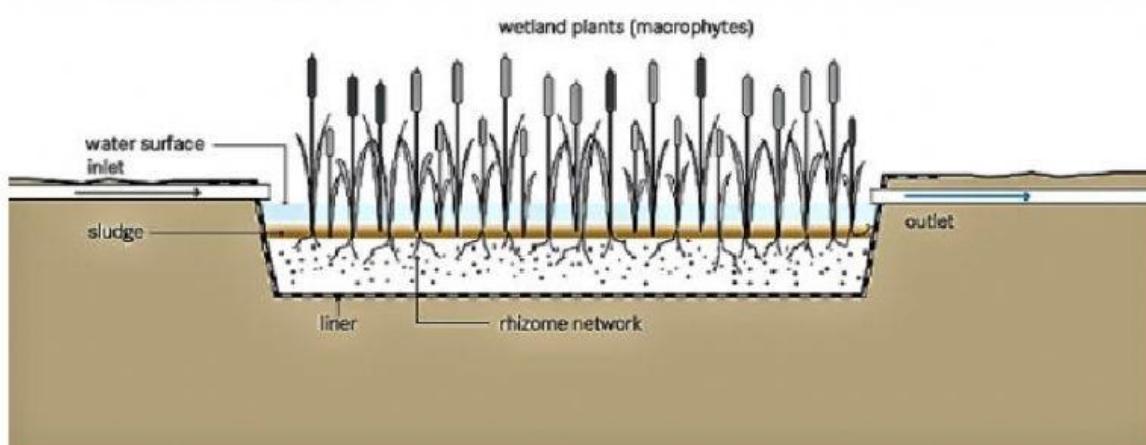


Feb. 22-26 Station 3: Explain Plan an Investigation

We know that wetlands help to slowly filter the water that moves through them. In fact—wetlands work so well to purify water—that communities have built artificial wetlands (called constructed wetlands) to filter waste water. Constructed wetlands represent an engineered ecosystem that can be built anywhere, including next to housing communities.

The three primary designs used for constructed wetlands are below.

Free-Water Surface Constructed Wetland	
<p>Description: A free-water surface constructed wetland aims to replicate the naturally occurring processes of a natural wetland, marsh or swamp. As water slowly flows through the wetland, particles settle, pathogens are destroyed, and organisms and plants utilize the nutrients. This type of constructed wetland is commonly used as an advanced treatment after secondary or tertiary treatment processes.</p>	
<p>Advantages:</p> <ul style="list-style-type: none">• Aesthetically pleasing and provides animal habitat• High reduction of BOD and solids; moderate pathogen removal• Can be built and repaired with locally available materials• No electrical energy is required• No real problems with odors if designed and maintained correctly• Low operating costs	<p>Disadvantages:</p> <ul style="list-style-type: none">• May facilitate mosquito breeding• Requires a large land area• Long start-up time to work at full capacity• Requires expert design and construction



Horizontal Subsurface Flow Constructed Wetland

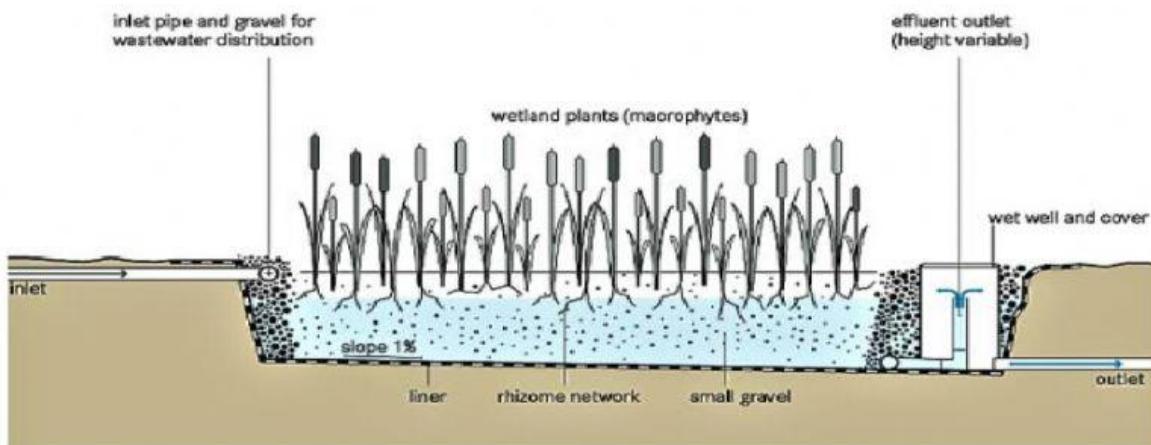
Description: A horizontal subsurface flow constructed wetland is a large gravel and sand-filled basin that is planted with wetland vegetation. As wastewater flows horizontally through the basin, the filter material filters out particles and microorganisms degrade the organics.

Advantages:

- High reduction of BOD, suspended solids and pathogens
- Does not have the mosquito problems of the Free-Water Surface Constructed Wetland
- No electrical energy is required
- Low operating costs

Disadvantages:

- Requires a large land area
- Little nutrient removal
- Risk of clogging, depending on pre- and primary treatment
- Long start-up time to work at full capacity
- Requires expert design and construction supervision



Vertical Flow Constructed Wetland

Description: A vertical flow constructed wetland is a planted filter bed that is drained at the bottom. Wastewater is poured or dosed onto the surface from above using a mechanical dosing system. The water flows vertically down through the filter matrix to the bottom of the basin where it is collected in a drainage pipe. The important difference between a vertical and horizontal wetland is not simply the direction of the flow path, but rather the aerobic conditions.

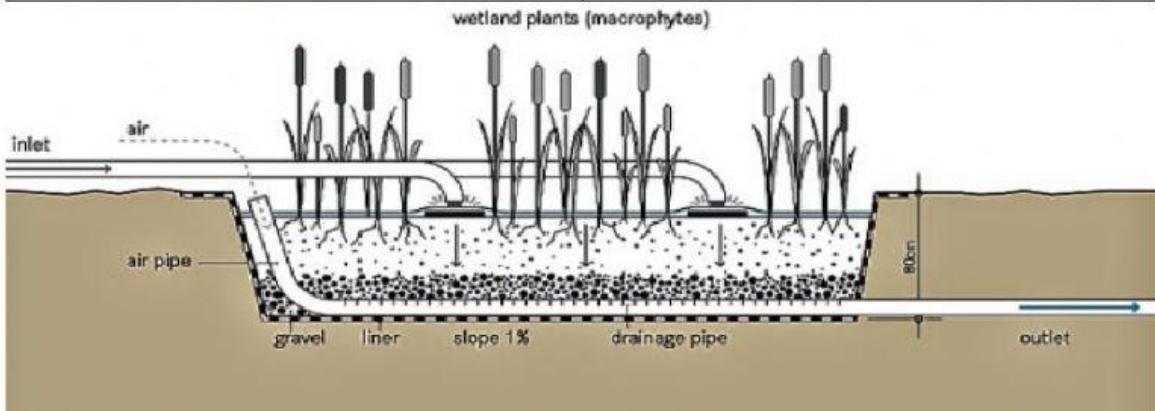
Advantages:

- High reduction of BOD, suspended solids and pathogens
- Ability to nitrify due to good oxygen transfer

Disadvantages:

- Requires expert design and construction, particularly, the dosing system
- Requires more frequent maintenance than a Horizontal Subsurface Flow Constructed Wetland

<ul style="list-style-type: none"> • Does not have the mosquito problems of the Free-Water Surface or Horizontal Wetland • Less clogging than in a Horizontal Subsurface Flow Constructed Wetland • Requires less space than a Free-Water Surface or Horizontal Flow Wetland • Low operating costs 	<ul style="list-style-type: none"> • A constant source of electrical energy may be required • Long start-up time to work at full capacity • Not all parts and materials may be locally available
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Craigmont Middle School wants to get clean water for the school using a constructed wetland. You have been given the job of deciding which of these designs would be best for the school. Use the advantages and the disadvantages for each design to make your decision.

Question 1: Which design do you think Craigmont should choose and why?

Question 2: What affects do you think the construction of this wetland would have on the ecosystem that already exists in the area?

Question 3: As you have learned in previous stations today, humans can have a negative impact on wetlands. If we constructed a wetland near the school, we need to ensure that the wetland stays safe. What are three potential ways that humans might impact our new wetland?

Question 4: How could we keep track of the impacts humans have on our new wetland?

Question 5: How could we mitigate these effects? In other words, what could we do to ensure that the negative impacts don't ruin our new wetland?