

# ***Pretreatment Practices for Bioretention: Capture of Sediment and Gross Solids***



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# Bioretention Practices

- Shallow Depressions
- Infiltrate Stormwater Runoff
- Aesthetic Amenity
- Maintenance?



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# Bioretention Maintenance

- Inspection, Inspection and Maintenance of pretreatment unit(s), Pruning, Mowing, Mulching, Watering (first 1-2 months), Vegetation Replacement, Weeding, Trash Removal, Clear Outlet Structures, Sediment Removal.
- **Green text = Homeowners can do!**
- **Black text = Our study**



# Study Objectives

- Synthetic runoff testing to measure capture of sediment and gross solids
  - Grass-lined inlet
  - Rain Guardian Bunker
  - Rain Guardian Turret (matching funds)
  - Rock-lined inlet
  - Shallow sump grit chamber
- Report results as mass-based percent removal





# Study Site 1 – Anoka, MN

600 ft<sup>2</sup> Surface Area  
10.5 ac drainage Area



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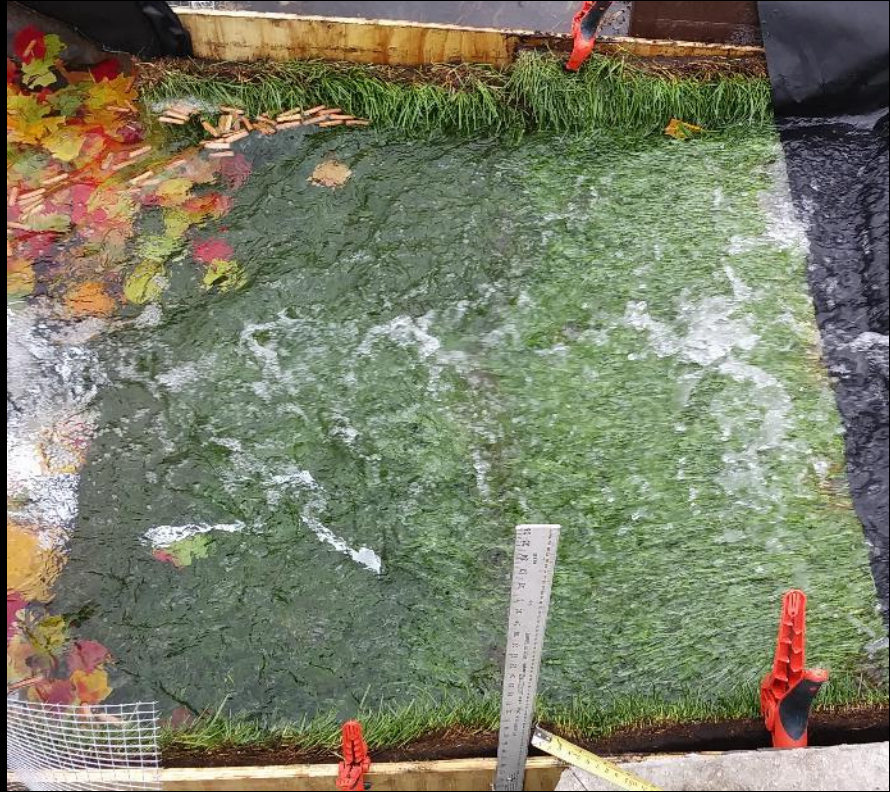
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# Grass Lined Inlet

- 48 inches wide
- 52 inches long
- 10.5 inches drop
- 5H : 1V, or 20%



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# Rain Guardian Bunker

- Proprietary rectangular chamber with top grate, concrete bottom, screened exit wall, and skimming debris wall.



# Rain Guardian Turret

- Proprietary cylindrical chamber with top grate, concrete bottom, screened exit wall, and skimming debris wall.



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# Rock Lined Inlet

- 48 inches wide
- 52.5 inches long
- 10.5 inches drop
- 5H : 1V, or 20%



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# Gross Solids and Sediment



Sediment conc. =  $\sim 160$  mg/L  
0.06 mm – 2 mm,  $D_{50}$  = 0.4 mm  
Gross Solids Conc. =  $\sim 40$  mg/L



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# Sediment and Gross Solids Feed



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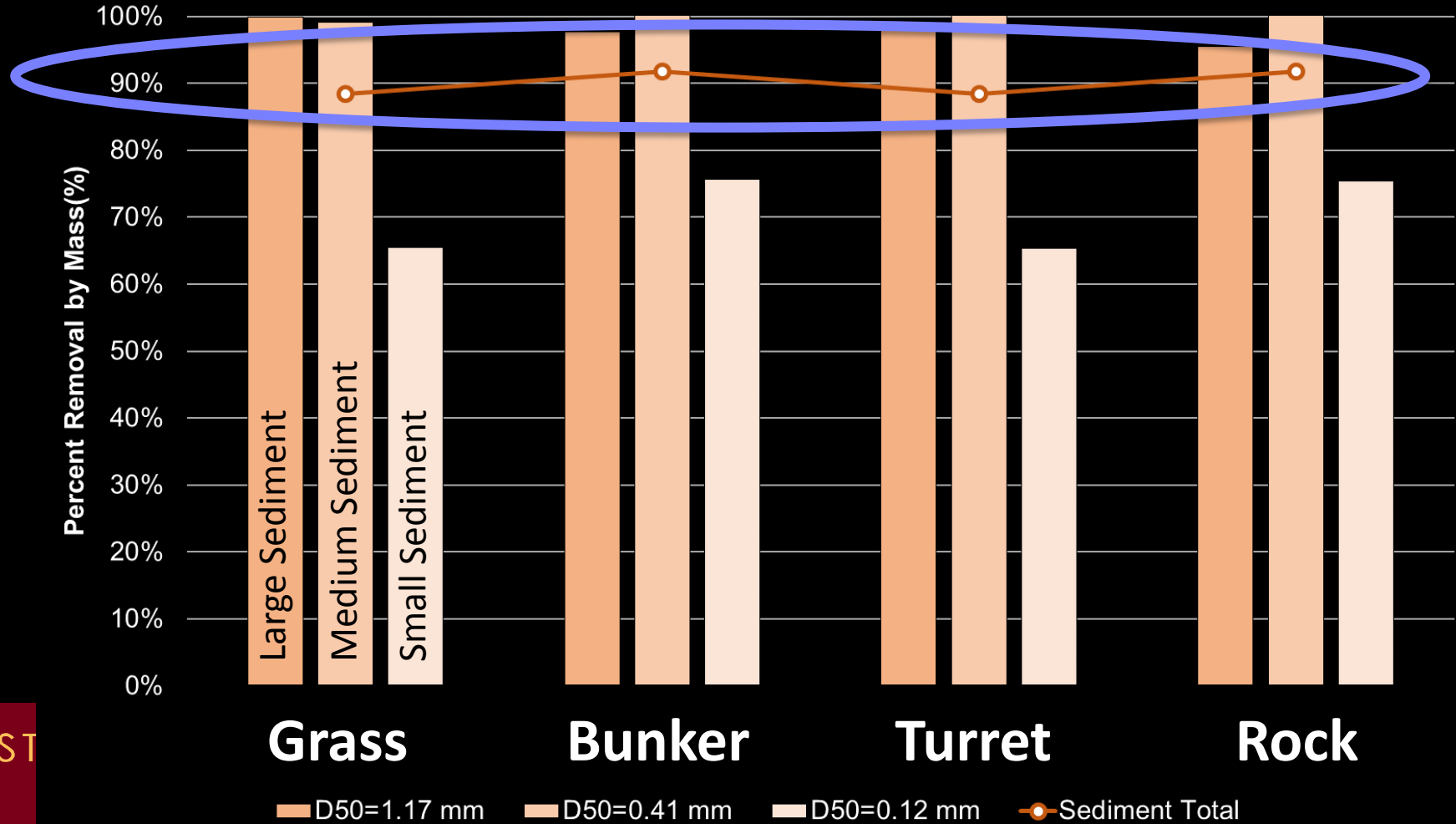
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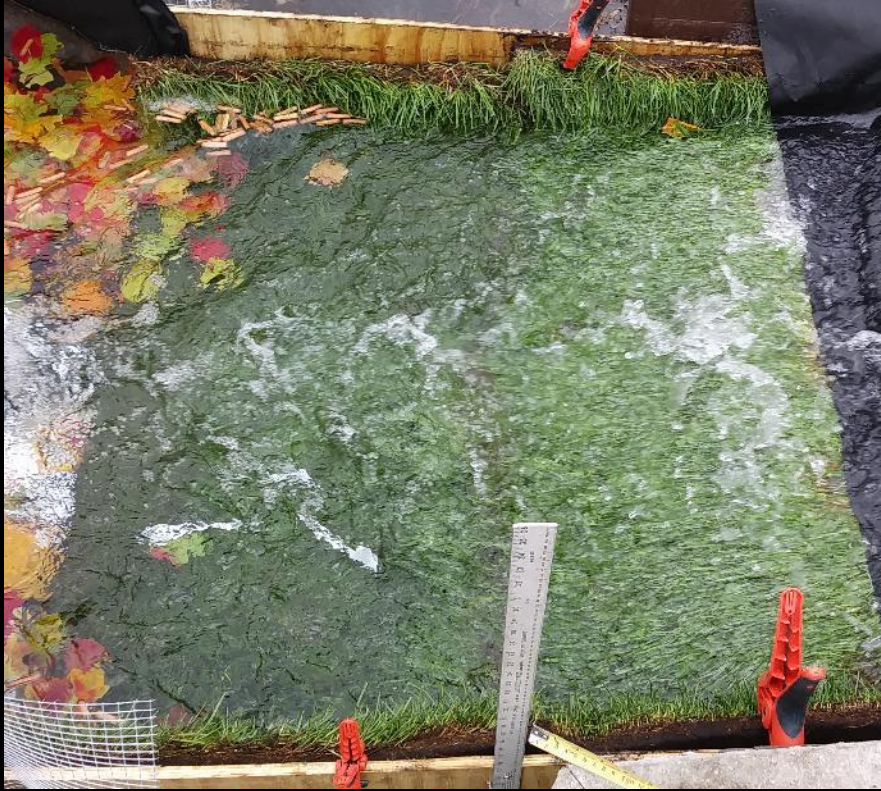
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## Sediment Capture - Low Intensity



# Grass Lined Inlet



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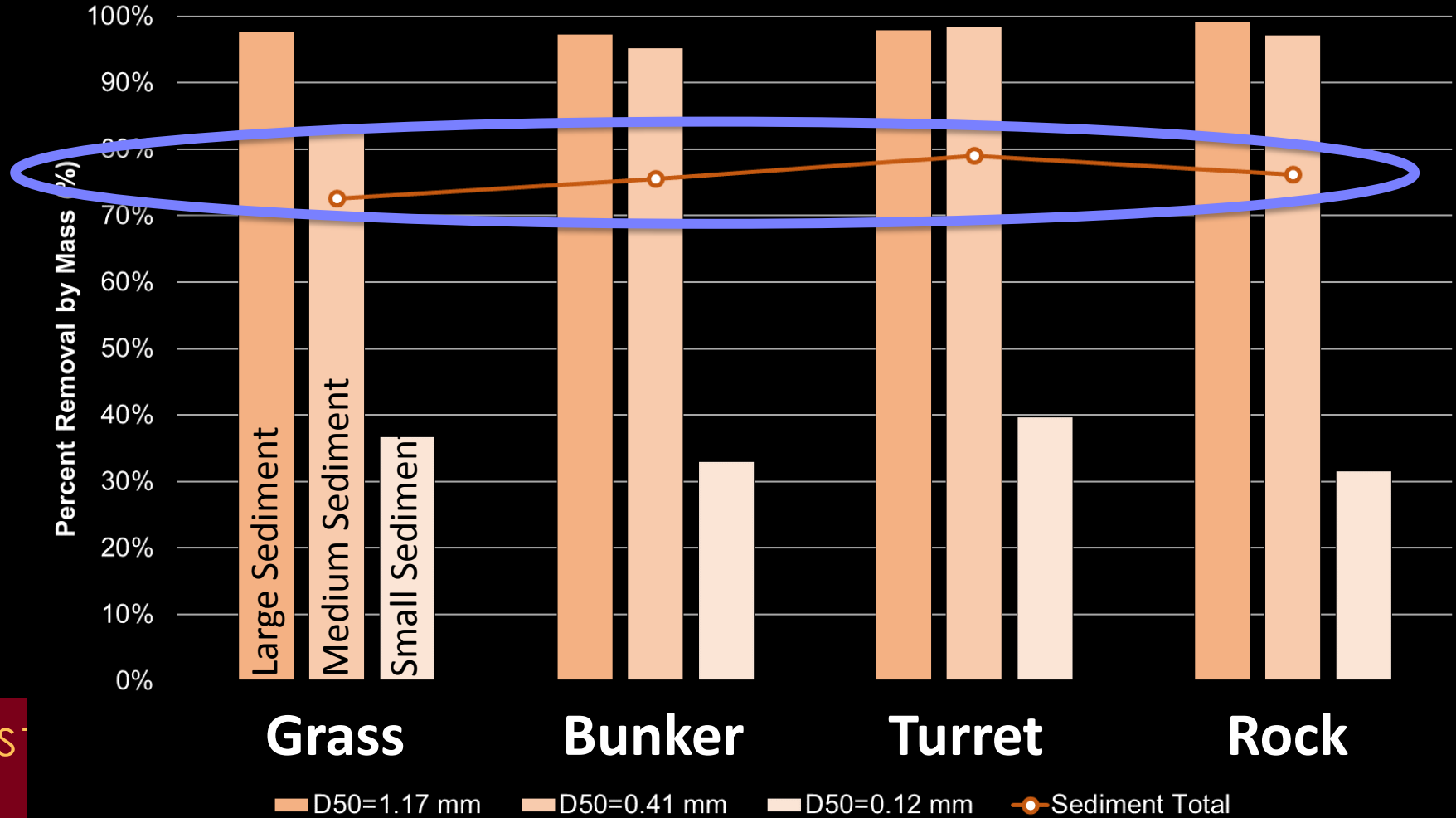


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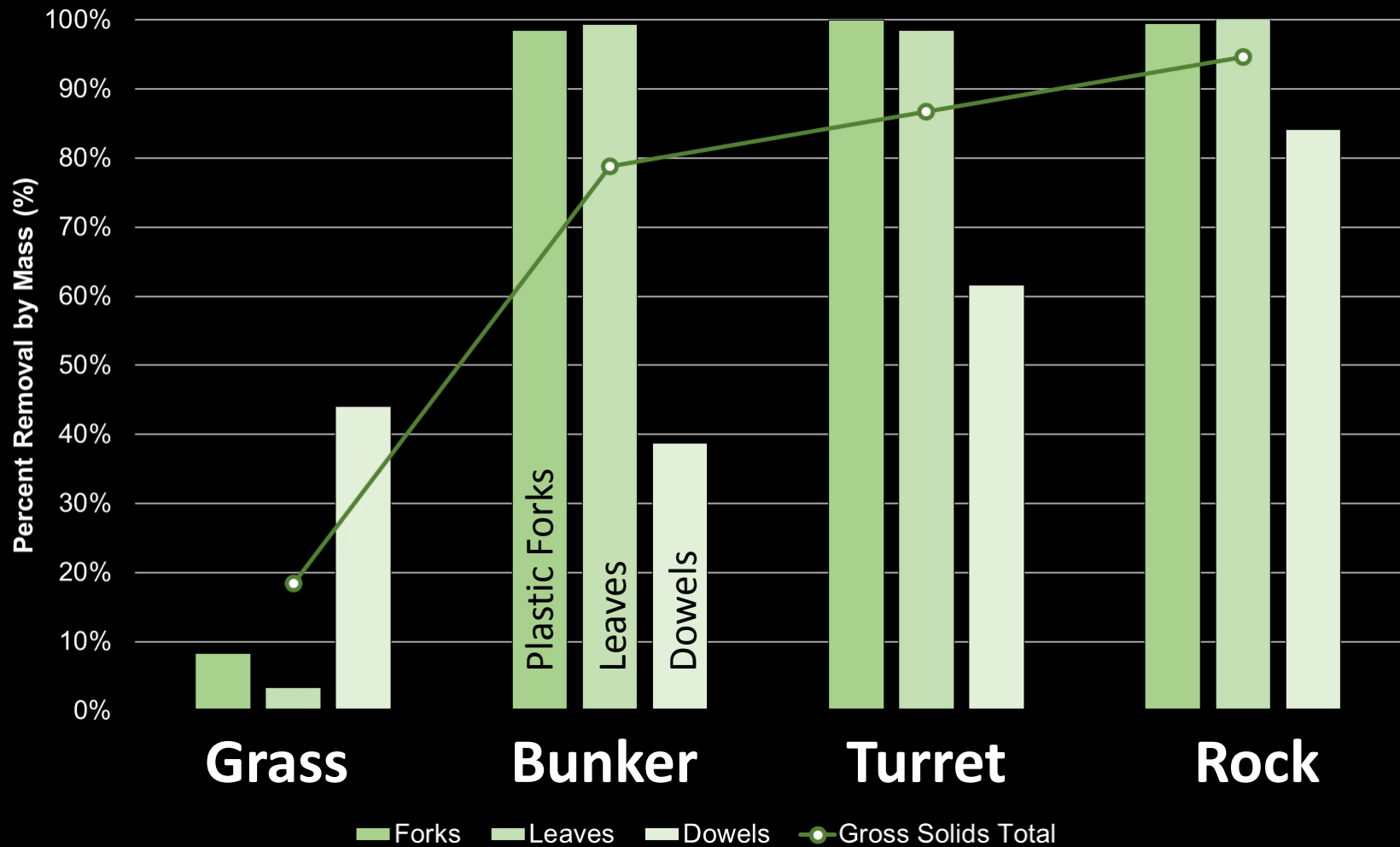
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## Sediment Capture - High Intensity

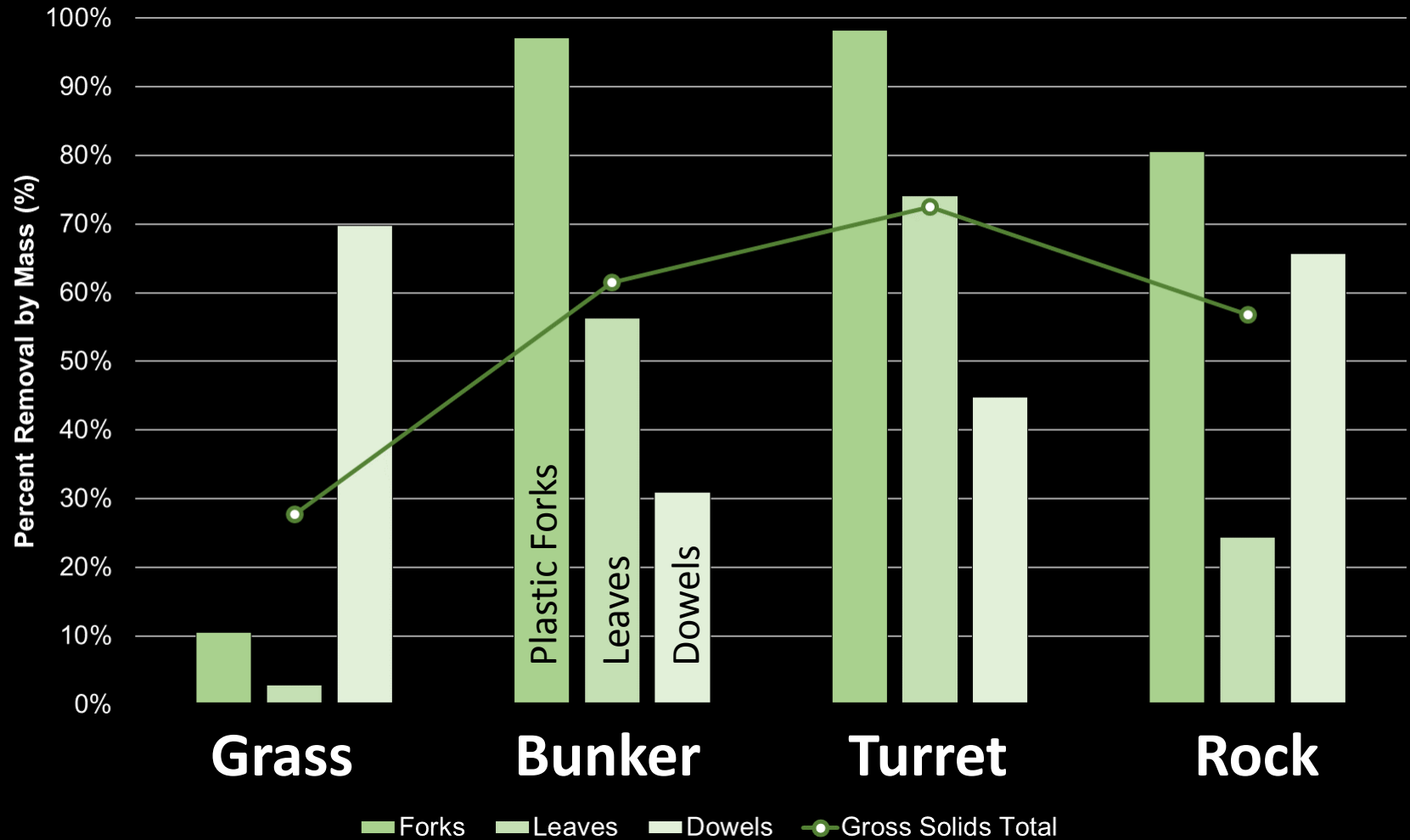


## Gross Solids Capture - Low Intensity





## Gross Solids Capture - High Intensity



# Rock Lined Inlet and Gross Solids



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# Study Site 2 – Bloomington, MN



150 ft<sup>2</sup> Surface Area  
2.3 ac drainage Area



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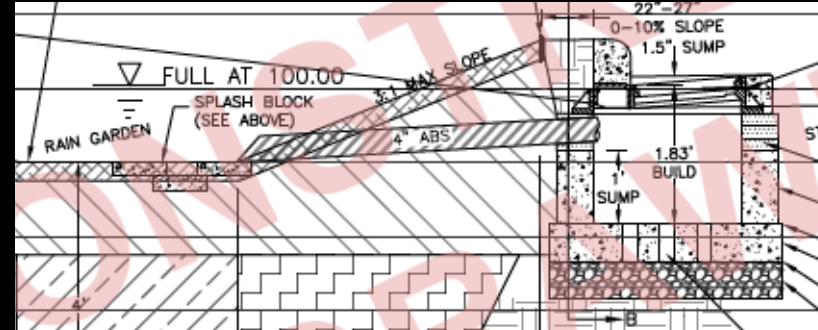
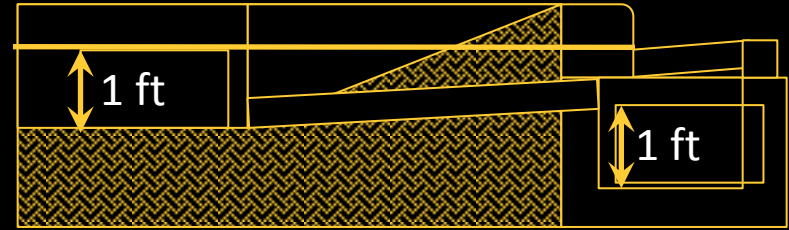
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# In-line Shallow Sump Grit Chamber



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# Study Site 2 – Bloomington, MN



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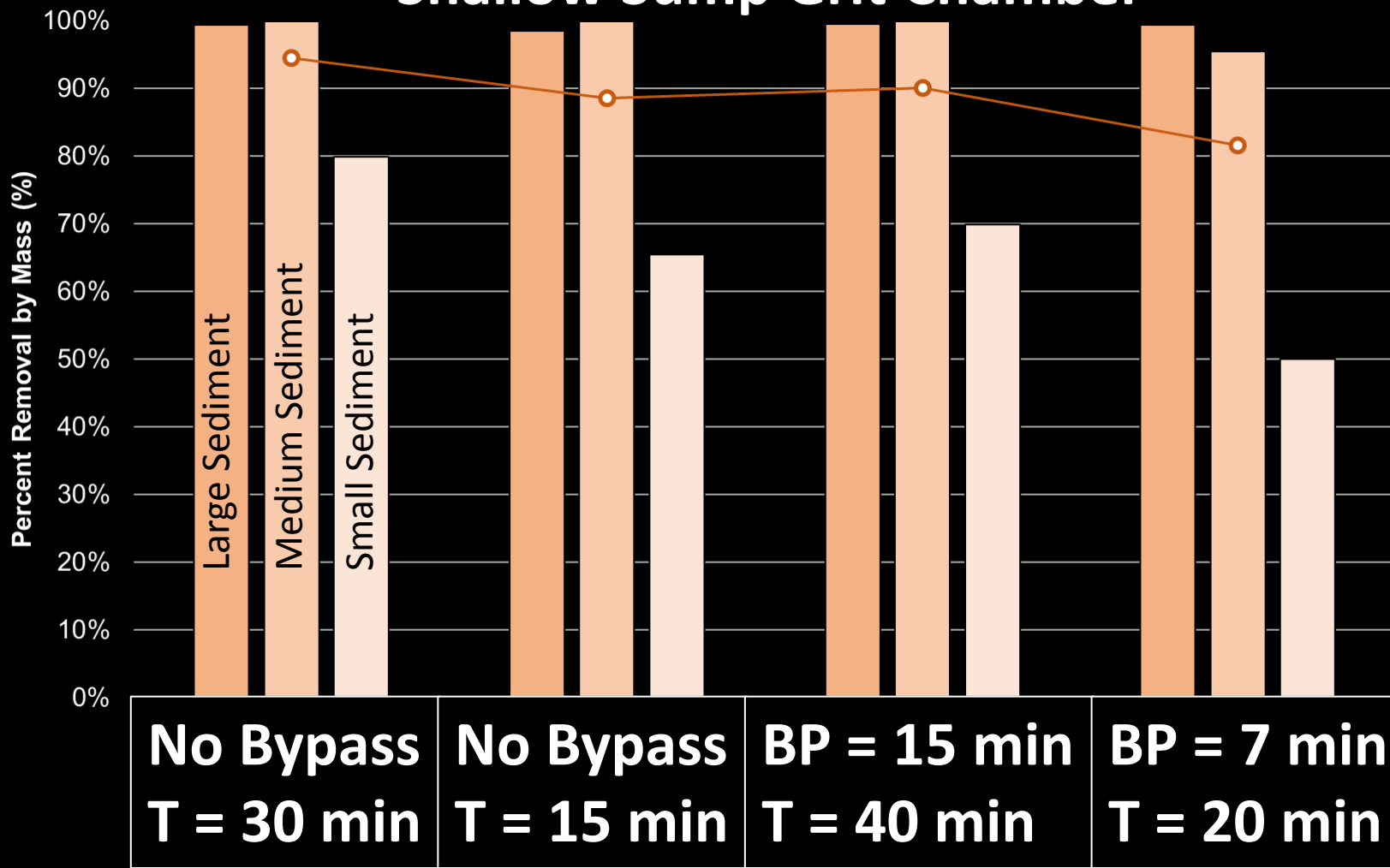
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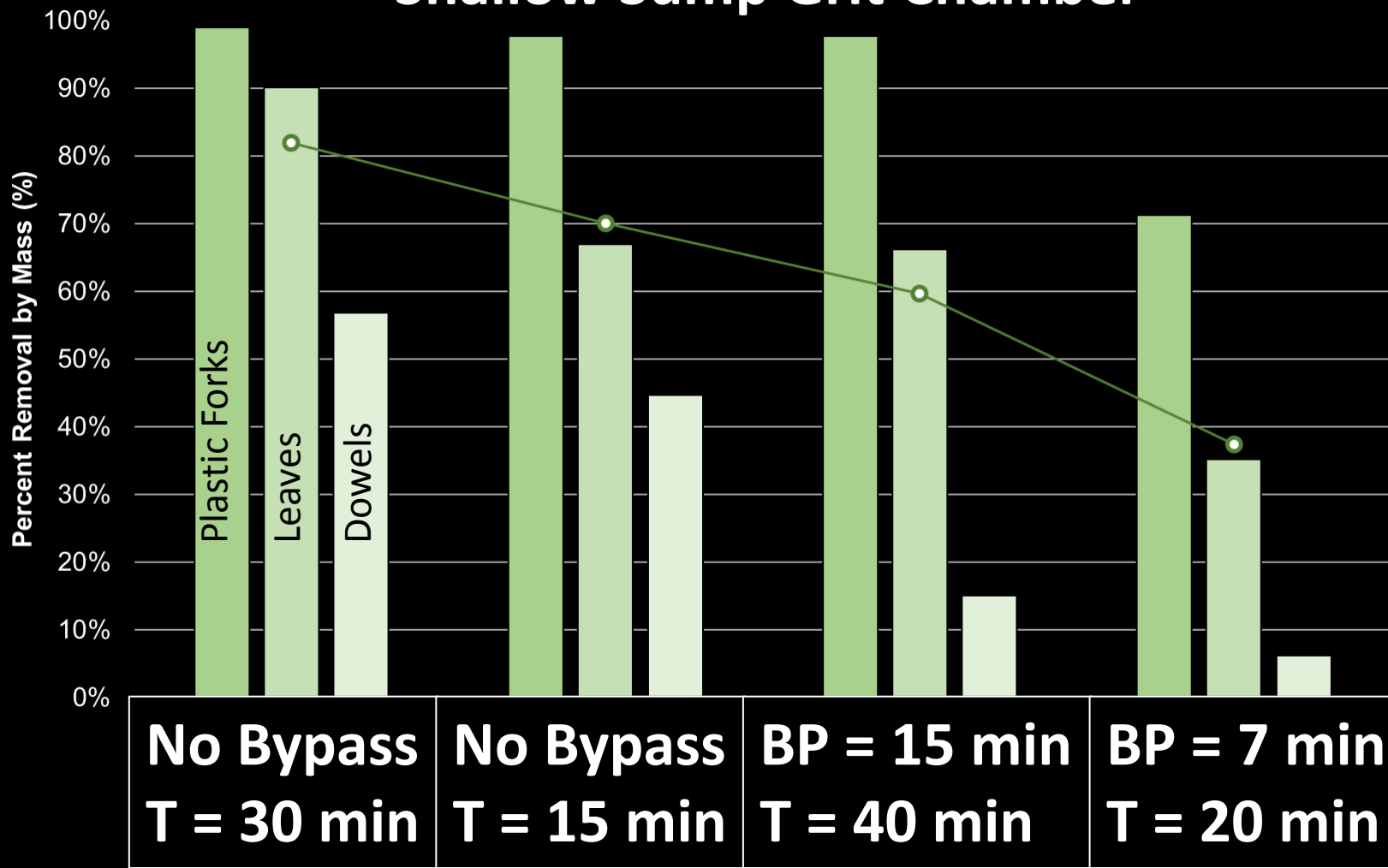
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# Shallow Sump Grit Chamber





# Shallow Sump Grit Chamber



# Summary and Maintenance Considerations

- Grass-lined Inlet:
  - Poor gross solids capture
  - Good sediment capture → increased soil elevation
  - Maintenance = complete rebuild
- Rain Guardian Bunker & Turret:
  - Good gross solids and sediment capture
  - Permeable screen wall → dry chamber between events
  - Easy inspections ← homeowners!
  - Maintenance = open, shovel or vac, close ← homeowners!





# Summary and Maintenance Considerations

- Rock-lined Inlet:
  - Good sediment capture, moderate gross solids capture
  - Capture limited by pore spaces between rocks
  - Maintenance = complete rebuild
- Shallow Sump Grit Chamber:
  - Good gross solids and sediment capture
  - Inline with flow → bypass can cause resuspension
  - Perpetual standing water → not easily inspected
  - Maintenance = open, shovel or vac, close



# Acknowledgements

- Collaborators:
  - SAFL: Matt Hernick, Rob Gabrielson, Peter Olson
  - Anoka Conservation District: Chris Lord, Jared Wagner, Green Corps
  - City of Bloomington: Steve Gurney
- Sponsors & Partners:
  - Minnesota Stormwater Research Council (MSRC), Anoka Conservation District, City of Anoka, City of Bloomington

**THANK YOU!!**





# Stormwater UPDATES Newsletter

What's your O&M Story?



## What's your Operation & Maintenance Story? Submit an abstract and share with your peers!

Do you have an Operation and Maintenance story to share? What have you learned about O&M that others might benefit from hearing? [Submit an abstract](#) to share your story at the 2019 O&M of Stormwater Control Measures Conference!

**What:** 2019 ASCE/EWRI O&M of Stormwater Control Measures Conference

**When/Where:** August 4 - 7, 2019. Minneapolis, MN.

**Find out more:** <https://www.omsconference.org/>

The O&M Conference for stormwater control measures is coming to Minneapolis, August 4 - 7, 2019! The organizing committee is pleased to invite you to the leading international conference on the operation and maintenance of stormwater control measures, including both green and gray infrastructure. [Submit your abstract](#) today and join leading experts and practitioners in operation and maintenance to share successes and lessons learned around the following topics:

### Conference Topics:

- Design Considerations
- Decision Making
- Costs
- Performance Aspects



Seminar/Webinar: Analysis of Shade Provided by Grassy and Woody Riparian Vegetation along a Small Coldwater Stream in the Upper Midwestern United States  
December 5, 2018



## December 5, 2018 Seminar/Webinar: Analysis of Shade Provided by Grassy and Woody Riparian Vegetation along a Small Coldwater Stream in the Upper Midwestern United States

You are invited to attend the following Masters defense for Olivia Sparrow on Wednesday, December 5th, at 1:00 pm (central US time) in the SAFL Auditorium or by [webcast](#).

**Title:** Analysis of Shade Provided by Grassy and Woody Riparian Vegetation along a Small Coldwater Stream in the Upper Midwestern United States

**Presenter:** Olivia Sparrow, Masters Candidate in Civil, Environmental, and Geo-Engineering

**Advisors:** John Gulliver, Professor in the Department of Civil, Environmental and Geo-Engineering and St. Anthony Falls Laboratory, University of Minnesota, and Bruce Wilson, Professor in the Department of Bioproducts and Biosystems Engineering at the University of Minnesota

*Analysis of Shade Provided by Grassy and Woody Riparian Vegetation along a Small*

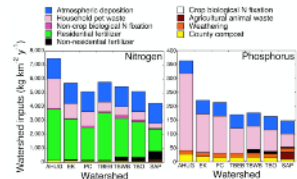
June 2018 (Volume 13, Issue 3): A Source reduction in small watersheds to improve urban water quality



## Source reduction in small watersheds to improve urban water quality

Despite years of effort to improve urban water quality, many lakes and streams in urban regions still suffer from impaired water quality, largely because of excessive loading of nutrients, particularly phosphorus (P), but also likely nitrogen (N). Traditional approaches to addressing urban water quality issues have mostly focused on monitoring impaired water bodies and engineering structures or mechanisms

to trap nutrients within or directly upstream of the focal water body. Yet, despite a lot of effort and money spent cleaning up urban lakes, streams, and rivers, poor urban water quality persists, suggesting that additional approaches are needed. Here we discuss how ecological



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# 2019 Operation and Maintenance of Stormwater Control Measures

- August 4 – 7, 2019
- Minneapolis, MN
- <https://www.omsconference.org/>

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Operation & Maintenance of Stormwater Control Measures

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PROGRAM ▾

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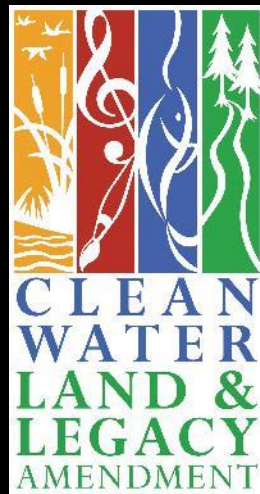
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Thanks for  
your attention!

Questions?

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