OPTIONS FOR WATER QUALITY TREATMENT

HYBRID TREATMENT SYSTEMS…AND MORE!

Jeanine West & Ann Huber, February 1, 2017

Recirculate or Discharge? "What do I do with my water?"

Goal to discharge 'clean' water or to safely re-use water

- If discharging, main concerns are…
  - Phosphorus & Nitrogen levels
  - Other elements that could impact wildlife/water quality

- Concerns in recirculation…
  - Pathogens
  - Nutrient levels
  - Other parameters (oxygen demand, buffering capacity, etc.) that could impact growing

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Options in Discharge

- Hybrid Treatment Systems “HTS” (Permit Required)
- Reverse Osmosis (Permit Required)
- Land Application (Approved Nutrient Management Plan or Strategy Required)
- Vegetative Filter Strips (Permit Required)
- Paid disposal off-site
- Discharge to municipal sewer system (local authority approval required)

All discharges to the environment must meet MOECC site-specific standards for water quality

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Options in Recirculation

- Nutrient/Element removal:
  - Hybrid Treatment Systems “HTS”
  - Membrane Technologies (need to dispose of waste concentrate)
  - Reverse Osmosis (need to dispose of waste concentrate)
- Pathogen removal:
  - Woodchip bioreactors and HTS
  - ECA, UV, Cu, ClO_2, Ozone, Hydrogen Peroxide, and other traditional in-line treatment methods

HTS Project
WHY are we doing this project?

- We're looking for a reasonably priced, flexible, low maintenance solution for recirculation
- Want to encourage growers to decrease P loading to environment
- Promising treatments for horticultural wastewater…
  - Woodchip Bioreactors
  - Constructed Wetlands
  - and Mineral Media…
  - Combine these treatments – get a 'hybrid treatment system' or HTS

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Woodchips for NO3-N and Pathogen Removal

1” hardwood chips

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Mineral media for P removal

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Treatment tanks inside the containers and “plumbing” installed

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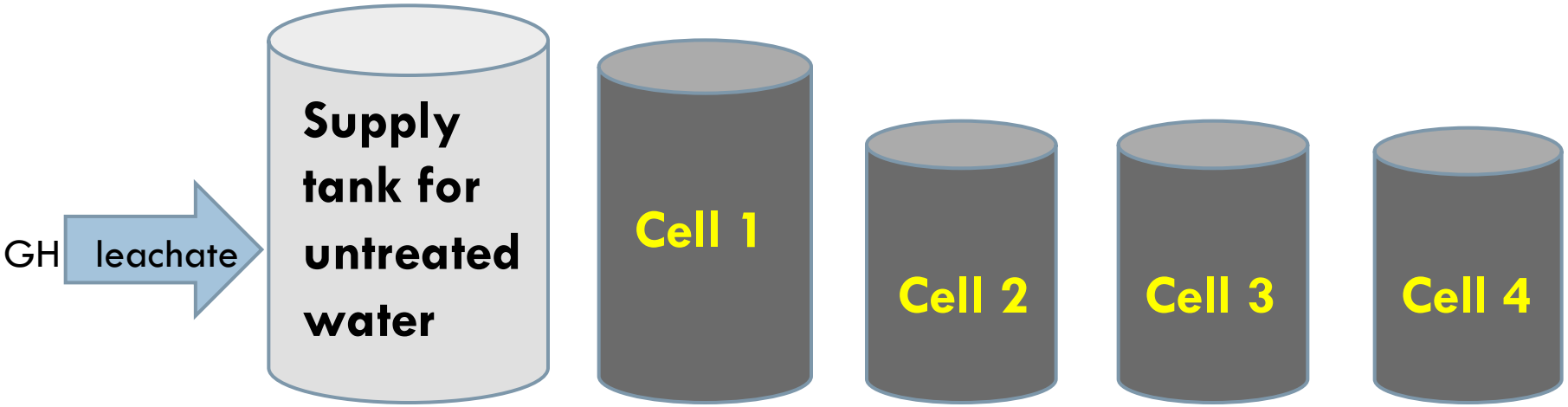
Treatment media sequence (pilots)



"GOLD"	Input water supply tank	Hardwood/ Shavings Mix	Pea Gravel	Wollastonite	Filter Sand
"SILVER"	Input water supply tank	Hardwood Chips	Pea Gravel/ Slag Mix	Pea Gravel/ Slag Mix	Filter Sand

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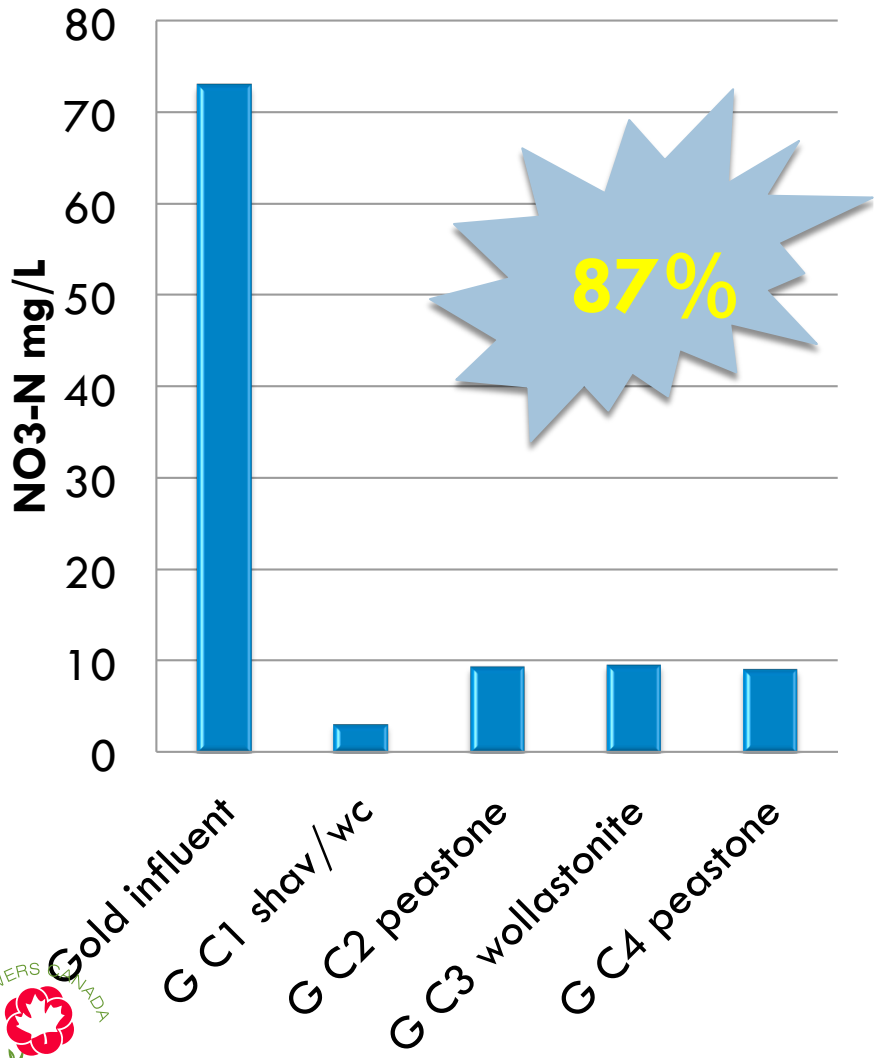
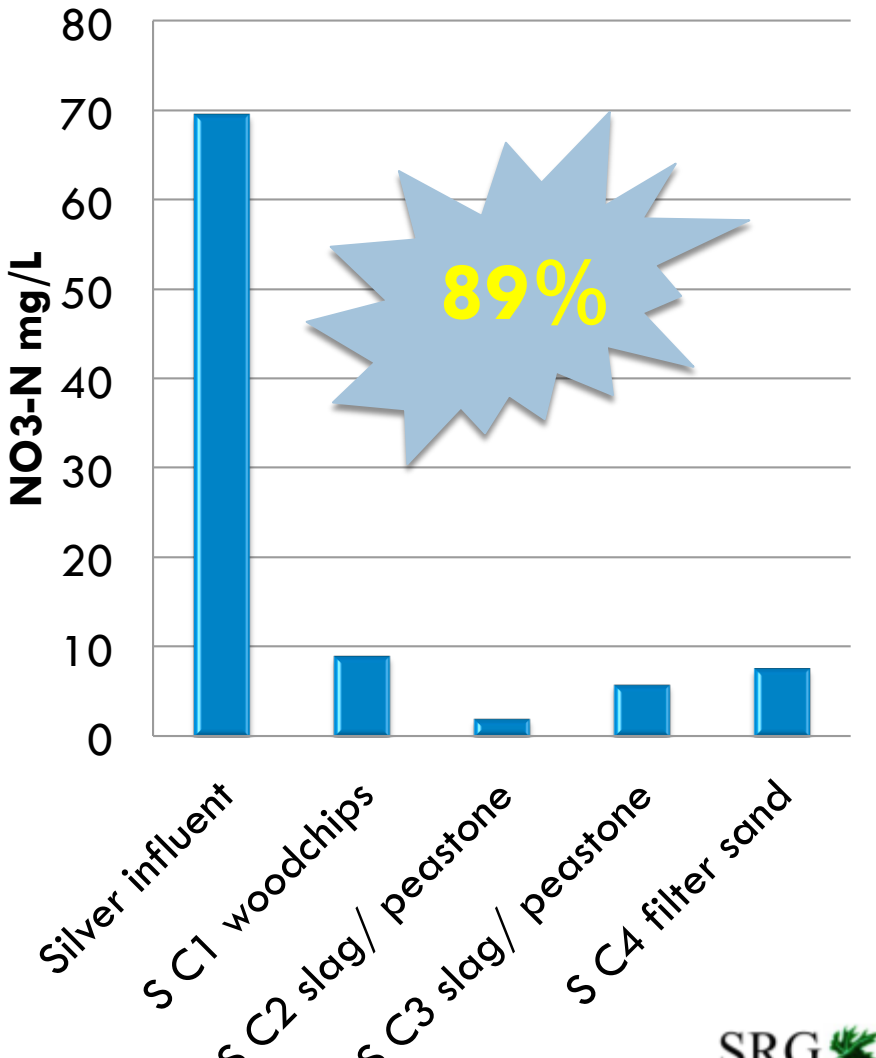
Average NO_3-N removal (July-Nov 2015)





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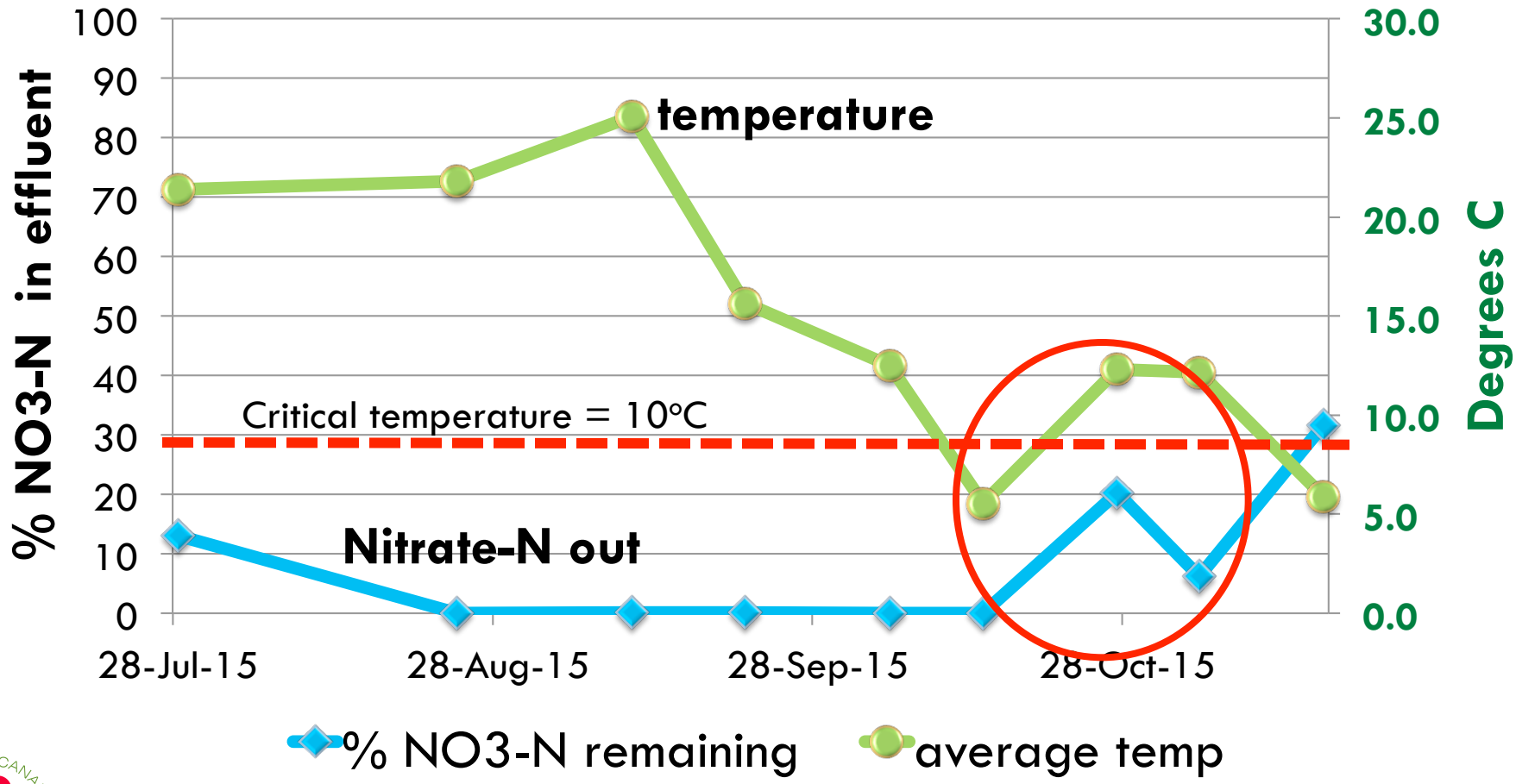
Effect of temperature on NO3-N removal in Woodchip cells (Cell 1)



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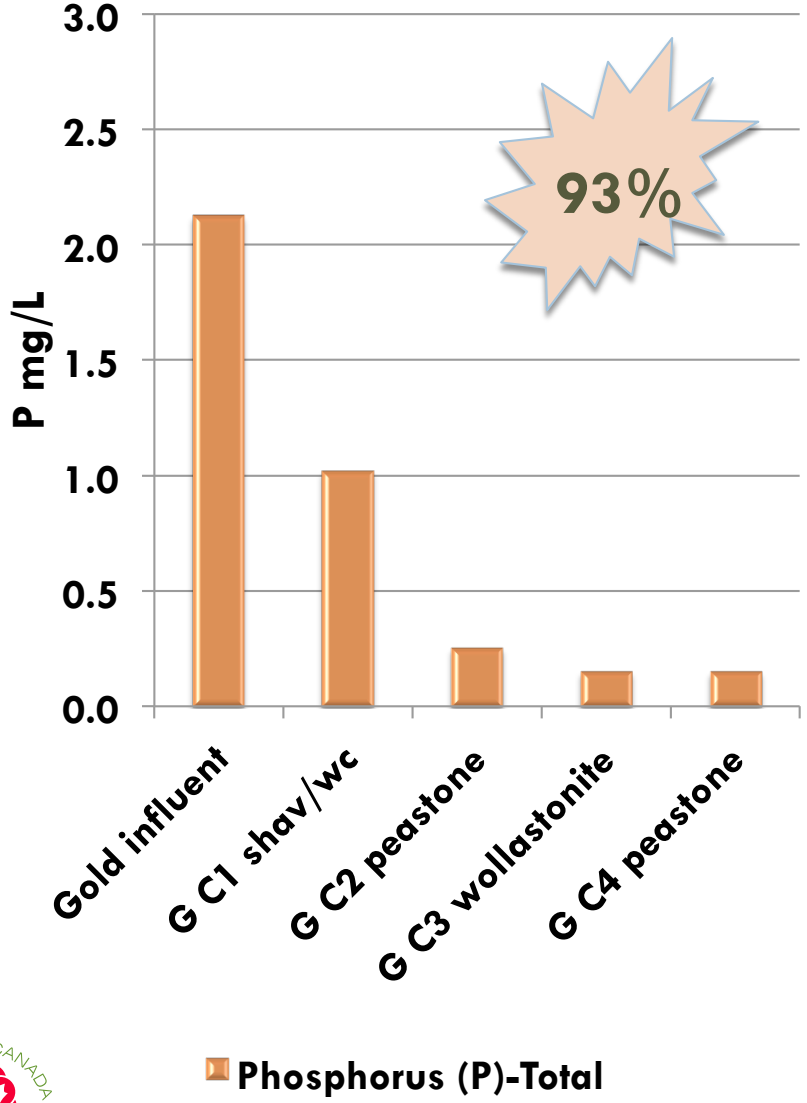
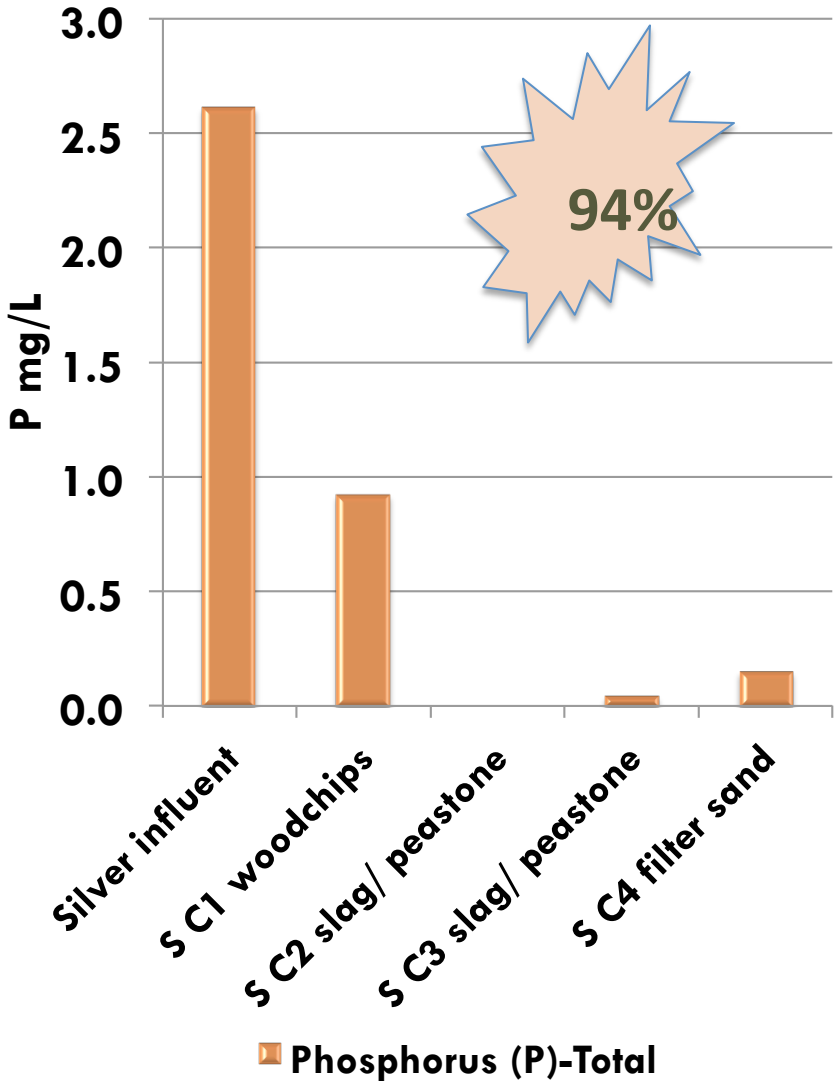
Average Total Phosphorus removal (July-Nov 2015)





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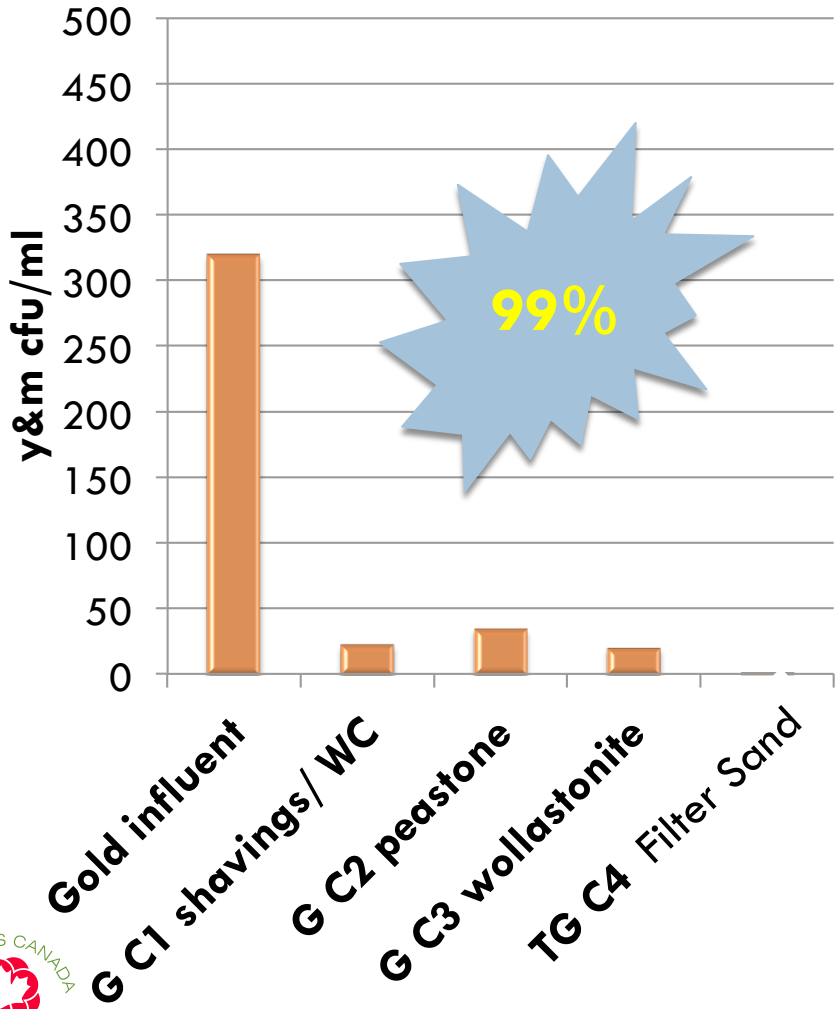
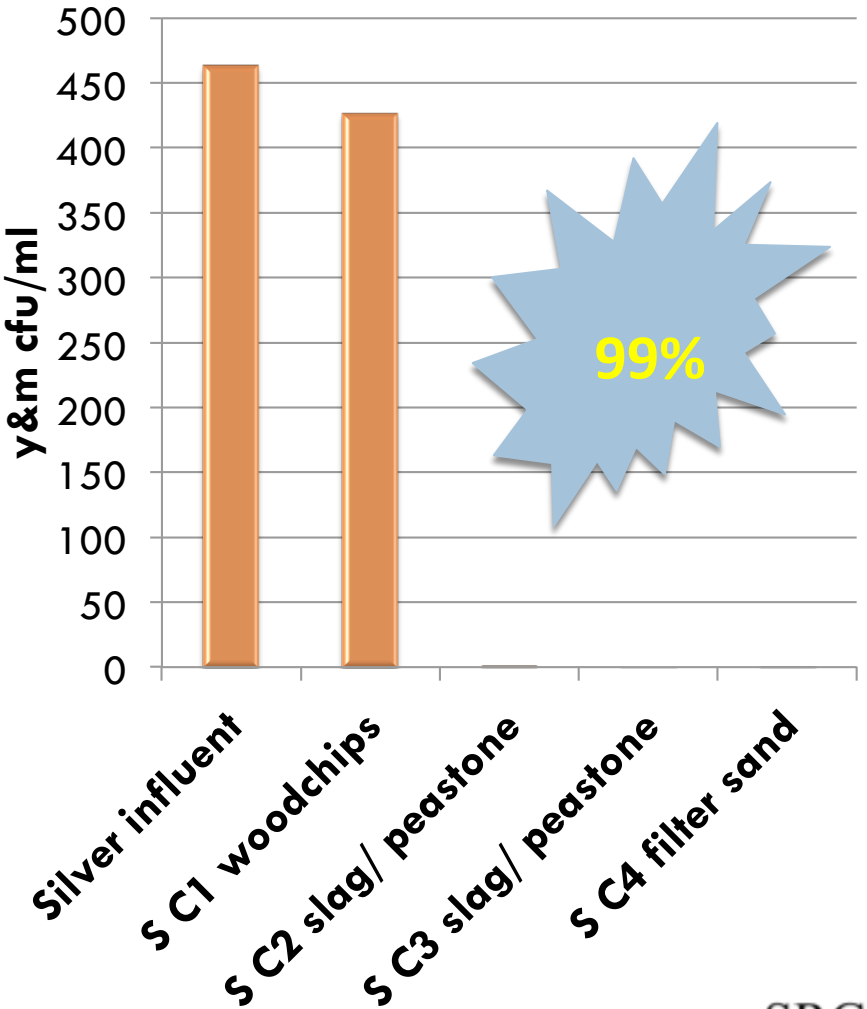
Average removal of fungi (July – Nov 2015)





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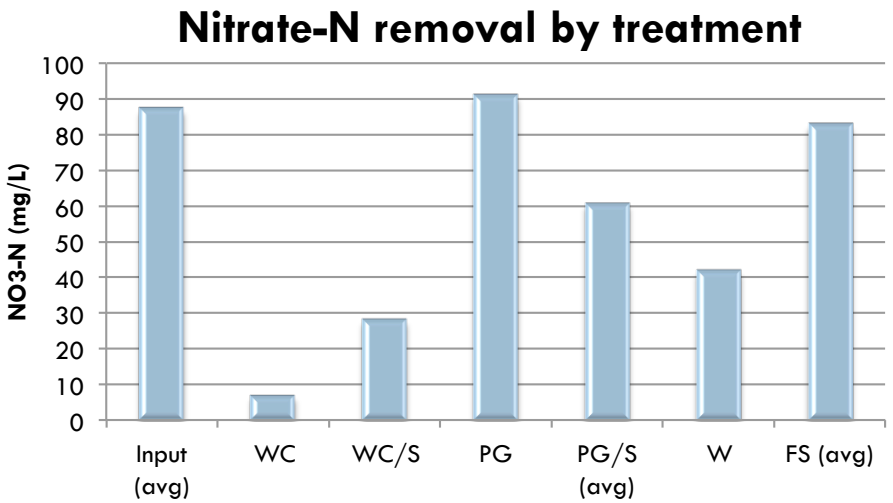
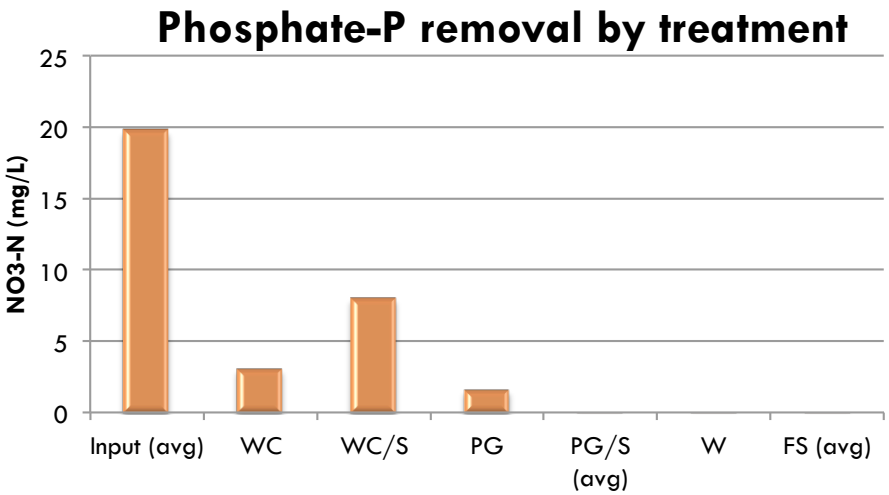
2016 Data (batch studies)





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Summary of 2015 & 2016 studies

Media	Nutrient Load	Average removal efficiency %		
		Microbial	NO3-N	P
Woodchip	High	Up to 99	99	60
Pea Gravel	High	increased	0	50
Filter Sand	High	50-90	0	10
Wollastonite	High	50-90	10	90
Slag	High	50-90	10	65

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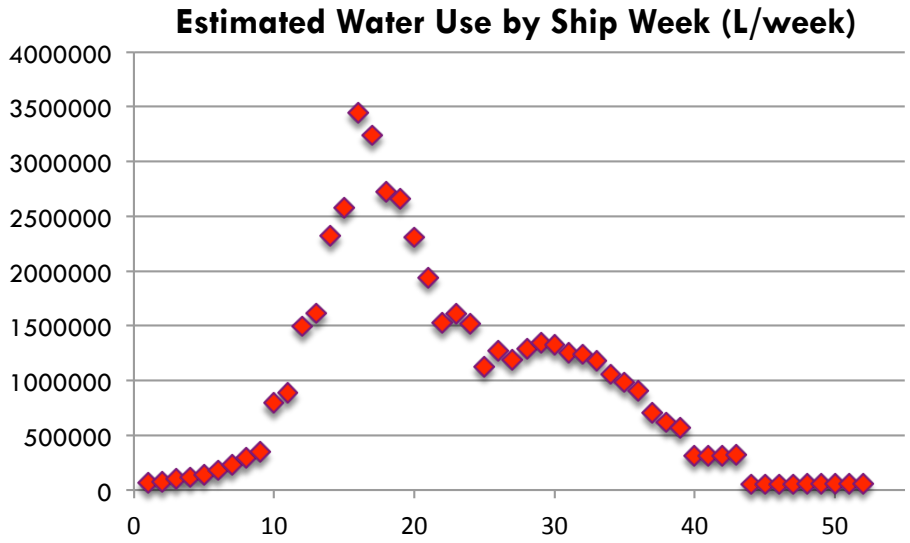
Sizing a permanent system

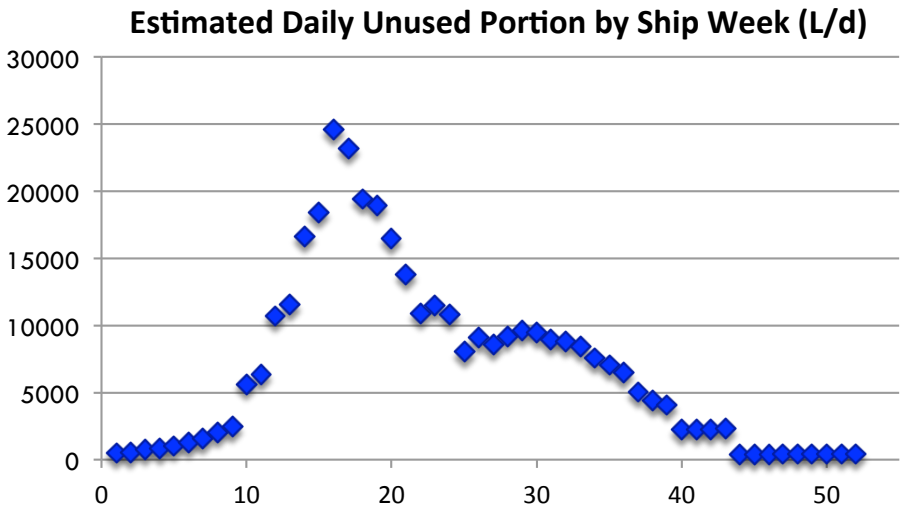


CONSIDER/UNDERSTAND:

- Crop cycles
- Watering needs
- Irrigation method
- Interception area
- Leachate potential

DETERMINE:

- Seasonal changes
- Average flow
- Peak daily flow
- Temperature ranges
- Storage
- Concentration N/P



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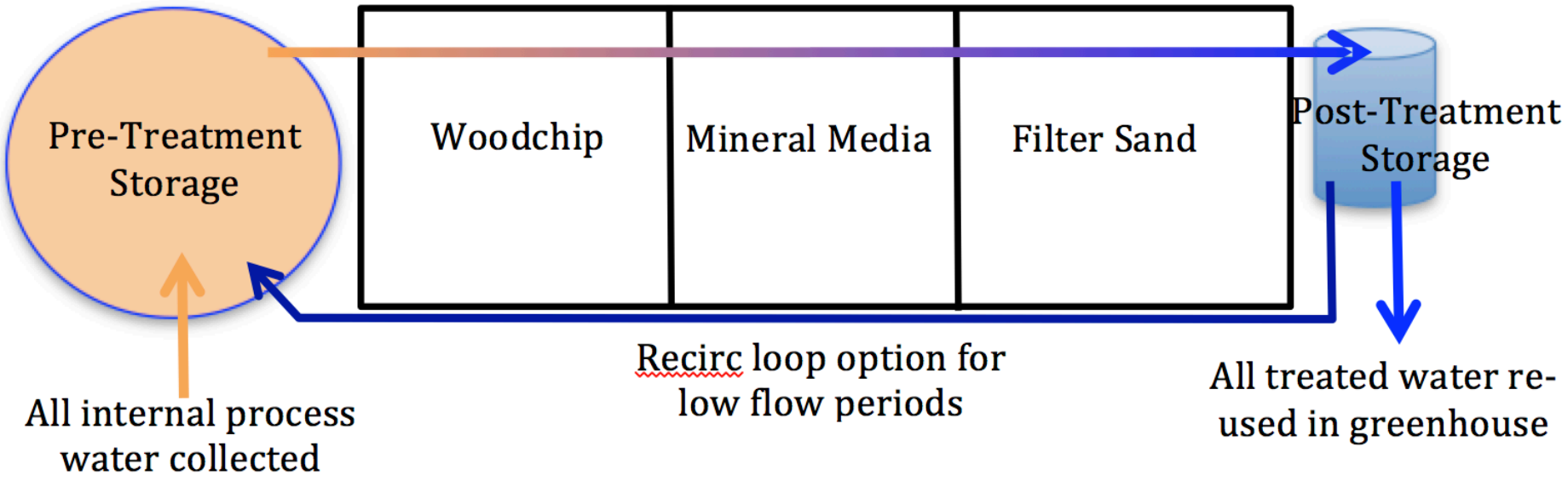
Sizing a permanent system



What do growers need to know?

- Decide if you will discharge or recirculate
- Know your volumes and concentrations, how they change over the year
- What are the risks? (e.g. to crop production)
- What specific elements/nutrients are of importance for the crop(s)?
- How much space is there for a treatment system?
- CONSULT AN EXPERT - We're here to help you!
- Look for Fact Sheets on our webpage (now there!) and the Guidance Document in Spring 2018

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Special thanks to Participating Growers & HMGA

Contact

ahuber@srgresearch.ca
jeanine@fco.ca

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