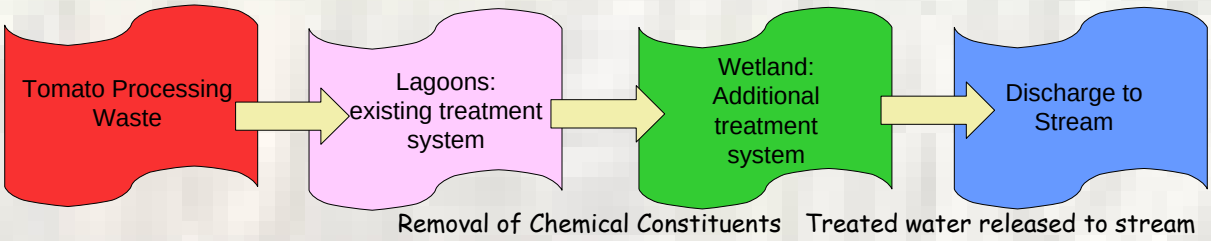
Constructed Wetland Design for the Treatment of Wastewater from a Tomato Canning Process in Central Indiana

Diane Fink & Sarah Amlung

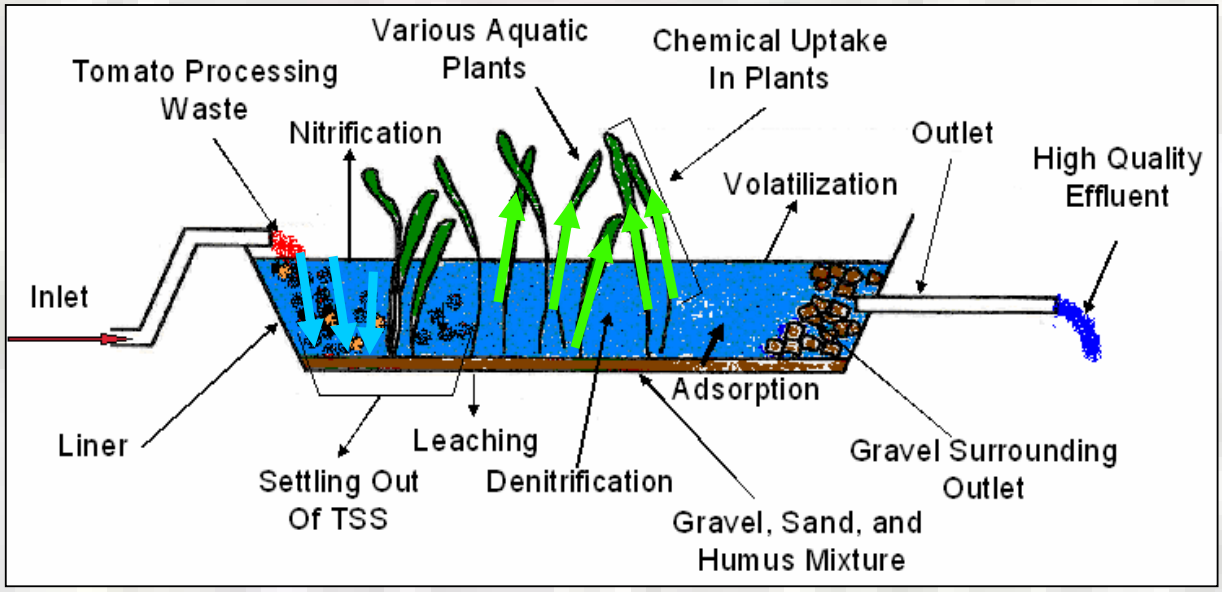
Problem Statement:

A tomato canning company in Central Indiana is looking to obtain a new permit, from IDEM, allowing a discharge period of eleven months. The permit requires that they reduce the chemical constituents in the tomato processing wastewater before being discharged into a nearby stream.

Overall Waste Treatment Process



Wetland Process



Objective:

Design a constructed wetland for the treatment of wastewater from a tomato canning company in Indiana that will improve the waste water after being treated in two lagoons, pumped into the wetland itself, and then released into a nearby stream to meet regulations of the eleven month permit.

Current Lagoons From Which the Wastewater will be Pumped into the Wetland

Proposed Design Area Where Wetland will be Constructed

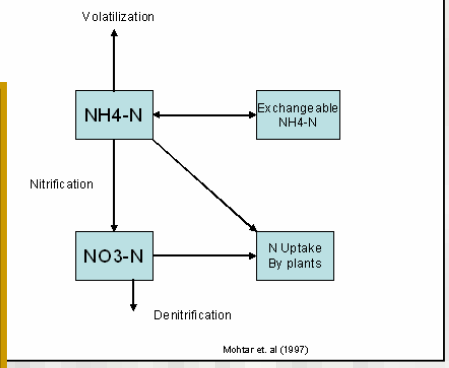
Stream Where the Treated Waste will be Released

Methods:

- Determined limiting factor by establishing a detention time (amount of time waste is kept in wetland) for each effluent.
  - BOD, N, TSS
- Longest detention time was the limiting factor the wetland design was based upon.
- From detention time, the wetland was sized

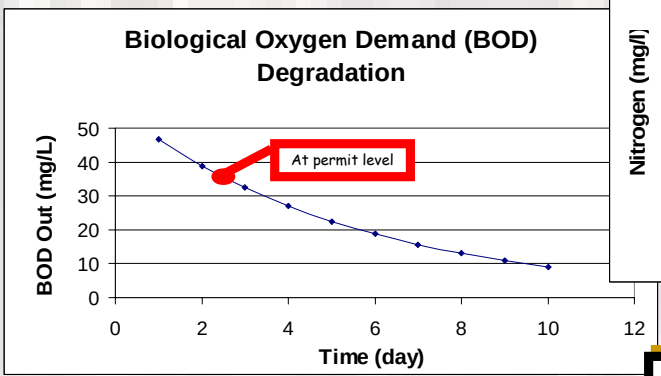
- **Nitrogen (N)**
  - Using wetland Nitrogen Cycle with simplified version GRASIM - a Grazing Simulation Model, Mohtar et. al (1997)
  - Graphically analyzed content versus time

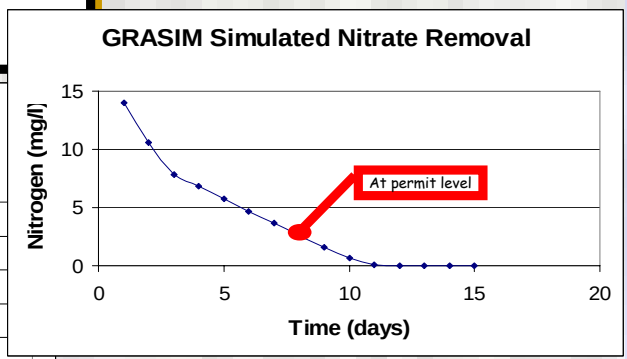
Wetland Nitrogen Cycle



- **Biological Oxygen Demand (BOD)**
  - Calculated removal rate constant
  - Used constant to calculate outflow concentration
  - Graphically analyzed content versus time

*Equation from EPA Constructed Wetlands Manual, 2000





- **Total Suspended Solids (TSS)**
  - Permit Levels do not change

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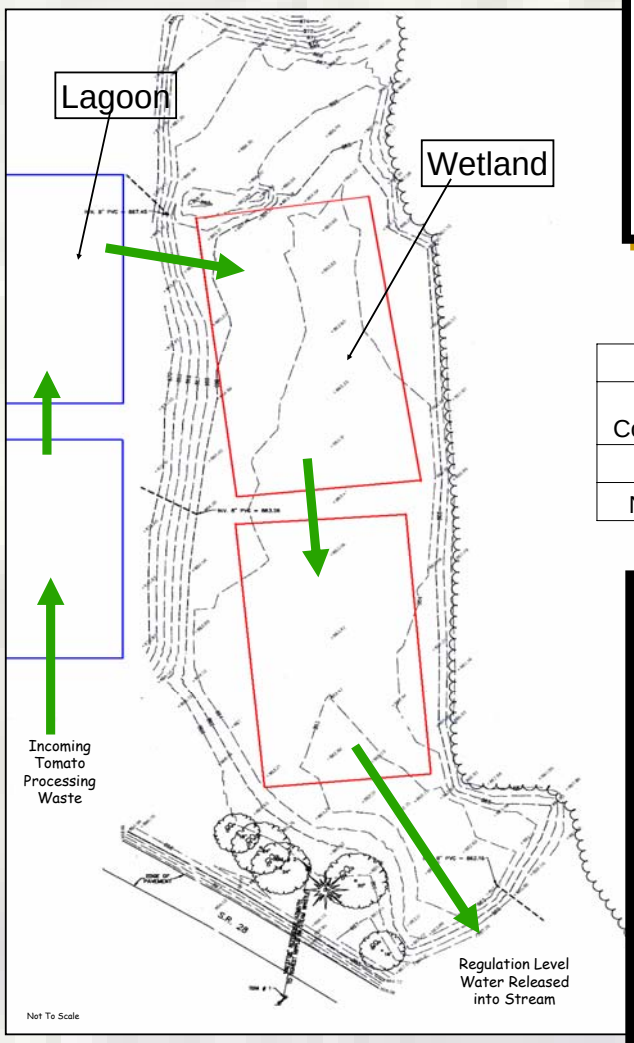
Current Location of Lagoons and Proposed Placement of wetland Cells



Results:

- 11 day detention time to ensure permit discharge levels are met during various conditions
- Calculated overall volume of 3200 m^3

Wetland Validation Analysis

Discharge Rates After 11 Days (mg/l)			
Constituent	From Lagoon	From Wetland	Permit Level
BOD	56	7.5	35
Nitrogen	17.5	0	1.5

Additional Design Information:

- Two cells in series for maximum results
- All PVC piping
- Simple plastic liner
- Gravel surrounding inlet and outlet
- Native plants: sedges, bulrush, cattail, rushes
- Recommended soil: pea size gravel mixed with sand and humus

Impacts to the Region:

This service learning experience will impact central Indiana in the following ways:

- Enable a family owned company to sustain its business in the community
- Improve water quality along with the quality of life
- Maintain the sustainability of the ecosystem

Wetland Cell Design Specifications

Flow Into Wetland (m^3/d)	283.9
Detention Time (day)	11
Total Volume (m^3)	3200
Volume of Each Cell (m^3)	1600
Length (m)	80
Width (m)	20
Depth (m)	1

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Environmental Protection Agency

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