Home Compost Systems

We all know adding compost can help build soil and microbial health and increase plant growth. In this seminar, we'll dip into the biology of compost before spending most of our time discussing practical compost systems for the home gardener.

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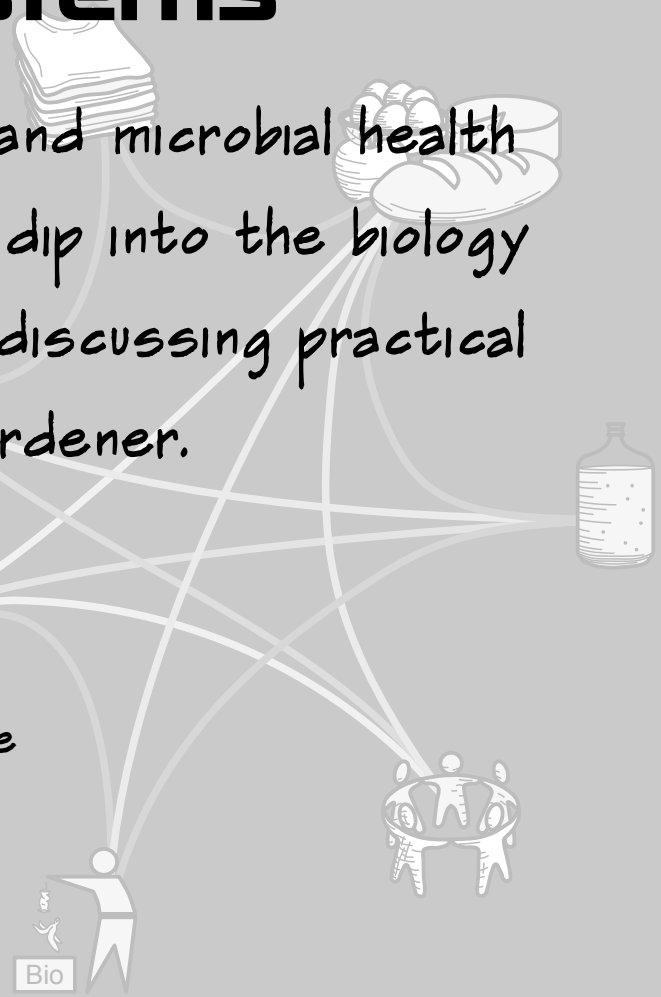
scott@lowtechinstitute.org



Home Compost Systems

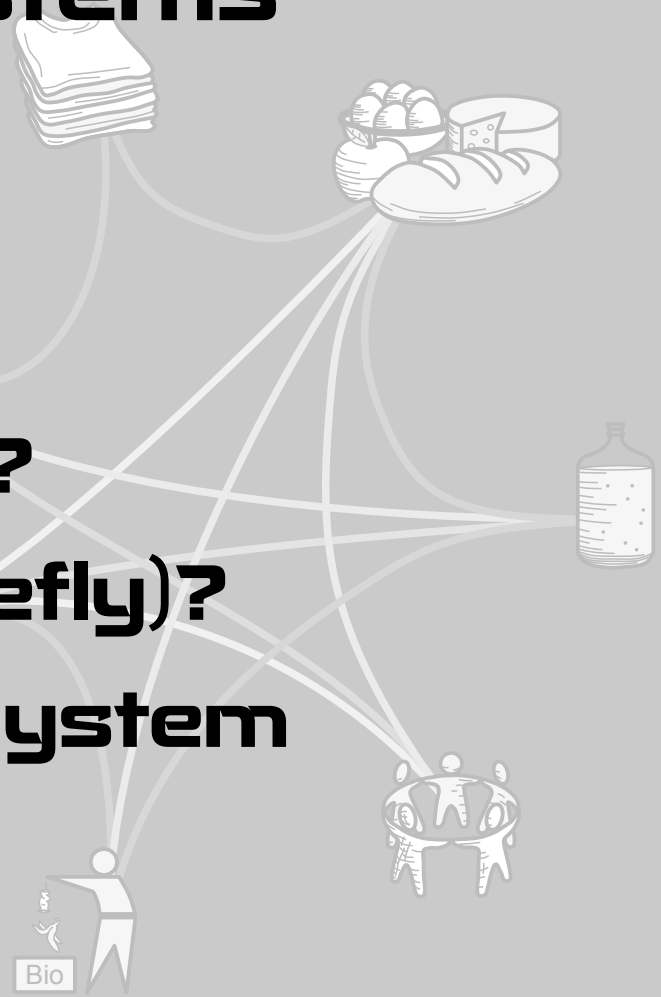
Today's Topics

Why Compost?

What is Compost?

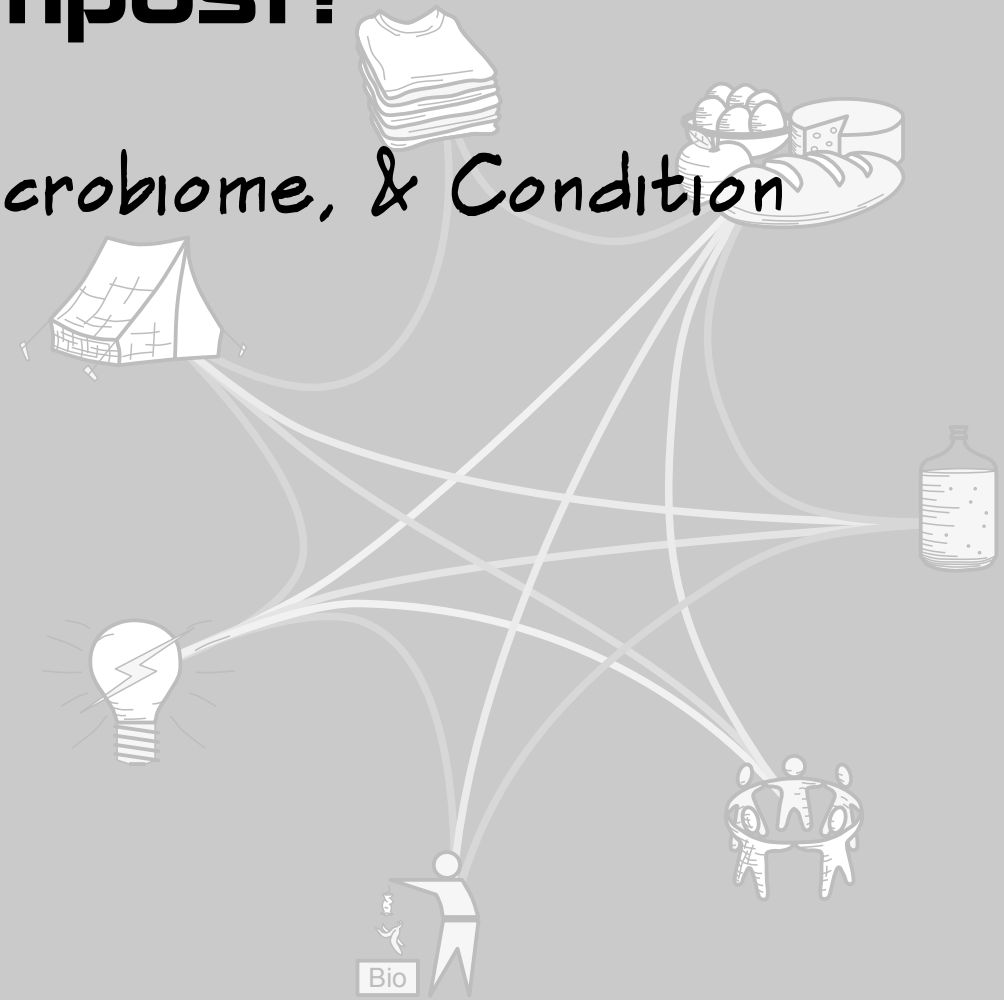
How to Compost (Briefly)?

Choosing a Compost System

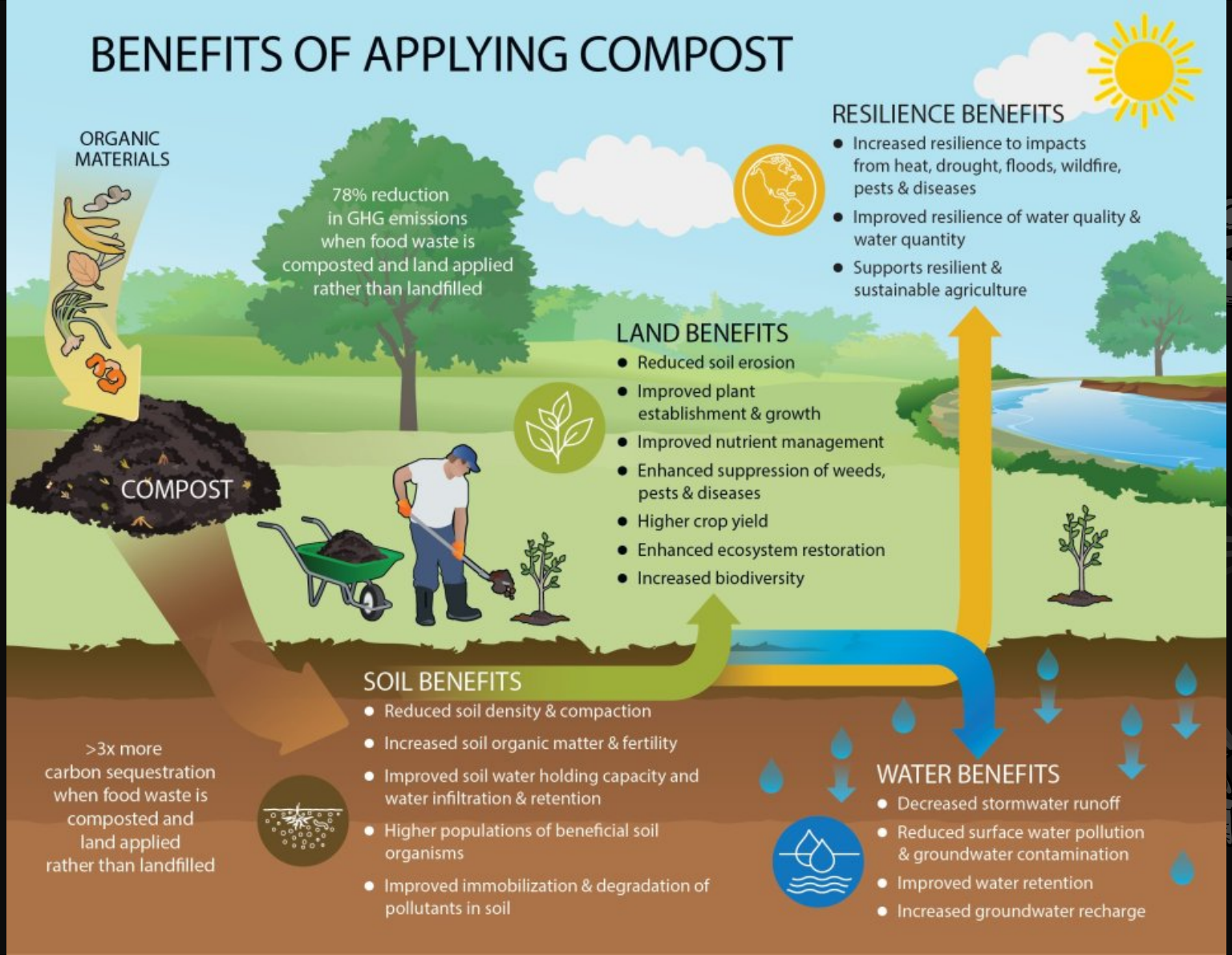


Why Compost?

- Improve Soil Fertility, Microbiome, & Condition



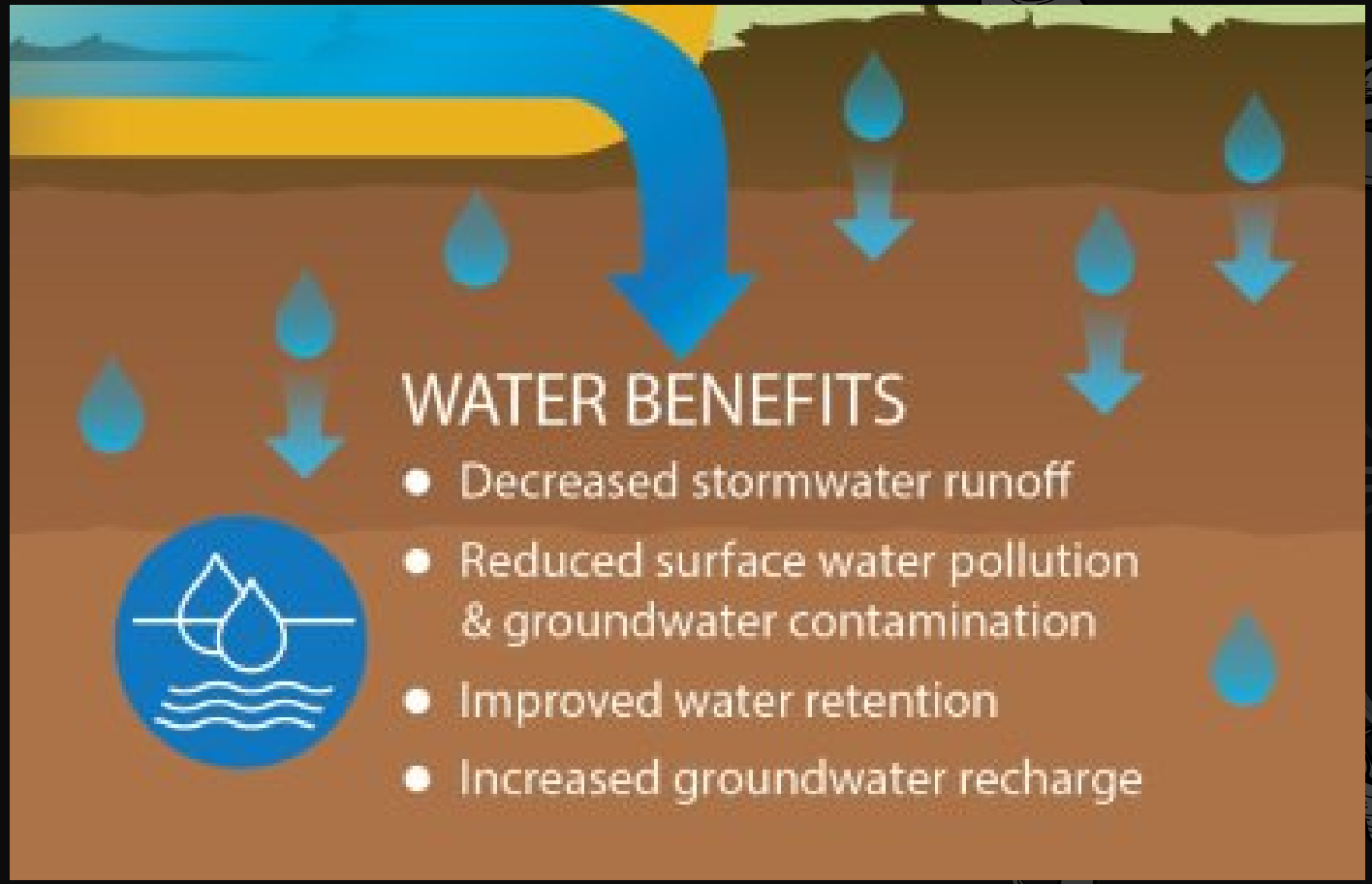
BENEFITS OF APPLYING COMPOST



>3x more
carbon sequestration
when food waste is
composted and
land applied
rather than landfilled

SOIL BENEFITS

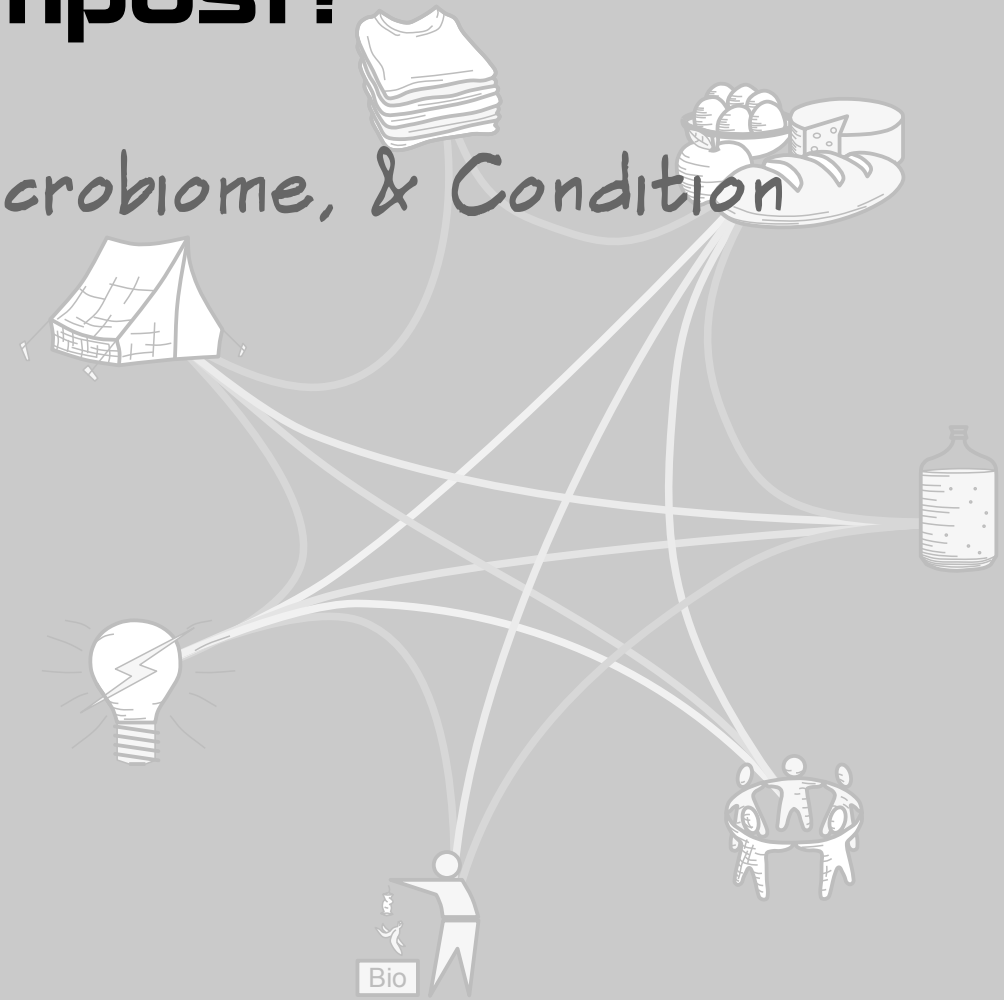
- Reduced soil density & compaction
- Increased soil organic matter & fertility
- Improved soil water holding capacity and water infiltration & retention
- Higher populations of beneficial soil organisms
- Improved immobilization & degradation of pollutants in soil

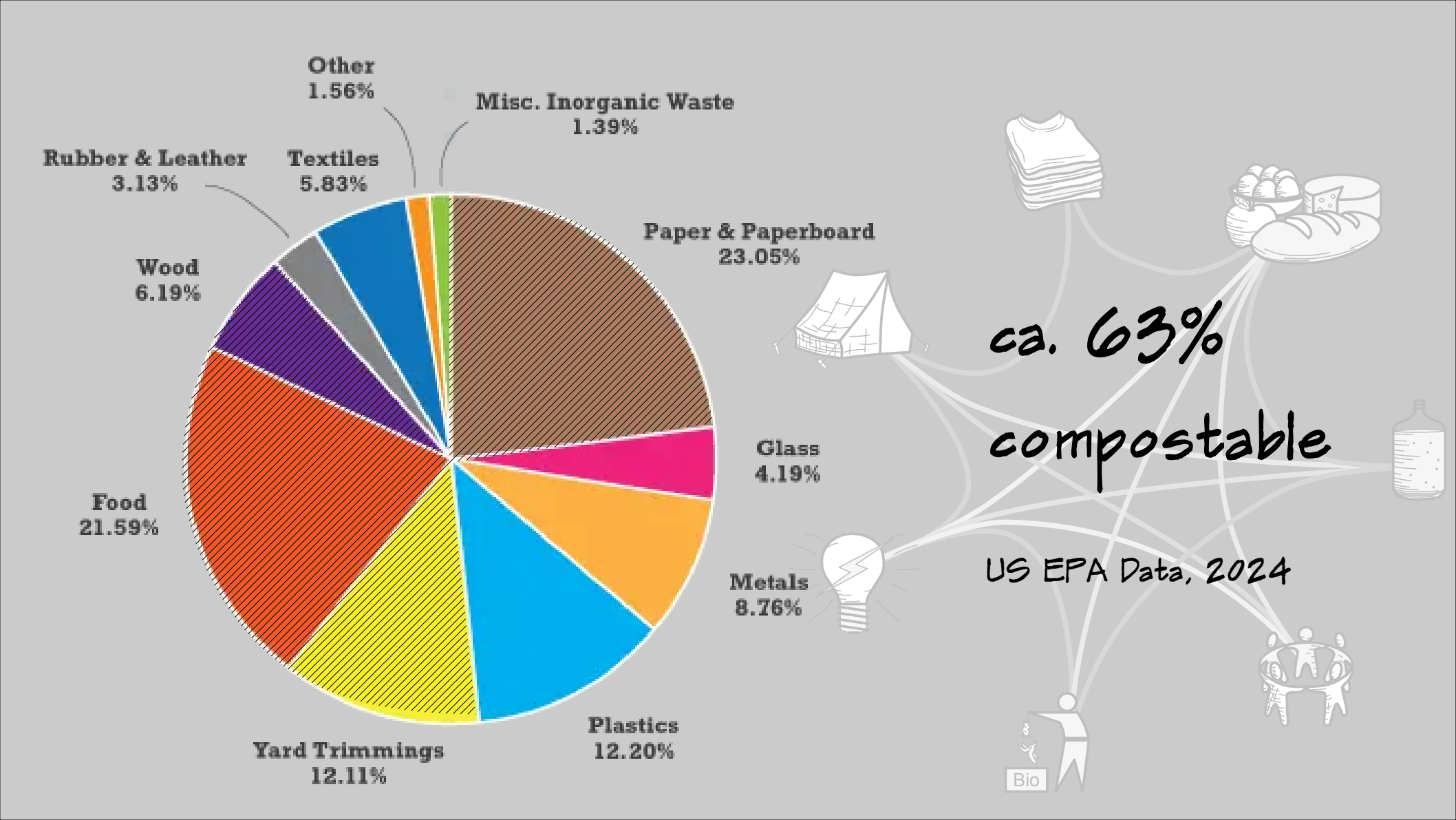

WATER BENEFITS
• Decreased stormwater runoff
• Reduced surface water pollution & groundwater contamination
• Improved water retention
• Increased groundwater recharge

Bio

Why Compost?

- Improve Soil Fertility, Microbiome, & Condition
- Reduce Waste




Other
1.56%
Misc. Inorganic Waste
1.39%
Rubber & Leather
3.13%
Textiles
5.83%
Paper & Paperboard
23.05%
Wood
6.19%
Glass
4.19%
Food
21.59%
Metals
8.76%
Plastics
12.20%
Yard Trimmings
12.11%
ca. 63%
compostable
US EPA Data, 2024
Bio

Why Compost?

- Improve Soil Fertility, Microbiome, & Condition
- Reduce Waste
- Reduce Inputs

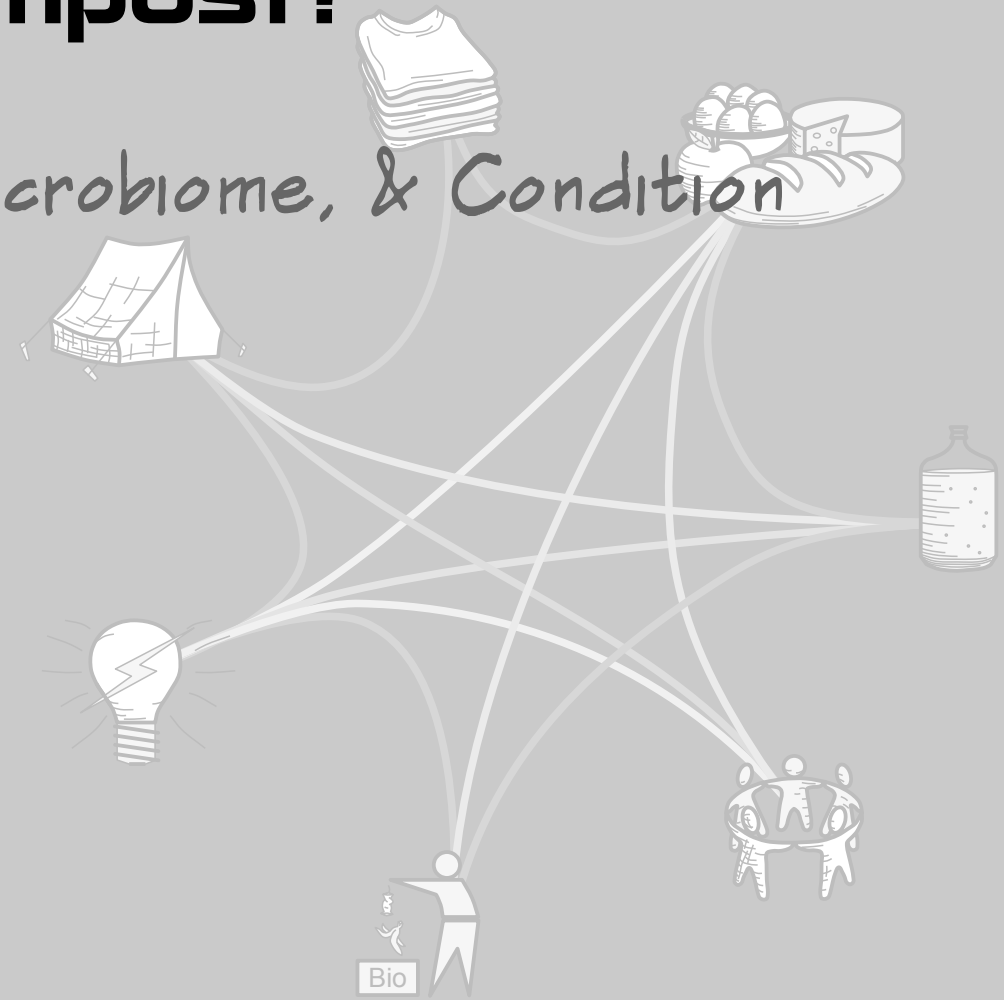
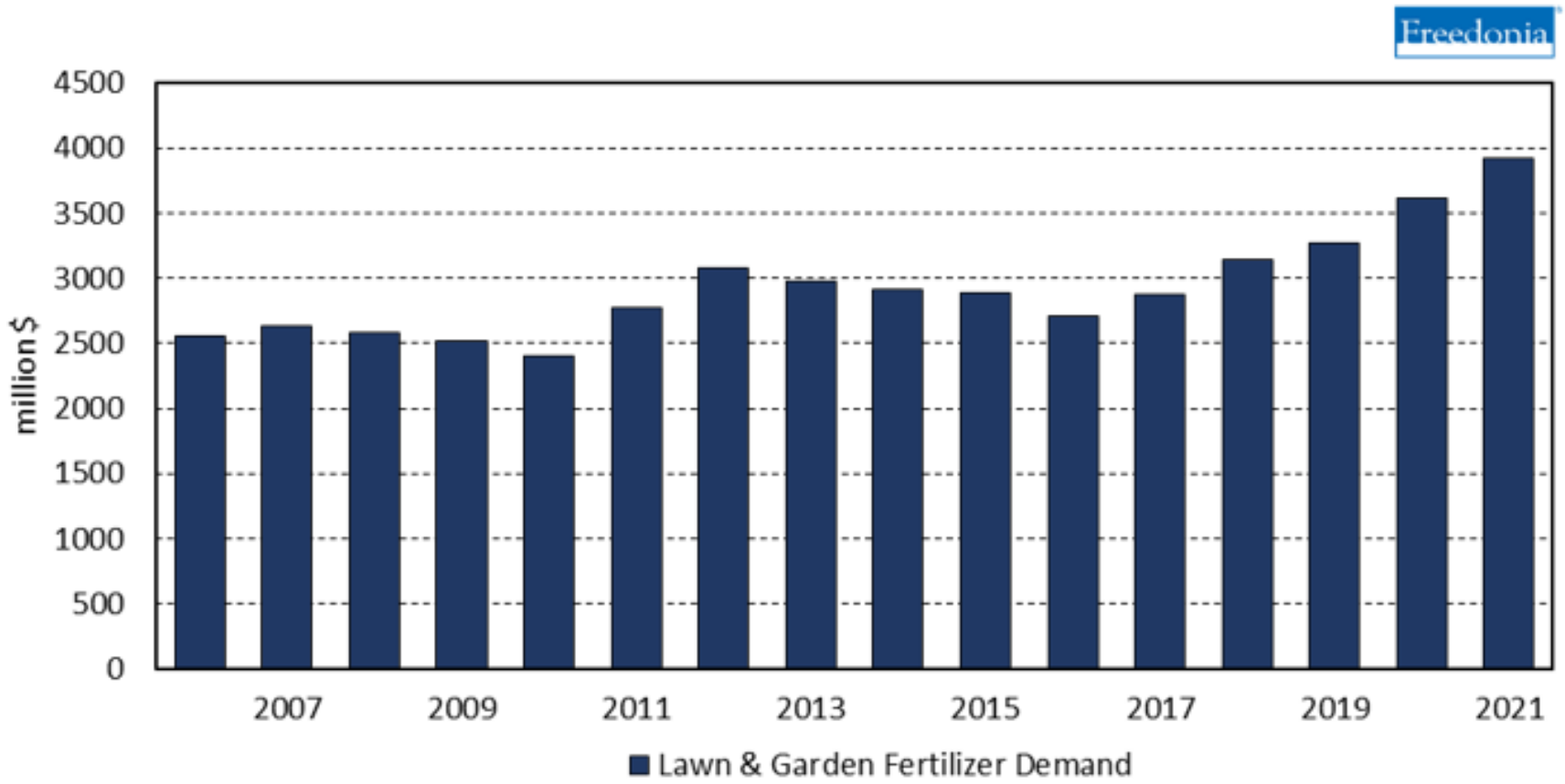


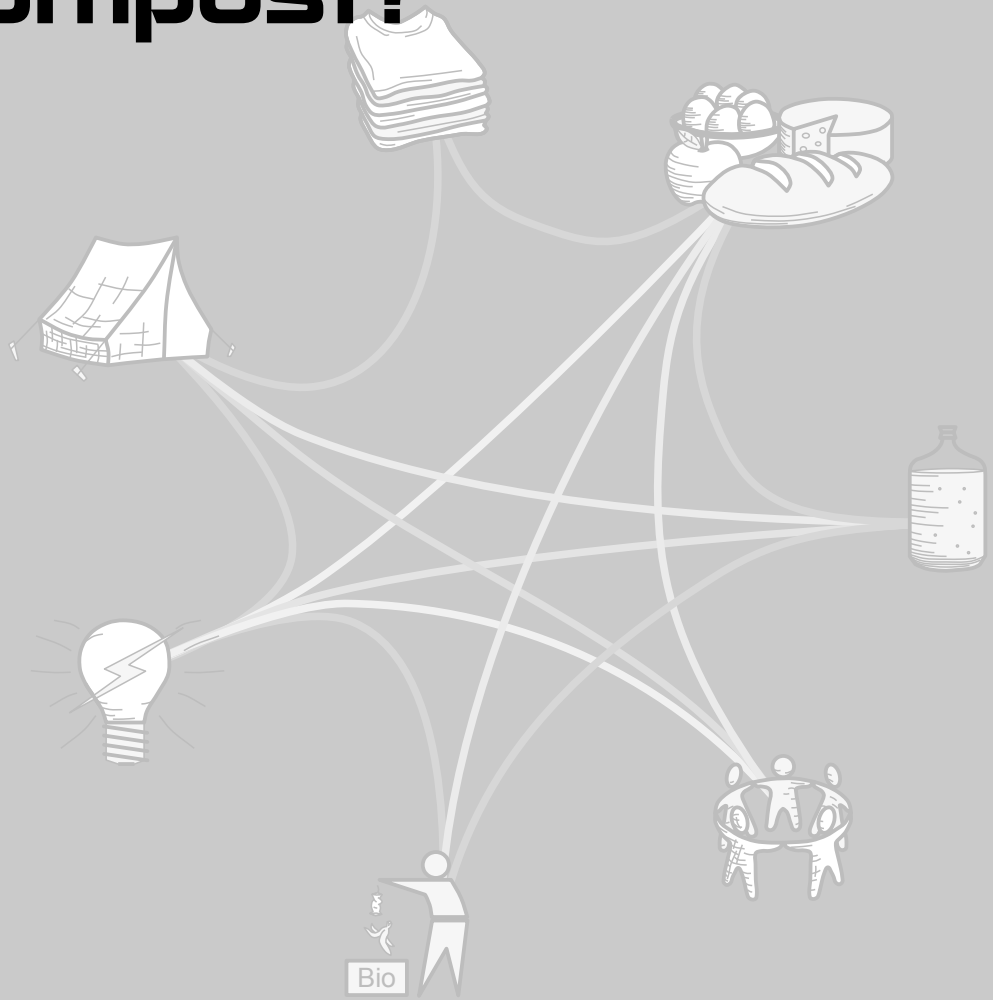
Figure 3-1.
Lawn & Garden Fertilizer Demand,
2006 – 2021
(million dollars)

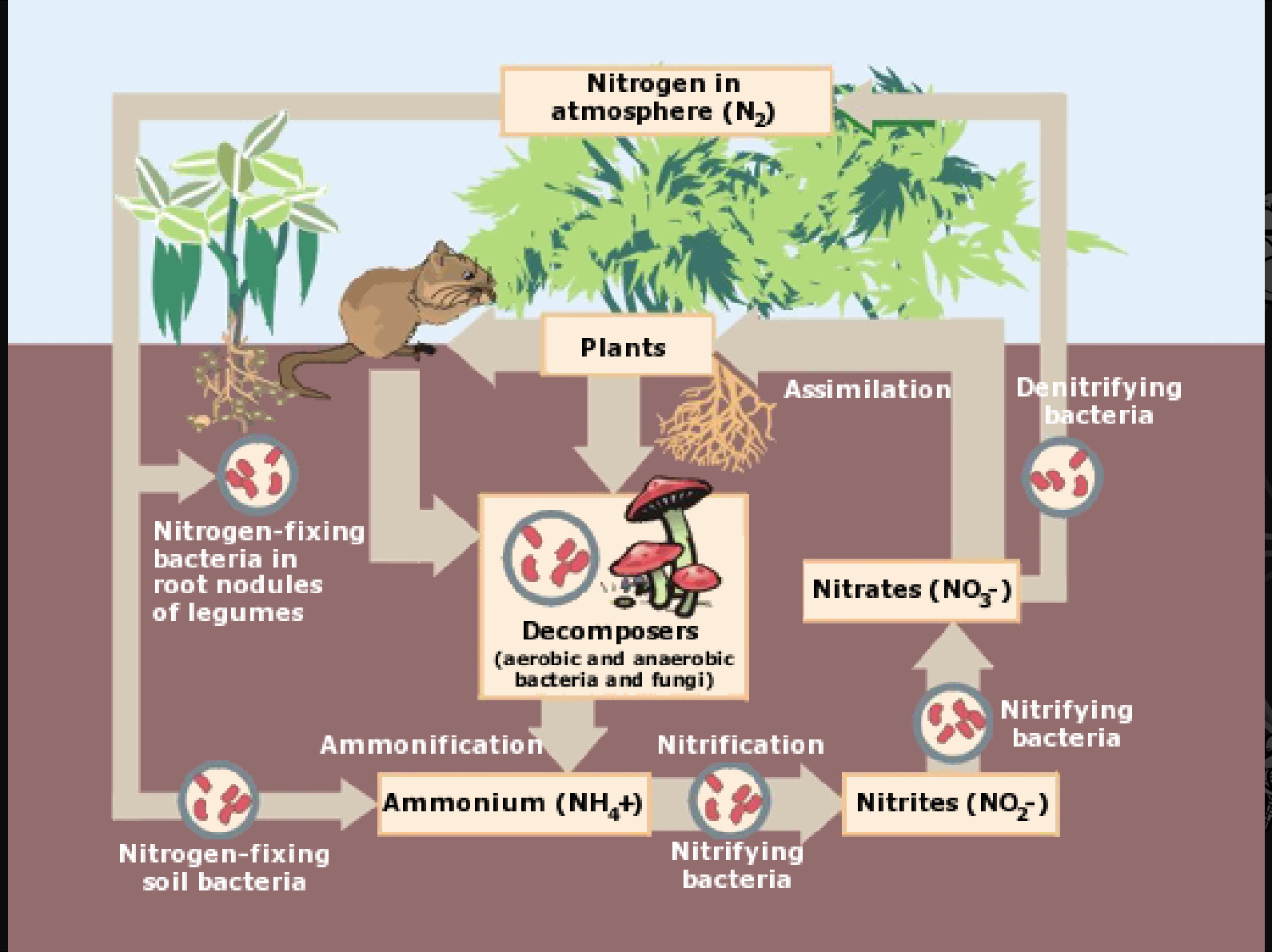


Source: The Freedonia Group

What is Compost?

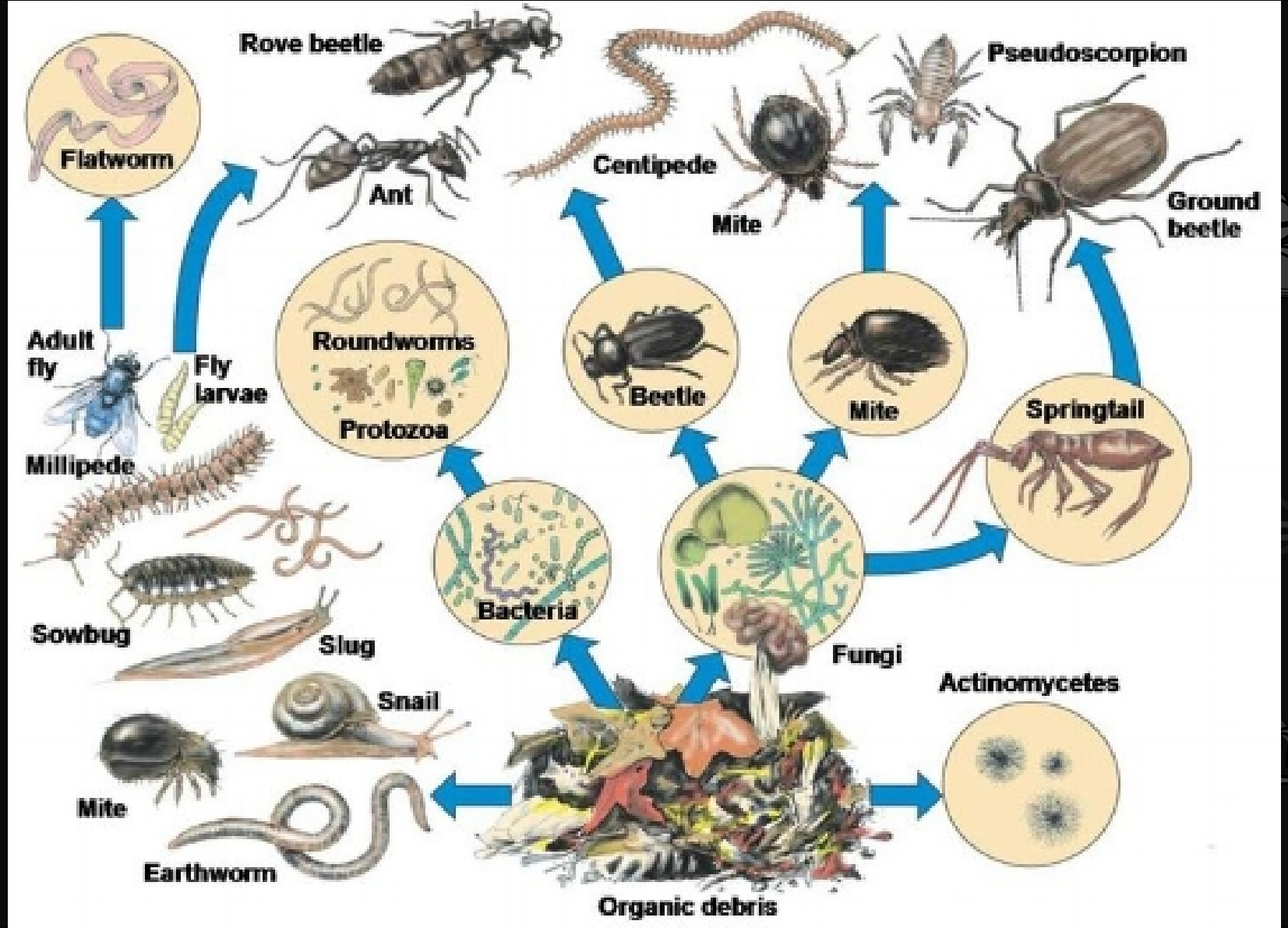
- Managed Decomposition




Nitrogen in atmosphere (N_2)
Plants
Assimilation
Denitrifying bacteria
Nitrogen-fixing bacteria in root nodules of legumes
Decomposers
(aerobic and anaerobic bacteria and fungi)
Nitrates (NO_3^-)
Nitrifying bacteria
Ammonification
Nitrification
Ammonium (NH_4^+)
Nitrites (NO_2^-)
Nitrogen-fixing soil bacteria
Nitrifying bacteria

What is Compost?

- Managed Decomposition
- Microscopic: Micro- and Macroorganisms


Rove beetle
Flatworm
Ant
Centipede
Pseudoscorpion
Mite
Ground beetle
Adult fly
Fly larvae
Roundworms
Protozoa
Beetle
Mite
Springtail
Millipede
Bacteria
Fungi
Sowbug
Slug
Snail
Actinomycetes
Mite
Earthworm
Organic debris

What is Compost?

- Managed Decomposition
- Microscopic: Micro- and Macroorganisms
- Ingredients

Keys to Good Composting

Carbon-to-nitrogen ratio (C:N ratio) by volume

Combine a mixture of dry leaves; old, dead plant material; or other sources of carbon with fresh, green plant material or manure for nitrogen. The volume of the brown plant material should equal or be up to three times as much as the green plant material in the pile (C:N ratios of 1:1 to 3:1 by volume).

Presence of microorganisms

Compost inoculants, starters or activators, garden soil, and other such materials do NOT need to be added to the piles because the microorganisms can be found in sufficient numbers on the plant material.

Moisture level

The pile should have the moisture of a wrung-out sponge. Add water as needed.

Oxygen level

A compost pile should be turned periodically to promote decay of its contents. Turning the pile adds oxygen, so the more you turn it, the faster it breaks down.

Particle size

The finer the particle size, the more surface there is for microorganisms to work. To speed compost formation, chop or shred leaves and larger materials before adding them.

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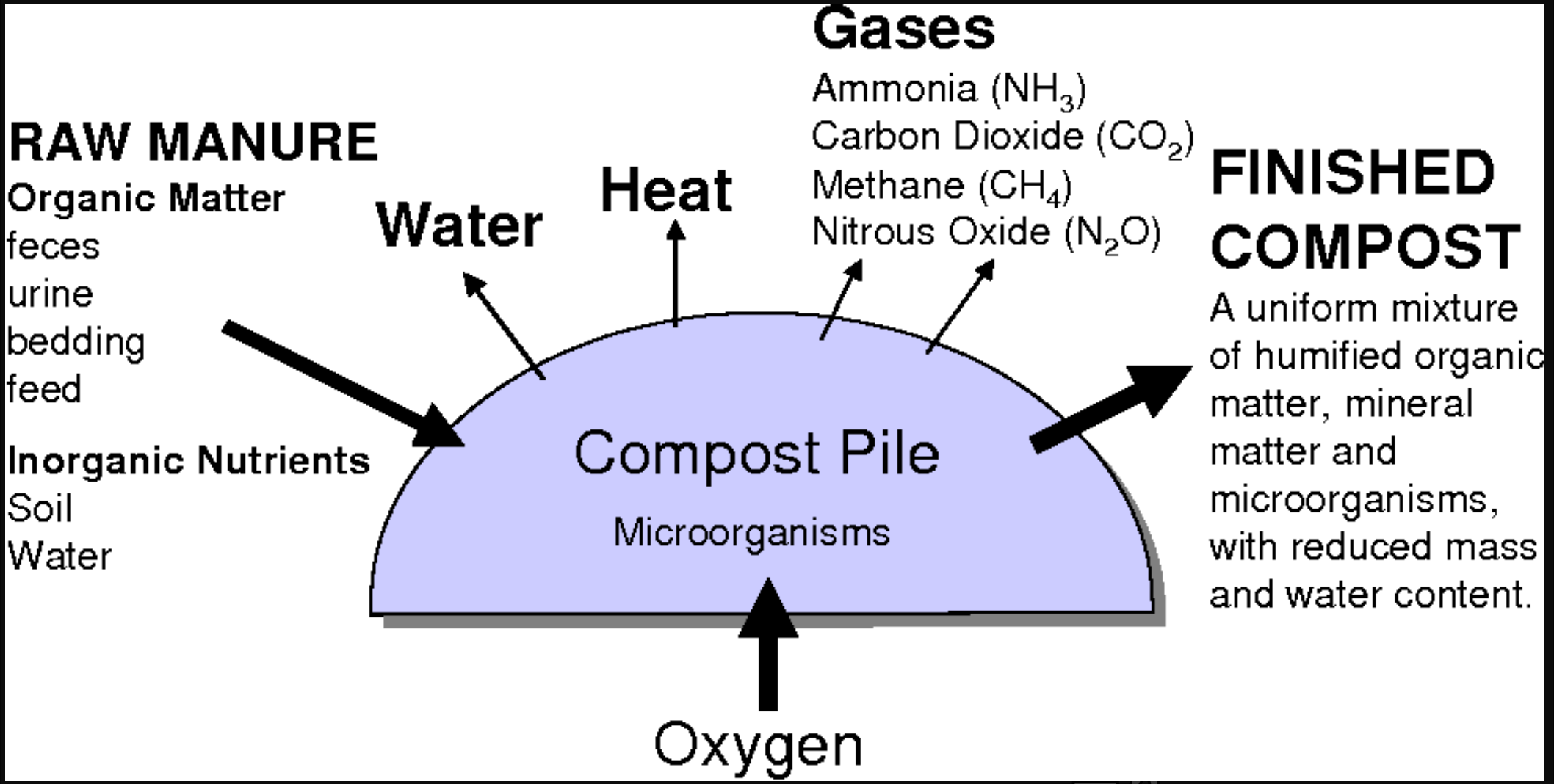
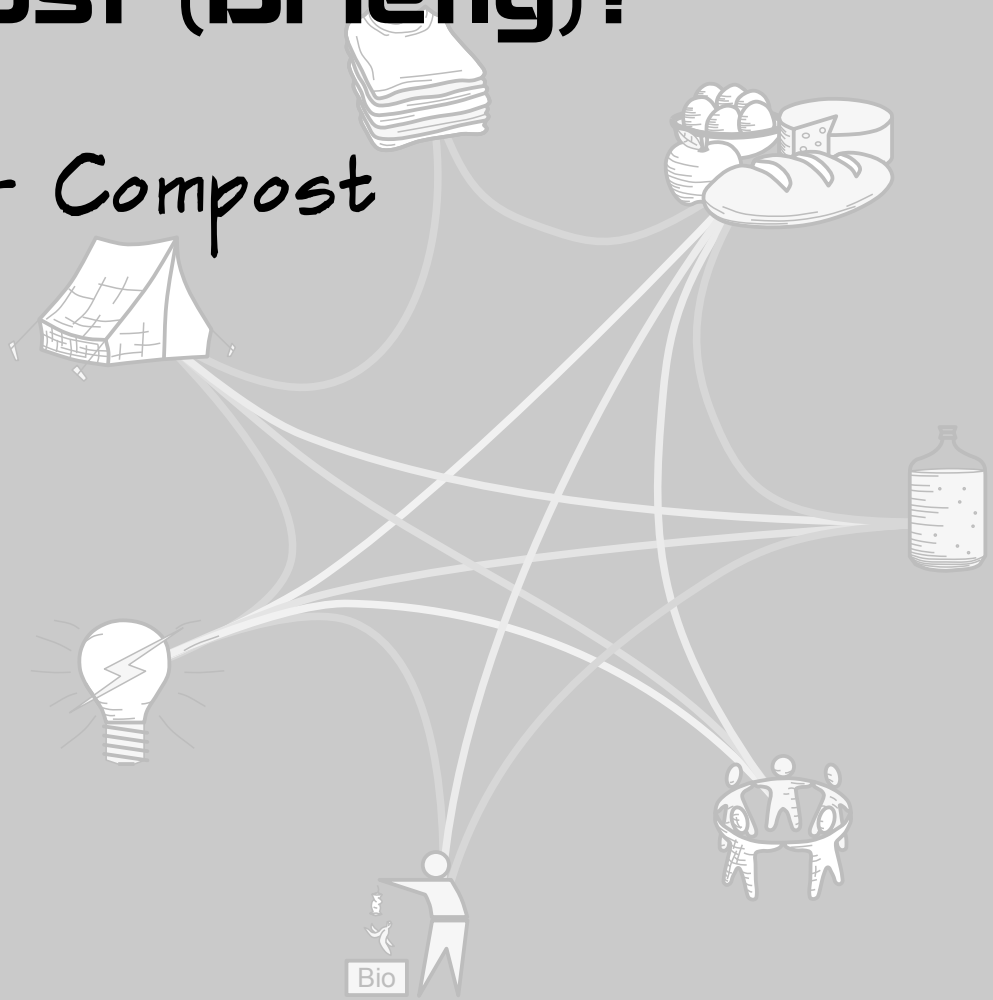
What is Compost?

- Managed Decomposition
- Microscopic: Micro- and Macroorganisms
- Ingredients
- Inputs & Outputs


Gases
Ammonia (NH_3)
Carbon Dioxide (CO_2)
Methane (CH_4)
Nitrous Oxide (N_2O)
RAW MANURE
Organic Matter
feces
urine
bedding
feed
Inorganic Nutrients
Soil
Water
Water
Heat
Compost Pile
Microorganisms
Oxygen
FINISHED COMPOST
A uniform mixture of humified organic matter, mineral matter and microorganisms, with reduced mass and water content.

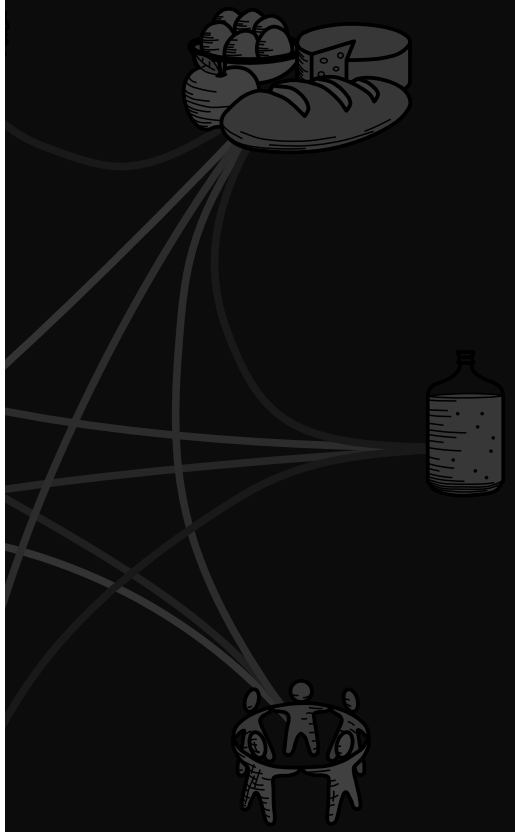
How to Compost (Briefly)?

- Add Carbon + Nitrogen + Compost



Carbon-Rich Materials (Brown)	C:N Ratio
Corn stalks	75:1
Corrugated Cardboard	600:1
Fruit waste	35:1
Leaves	60:1
Newspaper	175:1
Peanut shells	35:1
Pine needles	80:1
Sawdust	325:1
Shredded cardboard	350:1
Shrub trimmings	50:1
Straw	75:1
Waste paper	400:1
Wood (sawdust, shaving:	500:1
Wood ashes	25:1
Wood chips	400:1

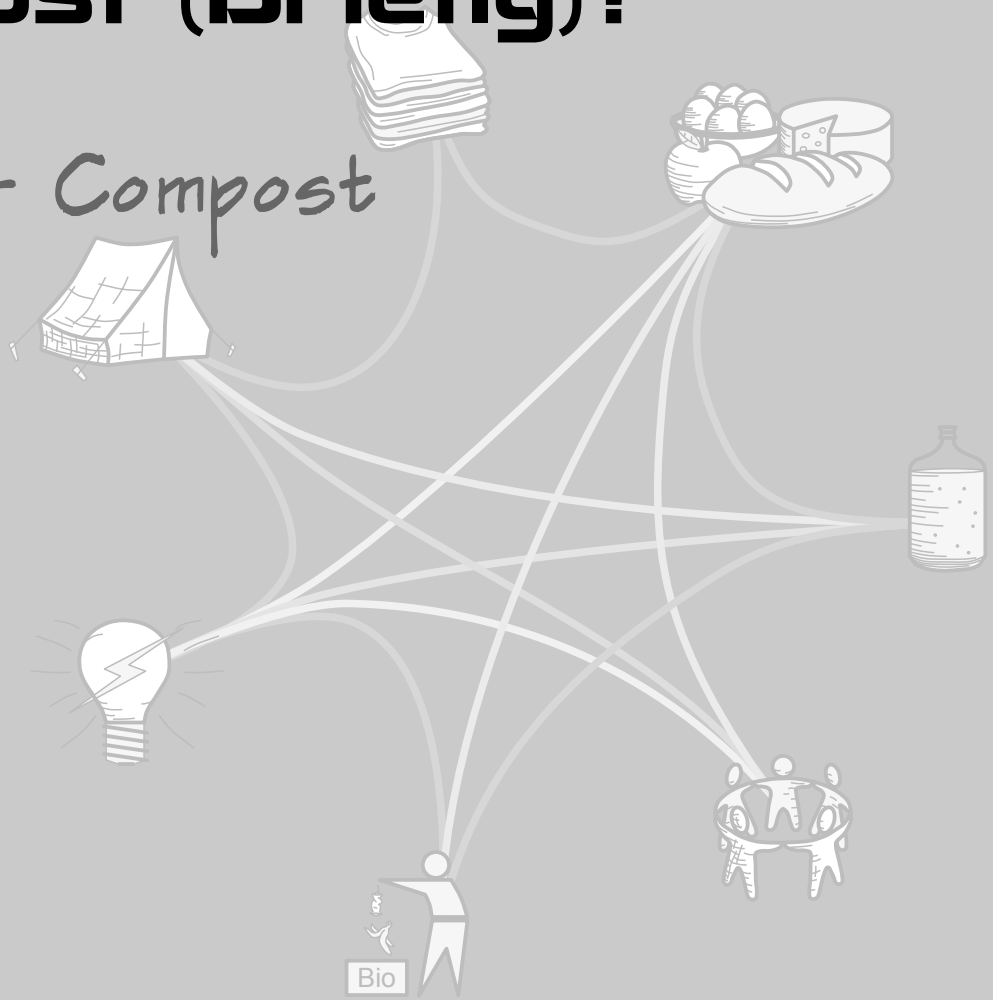
Nitrogen-Rich Materials (Green)	C:N Ratio
Alfalfa	12:1
Chicken Manure	10:1
Clover	23:1
Coffee grounds	20:1
Food waste	20:1
Garden plants & weeds	20-35:1
Garden waste	30:1
Grass clippings	20:1
Hay	25:1
Kitchen scraps	15:1
Manures	15:1
Rotted Manure	20-50:1
Seaweed	19:1
Vegetable culls	12:1
Vegetable scraps	25:1
Weeds	30:1

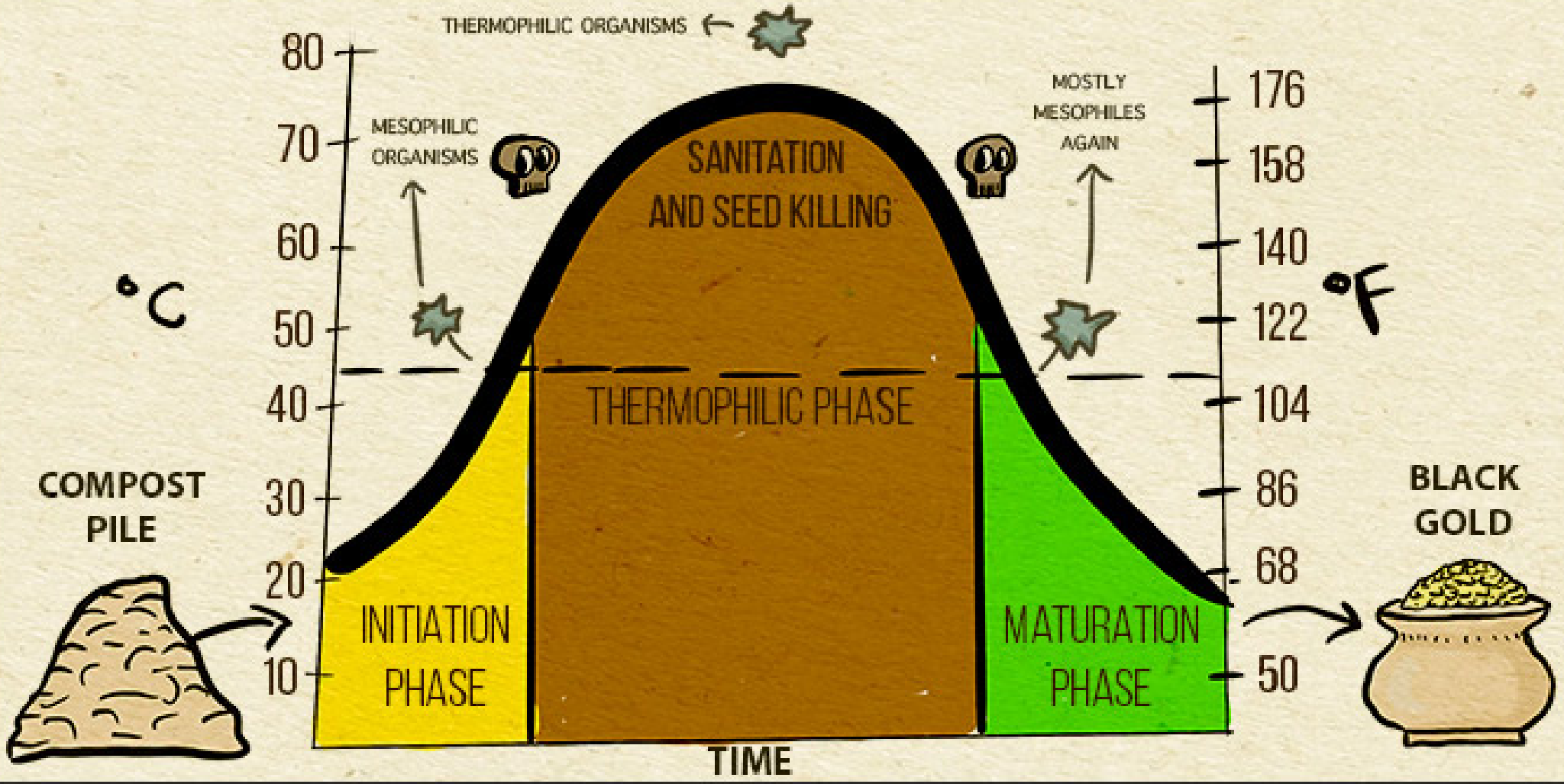


Carbon to Nitrogen Ratio. C:N Ratio of carbon rich materials and nitrogen rich materials for composting

How to Compost (Briefly)?

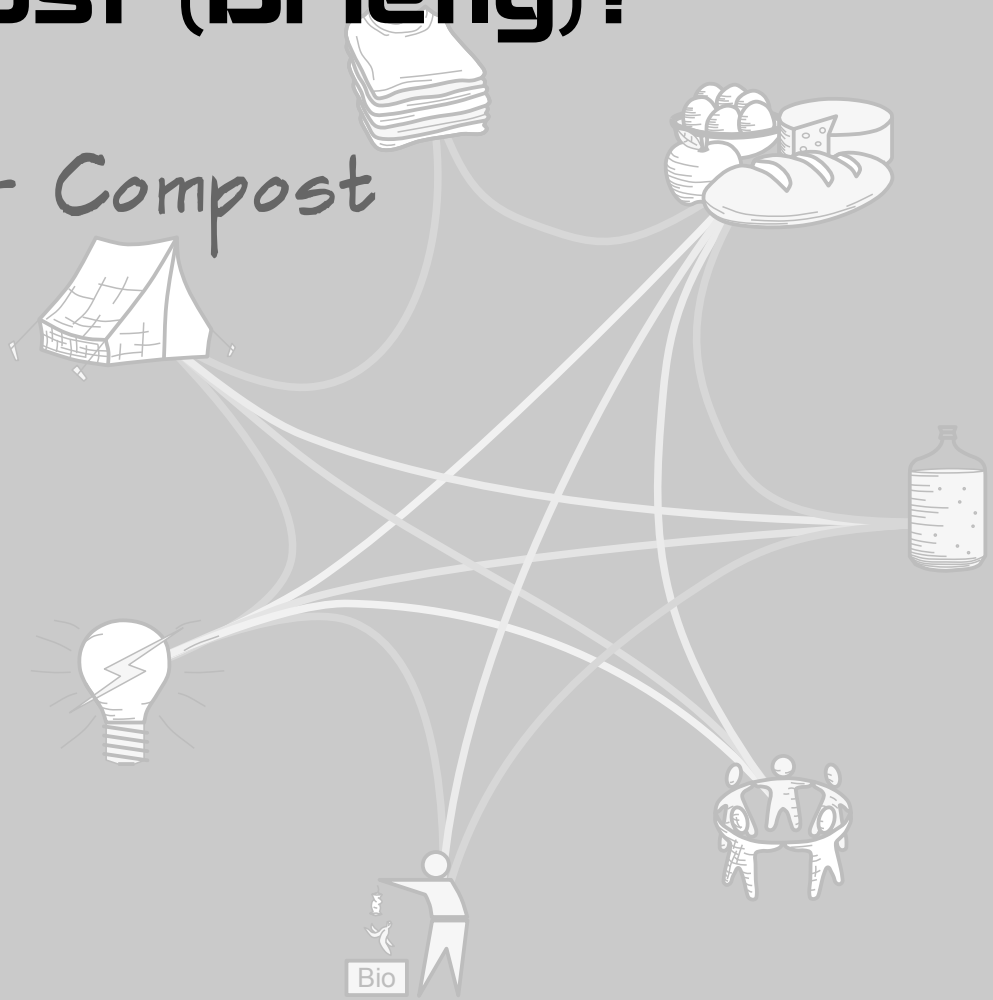
- Add Carbon + Nitrogen + Compost
- Manage Decomposition

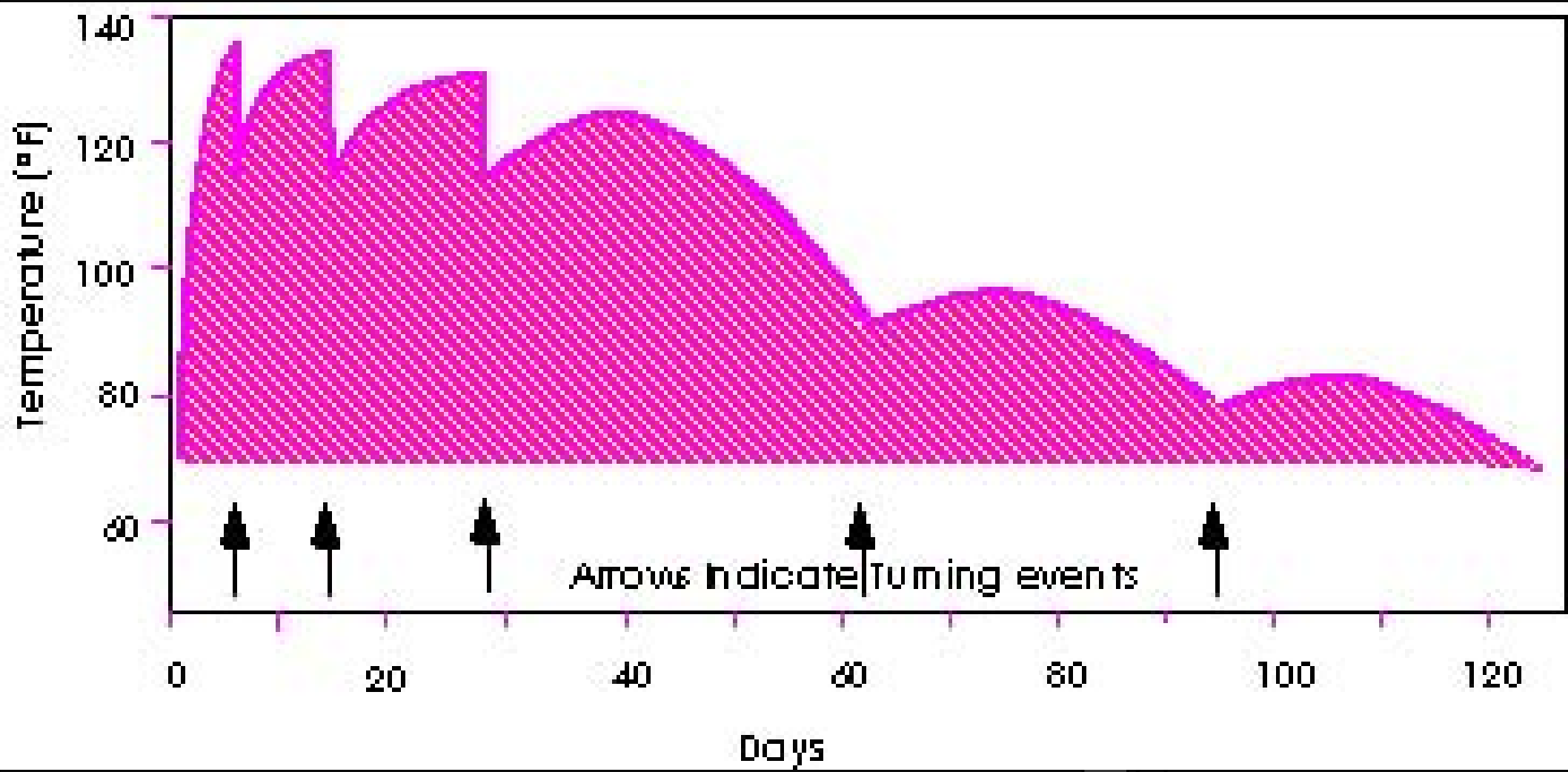



THERMOPHILIC ORGANISMS
MESOPHILIC ORGANISMS
SANITATION AND SEED KILLING
MOSTLY MESOPHILES AGAIN
THERMOPHILIC PHASE
°C
°F
80
70
60
50
40
30
20
10
176
158
140
122
104
86
68
50
COMPOST PILE
BLACK GOLD
INITIATION PHASE
MATURATION PHASE
TIME

How to Compost (Briefly)?

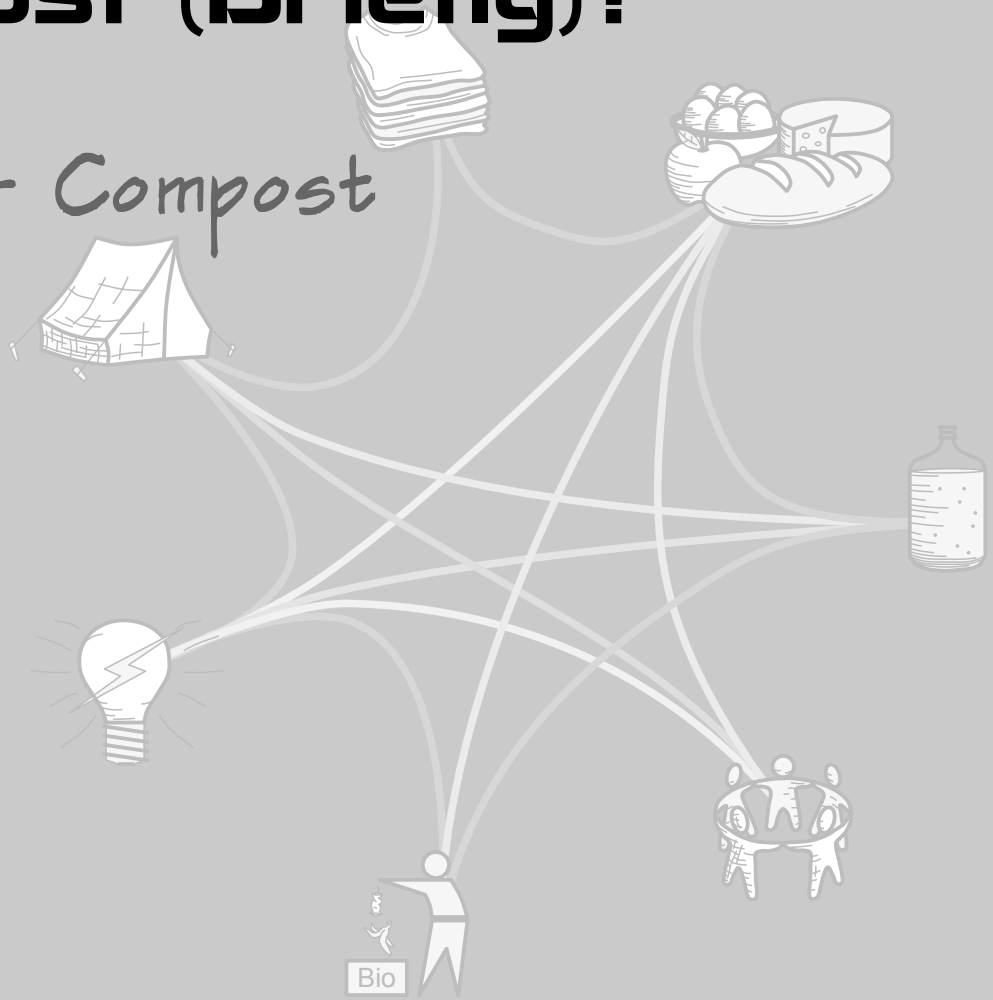
- Add Carbon + Nitrogen + Compost
- Manage Decomposition
- Finish Compost




140
120
100
80
60
Temperature (°F)
Arrows indicate Turning events
0
20
40
60
80
100
120
Days

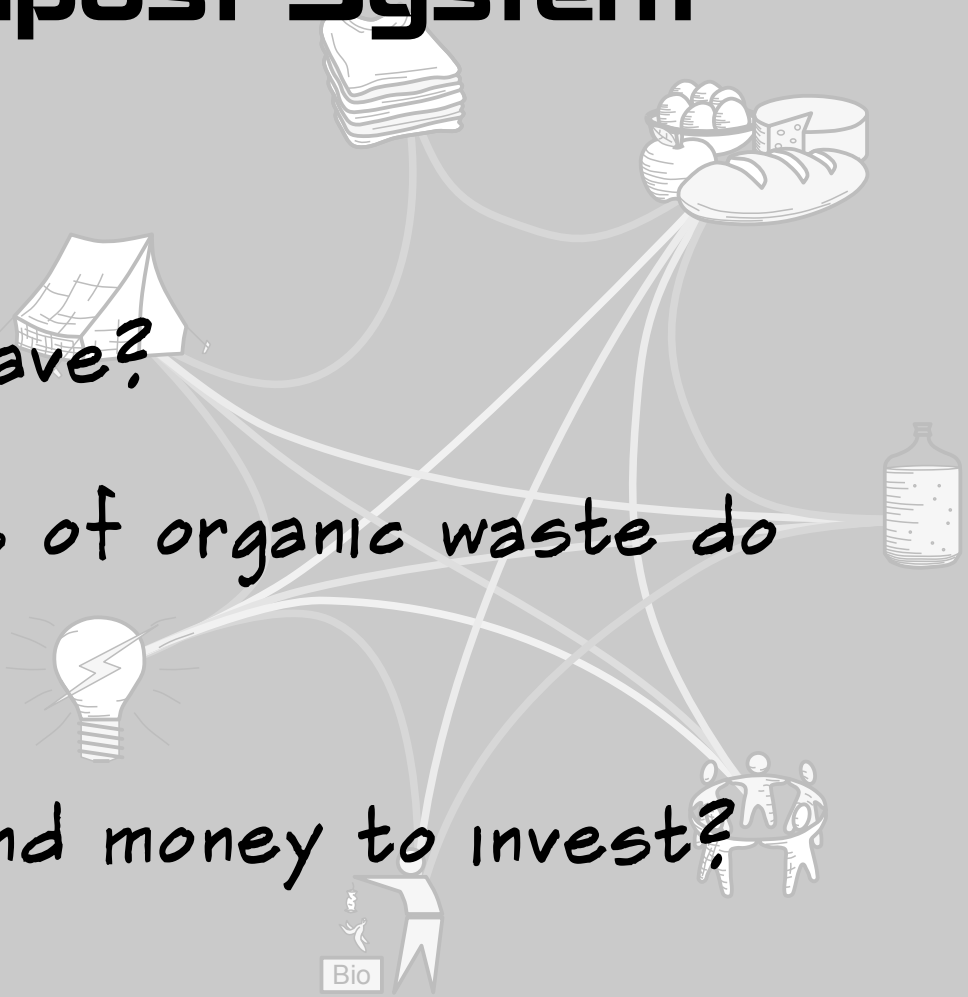
How to Compost (Briefly)?

- Add Carbon + Nitrogen + Compost
- Manage Decomposition
- Finish Compost
- Distribute Compost



Choosing a Compost System

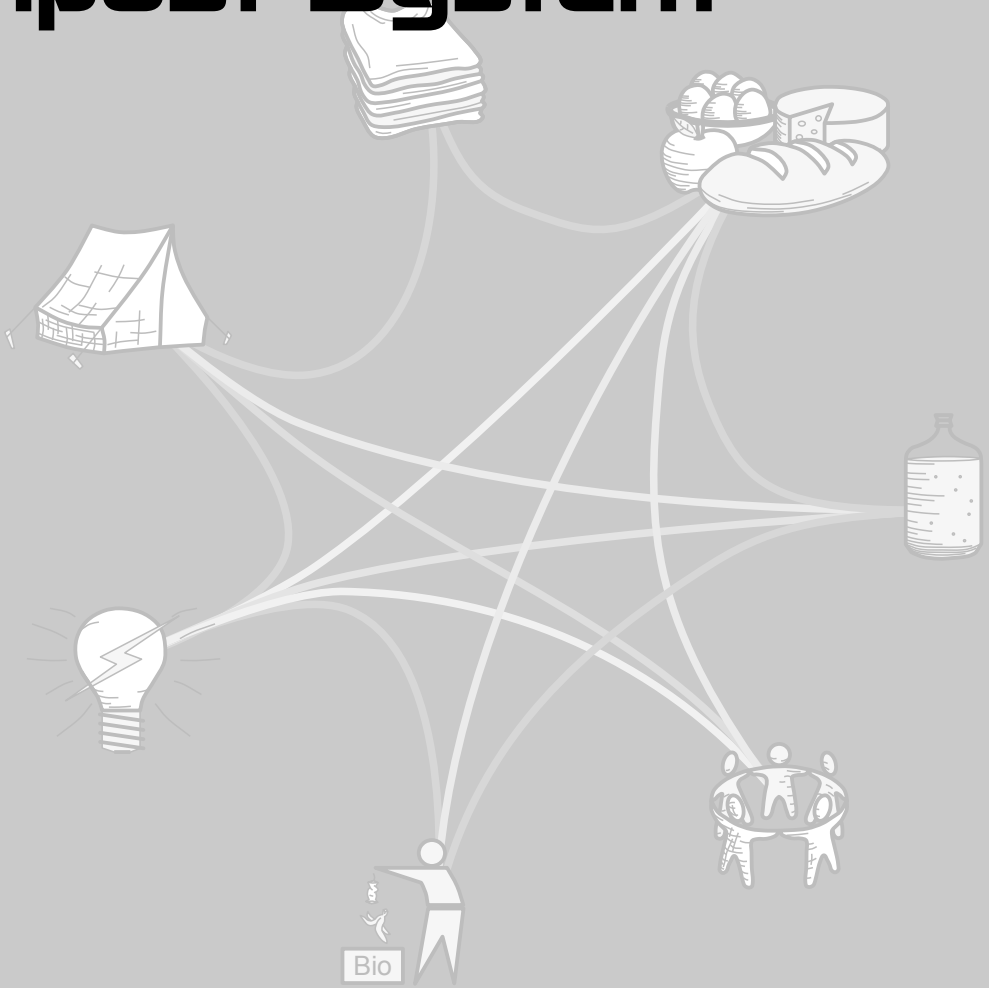
- Questions to Answer:
- How much space do you have?
- How much and what types of organic waste do you have?
- How much time, effort, and money to invest?



SO YOU WANT TO COMPOST?

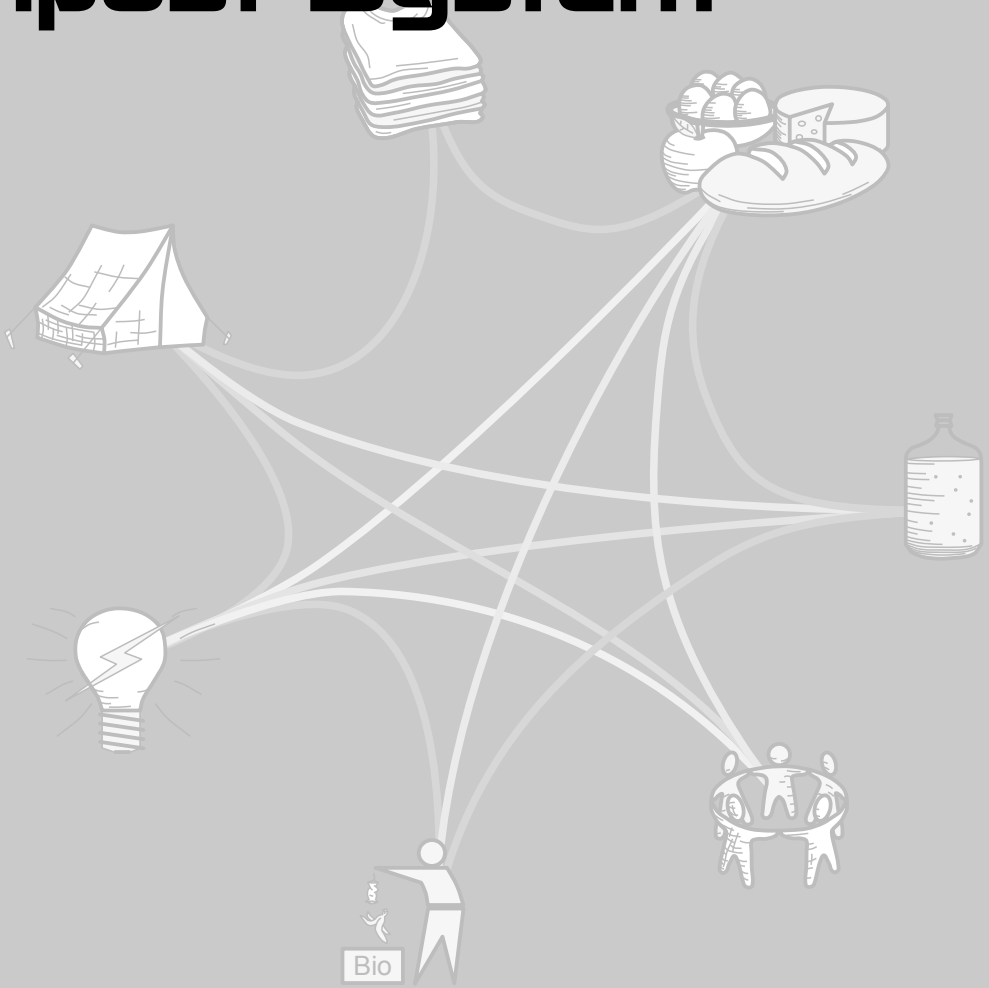
Choosing a Compost System

- Small Systems



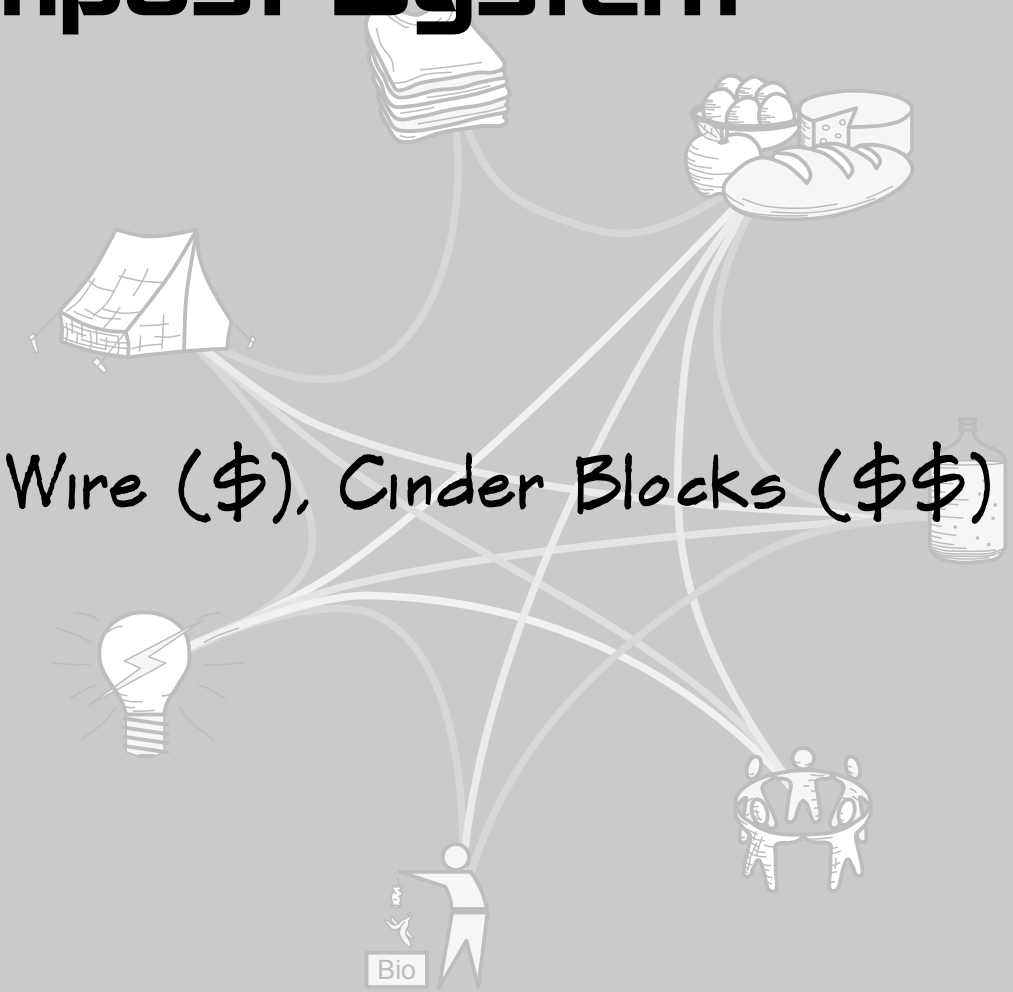
Choosing a Compost System

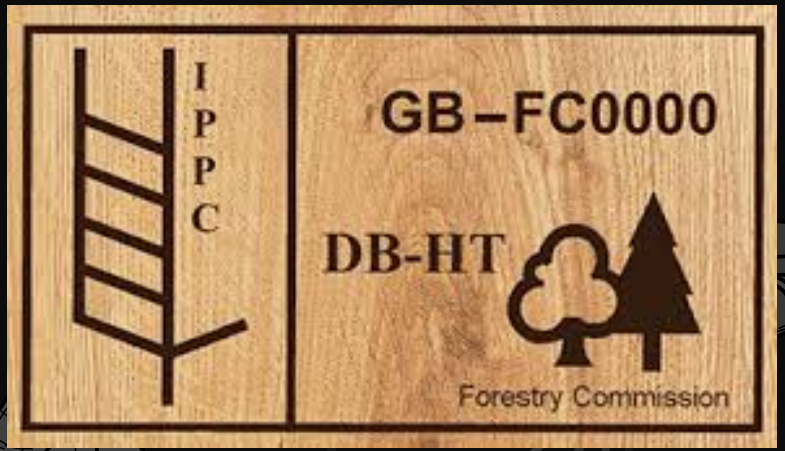
- Small Systems
  - Soil Incorporation ($)

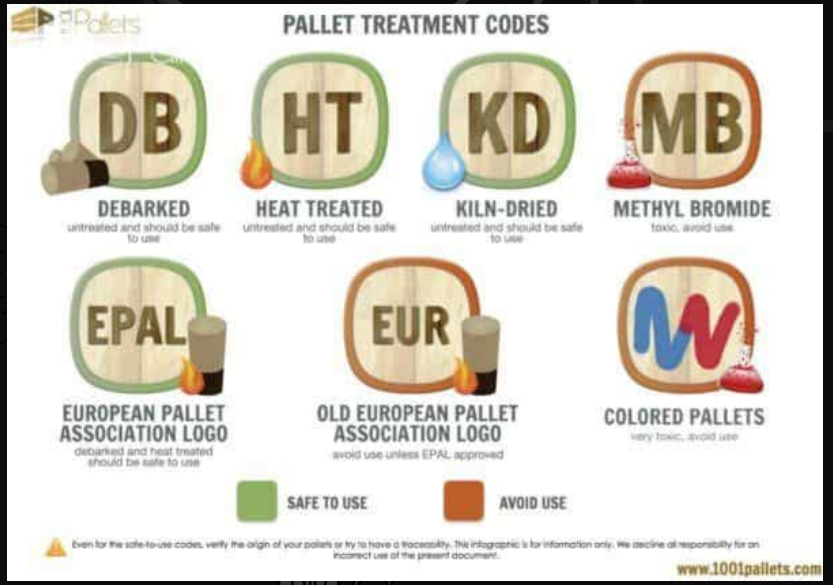


Choosing a Compost System

- Small Systems
  - Soil Incorporation ($)
  - Ground Bin: Pallets ($), Wire ($), Cinder Blocks ($$)

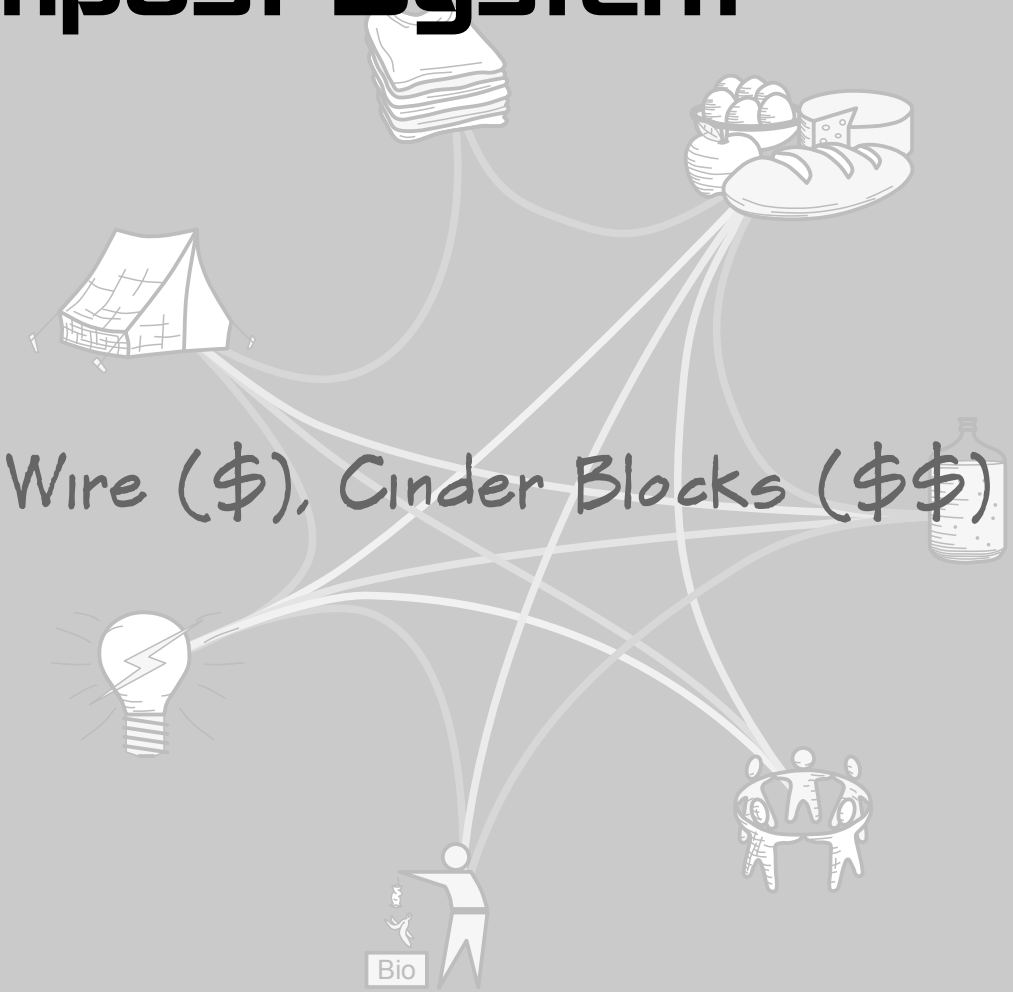


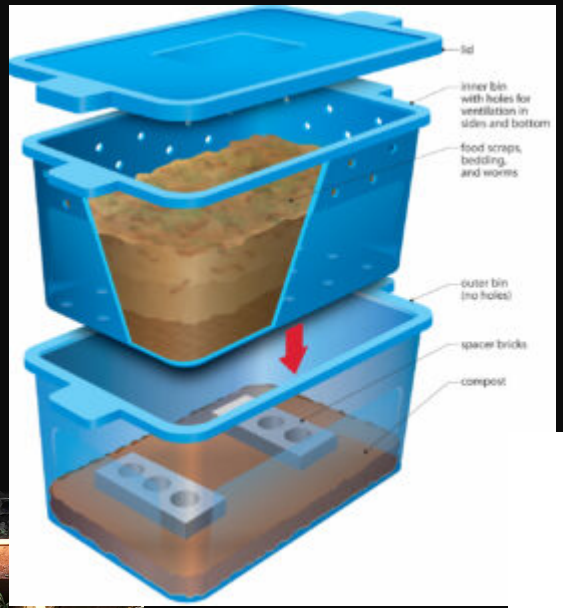

IPPC
GB–FC0000
DB-HT
Forestry Commission


PALLET TREATMENT CODES
DB
DEBARKED
untreated and should be safe to use
HT
HEAT TREATED
untreated and should be safe to use
KD
KILN-DRIED
untreated and should be safe to use
MB
METHYL BROMIDE
toxic, avoid use
EPAL
EUROPEAN PALLET ASSOCIATION LOGO
debarked and heat treated should be safe to use
EUR
OLD EUROPEAN PALLET ASSOCIATION LOGO
avoid use unless EPAL approved
COLORED PALLETS
very toxic, avoid use
SAFE TO USE
AVOID USE
Even for the safe-to-use codes, verify the origin of your pallets or try to have a traceability. This infographic is for information only. We decline all responsibility for an incorrect use of the present document.
www.1001pallets.com

Choosing a Compost System

- Small Systems
  - Soil Incorporation ($)
  - Ground Bin: Pallets ($), Wire ($), Cinder Blocks ($$)
  - Vermicompost ($$$)



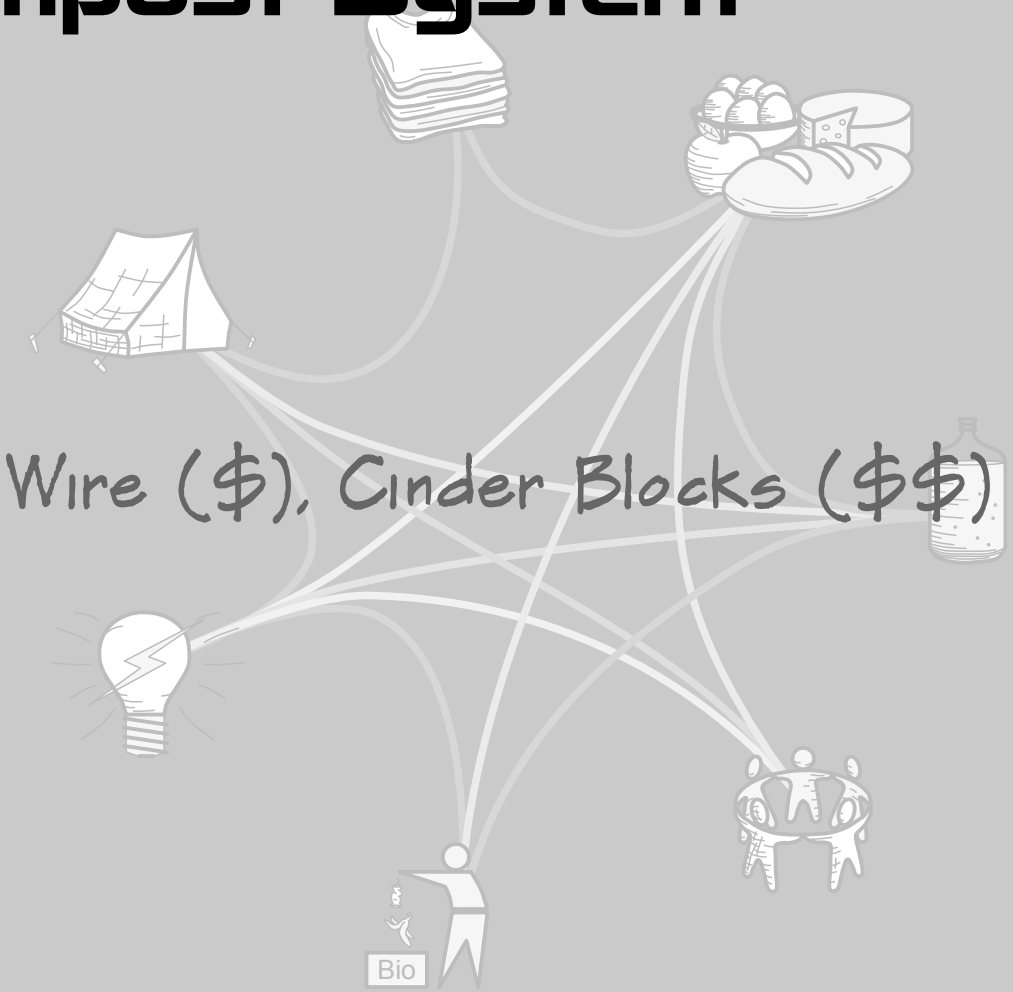

lid
inner bin with holes for ventilation in sides and bottom
food scraps, bedding, and worms
outer bin (no holes)
spacer bricks
compost


GROWING A
greener
WORLD


VERMICOMPOSTING
Cover
Air vents
Worm casting (compost)
Worm tea collection
Tap for tea
Drainage holes
Active area with scraps, worms
Worm blanket

Choosing a Compost System

- Small Systems
  - Soil Incorporation ($)
  - Ground Bin: Pallets ($), Wire ($), Cinder Blocks ($$)
  - Vermicompost ($$$)
  - Bokashi ($$$)

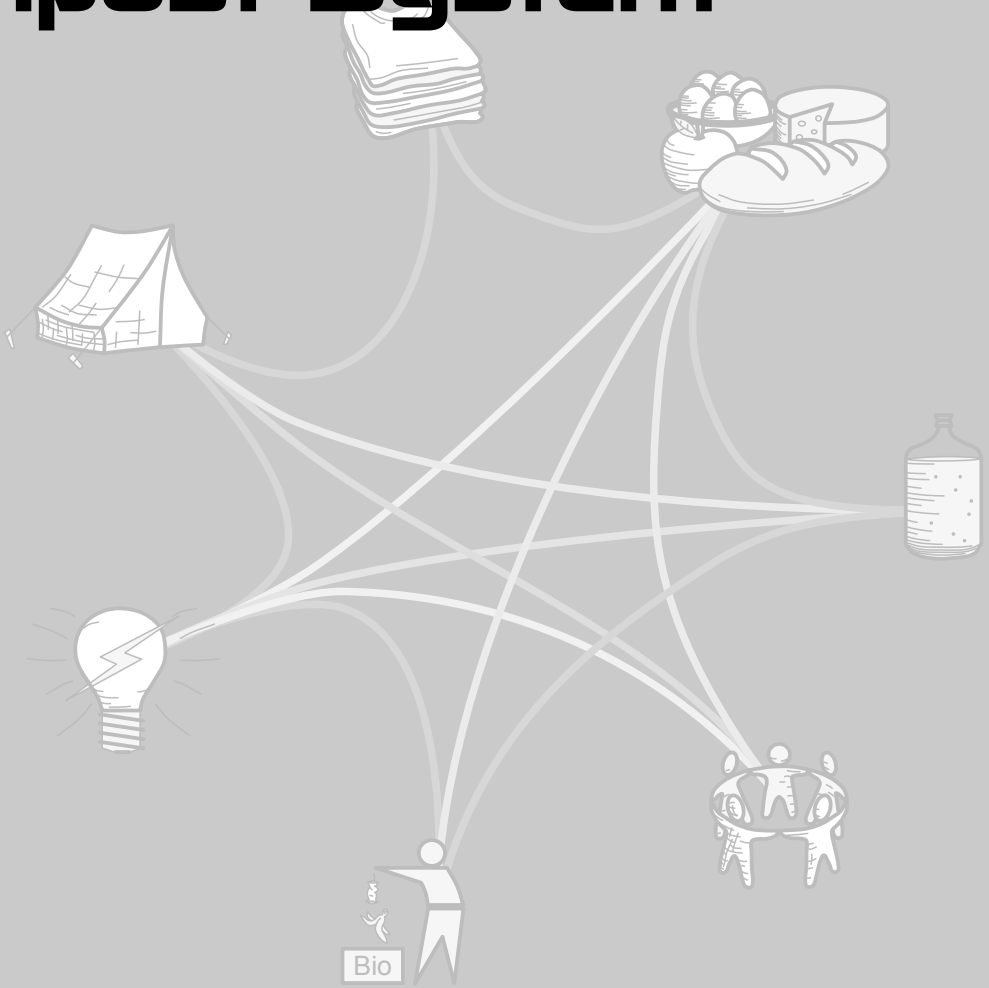



Eco Bokashi
Bucket
Eco Bokashi

Bio

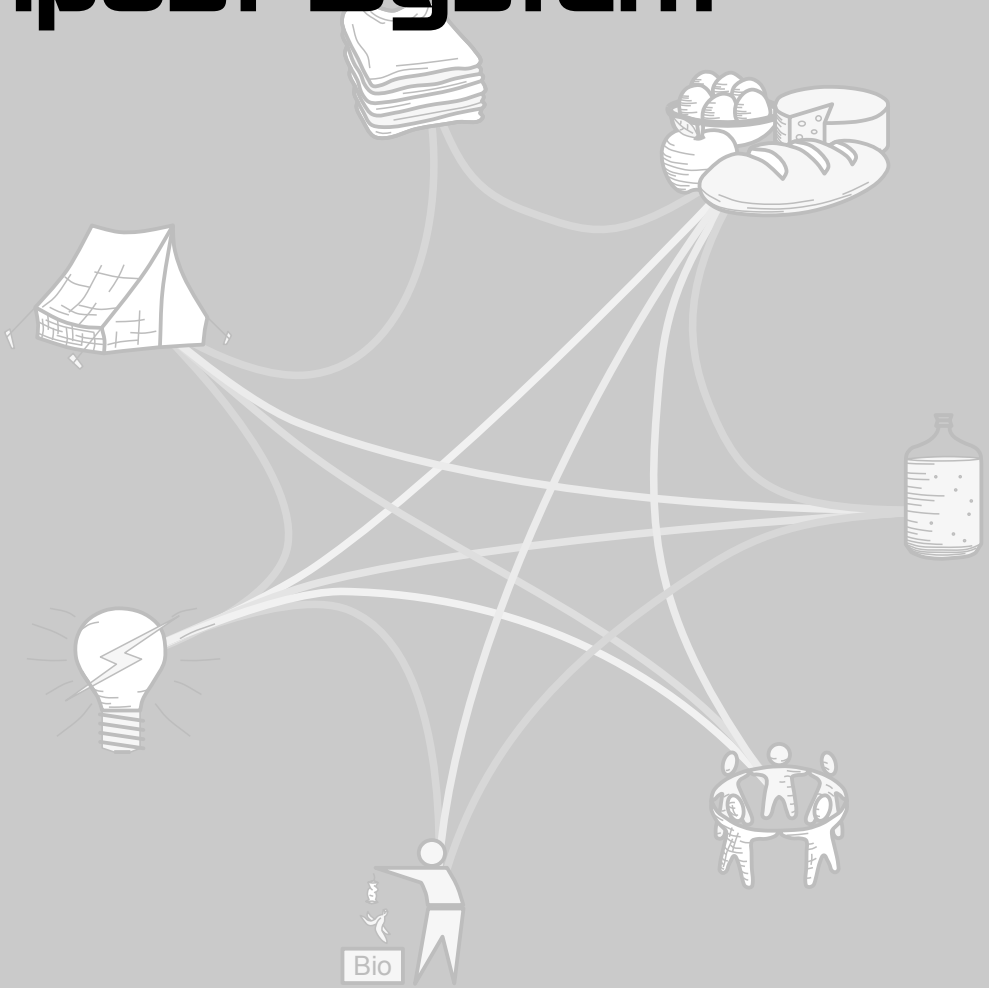
Choosing a Compost System

- Small Systems
- Medium Systems



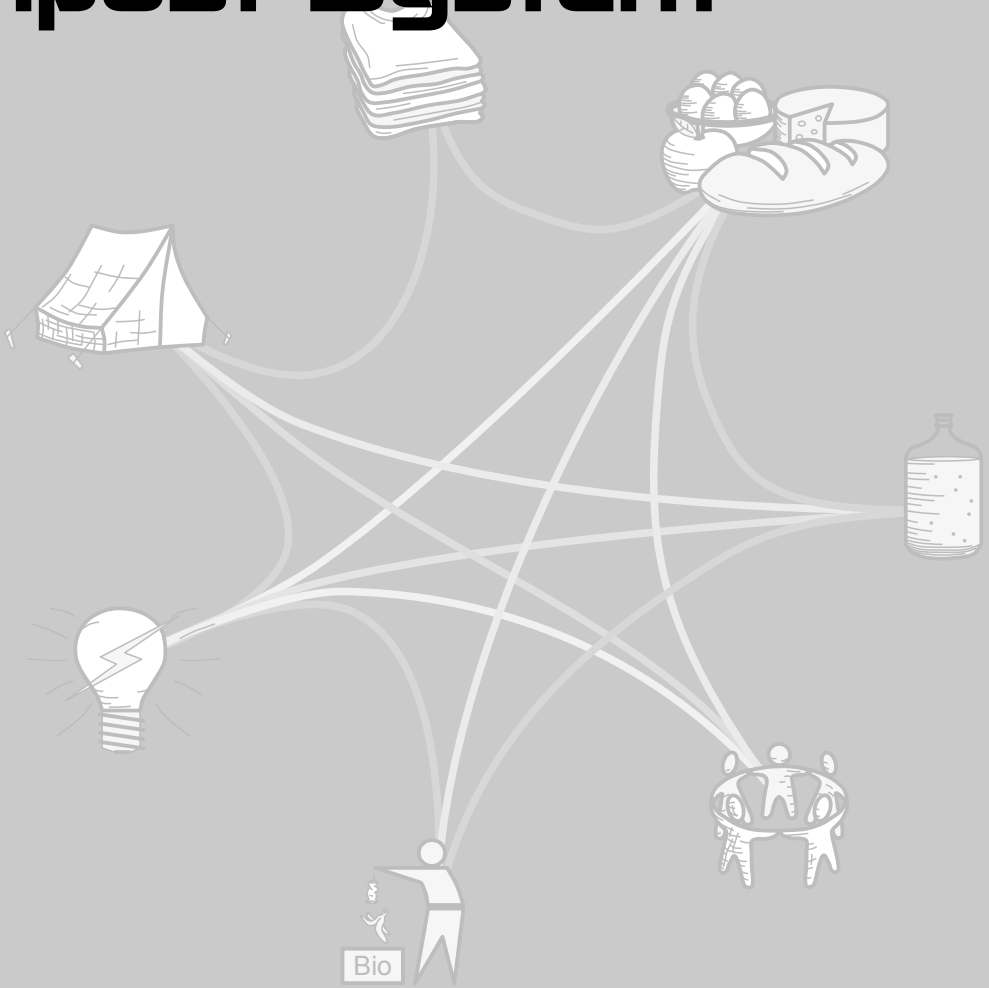
Choosing a Compost System

- Small Systems
- Medium Systems
  - Three-Bin Setup ($$)



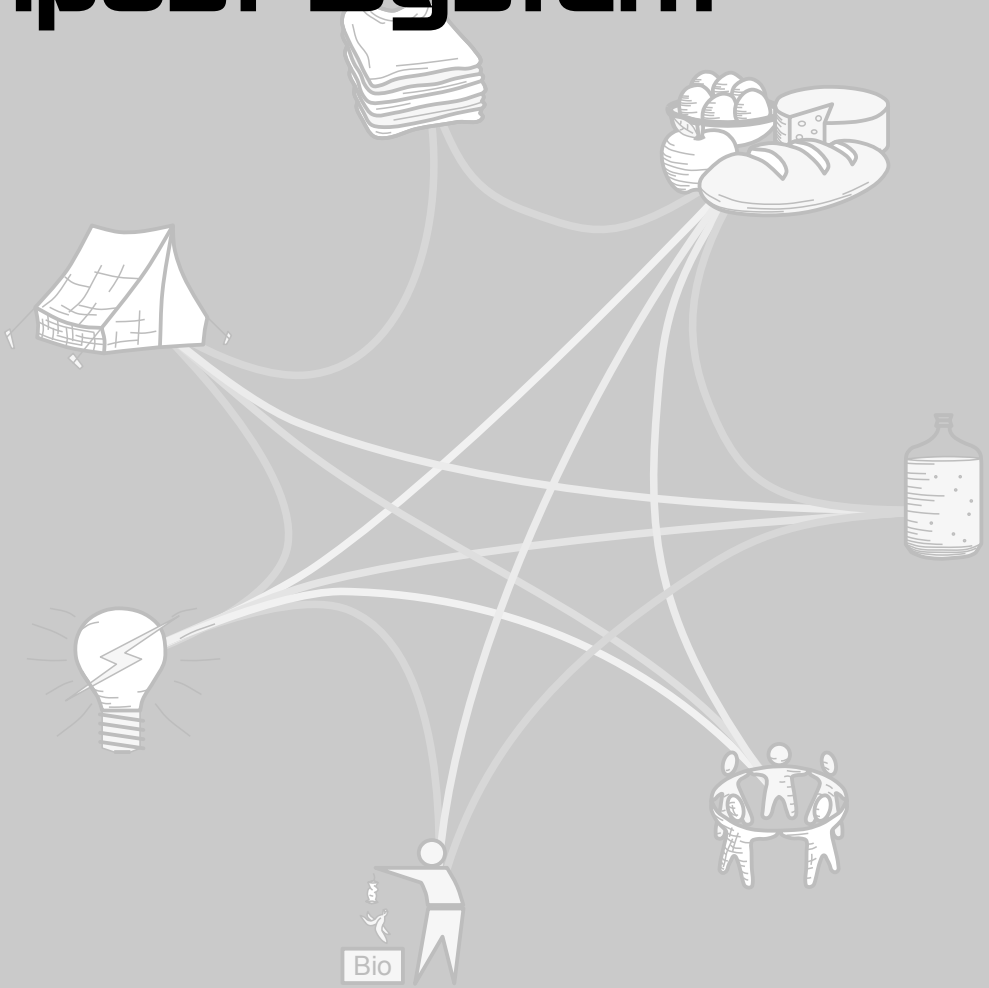
Choosing a Compost System

- Small Systems
- Medium Systems
  - Three-Bin Setup ($$)
  - Trash Bins ($$)



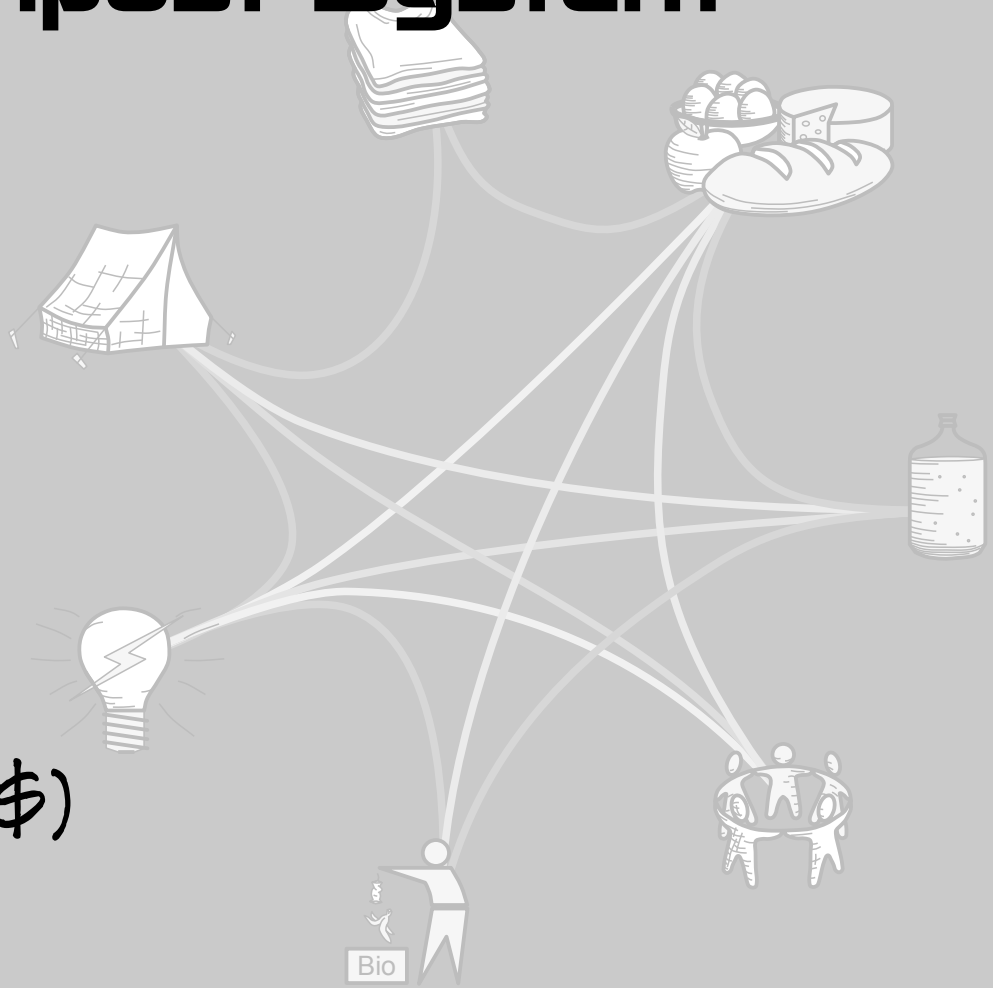
Choosing a Compost System

- Small Systems
- Medium Systems
  - Three-Bin Setup ($$)
  - Trash Bins ($$)
  - Rotating Drums ($$$)



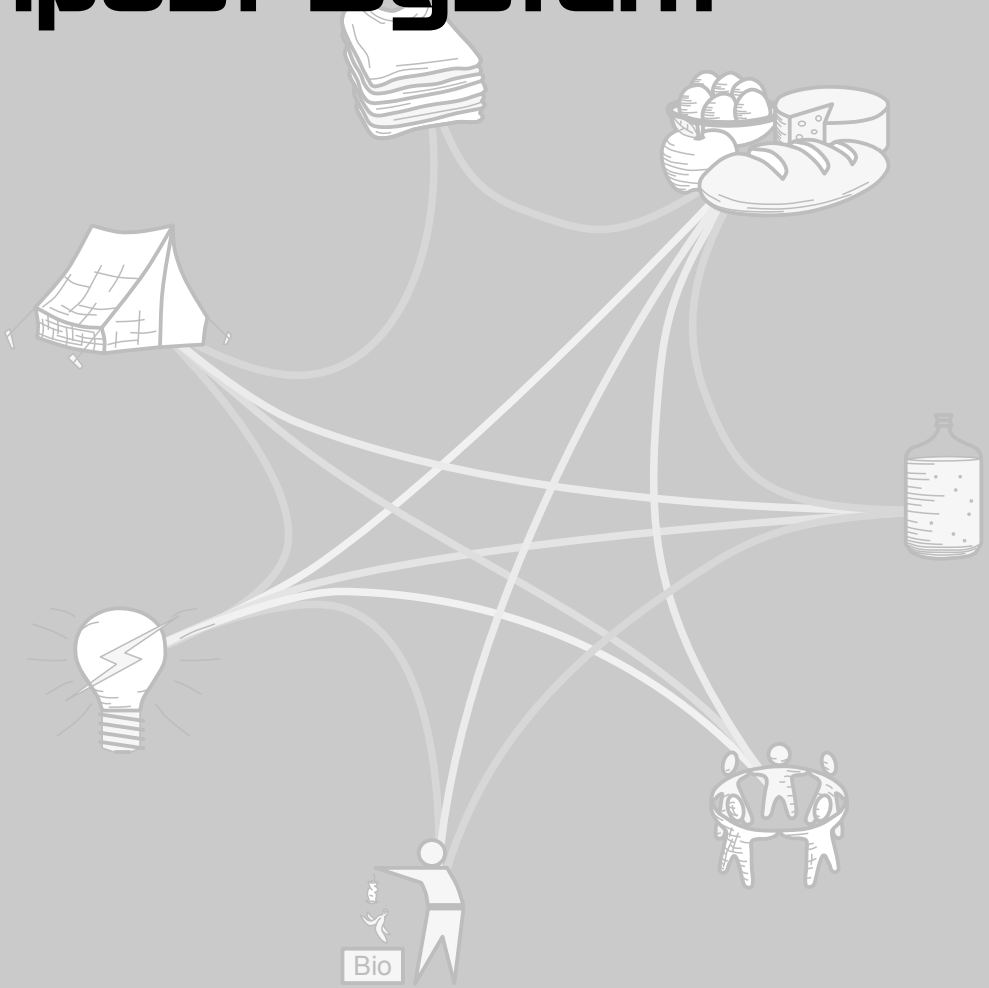
Choosing a Compost System

- Small Systems
- Medium Systems
  - . . .
  - Rotating Drums ($$$)
  - Chicken Composting ($$$)



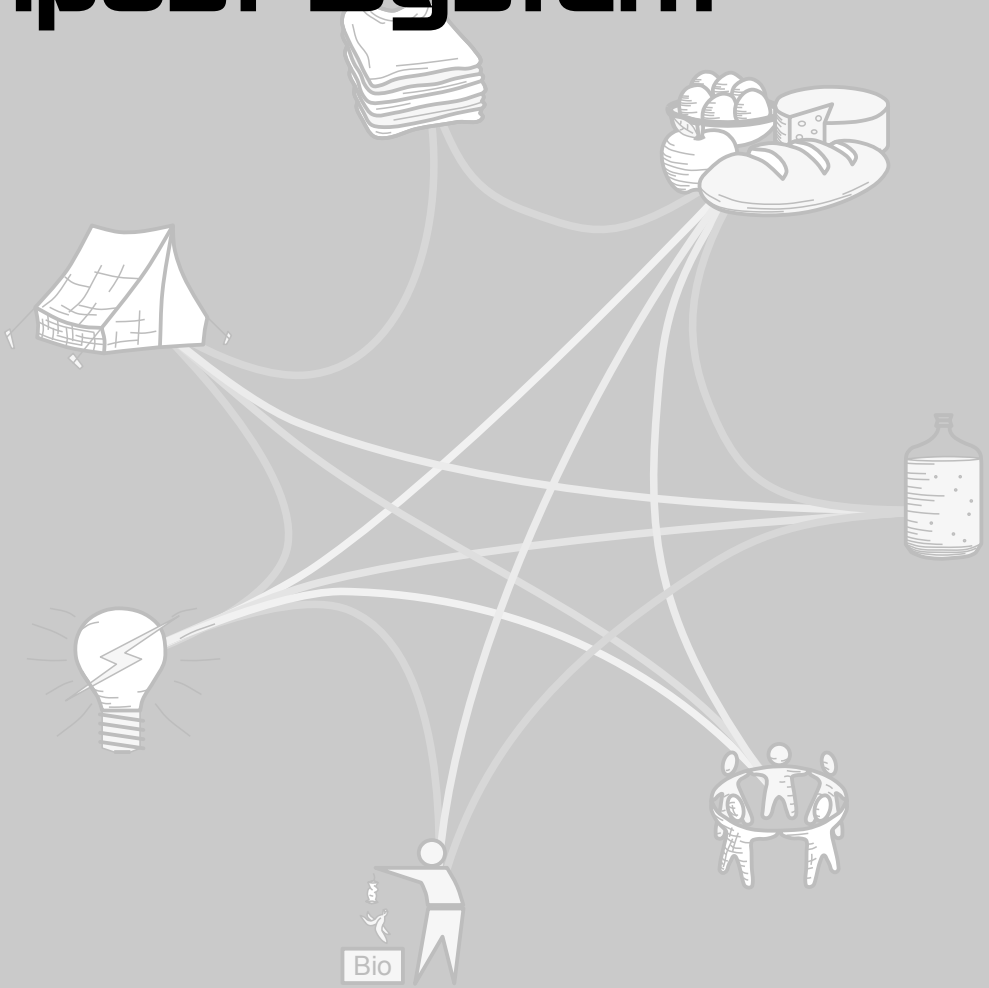
Choosing a Compost System

- Small Systems
- Medium Systems
- Large Systems



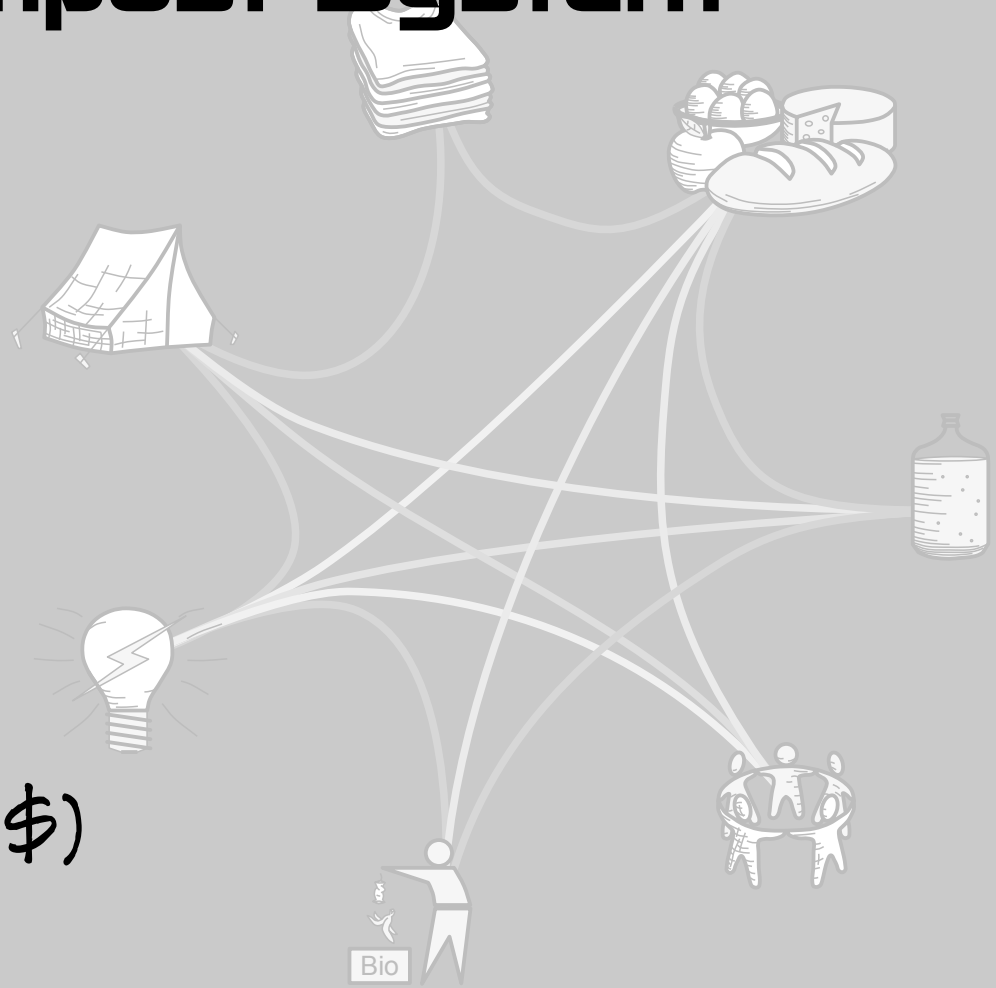
Choosing a Compost System

- Small Systems
- Medium Systems
- Large Systems
  - Windrow ($$)

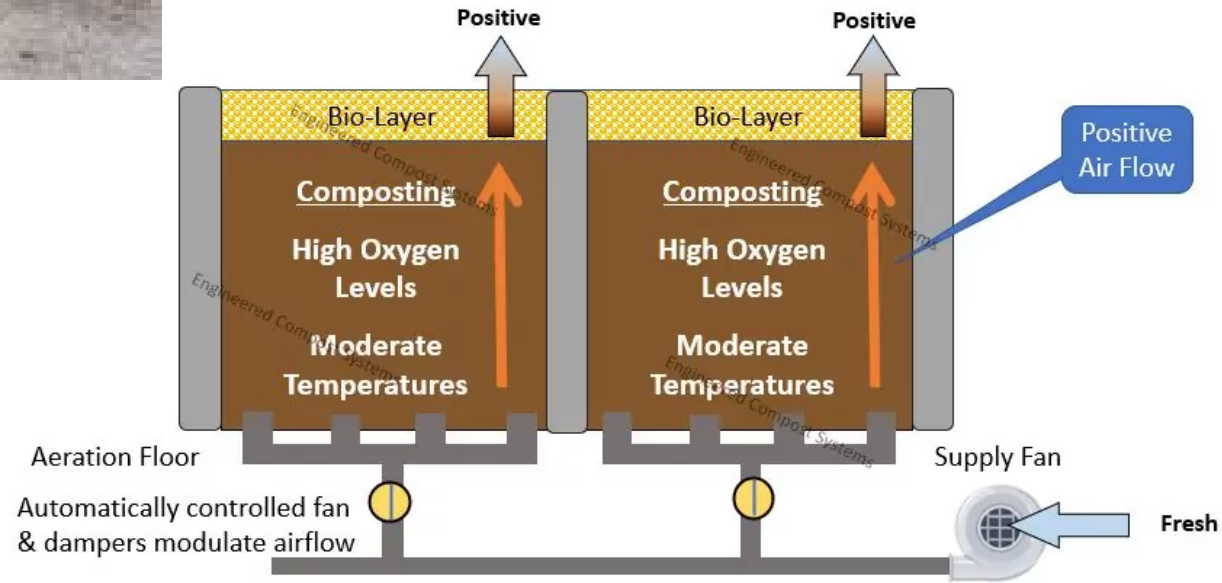


Choosing a Compost System

- Small Systems
- Medium Systems
- Large Systems
  - Windrow ($$)
  - Aerated Static Pile ($$$)



Positive Aeration



Resources

- Cornell: compost.css.cornell.edu/
- EPA: epa.gov/recycle/composting-home
- U of IL: extension.illinois.edu/composting
- US CC: compostingcouncil.org/

Home Compost Systems

Low Technology Institute

lowtechinstitute.org

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