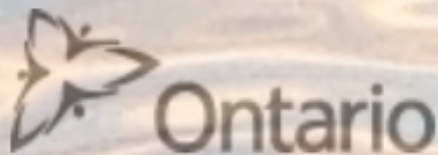


OPTIONS FOR WATER QUALITY TREATMENT

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

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

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, ClO₂, 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

Woodchips for NO₃-N and Pathogen Removal



1" hardwood chips

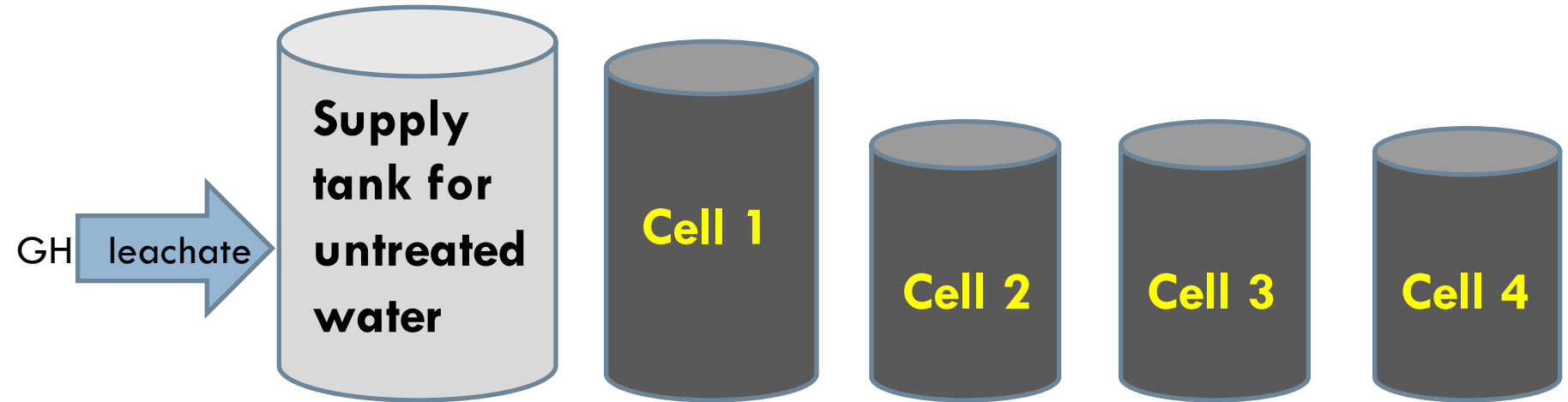
Mineral media for P removal



Treatment tanks inside the containers and “plumbing” installed

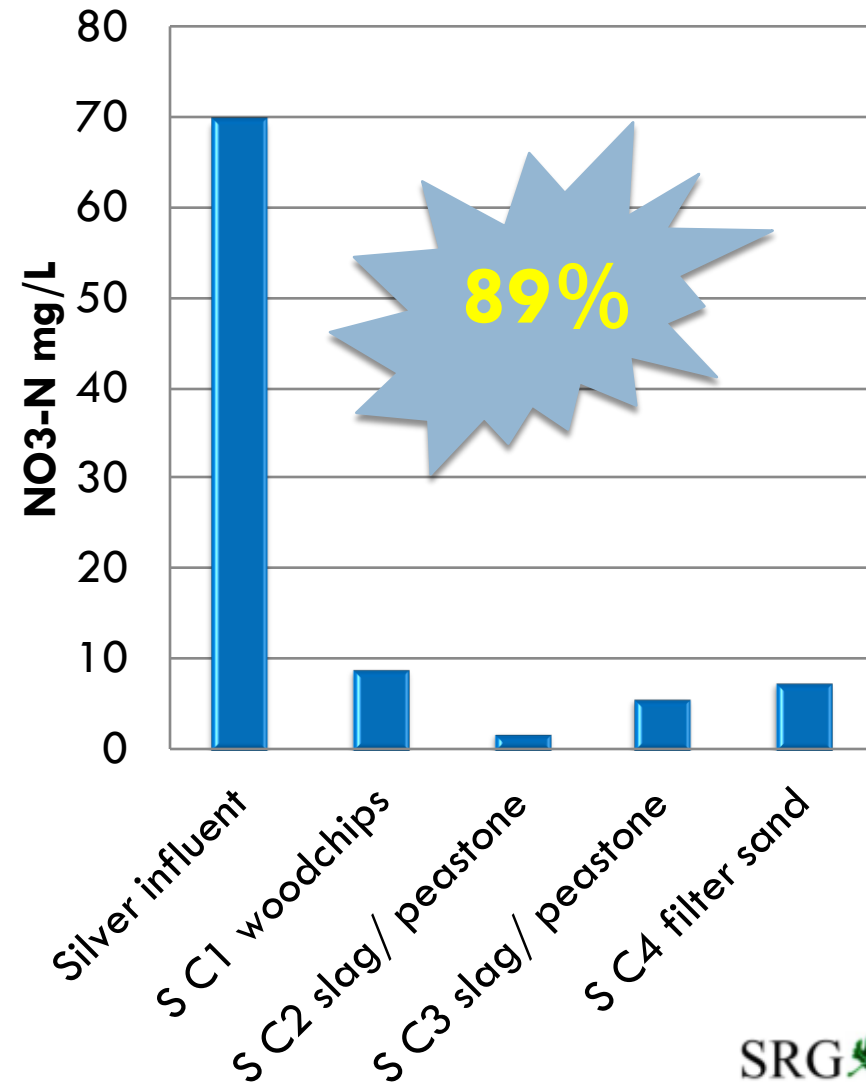
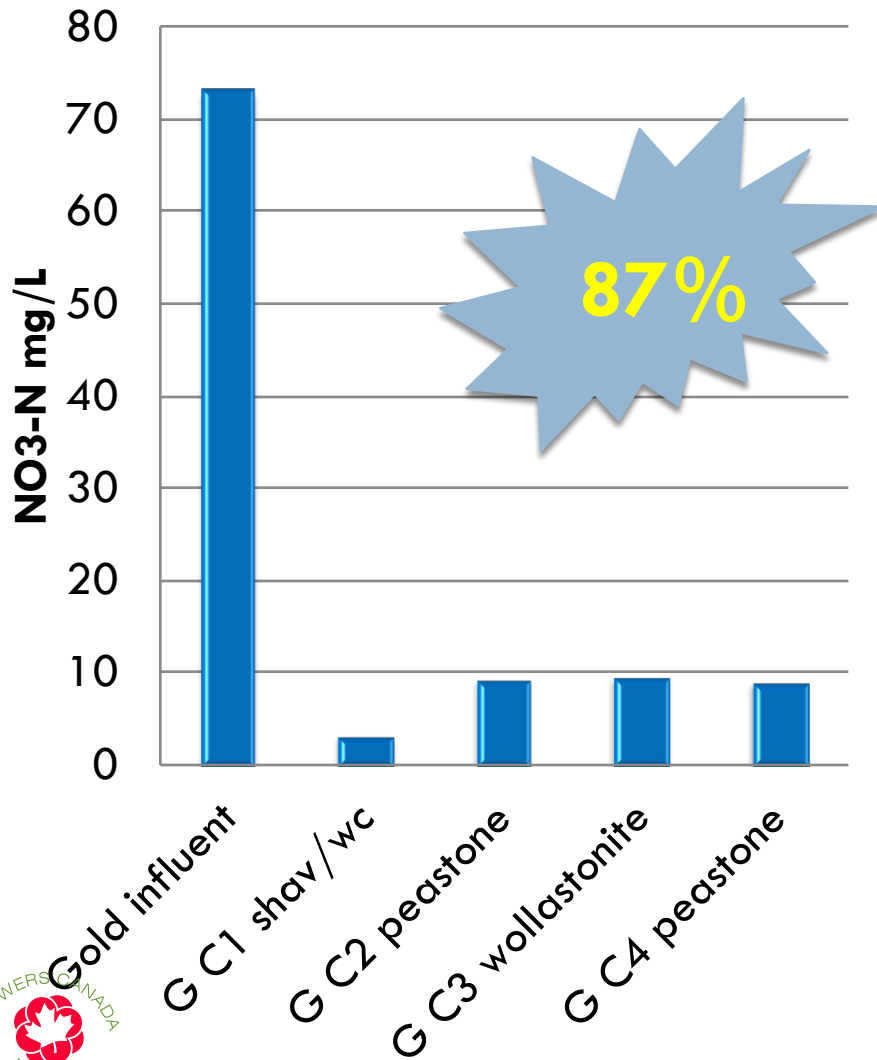


Treatment media sequence (pilots)

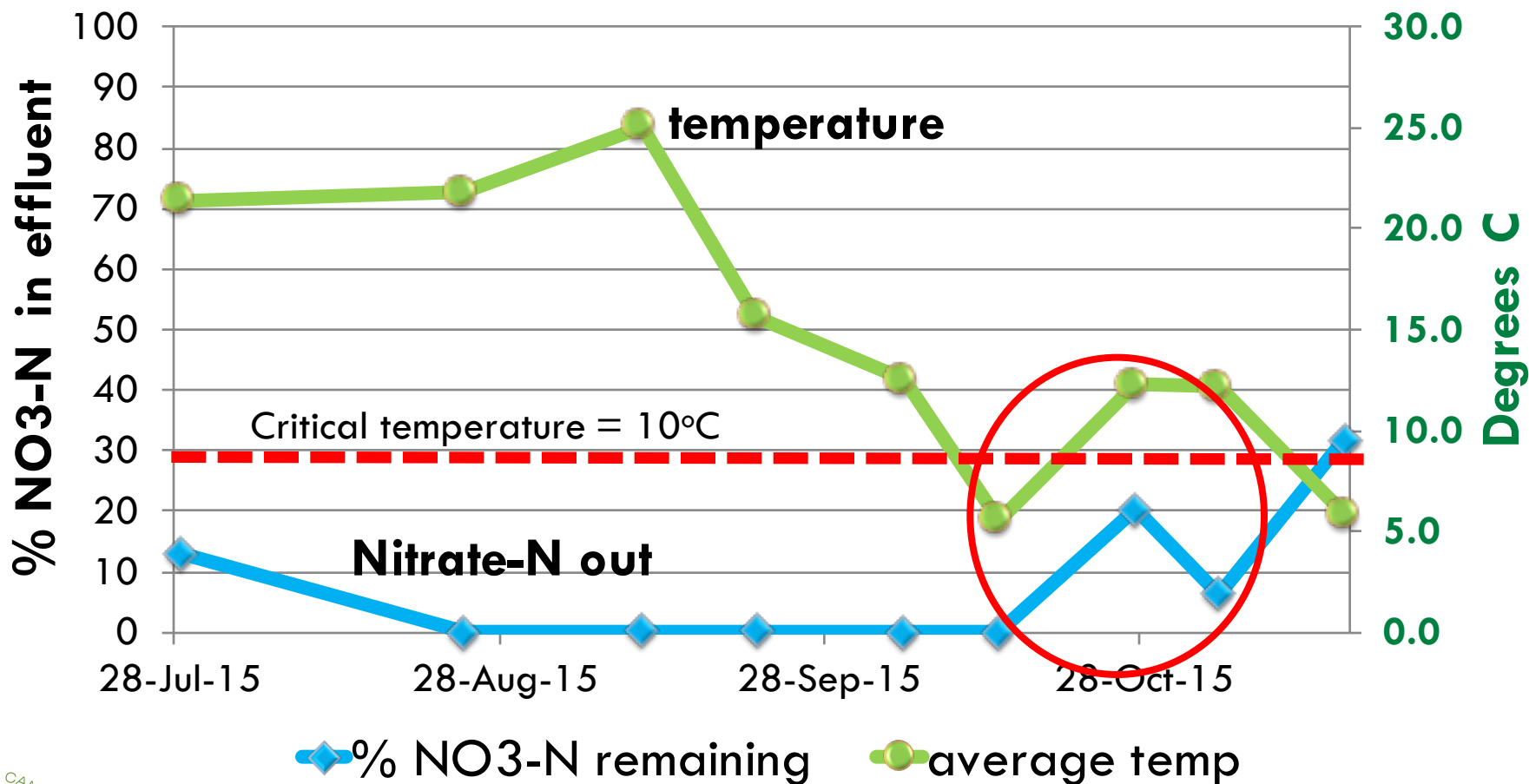


"GOLD"	Input water supply tank	Hardwood/Shavings Mix	Pea Gravel	Wollastonite	Filter Sand
"SILVER"	Input water supply tank	Hardwood Chips	Pea Gravel/Slag Mix	Pea Gravel/Slag Mix	Filter Sand

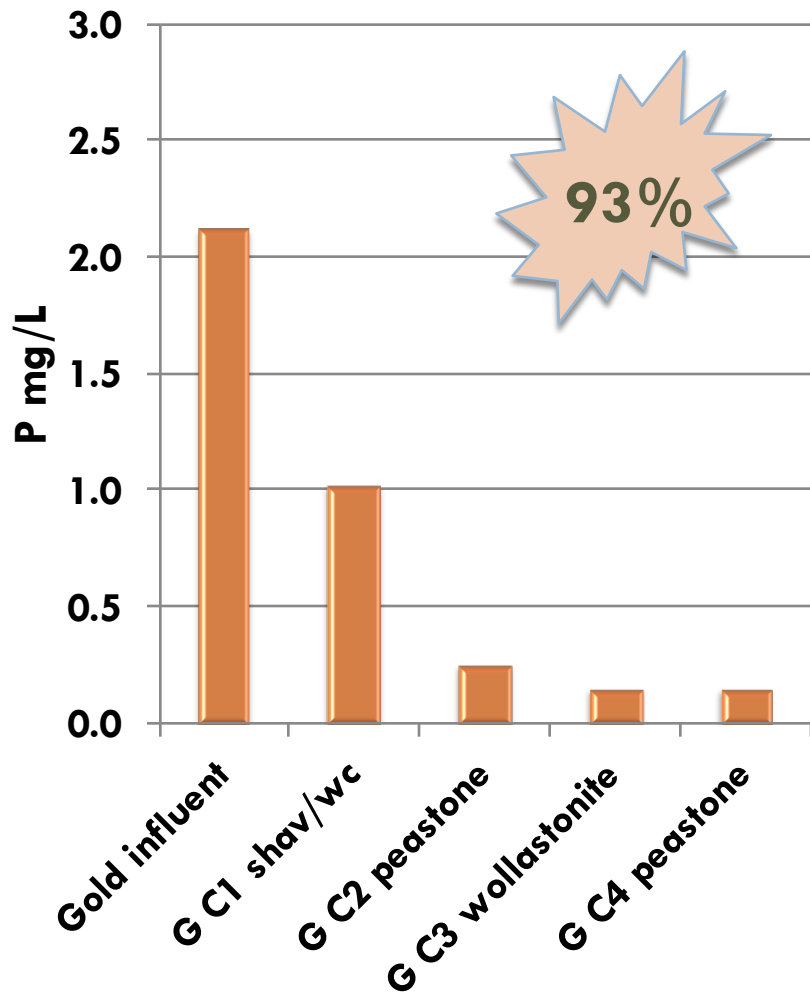
Average $\text{NO}_3\text{-N}$ removal (July-Nov 2015)



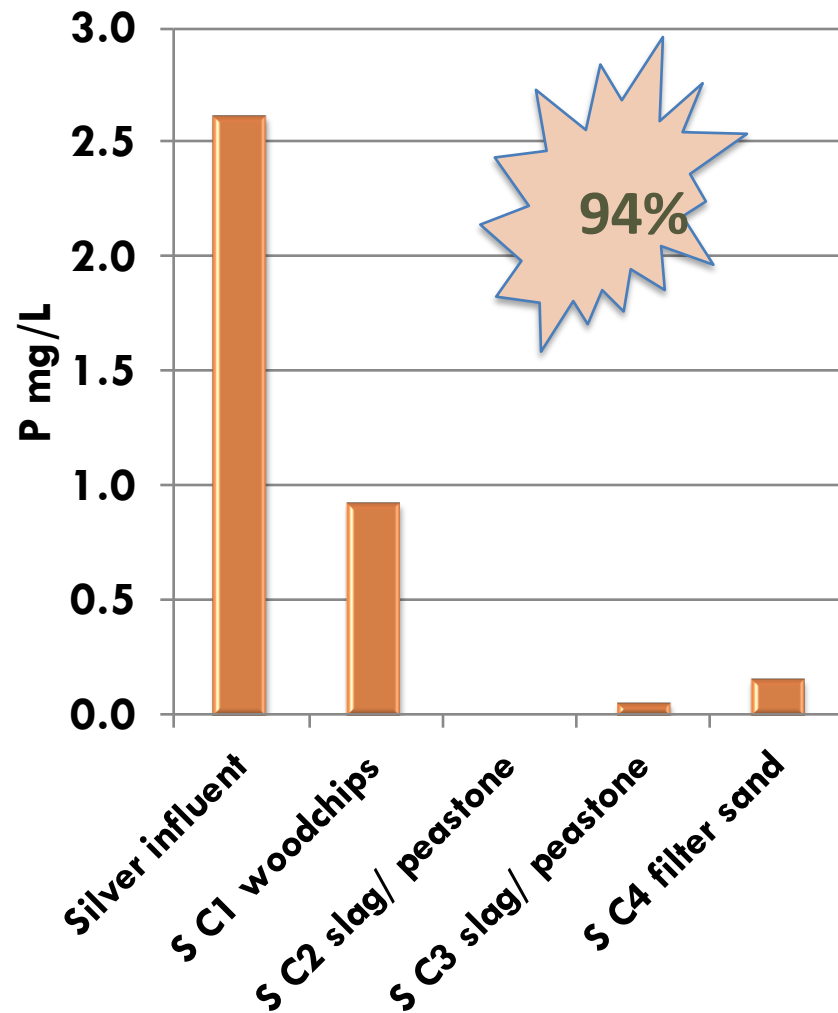
Effect of temperature on NO₃-N removal in Woodchip cells (Cell 1)



Average Total Phosphorus removal (July-Nov 2015)

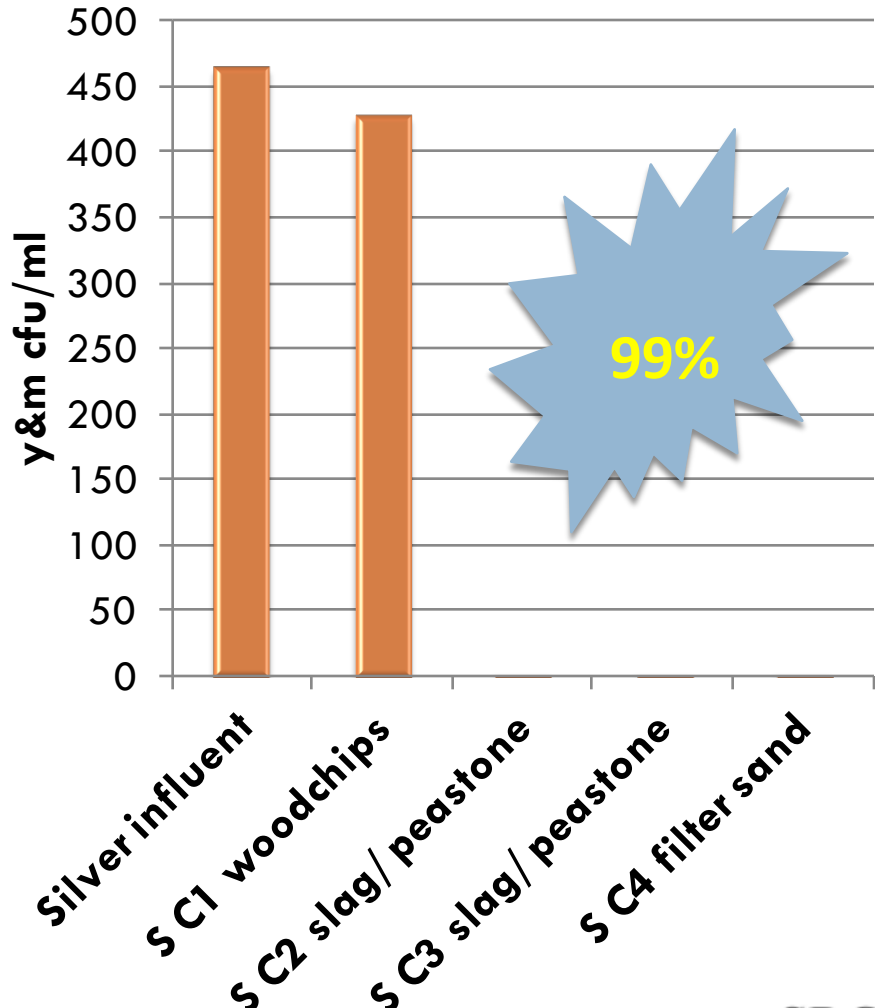
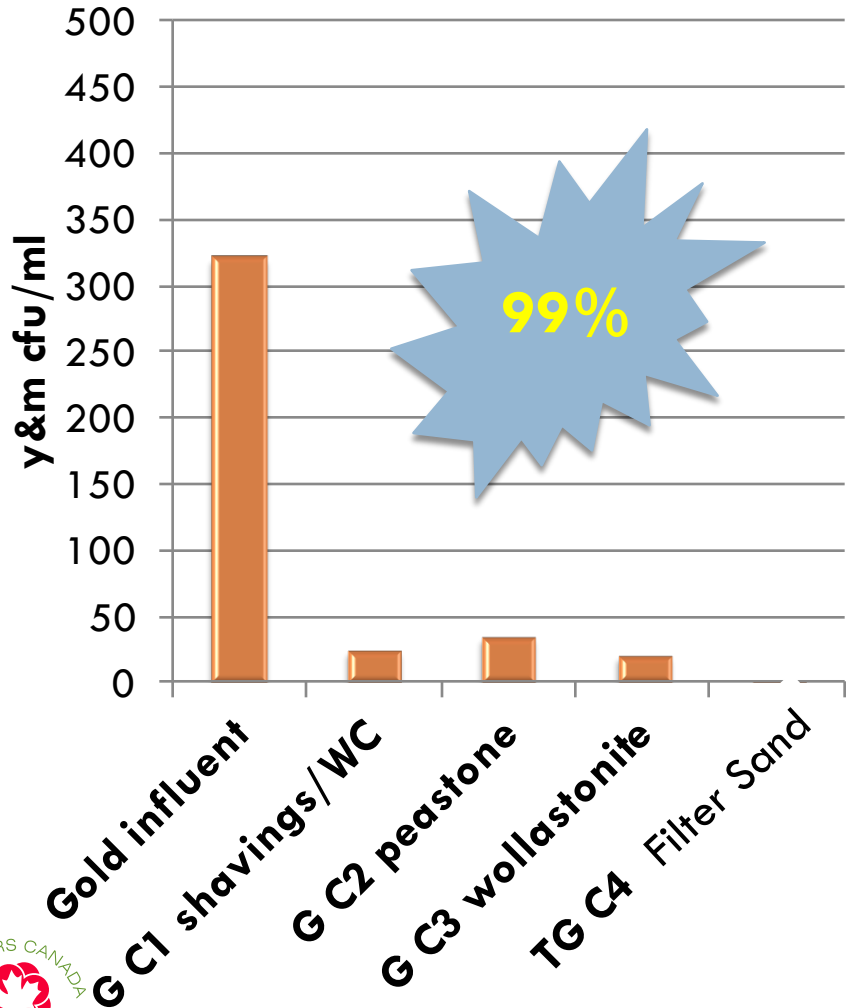


■ Phosphorus (P)-Total



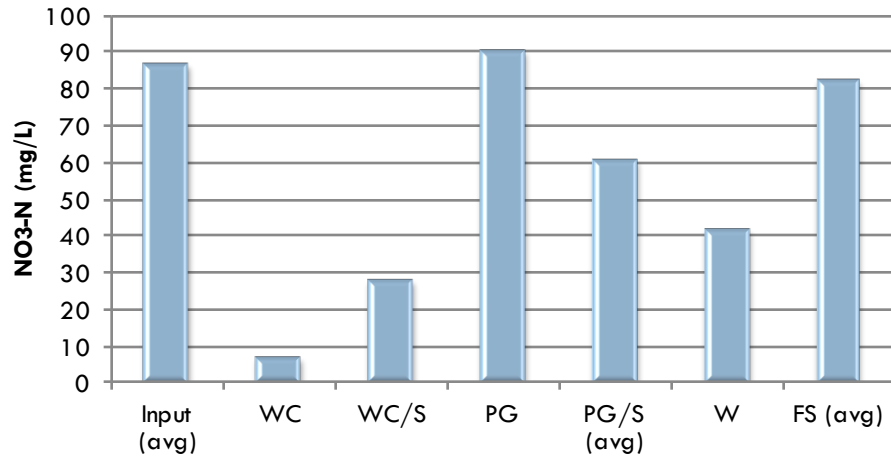
■ Phosphorus (P)-Total

Average removal of fungi (July – Nov 2015)

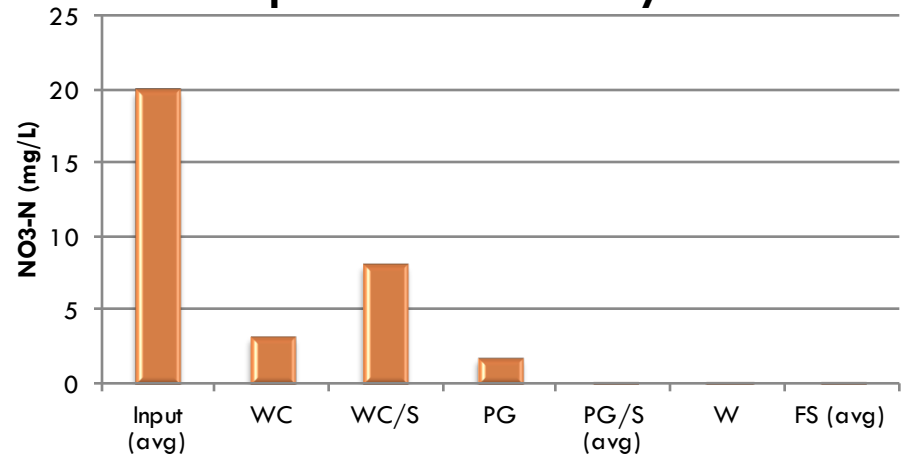


2016 Data (batch studies)

Nitrate-N removal by treatment



Phosphate-P removal by treatment

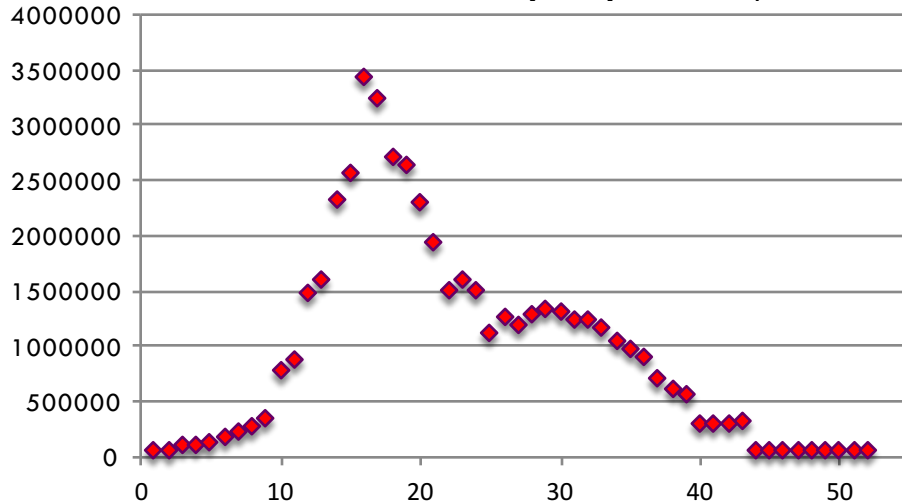


Summary of 2015 & 2016 studies

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

Sizing a permanent system

Estimated Water Use by Ship Week (L/week)



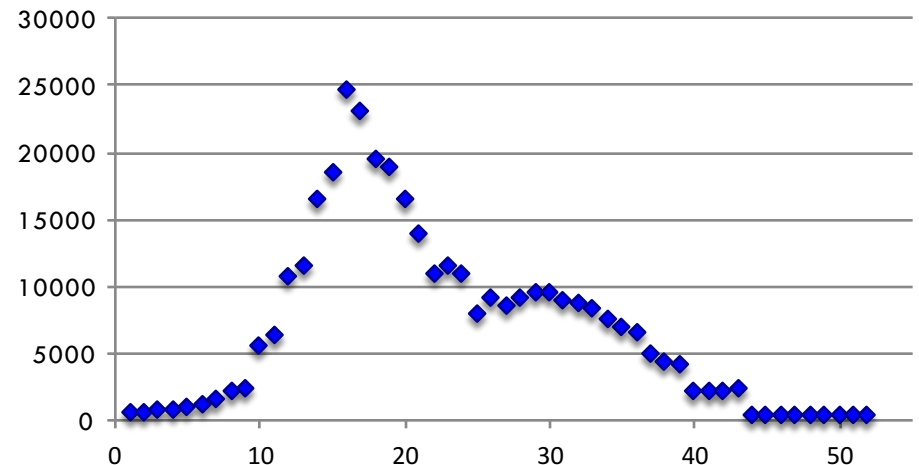
DETERMINE:

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

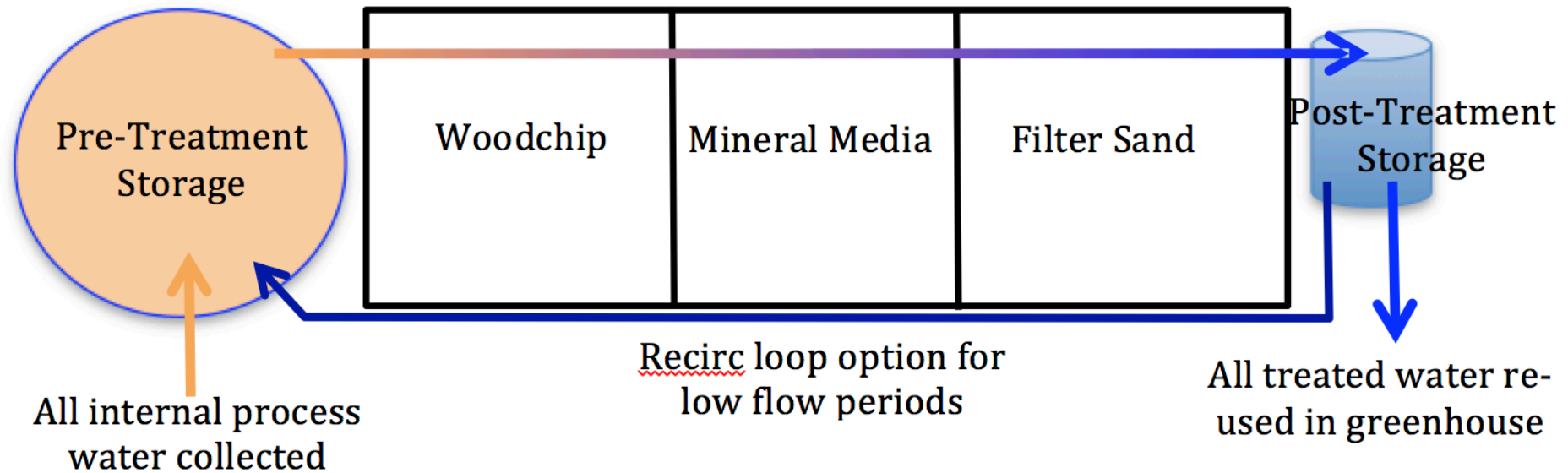
CONSIDER/UNDERSTAND:

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

Estimated Daily Unused Portion by Ship Week (L/d)



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

Special thanks to Participating Growers & HMGA

Contact

ahuber@srgresearch.ca

jeanine@fco.ca

Funding for this project has been provided by Agriculture and Agri-Food Canada through the Canadian Agricultural Adaptation Program (2014-2019).



Agriculture and
Agri-Food Canada

Agriculture et
Agroalimentaire Canada

The research team acknowledges the support of OMAFRA. The views expressed in this presentation are the views of the research team and do not necessarily reflect those of OMAFRA.