



# The Final Frontier

How green burial meets the needs of the environment and those who seek to sustain and protect it

# The Vault

- Wilbert Haase, Egyptian tour, 1930
- Asphalt-lined concrete vaults
- Promised:
  - protection from zombies and ghouls
  - protection of the body from vermin and graverobbers
  - airtight



# The Cost and Necessity of Vaults

- Protects the furniture
- Levels for grass mowing
- Carbon emissions per vault:  
1,860 lbs. CO<sub>2</sub>
- Cost between \$1200 and \$40K



# Governmental and Legislative Oversight



States with any form of environmental set-backs for burial: 6



States with any form of burial depth requirement: 17



States with depth requirements more than 3.5 feet: 2



Only cemeteries choose to require vaults; consumers bear the cost



Only funeral homes choose to require embalming for public viewing

# CT Burial Law



350' from buildings



2 ½' (30") of soil top of the body or casket to surface



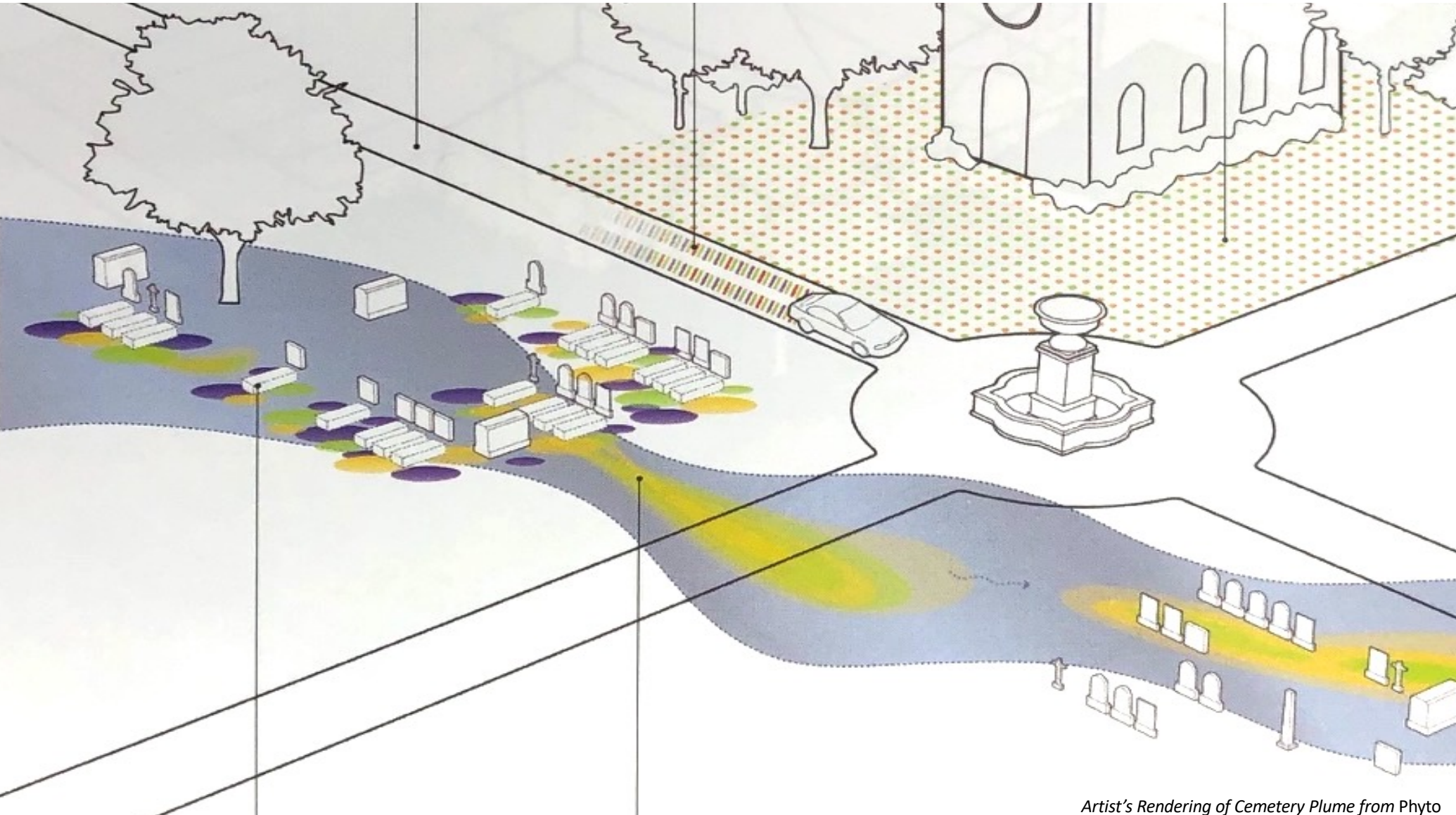
1 ½' (18") from top of the vault to surface



1/2 mile from a reservoir



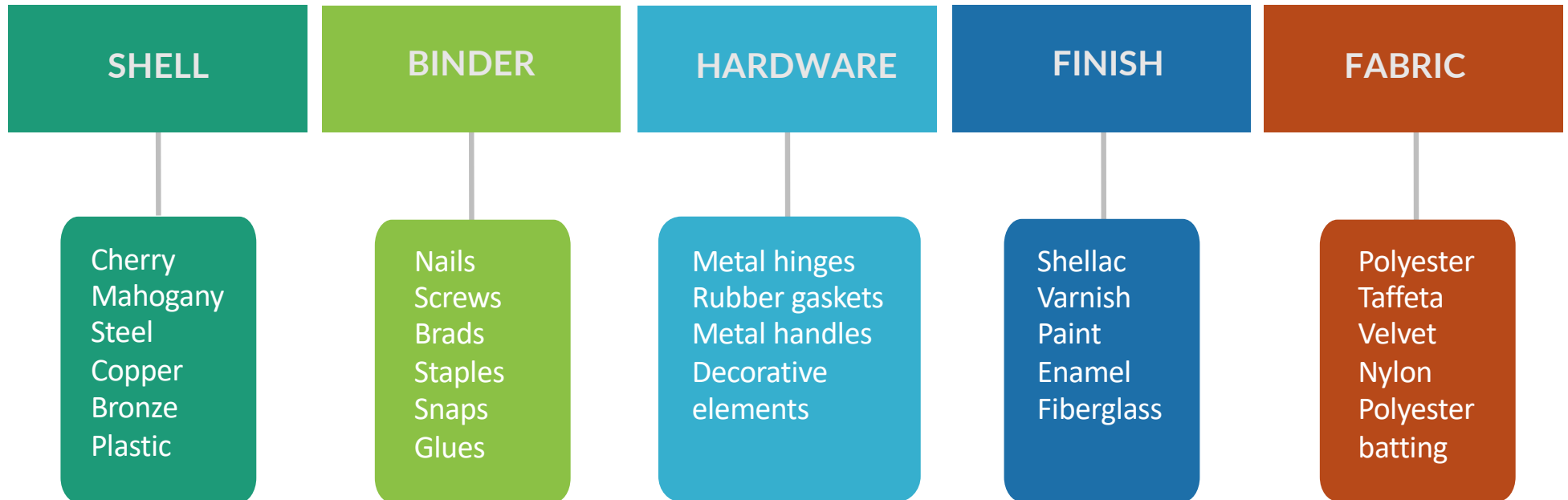
600' from an ice pond



Artist's Rendering of Cemetery Plume from Phyto

# Casket Furniture

Casket components are called **furniture**—anything that goes into the manufacturing and presentation of the casket. The **average American casket weighs** between 200 and 450 pounds, depending on materials and construction. What does cemetery plume pollution consist of? **Leachate** from the following:



# Arterial Embalming

- Cosmetic only
- Fluids drained from the body go into septic or water treatment
- Preservative effect lasts up to 2 weeks
- Cooling is sufficient
- *“Embalming is not required by law...”* The Federal Trade Commission’s Funeral Rule





# Health Risks to Embalmers

Exposure to formaldehyde, methanol, dyes, hydrochloric acid, disinfectants, humectants, sulfur dioxide, benzene in embalming fluid can result in:

- 13x higher risk of early death  
*Slocum and Carlson, Final Rights*
- 8x higher risk of leukemia  
*11.24.09 Journal of National Cancer Institute*
- 3x higher risk of ALS  
*7.13.15 Journal of Neurology, Neurosurgery & Psychiatry*
- Other disease abnormalities  
*1990 Journal of American Industrial Medicine*
- Chronic Obstructive Pulmonary Disorder (COPD)
- Neurological diseases, Parkinson's Disease



# Health Risks to Maintenance Workers

Exposure to herbicides and pesticides can result in:

- COPD
- Respiratory diseases
- Neurological disorders
  - Parkinson's Disease
- Cancer
  - 17 types of Lymphoma (Round-Up)



# Health Risks to the Environment



## Fertilizer

- Algae plume in waterways
- Decreased oxygen in water
- Decimation of aquatic food sources
- Increased ammonia
- Chemical burn to crops
- Soil and mineral depletion



## Herbicides

- Fast, broad-spectrum burndown of weeds affecting:
  - Neighboring or incidental foliage
  - Fruit and vegetable crops



## Pesticides

- Spray drift causing neighboring crop deformity and diminished productivity affecting:
  - Fruit crops
  - Apiaries
  - Vineyards
  - Vegetable crops

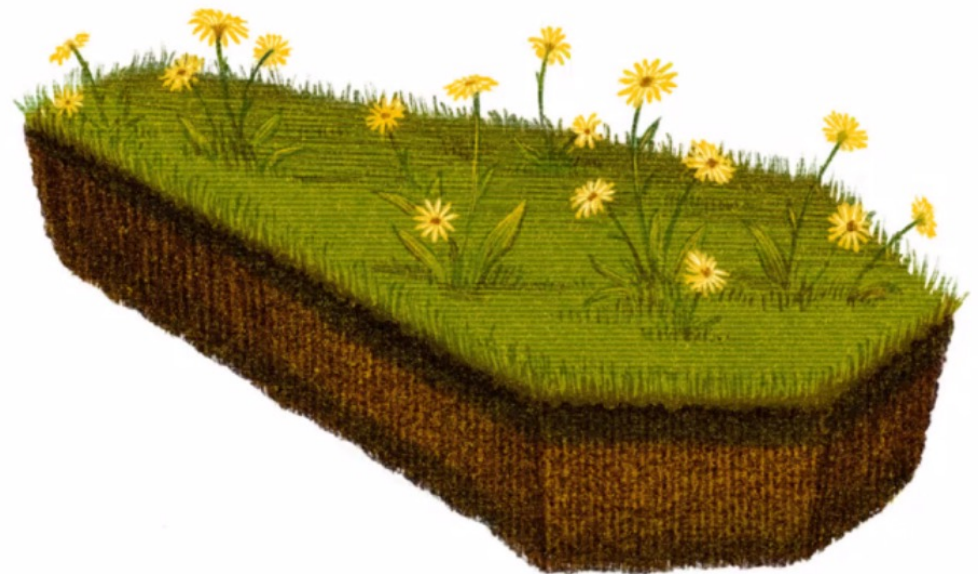
# What Green Burial Is

- Burial at 3.5 – 4 feet from bottom to surface
- No vault
- Biodegradable containers
- Non-invasive preservation



# Natural Burial Assumptions

- Humans are a high-quality source of available nutrients for soil and plant life
- Bodies nearer the surface will decompose faster and more aerobically
- Heavy metals, pharmaceuticals will be neutralized or bound by soil and plants
- Leachate from caskets and embalming is the primary pollution concern
- Biodegradable containers do not significantly impede decomposition



# The Safety of Dead Bodies

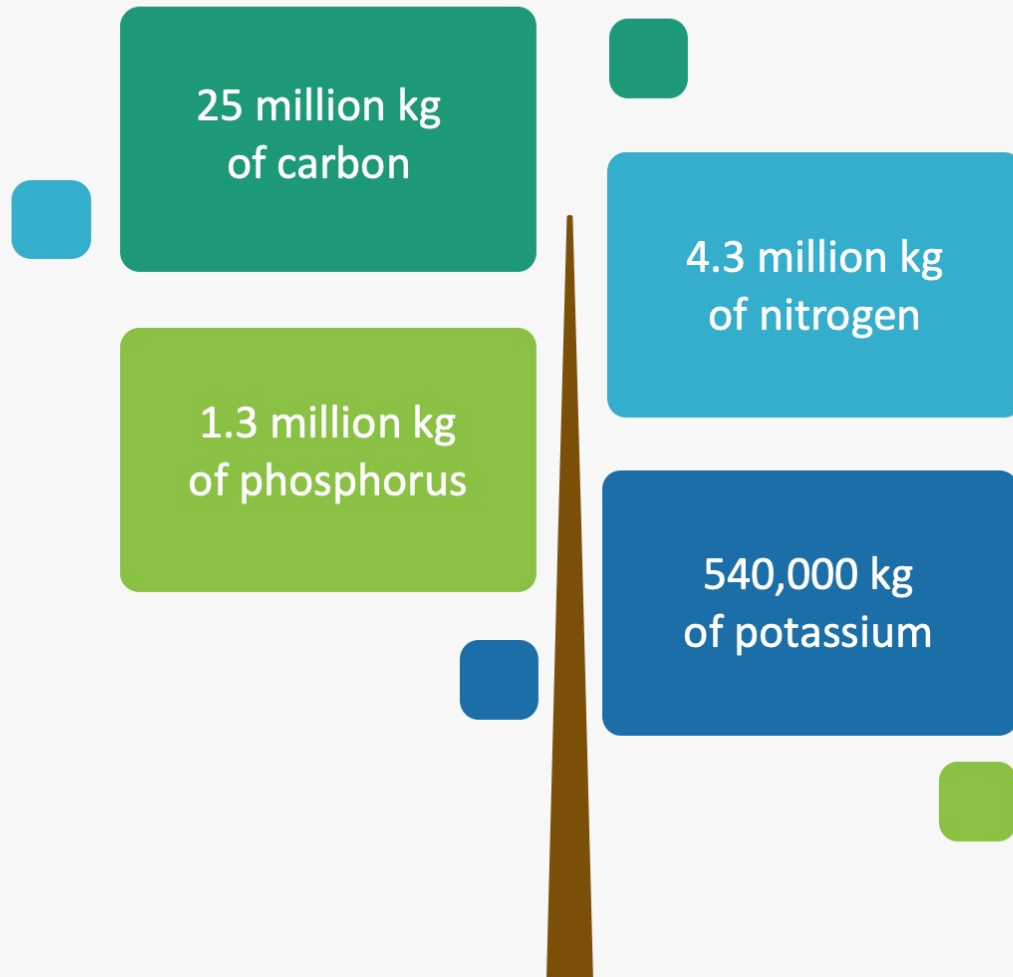
Major health organizations agree that **dead bodies do not pose an increased health risk** to health professionals, funeral directors, or the public when no infectious pathogen is present. **Decomposition does not introduce pathogens** and it **does not release polluting agents into soil or water** under average circumstances (in cemeteries as opposed to emergency disaster zones). The perception of danger from dead bodies to public health and safety is a vestige of an historic **misunderstanding of germ theory**. Bodies buried in natural cemeteries are no more likely to pollute water and soil than in vault burial; in fact, **casket and vault leachate** is the **primary cause of cemetery plume**.



# Survival Rates of Viruses and Bacteria

## Bacterial Expectancy Outside the Host Body:

- Hep B = 7 days
- HIV = minutes to hours
- Hep C = 26 hours to 4 days
- **“Ebola, Creutzfeldt-Jakob are less contagious in soil; most other diseases are no longer infectious.”**
- **“Most of the microorganisms that cause death do not survive for long after the host dies or are not readily transmissible in that context.” —Centers for Disease Control (CDC)**
  
- **“Of those deceased that had an infectious disease at the time of their death, the risk that they will disseminate it will be lower than it was during their life** and those that did not have an infectious disease offer a negligible risk.”
- **“Once the host is dead, most pathogenic microorganisms stop multiplying** and die rapidly as a result of microbial competition as the body decomposes.”
- “The recently dead may have been infected by a wide range of pathogens, those presenting particular risks include, tuberculosis, streptococcal infection, gastro-intestinal pathogens, the agents causing transmissible spongiform encephalopathies (e.g. Creutzfeldt-Jakob disease), hepatitis B and C, HIV infection, Middle East respiratory syndrome (MERS), hemorrhagic fever viruses such as Ebola, and possibly meningitis and septicemia (especially meningococcal). None of the organisms that caused mass death in the past (e.g. plague, cholera, typhoid, tuberculosis, smallpox) is likely to survive long in burials.” —**The International Society for Infectious Diseases**



## Our Bodies, Our Climate

Each year, **beneficial nutrients** are **prevented from being sequestered** due to **vault burial** and **cremation**.

**Natural burial** allows **nutrients** from our bodies to be **released** and **absorbed** by soil, contributing positively to **reducing greenhouse gas emissions** and **building climate resiliency**.

*Estimates by D.O Carter, PhD, Forensic Taphonomist*

Designed by Lee Webster, New Hampshire Funeral Resources, Education & Advocacy



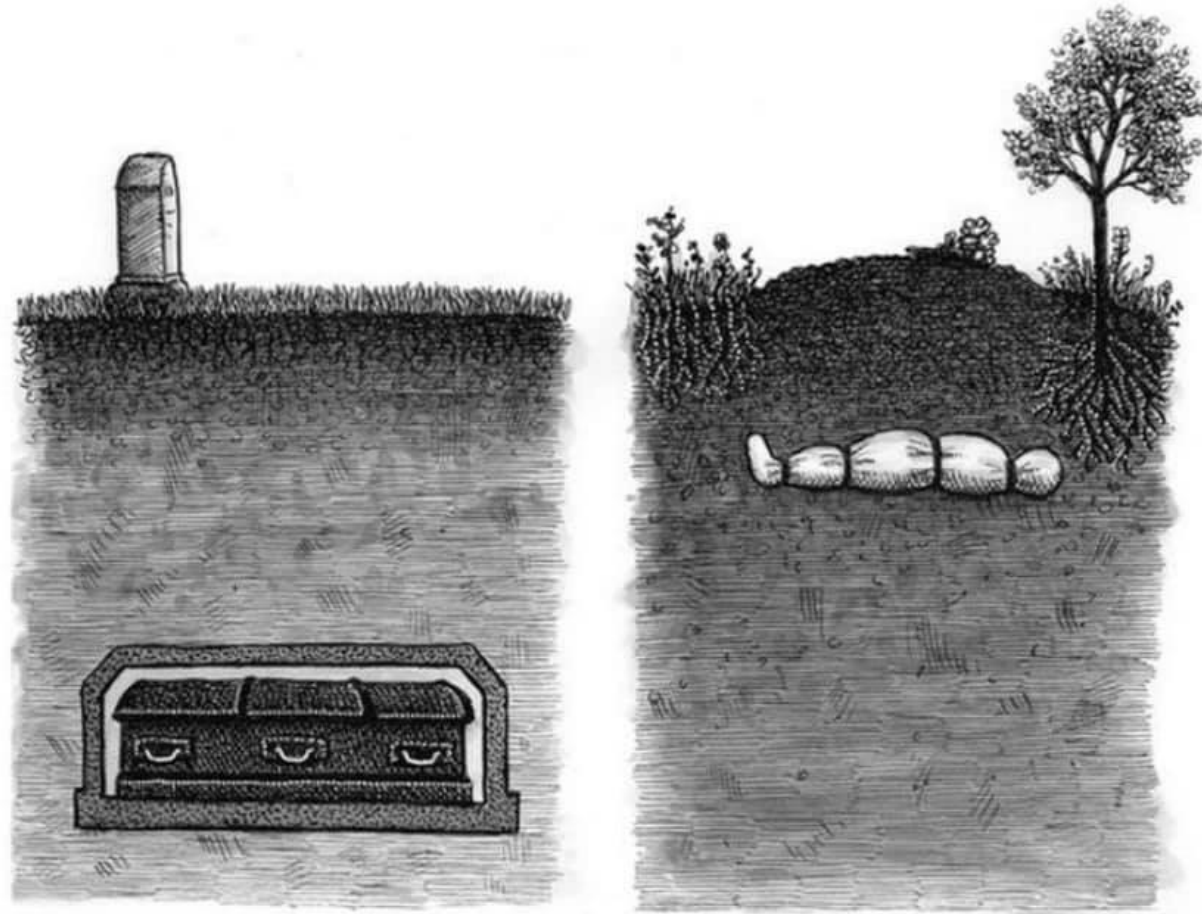
# Factors Determining Grave Soil Ecology

- Soil moisture, sustained humidity
- Oxygen content
- Microorganisms, insects
- Temperature
- Chemical composition of surrounding soil
- Post-death treatment (autopsy, cause of death, pharmaceuticals, embalming)
- Furniture — casket, clothing, shroud materials



# Ideal Conditions for Burial

- On gentle slopes
- On bedrock with clay, low permeability mineral content between 20 and 40%
- Bottom of grave 1.5 meters or 5 feet above maximum seasonal groundwater level
- Surround with buffer zones of trees and shrubs
- Install appropriate stormwater drainage
- Require biodegradable containers without potential contaminants or chemicals

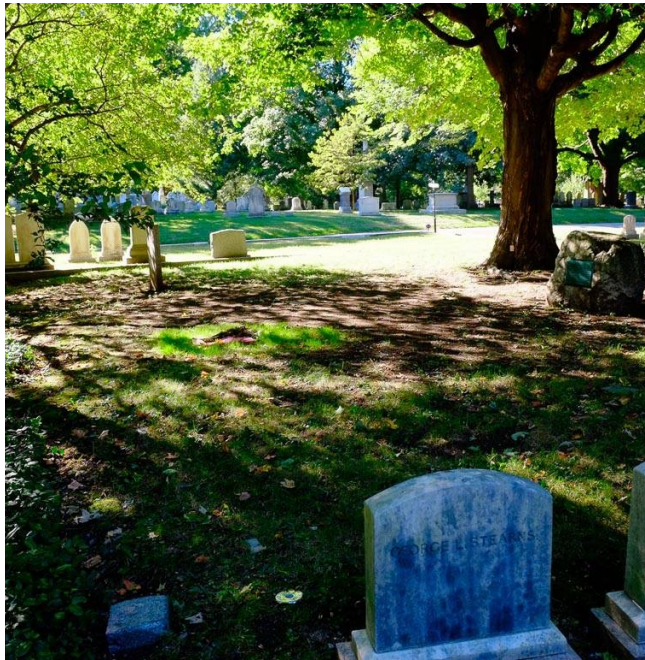


# Conservation Burial Best Practices

- Ecological Assessment (EciA) and/or Natural Resource Inventory
- Burial in clusters along the margins and meadows in higher elevations
- Avoid clay soils and seasonally wet areas
- Avoid woodland burial root zones
- Burial density: 6 – 20% of each acre
- Soil horizons separated and kept dry during hand digging
- Conservation strategy



# Types of Cemeteries



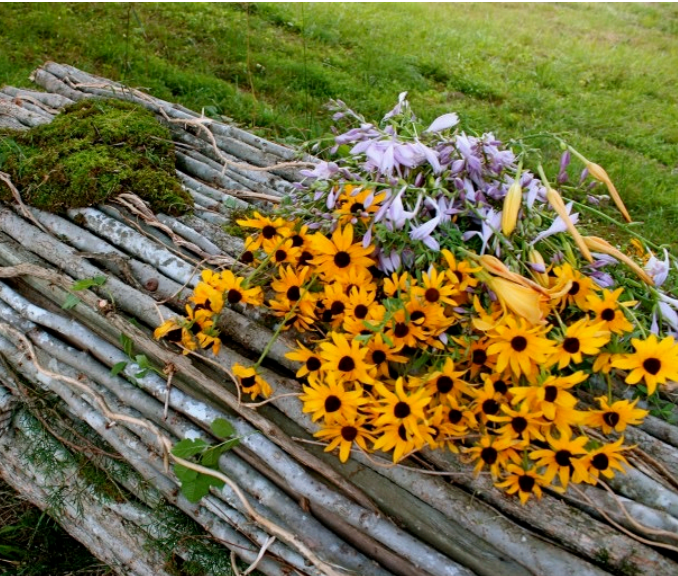
Hybrid



Natural



Conservation

















# Social and Environmental Justice

- Financial affordability
- Equal physical access nearby for all
- Mobility access
- Accommodations for visually and hearing impaired
- Acceptance of all religious and spiritual beliefs
- Respect for cultural preferences
- Multicultural community access to events, participation in nature
- Furthering the conservation of land



# Sources

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