TECHNOLOGY OPTIONS FOR DEALING WITH WASTEWATER

- WHERE TO START?

GREENHOUSE ENVIRONMENT EDUCATION SESSION,
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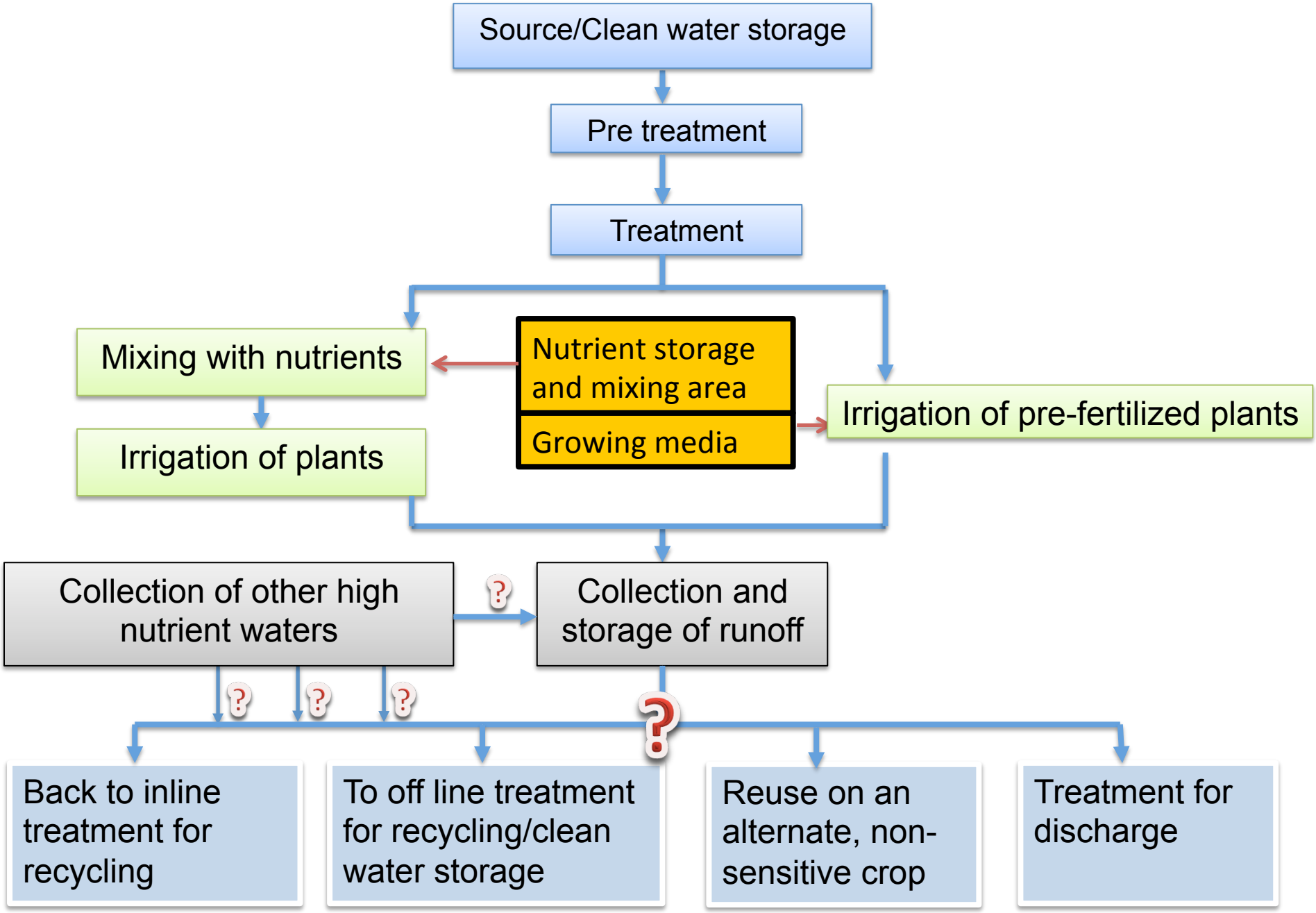
SRG
Soil Resource Group

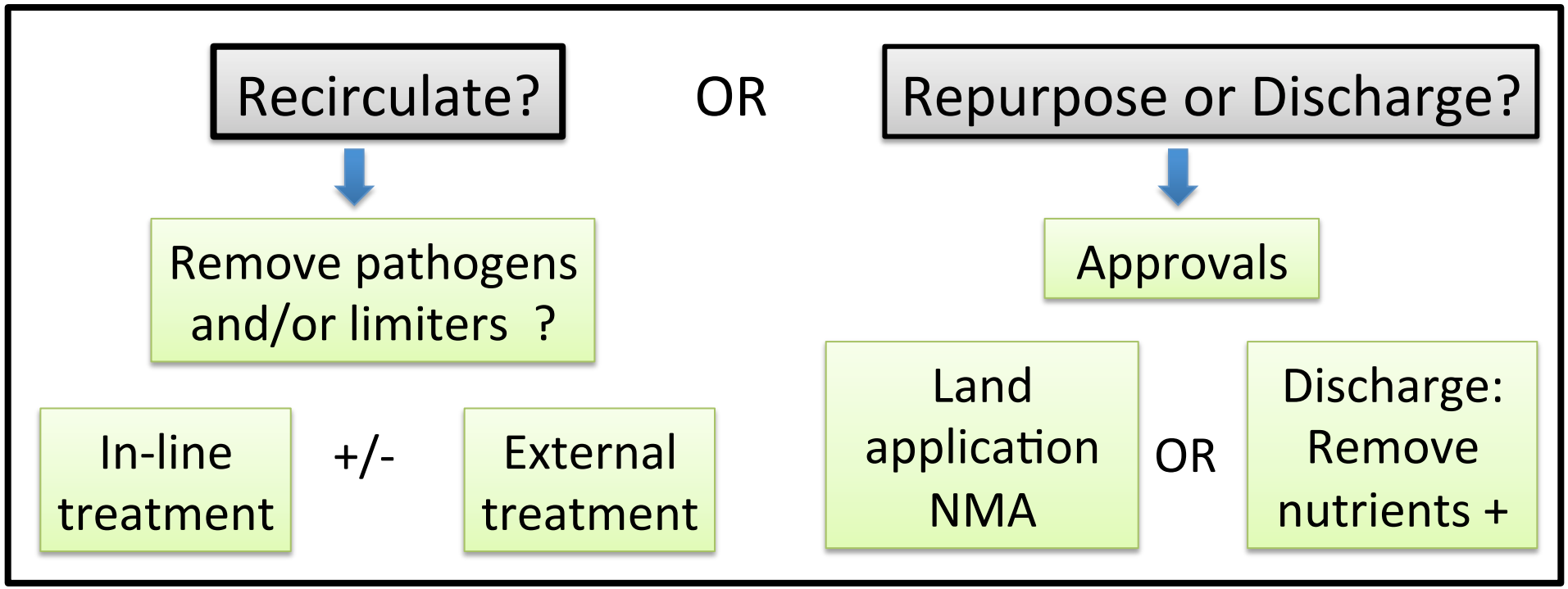
KNOW YOUR FARM!

- Map your farm and locate all of your water sources and 'losses'
- New OMAFRA BMP and Self-Assessment guide for water and fertilizer use in Greenhouse Floriculture …. coming soon!
- Water types
  - Volumes in and out – measure both!
  - Composition of each type (chemical & microbial)
- Does anything change seasonally??
- Water qualities that you need for your crops
  - What can you reuse? When or what can't you?


Source/Clean water storage
Pre treatment
Treatment
Mixing with nutrients
Nutrient storage and mixing area
Growing media
Irrigation of pre-fertilized plants
Irrigation of plants
Collection of other high nutrient waters
Collection and storage of runoff
Back to inline treatment for recycling
To off line treatment for recycling/clean water storage
Reuse on an alternate, non-sensitive crop
Treatment for discharge

WHAT DO YOU WANT TO DO?

- Separate your waters? YES!
- **Rule #1**: Keep the clean water clean!
- **Rule #2**: Optimize capture and good management of the 'used' water



RECIRCULATION

- Water Quality
- **Rule #3**: Keep track of water quality as well as quantity (in and out)
  - Pathogens and Overall Microbial load?
  - High ECs?
  - Specific elements of concern
    - Aluminum? Sodium? Chlorides? Others?
  - How well is your treatment system working?

- What crops are you putting it on? How sensitive are they?

TREATMENT OPTIONS FOR RECIRCULATION

- **Rule #4:** Aim for clean, not sterile
- In-line treatments, including
  - Filters plus….
  - H_2O_2
  - Chlorine; Chlorine dioxide
  - Copper ionization
  - UV
  - ECA (Electrolyzed water: H_2O+ NaCl → HOCl + NaOH)
  - Ozone
  - Heat
- External treatment systems, including
  - Woodchip bioreactors
  - Mineral media systems
  - Constructed wetlands
  - Hybrid treatment systems combining all 3

Construction of woodchip bioreactor



Oct 2008

Construction of a hybrid treatment system (HTS)

Vertical flow constructed wetlands

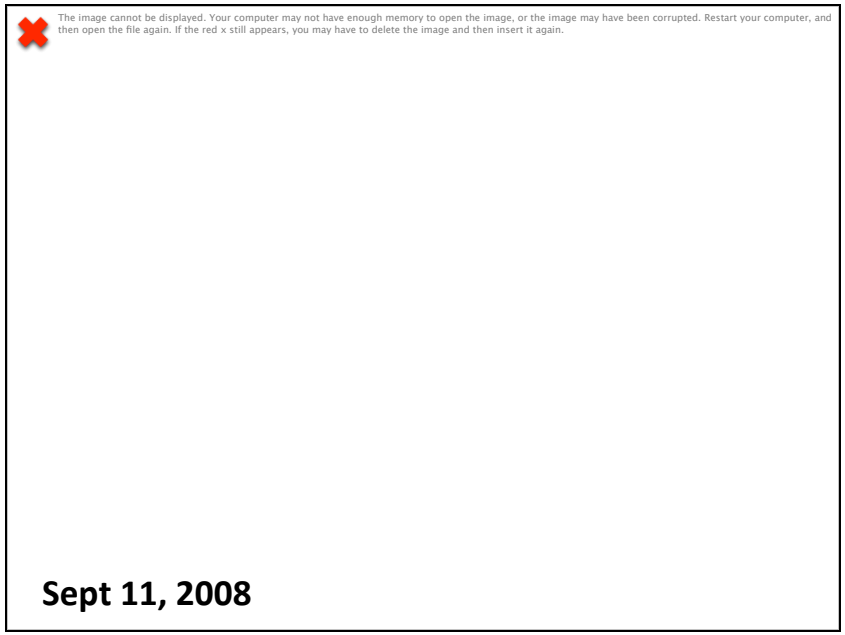
"RE-PURPOSE" or DISCHARGE

Rule #5: If it goes out of your system, you must have an approval

1. Land Application under the NMA
   - Greenhouse Nutrient Feedwater Ontario Reg 300/14

2. Discharge:
   - Must meet MOECC targets specific to watershed
   - Treat to remove nutrients etc. to the required target level, for example stormwater targets

Miscanthus trials (irrigation of nursery runoff)



POSSIBLE TREATMENTS FOR DISCHARGE

- External treatment systems
  - Denitrification bioreactor
  - Mineral media systems
  - Constructed wetlands
  - Hybrid treatment system combining all 3
- But…
- Vegetated filter strips (zero discharge design)
- Dry or wet swales
- Retention ponds

Vegetated filter strip: graded area and distribution system

Vegetated swale

Nothing works all the time & everywhere!

HOW TO DECIDE – "COMING SOON…"

- Matrix table to assist with decision making:
  - Type of operation
  - Type and volume of water
  - Nutrient level
  - Treatment options
  - Capital costs ($ per cu m/day treatment volumes)
  - Operating costs
  - Pros & Cons
- Guidance document at the end of the OMAFRA/CAAP HTS project
- Support from consultants & engineers
- FCO Water Specialist

RESOURCES

- http://watereducationalliance.org
- http://www.ces.uoguelph.ca/water