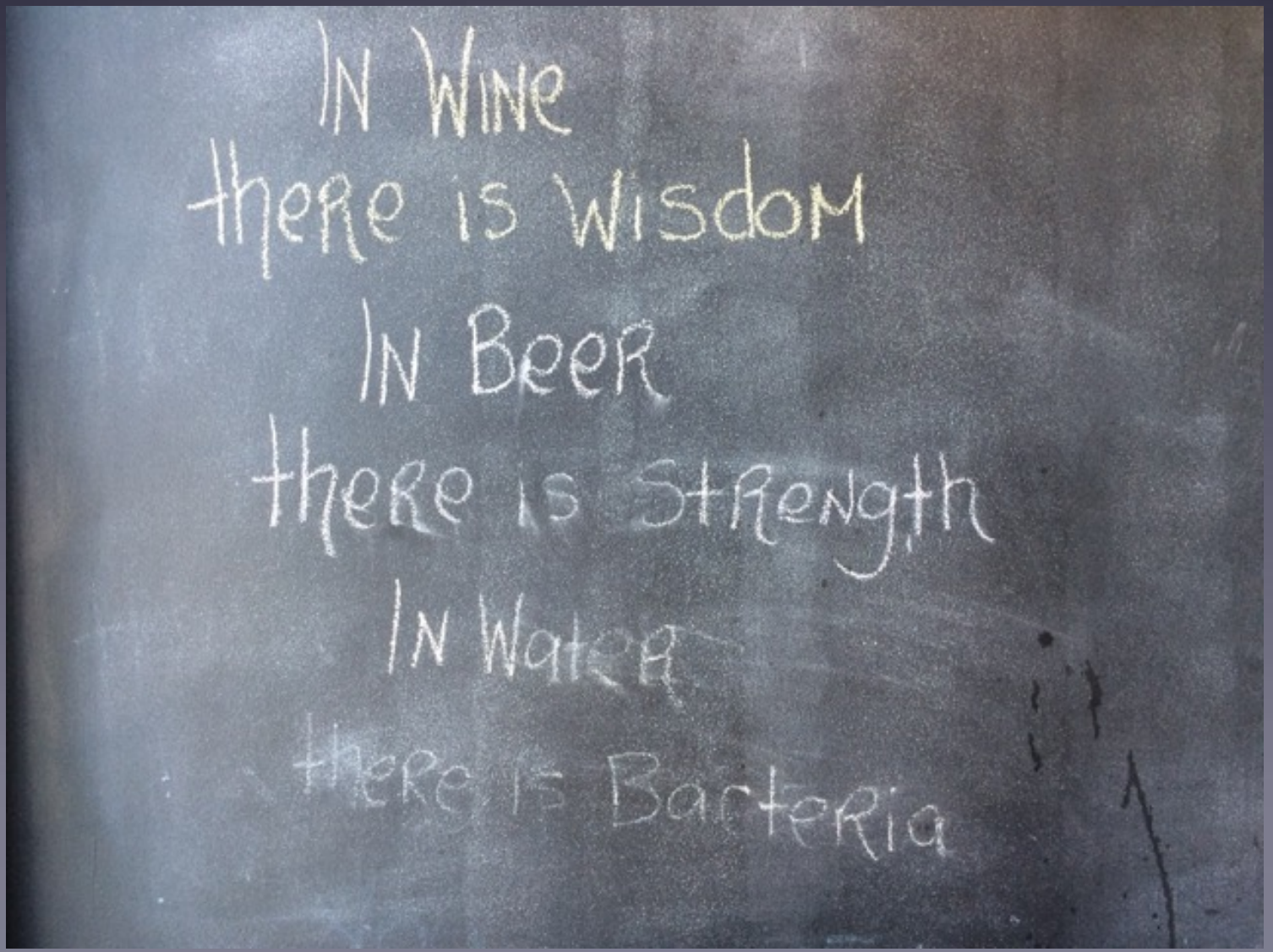

In Wine
there is Wisdom
In Beer
there is Strength
In Water
there is Bacteria

Expanding your risk management toolbox - on-farm tools for water quality and pathogen monitoring

(GF2 0251 FCO-HMGA)

FCO Research Conference

February 1, 2017

FLOWERS CANADA ONTARIO

SRG Soil Resource Group

Objective:

- Develop **PRACTICAL** methods that growers can use to:
  - Track microbial water quality – **manage RISK**
  - Monitor water **treatment system performance**
  - Proactively manage water quality throughout the **whole production system**

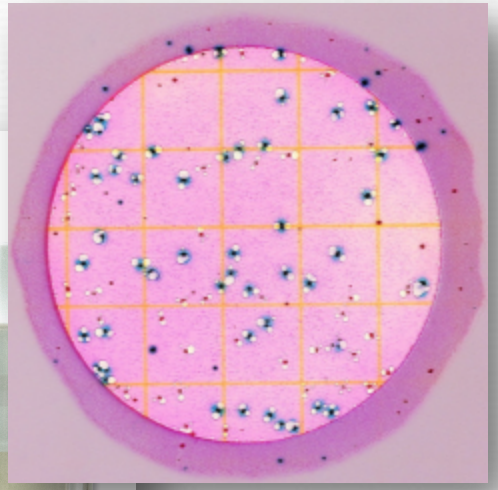
Concerns for **Greenhouse Flower** Growers

- **Plant pathogens** going into production areas from fresh or **recycled** water
- **Treatment system** performance

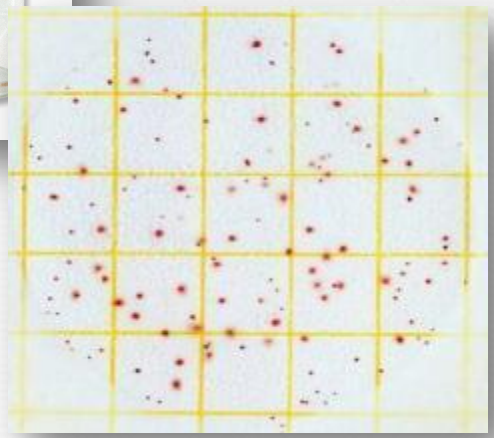
Concerns for Vegetable & Herb Growers

- **Food safety** in production and processing
- Food safety **Regulations**
- Plant pathogens going back onto cropland

Tools for Food Safety: *E.coli*, Coliforms



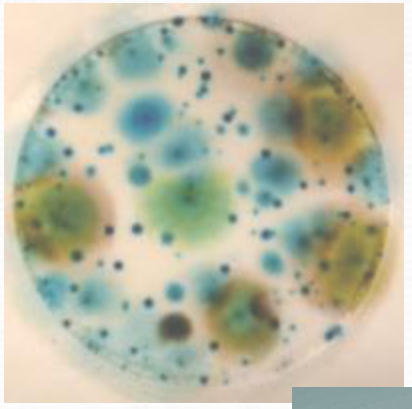
3M Petrifilms



General water quality:
Total aerobic bacteria

Tools for fungal plant pathogens

- 3M Petrifilm Yeast & Mold
- Standard plating methods
- Sani-Check dipslides
- AgDia test strips
- DNA Multiscan (UofG Lab Services)



SRG Soil Resource Group

FLOWERS CANADA ONTARIO

DNA Multiscan testing

Site code	F2
Crop	Cut mixed
System	Recirculating
Treatment	UV

Untreated recirc. water

Treated water

DNA Multiscan scores

		Leach or Runoff water - untreated					Treated				
Sample Code		F2-3	F2-3	F2-3	F2-3	F2-3	F2-4	F2-4	F2-4	F2-4	F2-4
Sample Name		Cistern 1	Cistern 1	Cistern 1	Cistern 1	Cistern 1	Cistern 2	Cistern 2	Cistern 2	Cistern 2	Cistern 2
Sampling Date		14-May-12	5-Jun-12	5-Jul-12	1-Aug-12	15-Aug-12	14-May-12	5-Jun-12	5-Jul-12	1-Aug-12	15-Aug-12
Target Organism	Botrytis cinerea	1	0	0	0	0	1	1	0	0	0
	Fusarium oxysporum	1	0	0	1	1	0	1	1	1	0
	F. solani	1	0	0	1	1	1	1	1	1	1
	Phytophthora sp.	1	0	0	1	0	2	0	0		0
	P. cactorum	0	0	0	0	0	0	0	0		0
	P. capsici	0	0	0	0	0	0				0
	P. cinnamomi	0	0	0	0	0	0				
	P. cryplogea	0	0	0	0	0	0				0
	P. drechsleri	0	0	0	0	0	0				
	P. fragariae	0	0	0	0	0	0	0			0
	P. infestans	0	0	0	0	0	0	0		0	0
	P. nicotianae	0	0	0	0	0	0	0	0	0	0
	Pythium sp.	3	1	1	1	1	4	3	1	1	0
	P. aphanidermatum	0	0	0	0	0	0	0	0	0	0
	P. dissotocum	6	1	2	3	3	6	8	1	1	0
	P. irregulere	1	0	0	0	0	0	0	0	0	0
	P. polymastum	0	0	0	0	0	0	1	0	0	0
	P. sylvaticum	0	0	0	0	0	0	0	0	0	0
	P. ultimum	1	0	0	0	0	0	0	0	0	0
	Rhizoctonia solani	0	0	0	0	0	0				
	Sclerotinia sp.	0	0	0	0	0	0				
	Thielaviopsis basicola	0	0	0	0	0	0				
	Verticillium albo-atrum	0	0	0	0	0	0				
	Verticillium dahliae	0	0	0	0	0	0				
	V. dahliae (ver longisporum)	0	0	0	0	0	0				

OOPS !

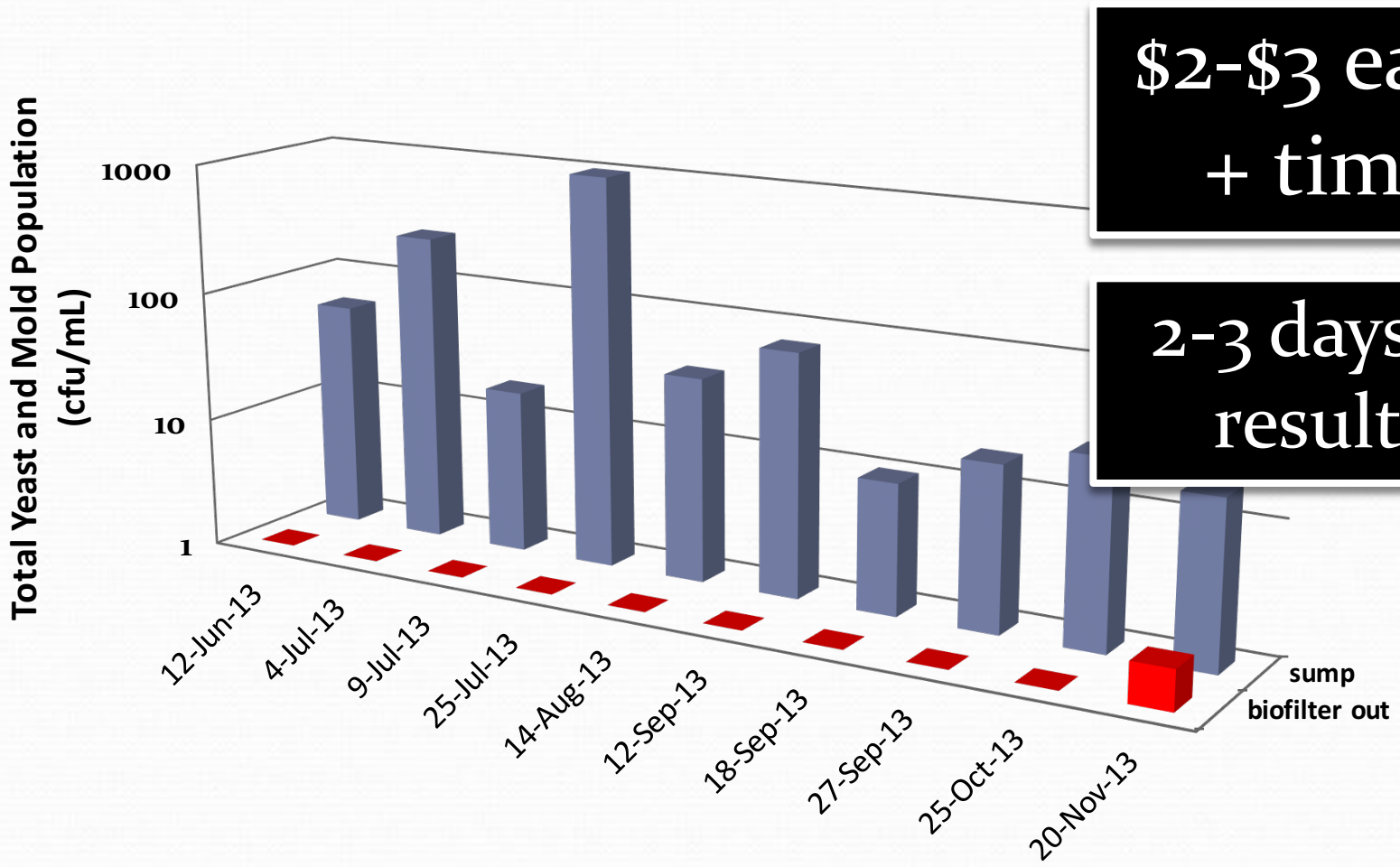
2 weeks for results

Plant pathogen removal by woodchip bioreactor – DNA Multiscan testing

Target Organism	Untreated Sump Water							Woodchip Bioreactor Treated						
	22 May 12	5 June 12	5 July 12	1 Aug 12	15 Aug 12	12 June 13	5 Sept 13	22 May 12	5 June 12	5 July 12	1 Aug 12	15 Aug 12	12 June 13	5 Sept 13
Botrytis	2	3	1	0	1	0	0	0	0	0	0	0	0	0
Fusarium	0	1	1	1	2	1	1	0	0	0	0	0	0	1
Phytophthora	0	1	0	0	0	1	0	0	0	0	0	0	1	0
Pythium	0	5	4	5	3	10	1	0	0	0	0	0	1	0
Rhizoctonia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olpidium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sclerotinia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thielaviopsis	0	0	0	0	0	0	0							0
Verticillium	0	0	0	0	0	0	0							0

$175-$225 each

3M Petrifilm for yeast & mold



$2-$3 each + time

2-3 days to results

SRG Soil Resource Group

FLOWERS CANADA ONTARIO

Project Cooperators

Cooperator	Crops	Irrigation systems	Recirc ?	treatment
Greenhouses (7)	❑Cut ❑Potted ❑Bedding ❑Vegetable	❑Flood •floor, •trough, •Dutch tray ❑Drip ❑Overhead	YES	❑UV (5) ❑Cloth filter(7) ❑Peroxide (2) ❑Copper ❑Chlorine dioxide ❑ECA ❑Ozone ❑Woodchip Bioreactor ❑Constructed wetland
Vegetable growers/ Washers (8)	❑Carrots, beets, parsnips ❑Greens ❑Asian veg	❑Overhead irrigation ❑Wide range of washing systems	Some	Nothing to everything!

SRG Soil Resource Group

FLOWERS CANADA ONTARIO

Results -

Toolbox for Microbial water quality assessment

- **3M Petrifilms** - a measure of RISK
  - **Total yeast & mold** – risk of fungal pathogens
  - **Total aerobic plate count** (bacterial) – general water quality; risk of biofilm development in pipes and drippers
  - ***E.coli* and total coliforms** (only if food safety is a concern)

- **DNA multiscan** – identifies WHAT is there

SRG Soil Resource Group

FLOWERS CANADA ONTARIO

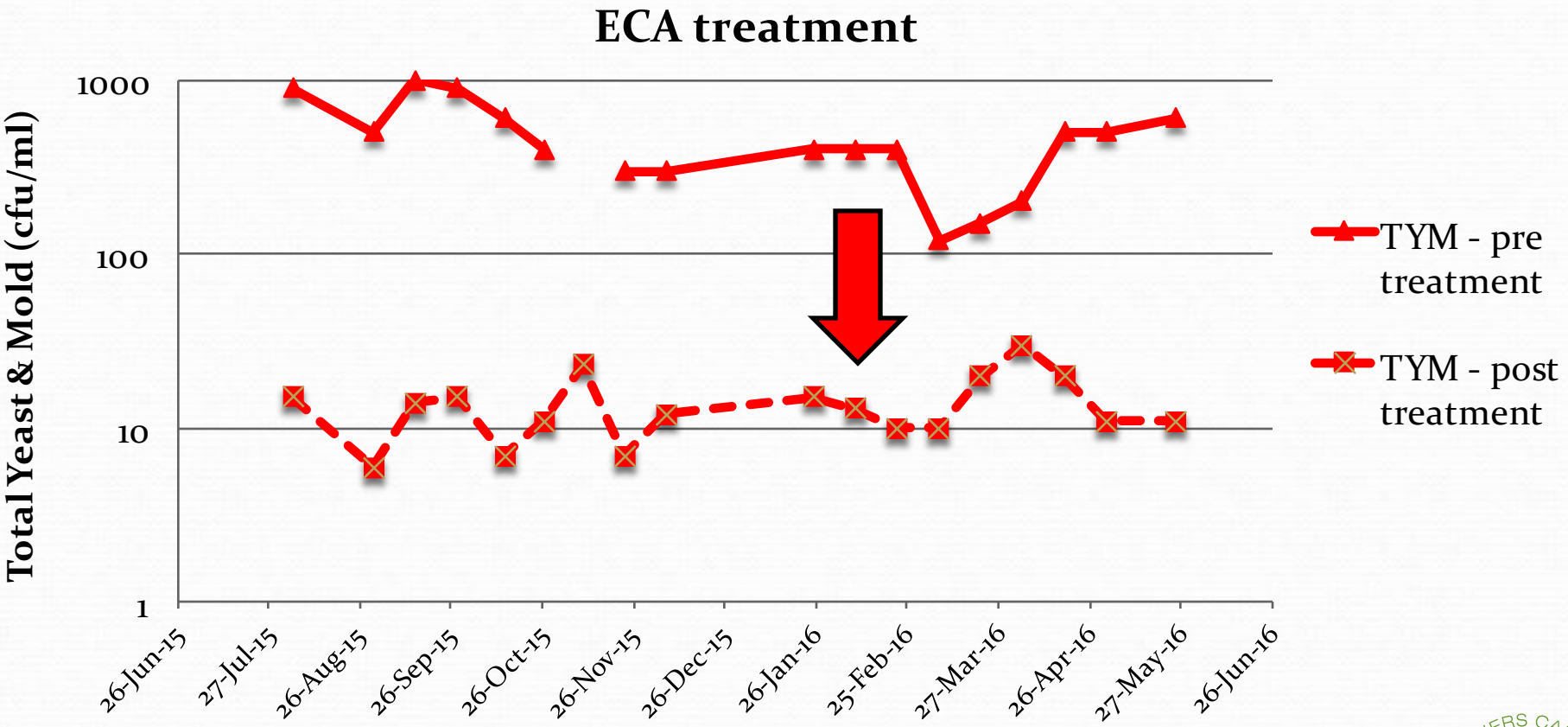
Results -

Baseline microbial water quality data (2 years)

- **treatment system performance** and general **water management**
  - 7 greenhouse systems
  - 8 vegetable production and processing systems

- >3000 Petrifilm analyses!!

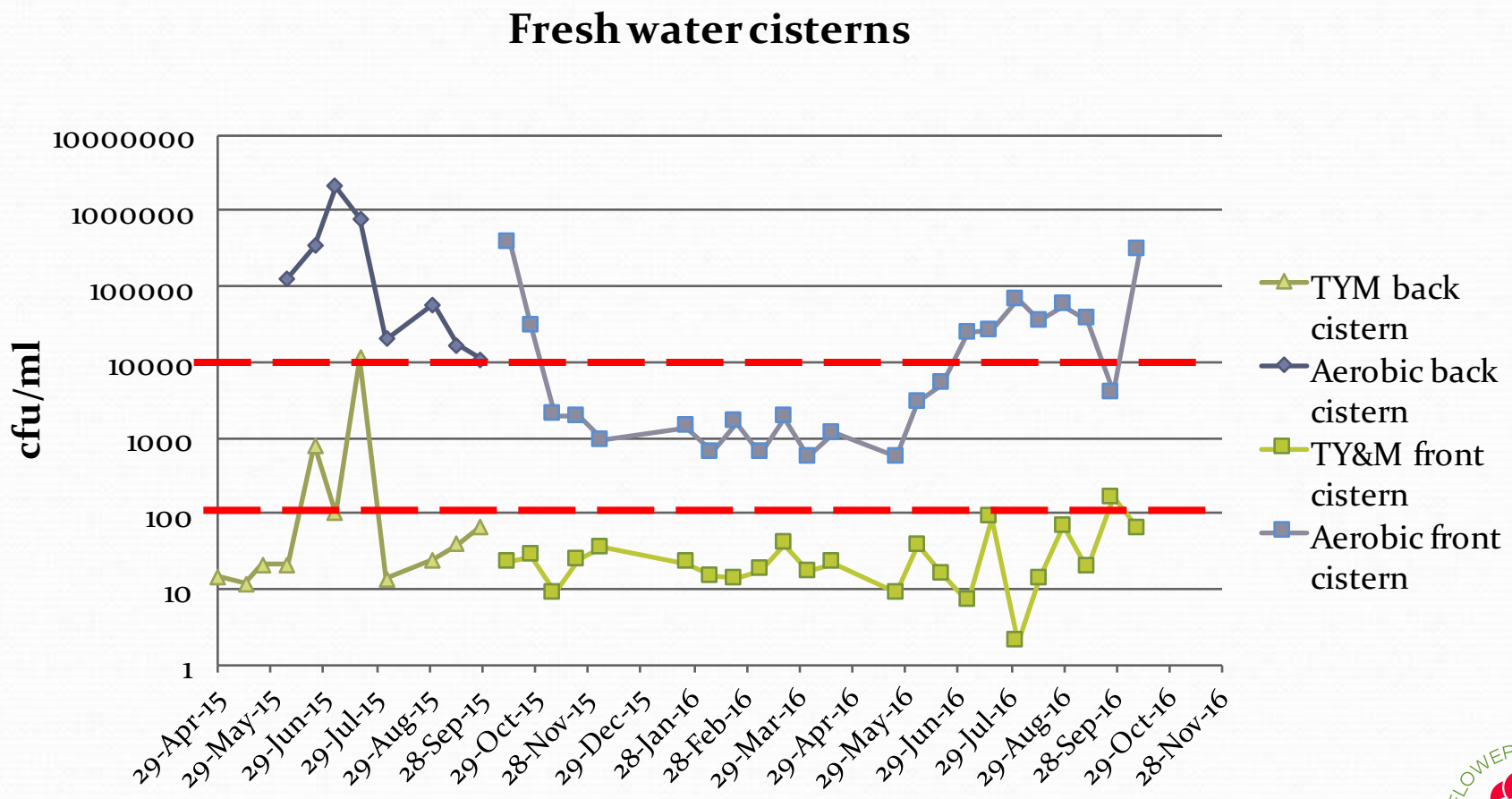
Typical results: treatment system performance



SRG Soil Resource Group

FLOWERS CANADA ONTARIO

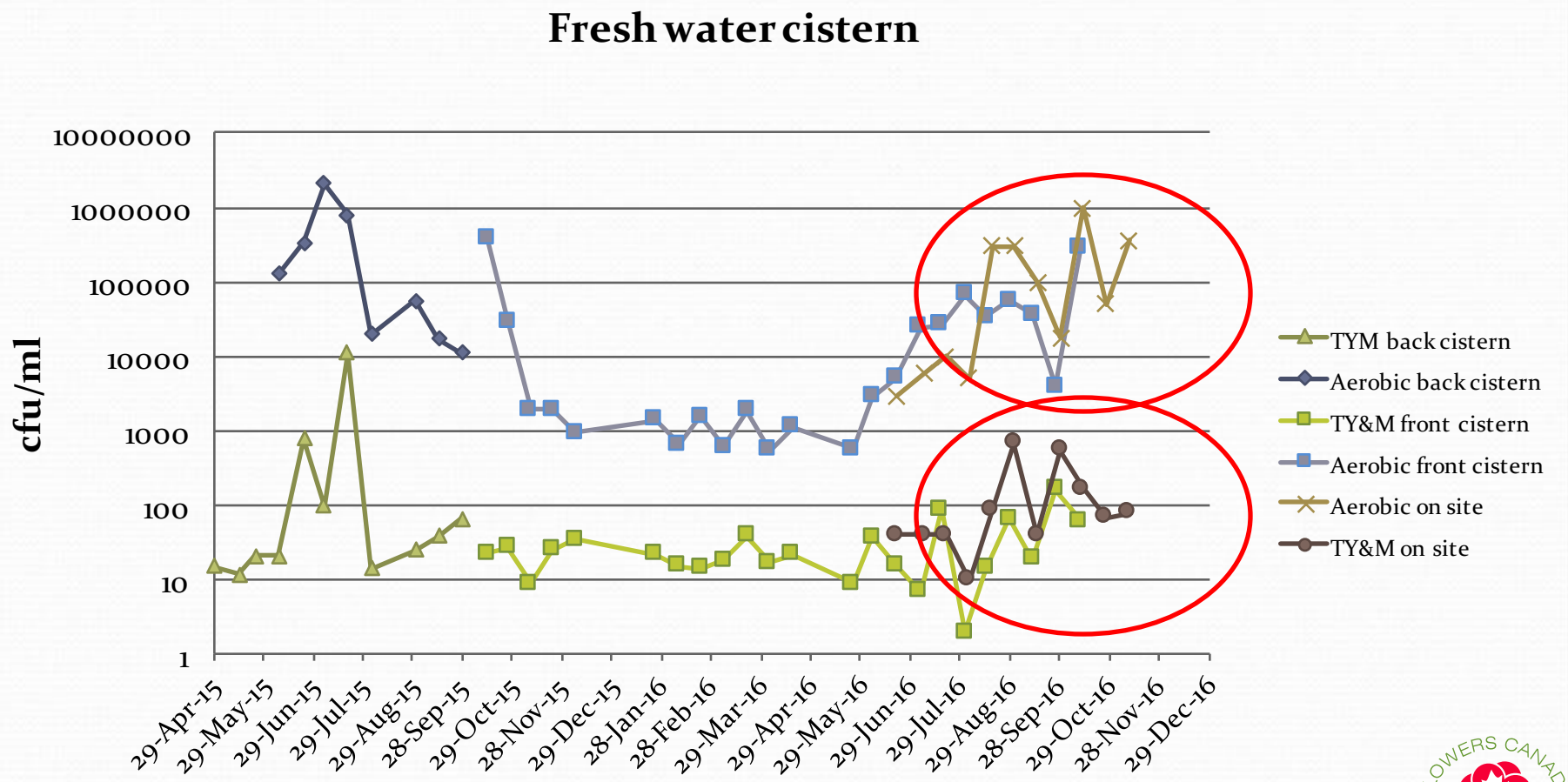
Typical results: changes over season and management



SRG Soil Resource Group

FLOWERS CANADA ONTARIO

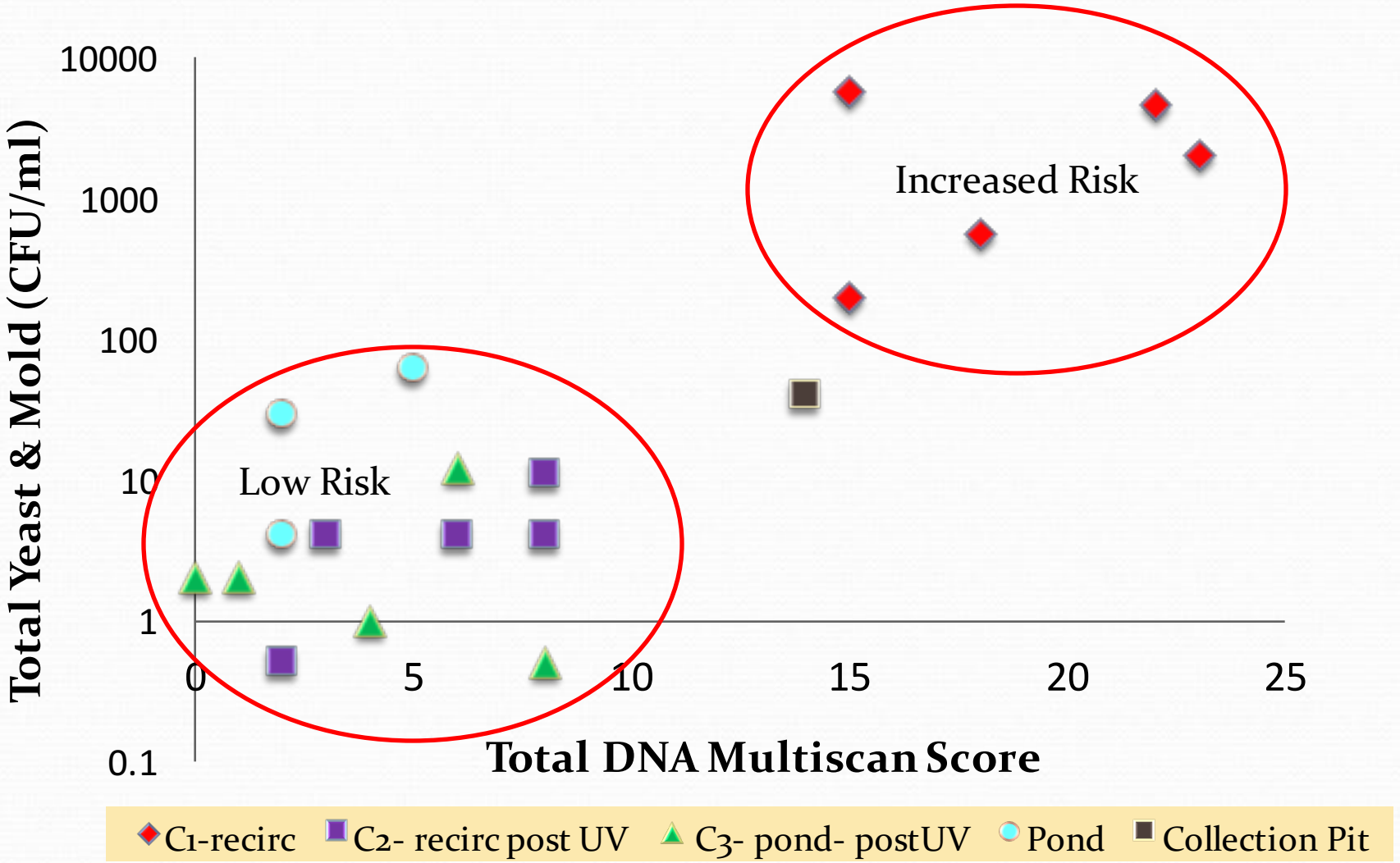
On-site comparisons



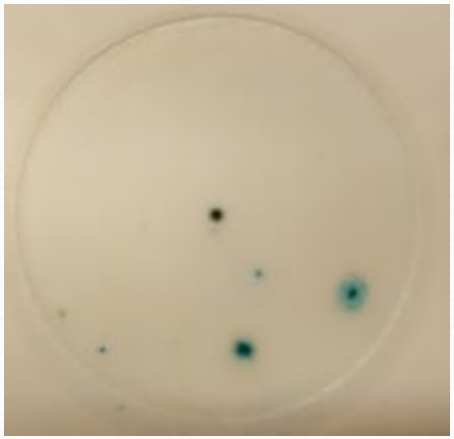
SRG Soil Resource Group

FLOWERS CANADA ONTARIO

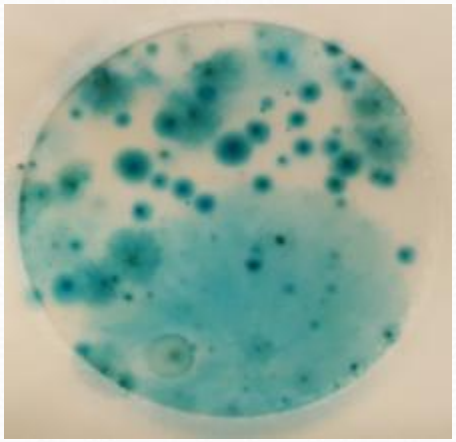
Implications for growers



RISK Determination



- Low counts
- Consistent results
- Treatment system OK
- Scouting looks OK
- Track changes in levels with water sources changes (e.g. pond vs roof)



- High counts
- Inconsistent results
- Unusual spikes in data
- Send for DNA multiscan?
- Extra scouting for issues?
- Check/maintain treatment equipment?
- Clean tanks, including feed tanks

SRG Soil Resource Group

FLOWERS CANADA ONTARIO

Equipment alternatives

OR

OR

$159 at Amazon.ca

$373 at Amazon.com

OR Room temperature for Aerobic and Y&M

Other parameters

- Test strips/meters for sanitizer residuals and other chemicals
  - **peroxide**
  - **chlorine – free & total**
  - **chlorine dioxide**

  - **pH**
  - **ammonia**
  - **nitrate**
  - **phosphate**

Next Steps

- **Workshops** – February:
  - Niagara area
  - Holland Marsh area
- **Ordering supplies and equipment** through FCO
  - SOON please!!!!!

- **Contact us:**
  - Ann Huber, SRG; ahuber@srgresearch.ca
  - Jeanine West, FCO; jeanine@fco.ca

SRG Soil Resource Group

FLOWERS CANADA ONTARIO

Acknowledgements

- Flowers Canada (Ontario) Inc.,
- Holland Marsh Growers Association & LSGBCUF project,
- Steering Committee Members, and
- Our Growers!!

This project was funded in part through *Growing Forward 2 (GF2)*, a federal-provincial-territorial-initiative. The Agricultural Adaptation Council assists in the delivery of *GF2* in Ontario.

Growing Forward 2 AAC agricultural adaptation council Ontario Canada