

# This presentation premiered at WaterSmart Innovations

[watersmartinnovations.com](http://watersmartinnovations.com)



# Up S\*\*t Creek: How We Got Hooked On Sewage and How We Can Break the Habit

Presenter: Don Mills, Clivus Multrum, Inc.

# Presentation Outline

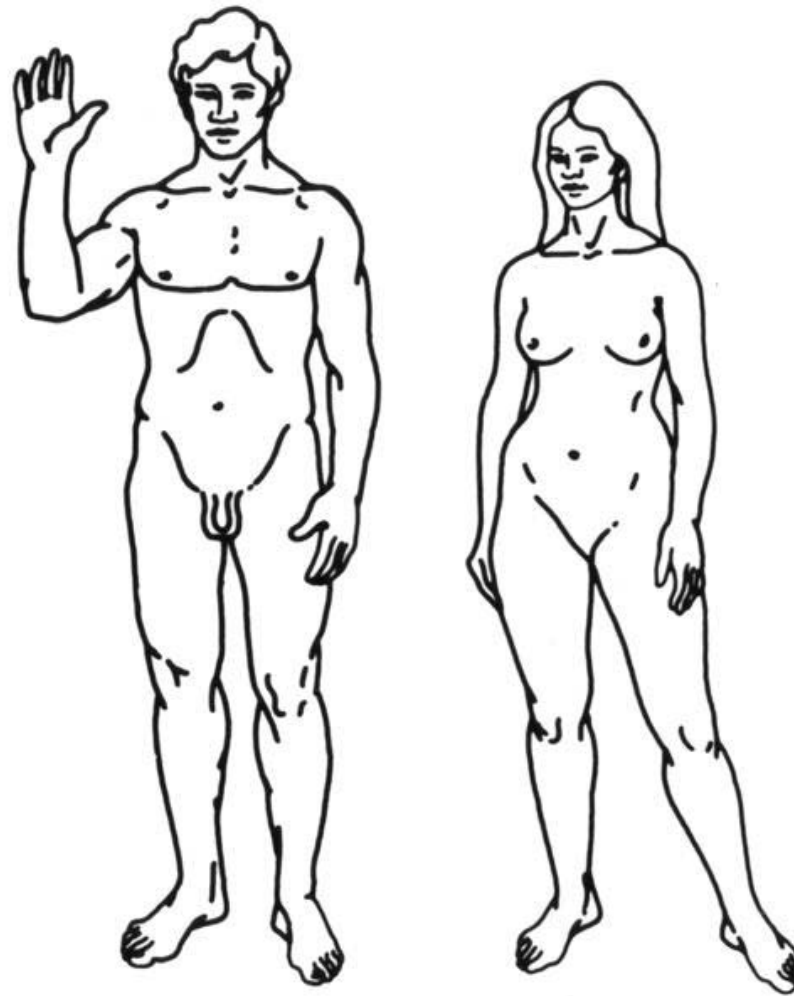
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- Background on Pollution Issues
- Rationale for Composting and Greywater Systems
- Composting Toilet Systems Design
- Greywater Systems Design
- Systems Maintenance
- Examples

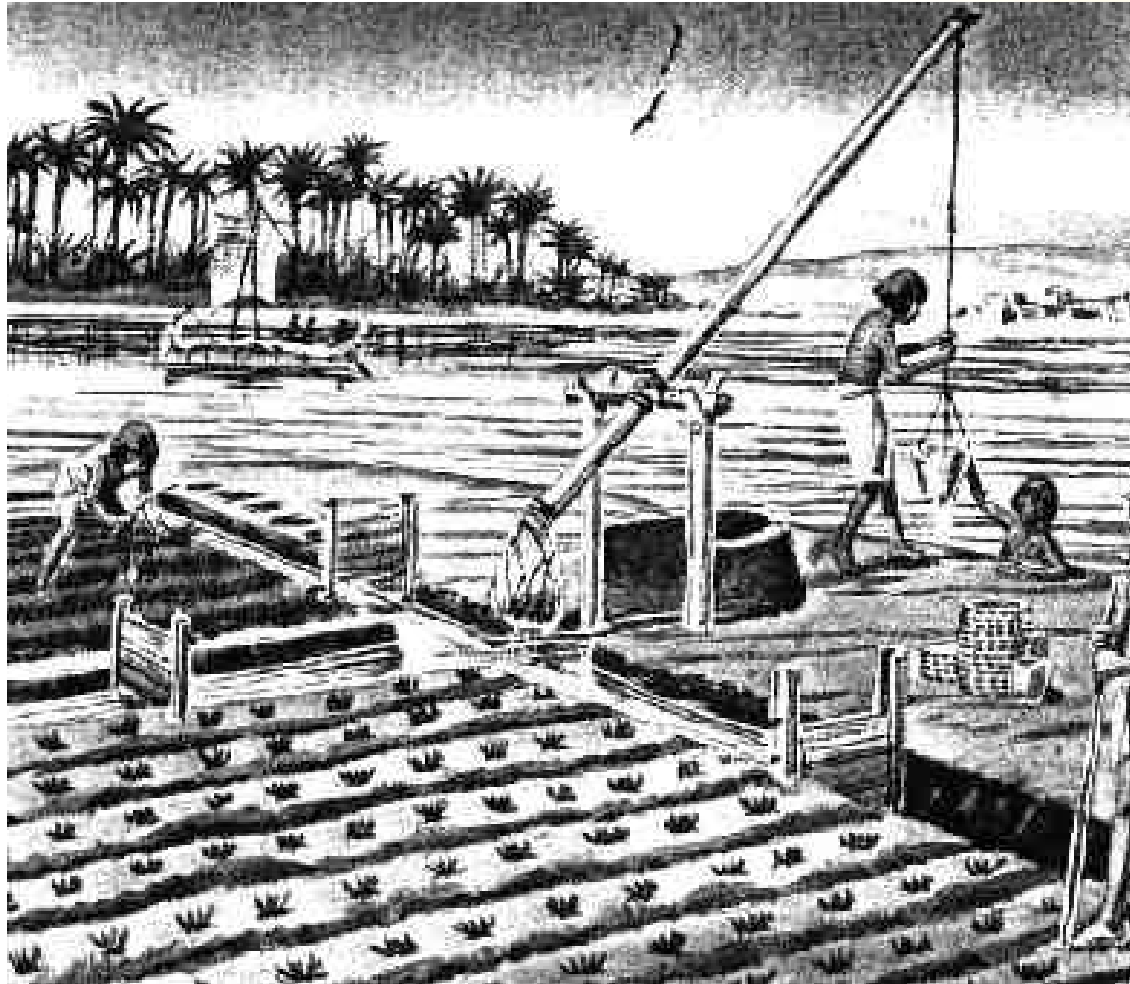
# Early Homo Sapiens



# Early Homo Sapiens II (friendly)



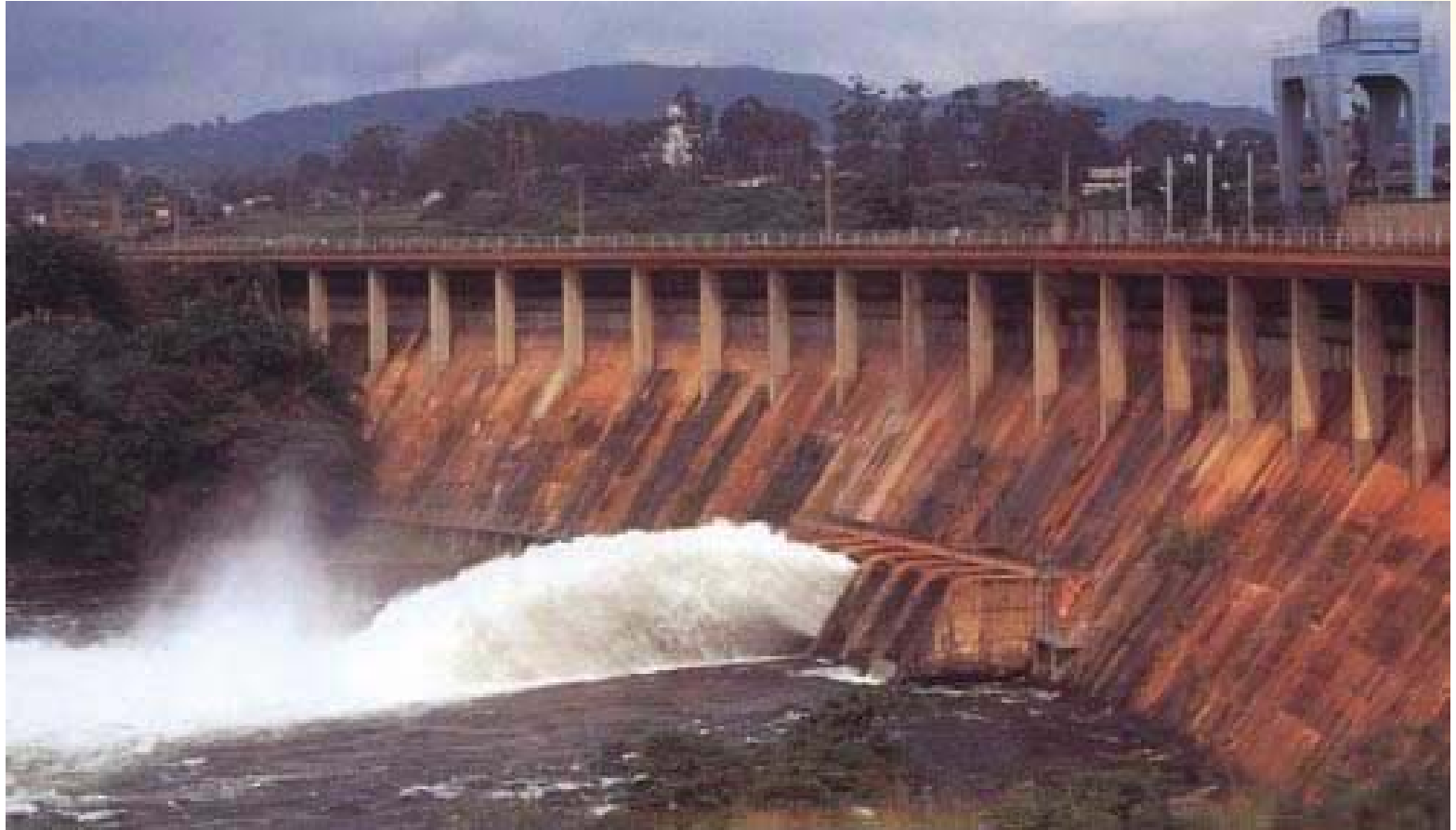
# Continuous Cultivation = Culture



# Differentiation of Labor

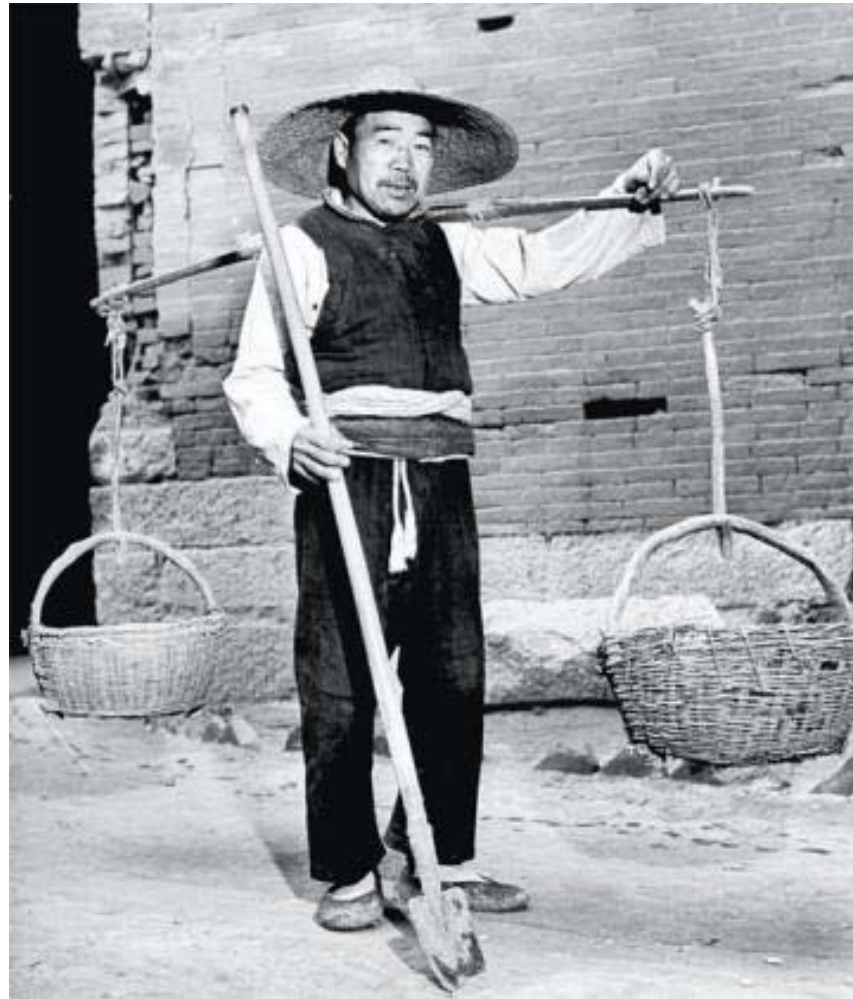


# High Aswan Dam





# Night Soil Collector--Shanghai



# Regressive Delivery Device



# Haber-Bosch Process



Fritz Haber 1918

Ammonium-Nitrate  
Fertilizer Production:  
more than 100 million  
tons world-wide

# Human Population Growth

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- 1800: 1 billion
- 1920: 2 billion
- 2010: 7 billion
- 2100: 14 billion (UN estimate)

# Chemical Fertilizer, Pesticides, Antibiotics



# Monocultures



# Factory Food



# Eating Our Oil

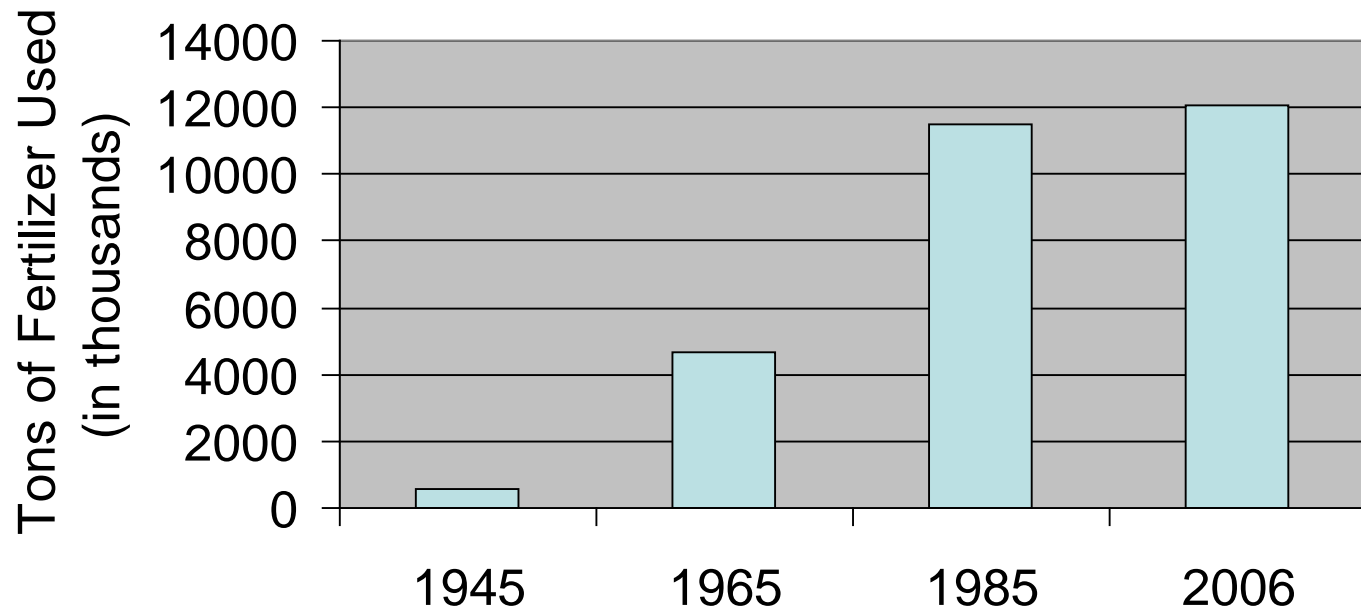
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- US: 400 gallons of oil equivalents per person, per year for food production (1994)



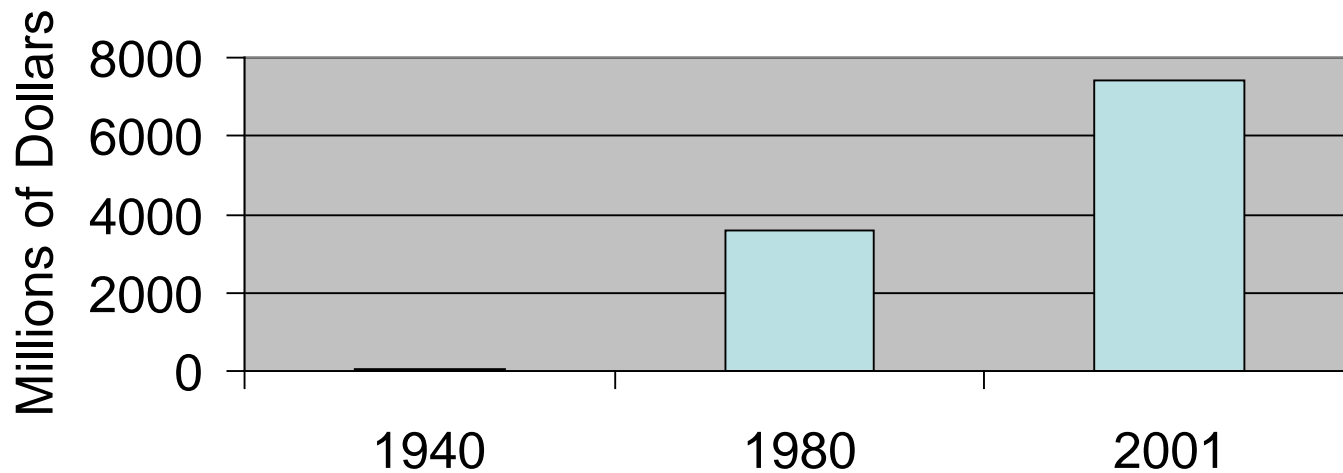
# Nitrogen Fertilizer Use in US

Sources: U.S Geological Survey & USDA  
Economic Research Service



# Pesticide Expenditures: US Agricultural Sector

Sources: Fernandez-Cornejo, Jans & Smith;  
U.S. EPA



# Regressive Delivery Device

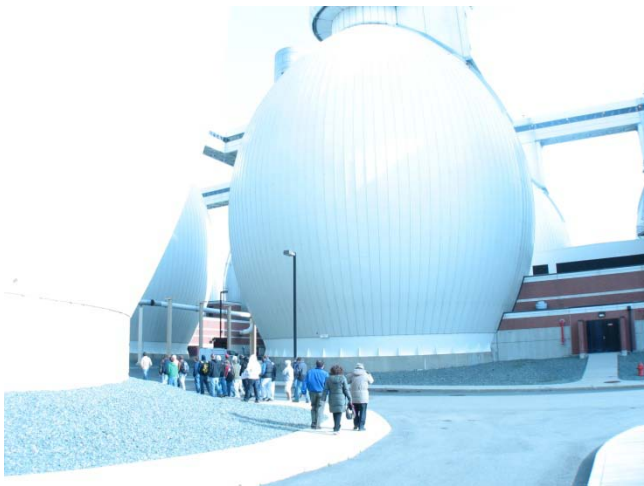


# EPA Clean Water Act--1972

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- Goal: zero discharge of pollutants by 1985 and, as an interim goal and where possible, water quality that is both “fishable” and “swimmable” by mid-1983.

# Sewage Treatment Plant



# Sludge (a.k.a. 'biosolids')

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- 7 million dry tons per year in US
- Either incinerated, landfilled, or used as 'fertilizer'
- Only 9 heavy metals regulated by EPA
- Contains toxics (e.g., flame retardants, dioxin)
- Application largely unmonitored

# Pseudo-cycling



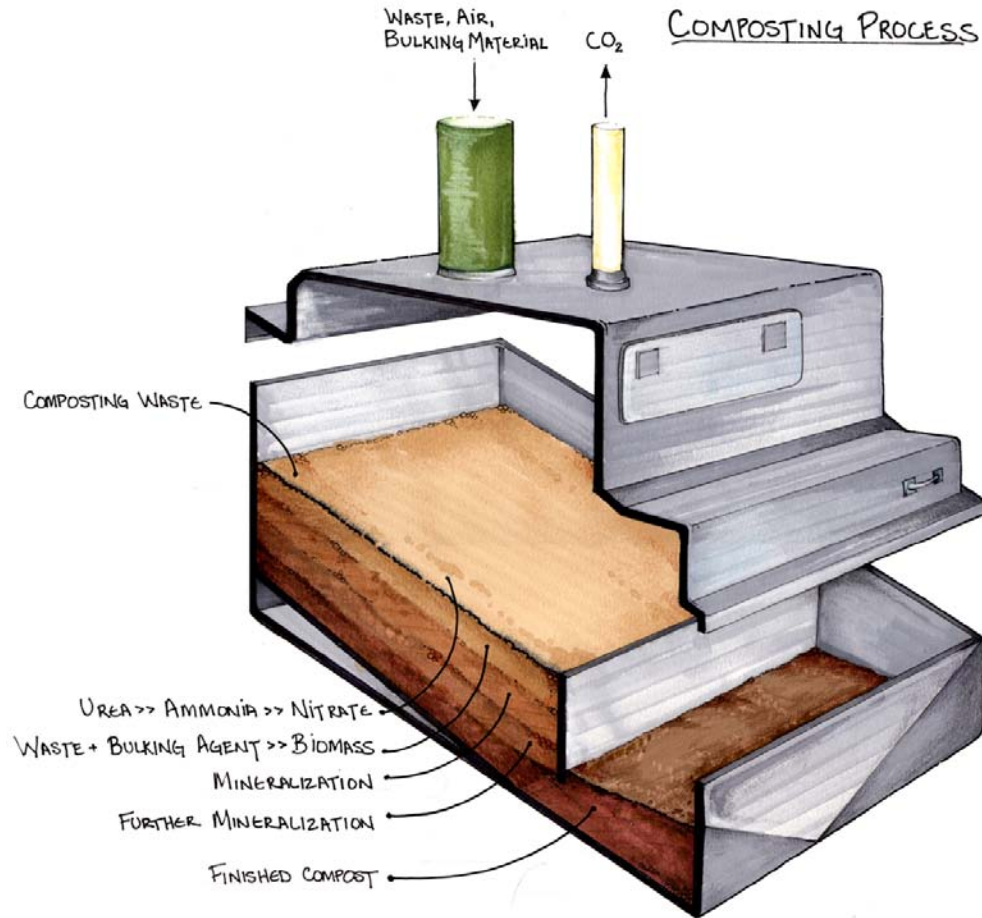
# Compost Toilet

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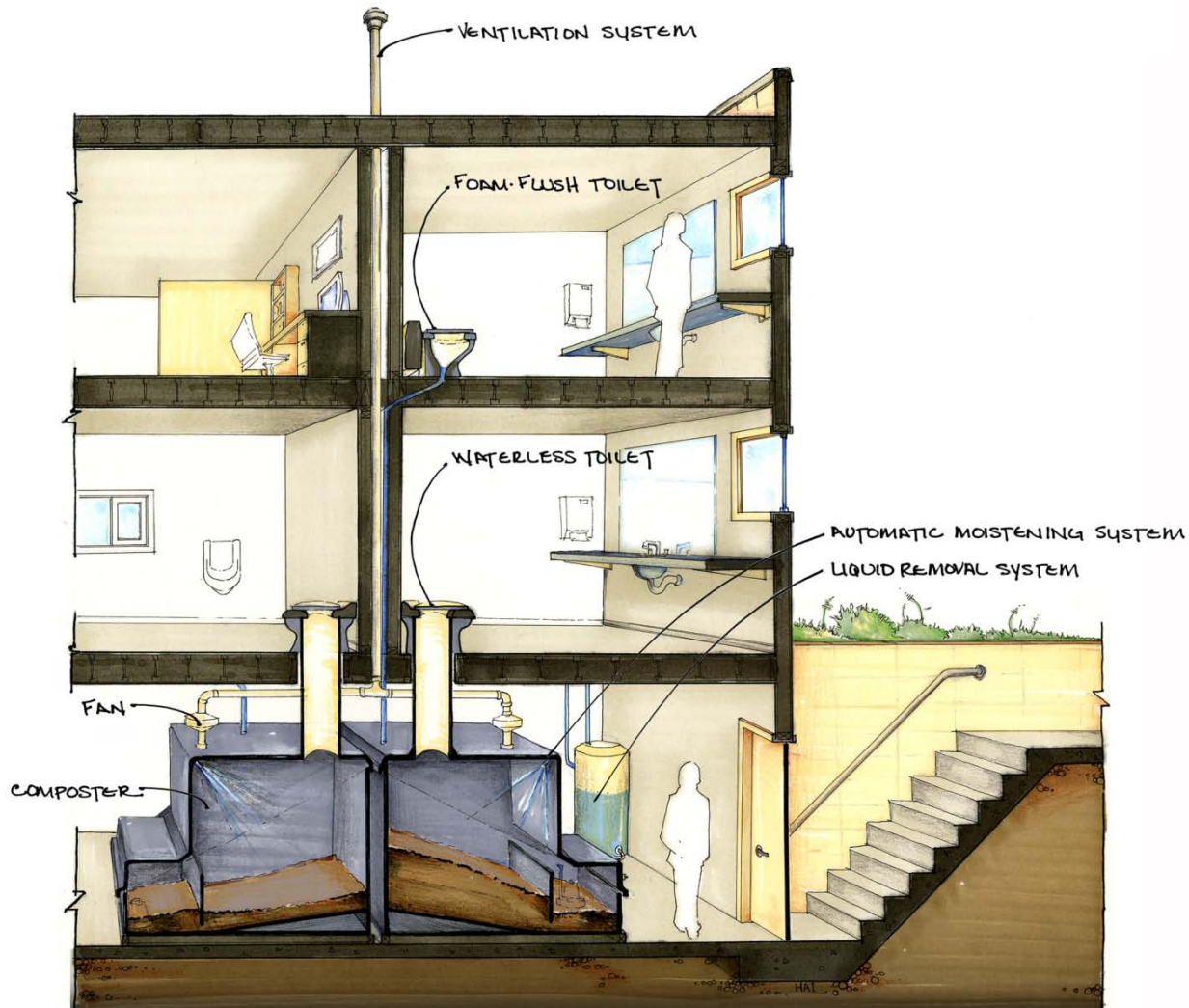
- Saves 95% water compared with 1.6 gallon toilet
- Eliminates need of infrastructure
- Eliminates nutrient pollution
- Creates useful fertilizers



# Composting Layers



# Building Design



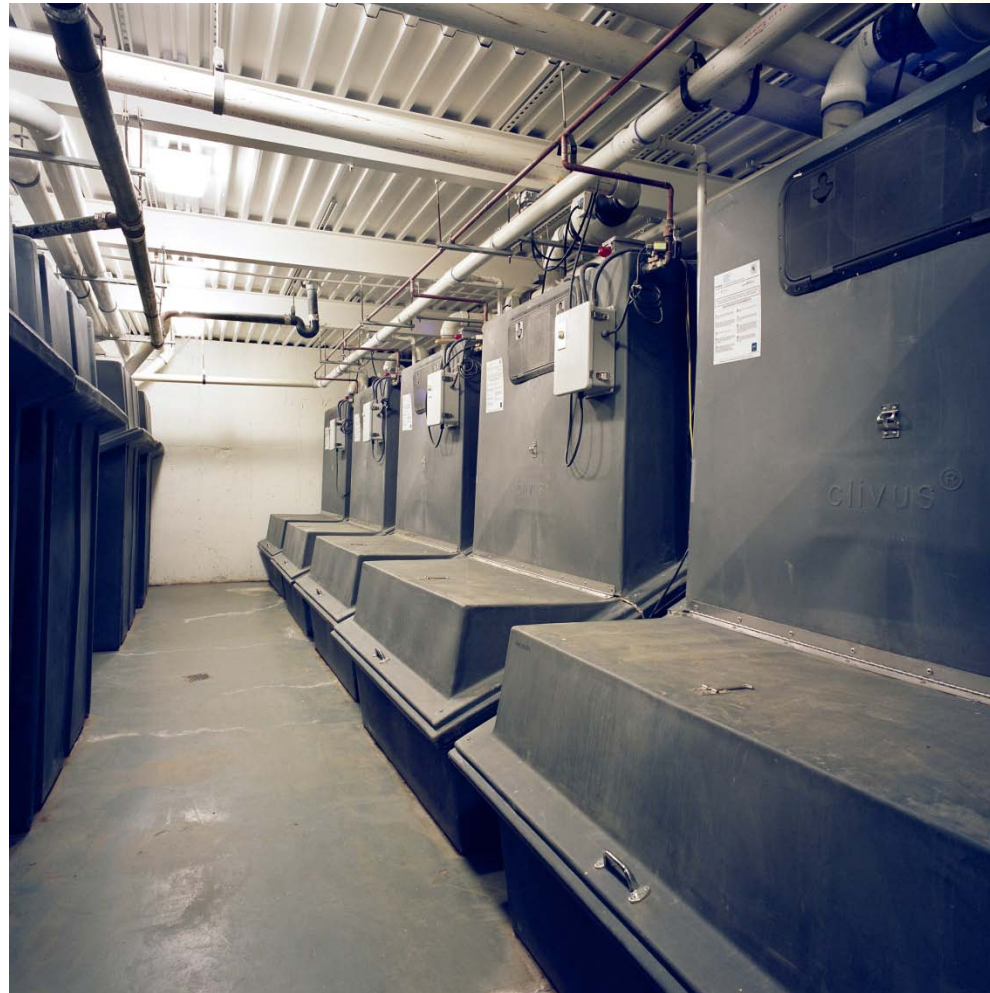
# Medium-size Commercial System



# Large-size Commercial System



# High Capacity Facility



# Dry Toilet Fixture



# Foam-Flush Toilet Fixture



# Foam-Flush Toilet Fixture



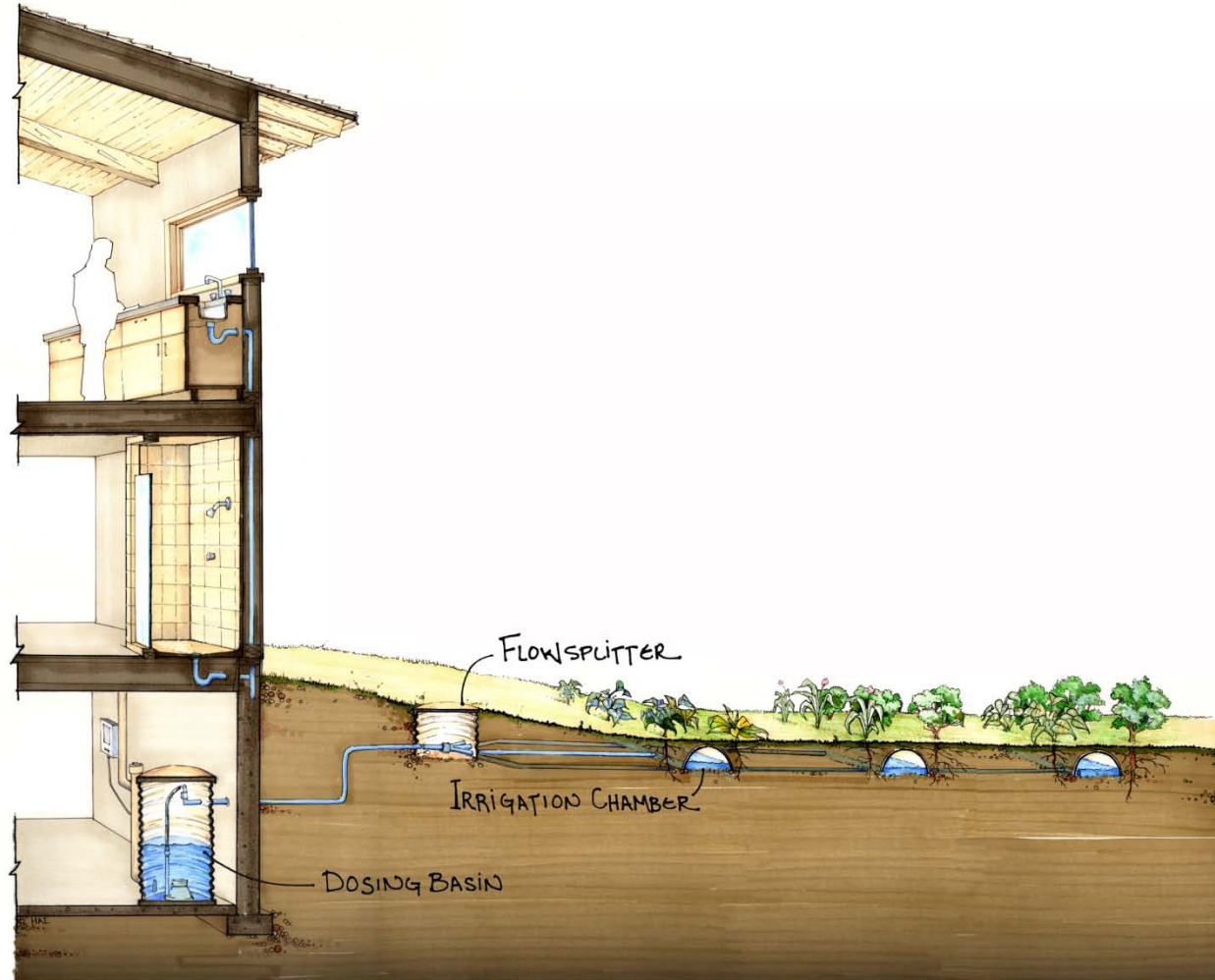


# Greywater Characteristics

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- Low in Nutrients (e.g., soaps)
- Low in Bacteria
- High Biological Oxygen Demand (i.e., can't be stored long)
- Perfect for Plant Irrigation

# Greywater System Design



# Greywater Irrigation Chamber Installation



# Queens Botanical Garden

Queens, NY *LEED Platinum*



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Queens, NY *LEED Platinum*



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Queens, NY *LEED Platinum*



# Neptune Community School

Neptune, NJ *LEED Platinum*



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# Southface Eco-Office

Atlanta, GA *LEED Platinum*



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Atlanta, GA *LEED Platinum*



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Atlanta, GA *LEED Platinum*



# Tyson Living and Learning Center

St. Louis, MO *Living Building Challenge*



# Tyson Living and Learning Center

St. Louis, MO *Living Building Challenge*



# Kansas City Structural Steel

Kansas City, KS



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Kansas City, KS





# Kansas City Structural Steel

Kansas City, KS



# Bronx Zoo Eco-Restroom

New York, NY



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