

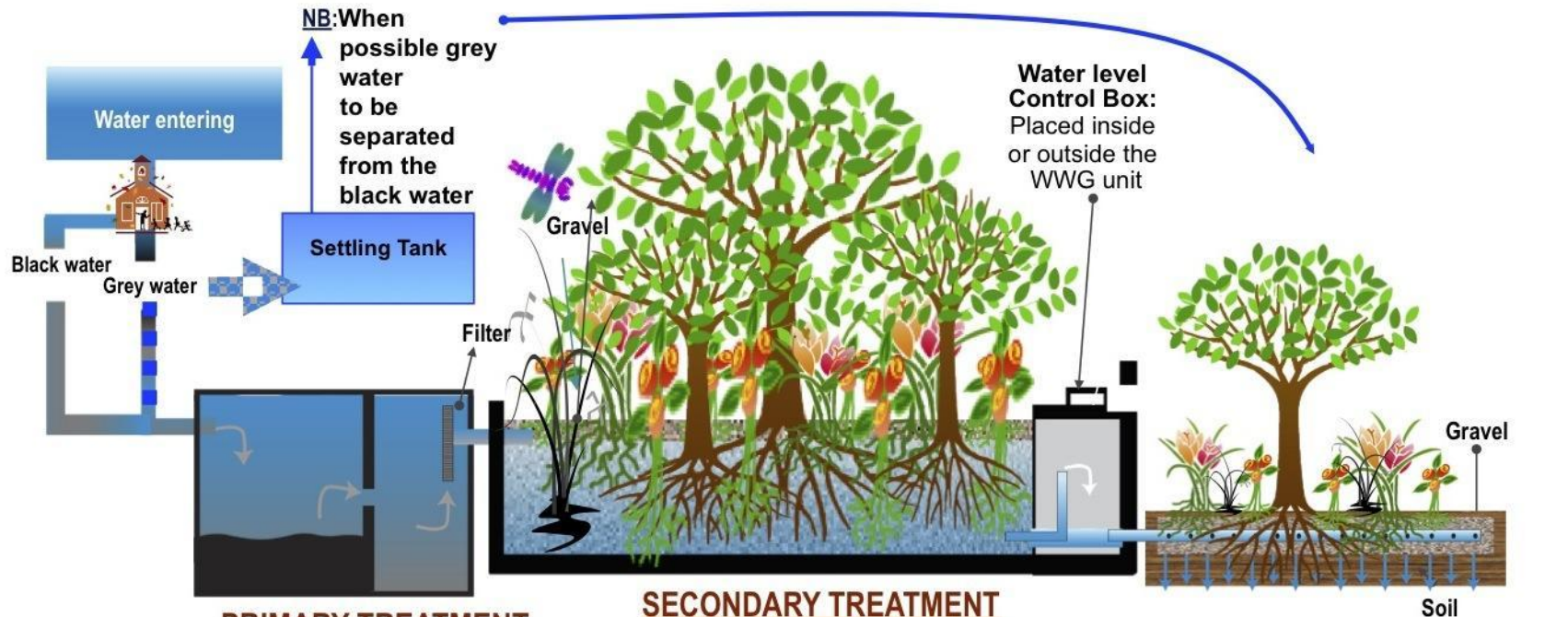
Wastewater Treatment

- ▶ Why should we treat our wastewater?
- ▶ What would be a consequence of NOT treating our water so completely?
- ▶ What eco-systems are most vulnerable to pollution and contamination?

- Septic
- Wetland
- Aerating Pond



Schematic for the Wastewater Gardens (WWG) system



PRIMARY TREATMENT

SEPARATION OF SOLIDS FROM LIQUIDS

For organic wastewater: Septic tanks (here on schematic), Faecal bags, Imhoff, screener,....

For highly polluted wastewater and/or industrial wastewater: system adapted to nature of wastewater

-If using a septic tank: Residence time should be at least 2.5 days.



SLUDGE SECONDARY TREATMENT AND REUSE

If organic: composting, drying-bed, vermicompost, methane production, ...

SECONDARY TREATMENT

WWG Unit

Subsurface Flow constructed wetland (SFCW)

NB: - Drawing here is of an horizontal flow CW with a minimum residence time of 4 days

- SFCWs can also be designed to provide PRIMARY treatment or TERTIARY treatment.

REUSE OR DISPOSAL OF TREATED WATER

- Small scale systems: drainage trenches filled with gravel adapted to local soil permeability.

- Medium to large scale systems: Tertiary treatment applied or direct disposal in water ways or reuse for additional productive green zone.

Wastewater Treatment



- ▶ How do Constructed Wetlands Treat Sewage Water
 - ▶ Plants, Microbes, Sunlight, and Gravity
 - ▶ Sedimentation and Physical Filtration
 - ▶ Biological Uptake
 - ▶ Transformation of nutrients
 - ▶ Bacteria – Aerobic and Anaerobic
 - ▶ Plant Roots and Metabolism
 - ▶ Chemical Process –
 - ▶ Precipitation
 - ▶ Absorption
 - ▶ Decomposition
 - ▶ WATER CONSUMPTION

Constructed Wetlands

BLACK / FAECAL WASTEWATER				ALL WASTEWATER (BLACK WATER + GREY WATER)			
Parameters of analysis	Entrance WWG unit/s	Exit WWG unit/s		Parameters of analysis	Entrance WWG unit/s	Exit WWG unit/s	
COD	1200	120	mg/L	COD	500	120	mg/L
BOD5	500	25	mg/L	BOD5	308	25	mg/L
NH4 / Amonium N	62.5	10	mg/L	NH4 / Amonium N	20	10	mg/L
NO3-N / Nitrate N	125	10	mg/L	NO3-N / Nitrate N	68	10	mg/L
NT	187.5	20	mg/L	NT	88	20	mg/L
PO4 / Phosphate	18.75	5	mg/L	PO4 / Phosphate	23.4	2	mg/L
TSS (Total Susp. Solids)	230	30	mg/L	TSS (Total Susp. Solids)	228	30	mg/L
Coliforms bacteria	1800000	99	% + elimination	Coliforms bacteria	1800000	99	% + elimination

- COD - Chemical Oxygen Demand – Measures the Amount of organic compounds in water
- BOD - amount of dissolved oxygen needed (i.e., demanded) by aerobic biological organisms to break down organic material present in a given water sample at certain temperature over a specific time period. – Basically a measure of pollution



Constructed Wetlands

Advantages



- ▶ Highly Effective treatment of different contaminants and nutrients that could pollute waterways and/or groundwater
- ▶ System is Natural, Biological, and Chemical – Emulating effective natural wetlands
- ▶ System gets MORE effective over time – as opposed to degrading over time as most technologies do
- ▶ Requires no input of energy or chemicals
- ▶ Make great habitats for plants and animals
- ▶ We can sleep well knowing we are doing all we can to prevent contamination from the operation of our lodge!