

CREATED WETLAND FOR WASTEWATER TREATMENT



SEPTEMBER,  
2002

# Wetland Biofilter System

- Original research funded by:
  - U.S. EPA
  - Ontario Ministry of Environment
- Vertical Flow Wetland System
  - Enhanced aerobic zones = better ammonia and phosphorus reduction
  - Smaller foot print
  - Winter time operation

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## Wetland designs:

- Surface-flow wetlands
- Subsurface horizontal flow wetlands
- Subsurface vertical flow wetlands

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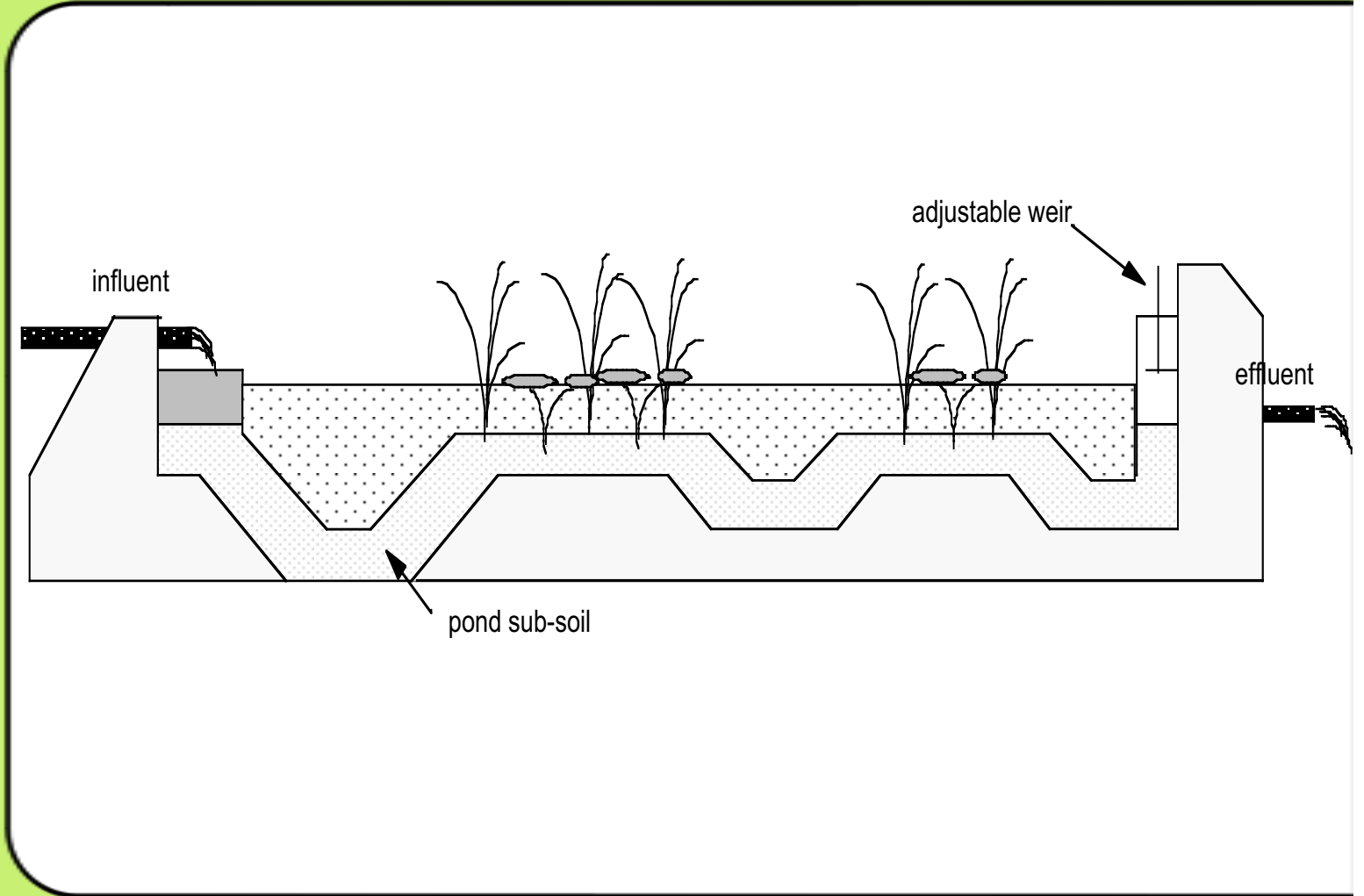


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## Surface-flow wetlands

- Mimic natural wetland systems / vegetation cultivated in shallow channels
- Wastewater flows through at low velocity
  - poor winter performance when treating high strength wastewater
    - requires significant land area
    - mosquito, odor

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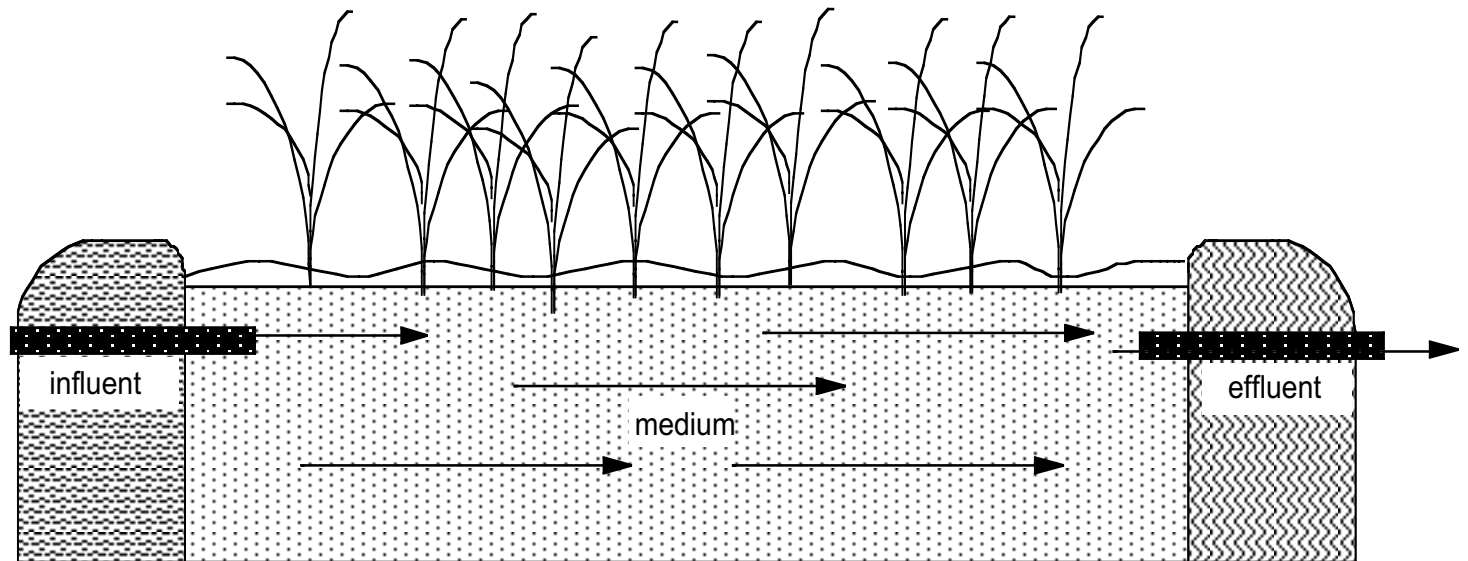
## Subsurface Flow Wetlands

- Sand medium to support aquatic plants
- Water level maintained below the sand
- Wastewater flows horizontally
  - insufficient aerobic zones to allow for good ammonia reduction
  - plugging of sand media leading to 'short circuiting'

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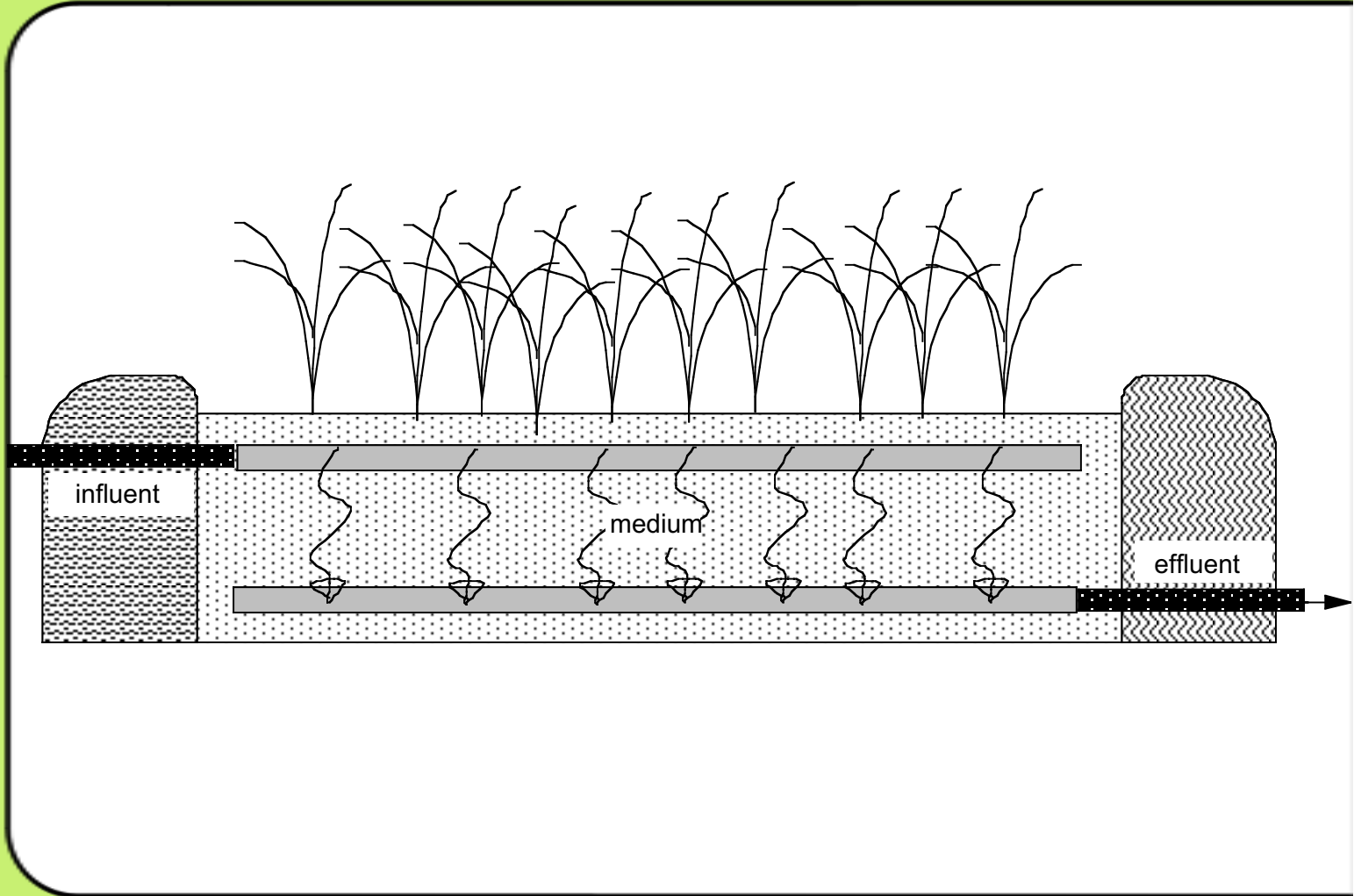
# Vertical Flow Wetlands

- Hybrid subsurface flow wetland
- History of development
- One or more cells in series
- Water percolates vertically down through medium

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- Draws oxygen through the medium
- Allows for increased contact between wastewater and sand, bacteria, plant roots
- Reduces the creation of channels (or short circuiting) around the roots of aquatic plants
- Provides tertiary treatment to sanitary sewage – winter and summer

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## Ten MOE approvals issued:

Niagara Under Glass WBS	C of A # 2111-4QTPKG
Pelee Island WBS	C of A # 7486-4NBQUU
Peninsula Ridge	C of A # 3455-58UM2Y
Vineland Estates	C of A # 6572-5ECQU9
East Dell Estates	C of A # 3784-56FQ7U
Welland Golf and Country Club	C of A # 7157-5A5NQE
Kurtz Orchards	C of A # 7056-5FTQBU
Lunge Lodge	C of A # 4896-5CYPNL
Georgian Bay Fishing Camp	C of A # 2967-5DTMPZ
Angel's Gate Winery	C of A # 1337-58VN9G

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## Hydraulic loading rates & wetland size

- Controlled by
  - 1) influent characteristics
  - 2) design objectives
- Liquid swine manure 30 L/m<sup>2</sup>/day (6 gal/yd<sup>2</sup>)
- Sanitary sewage : 120 L/m<sup>2</sup>/day (24 gal/yd<sup>2</sup>)
- Greenhouse leachate 300 L/m<sup>2</sup>/day (60 gal/yd<sup>2</sup>)

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## Treatment of liquid swine manure

- Purpose: reduce odors from the storage lagoon
- 2,000 pigs
- 2,000 L/day of Liquid Swine Manure drawn from the storage lagoon
- Treated water discharged back into the lagoon

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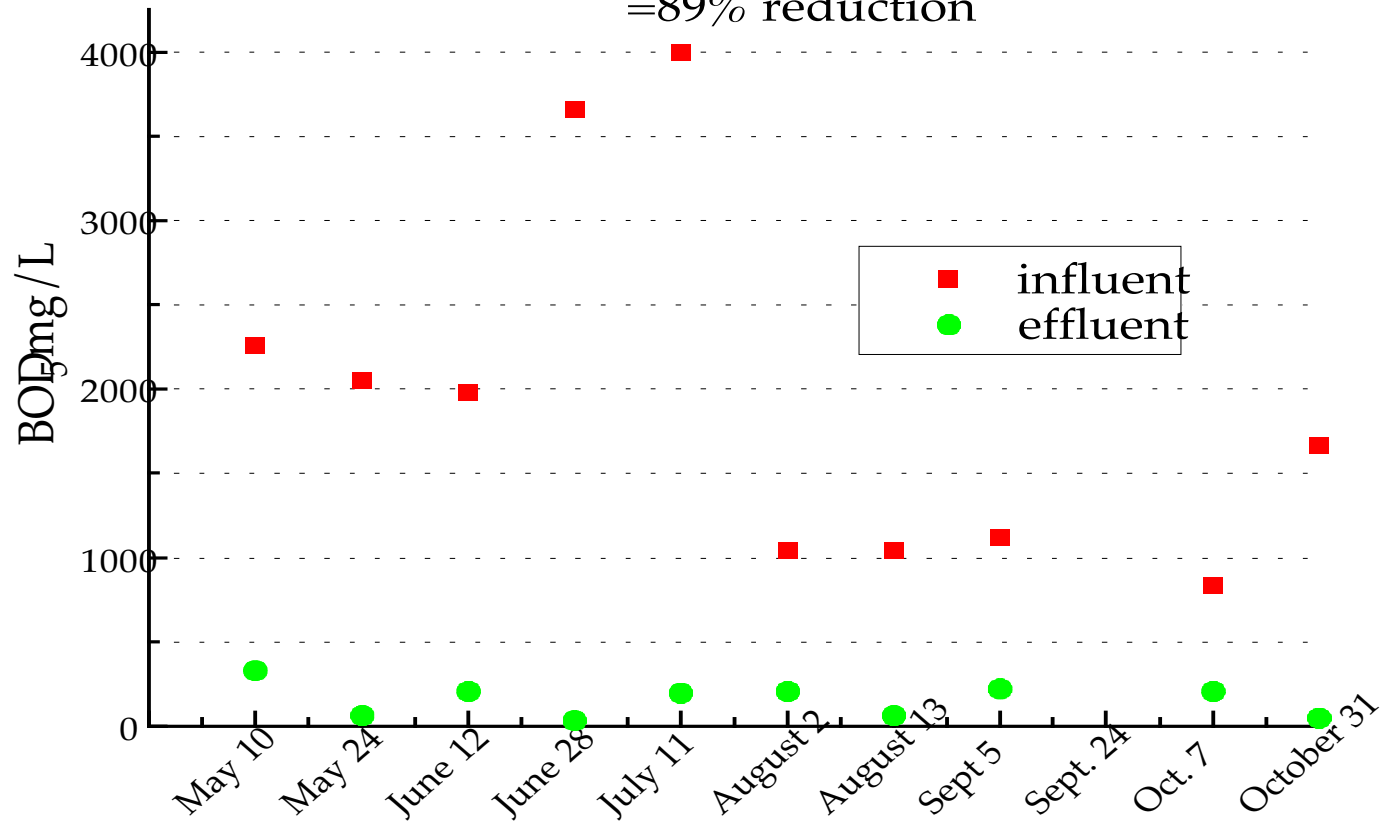


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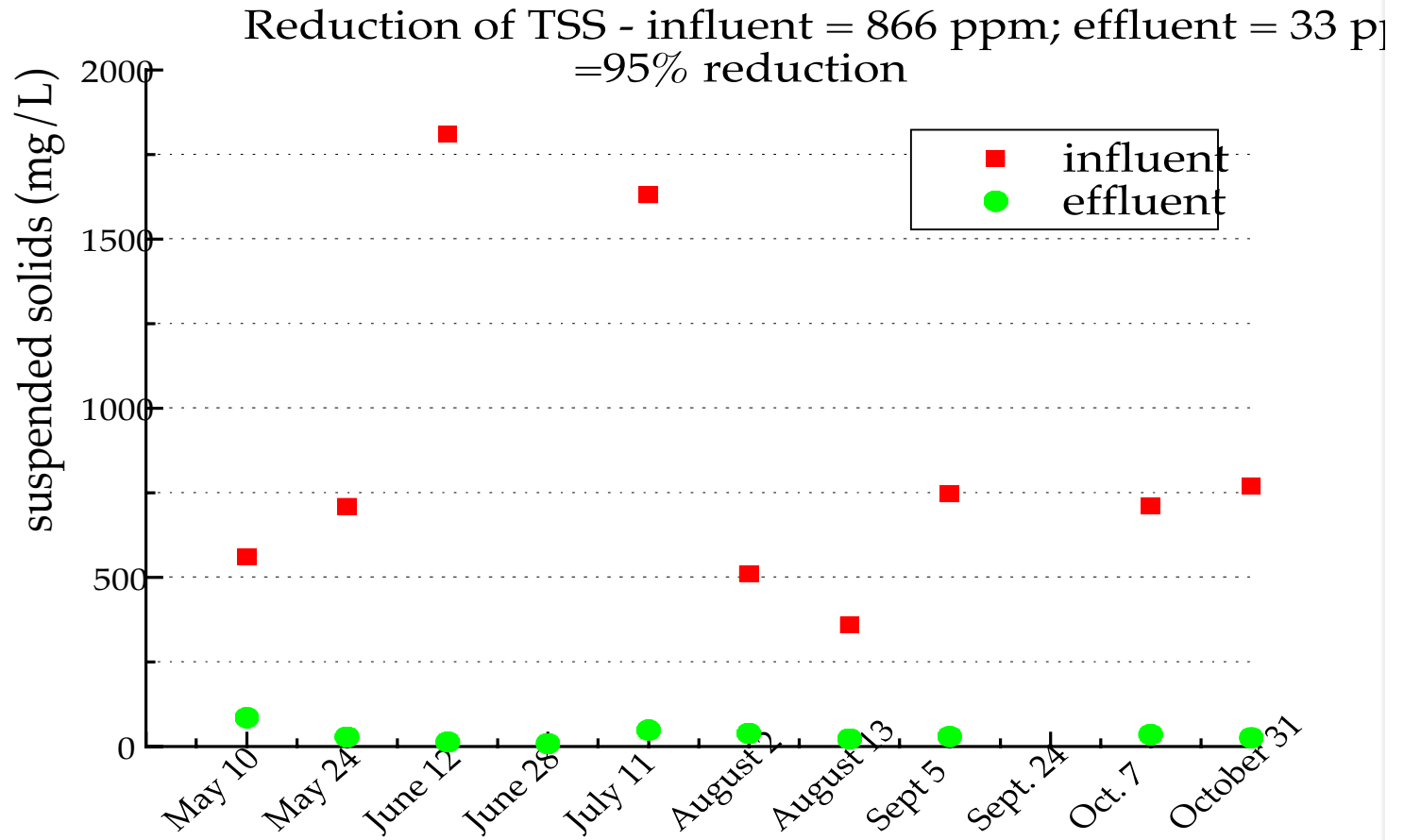
Reduction of BOD  
Influent = 1,967 ppm; effluent = 160 ppm  
=89% reduction



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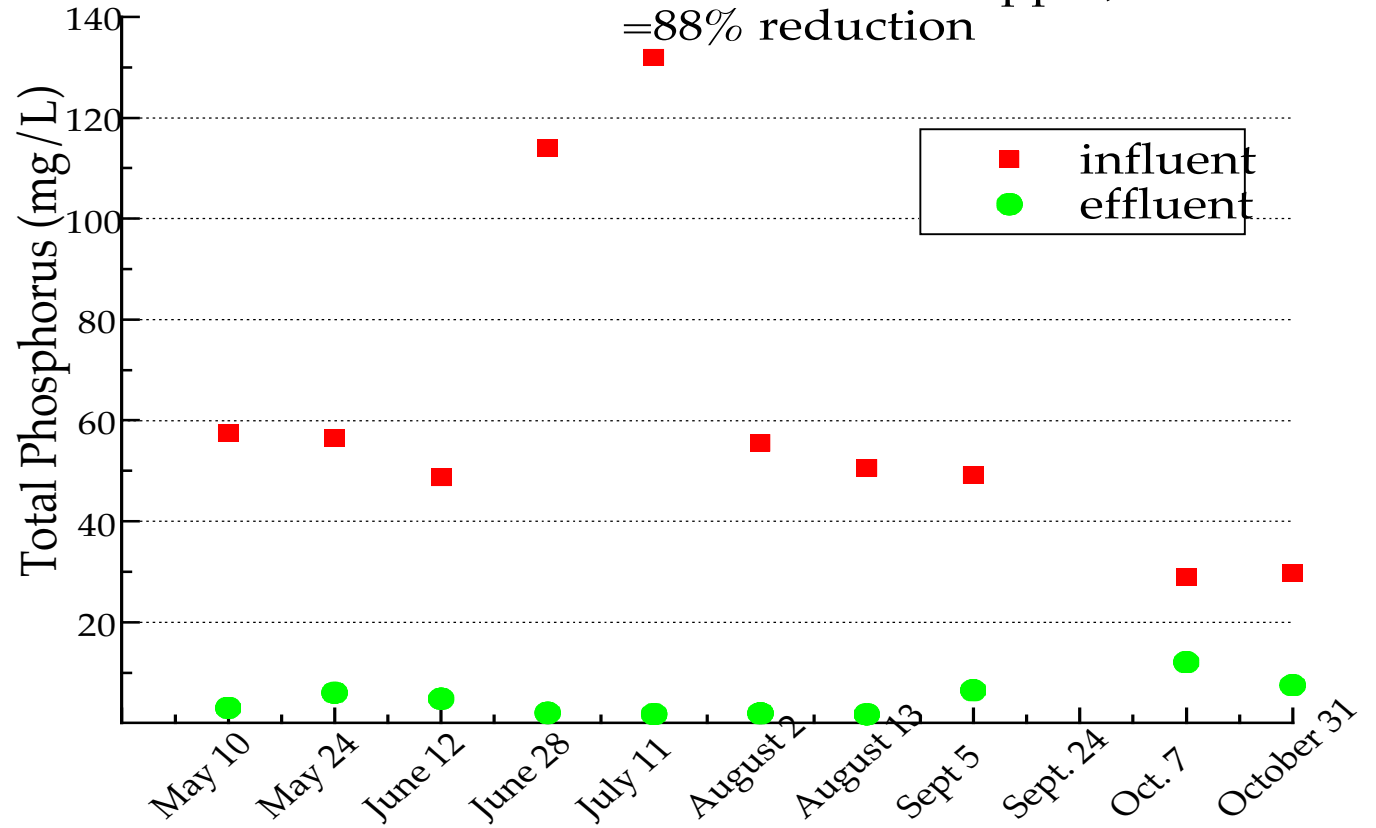


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Reduction of TP - influent = 62 ppm; effluent = 5 ppm  
=88% reduction

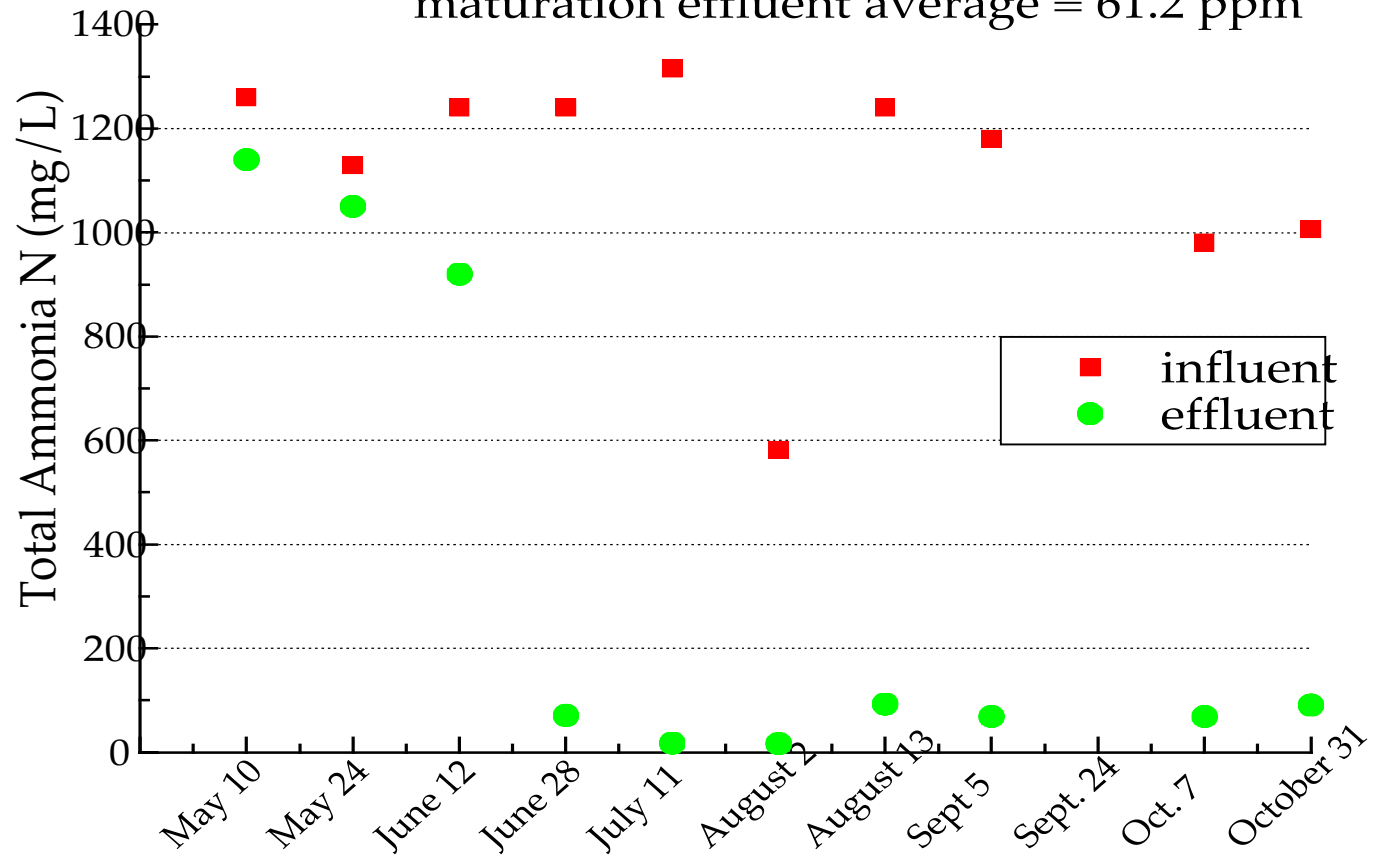


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Reduction of Ammonia - influent = 1,117 ppm; after system maturation effluent average = 61.2 ppm



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## RosaFlora Greenhouses

- Treatment of irrigation leachate water
- 400,000 liters / day (100,000 gal/day)
- endosulfan (organochlorine pesticide)
- 2-300 times P.W.Q. Guidelines
- H.L. of 300 liters / m<sup>2</sup> day (60 gal/yd<sup>2</sup>)
- 1,600 yd<sup>2</sup> wetland system

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