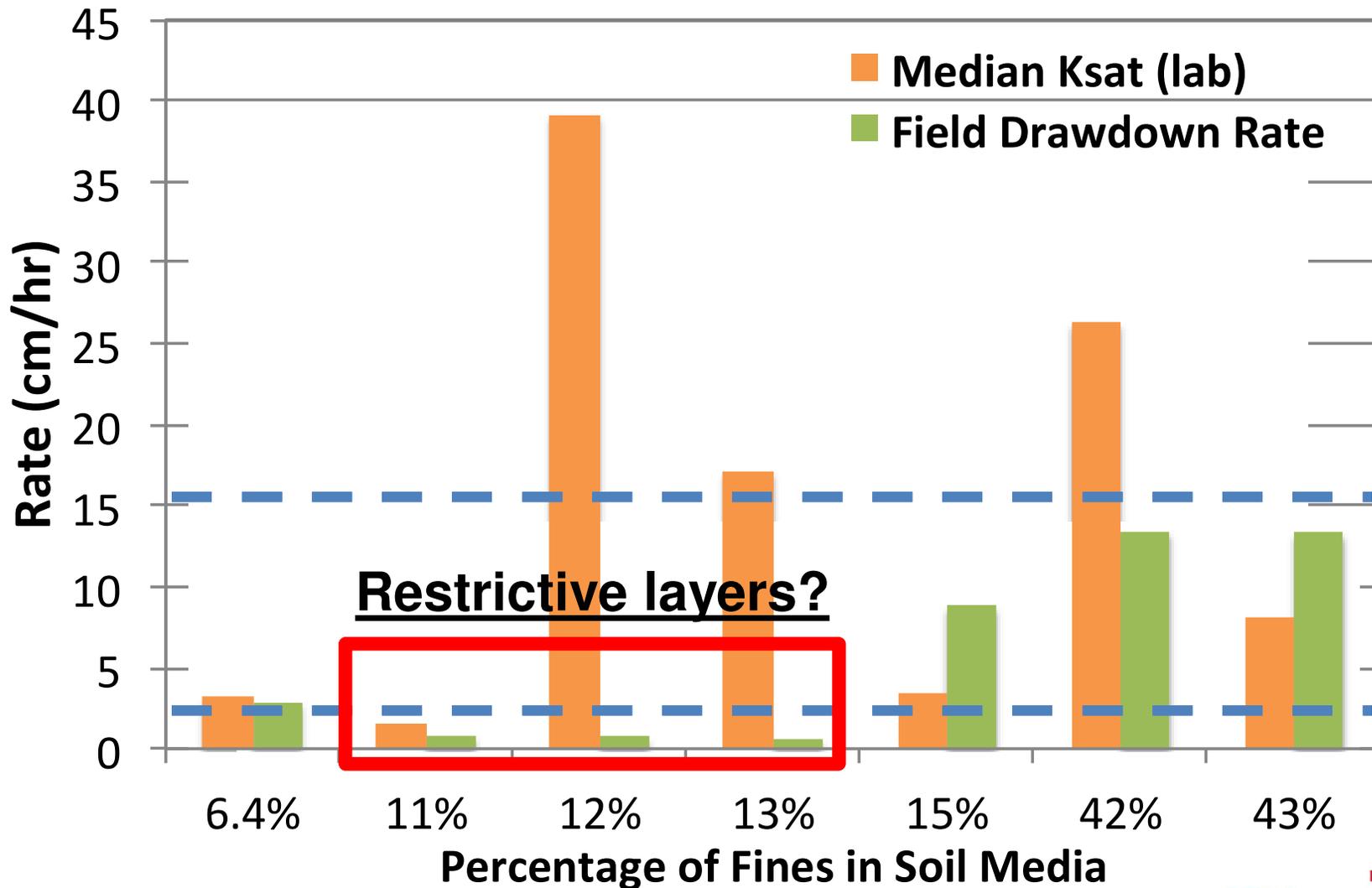
Results: Soil Media Analysis



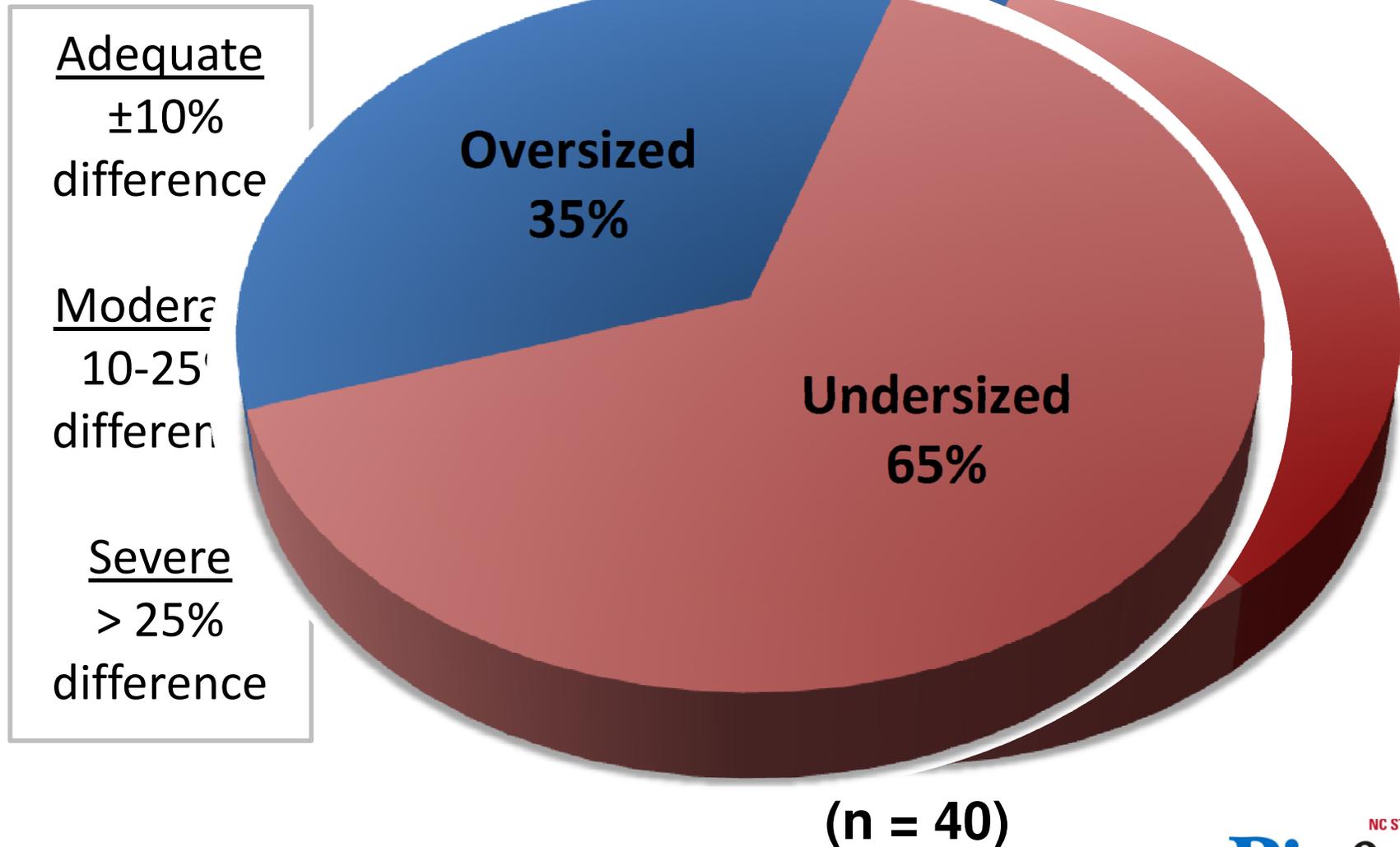
Results: Factors Effecting % of Fines

Factor	P-value	Significant Effect? ($\alpha=0.05$)
Year of Construction	0.004	✓
Jurisdiction	0.246	
Intra-Site Location	0.746	No spatial effect implies insignificant accumulation
Sample Depth	0.921	

Results: Field Drawdown Tests



Results: Storage Volume

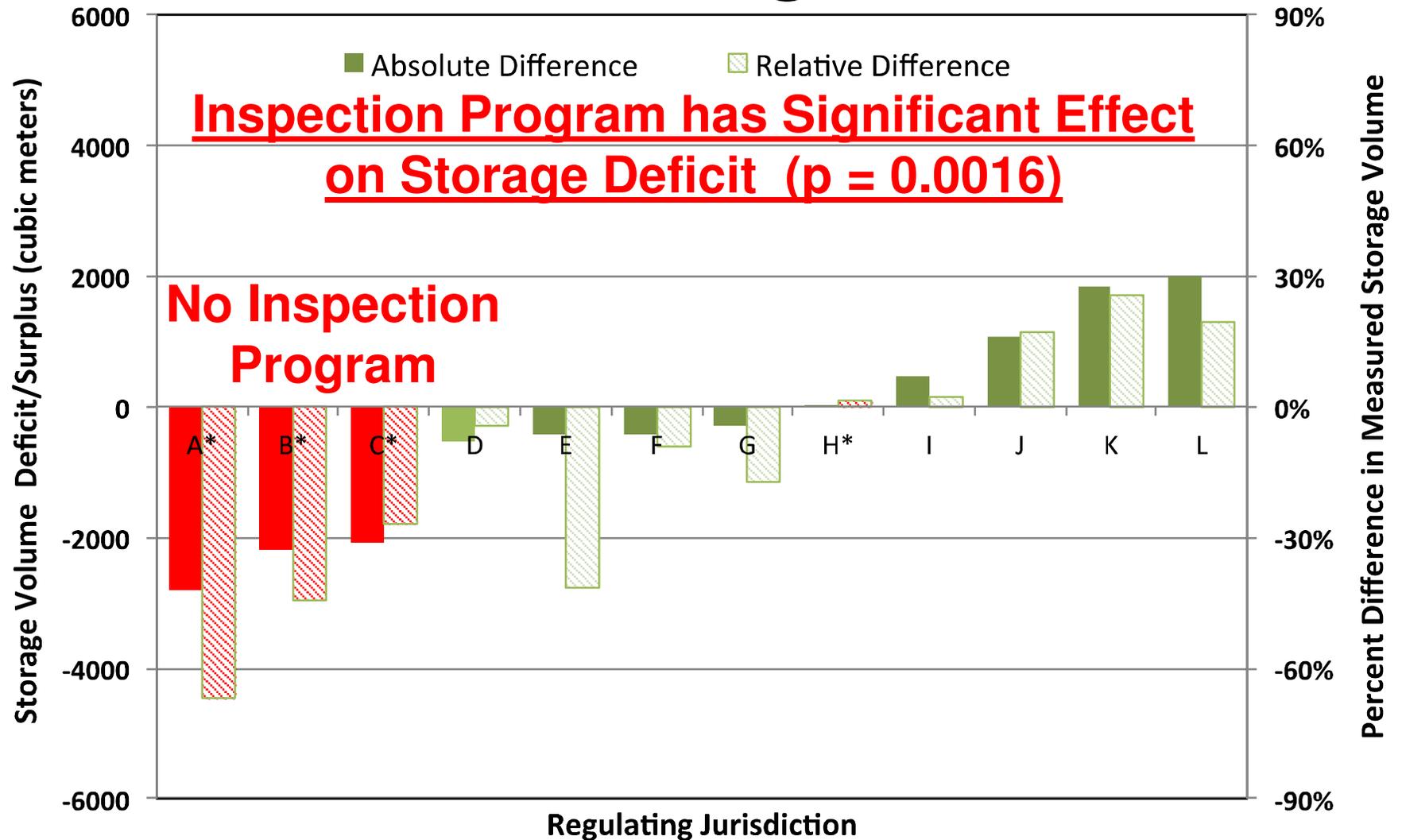


Results: Storage Volume

Total Intended Storage	2378 m³ (1.93 acre-ft)
Total Storage Provided	2284 m³ (1.85 acre-ft)
Percent of Intended Storage	96%

Note: Summed for all sites across NC (n = 40)

Results: Storage Volume



Results: Factors Effecting Storage Volume Discrepancy

Factor	P-value	Significant Effect?
<u>Age</u>	0.0128	✓
Jurisdiction	0.205	
<u>Inspection/Maintenance Program</u>	0.0016	✓
Design Cell Size	0.351	
Design Ponding Depth	0.978	
Outlet Structure Height Discrepancy	0.392	
<u>Average Ponding Depth Discrepancy</u>	0.0160	✓

Results: Storage Volume

Need to inspect average ponding depth
(*not* height of outlet structure)



Summary of Findings

- **Maintenance is key!**
 - Stabilize watershed
 - Remove sediment
- Soil media is adequate
- Over half of cells are moderately/severely undersized
 - Inspect and maintain
 - Accurately grade average ponding depth

Median Characteristics

88% of Intended Surface Capacity

12% Fines

**Permeability
= 12 cm/hr (4.7 in/hr)**

Implications of Findings

- Are bioretention cells meeting standards?

SOMETIMES

- Is current standard adequate?

YES, BUT COULD BE BETTER

- How does this affect performance?

IT DEPENDS...



Implications of Findings

- By how much can cells be undersized and still meet goals?
- How do changes in multiple design components effect performance?
- What models/tools can be used to analyze/design custom cells?



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References

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Questions?

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