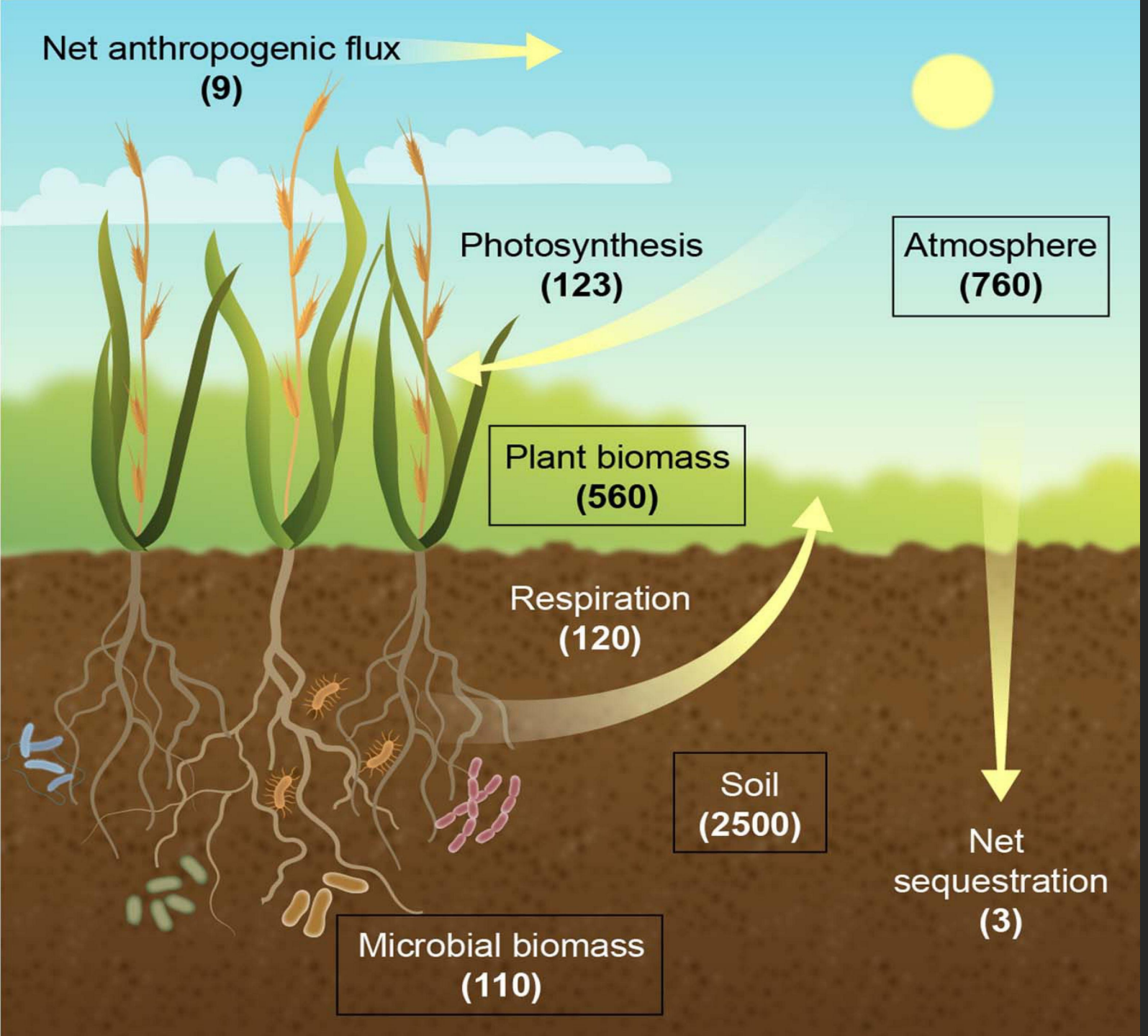
Intro to Composting: an Ecological Perspective

DR. JANE LUCAS, ASSISTANT SCIENTIST

CARY INSTITUTE OF ECOSYSTEM STUDIES

Microbial Ecologist and Soil Scientist



Soils are our biggest terrestrial C pool!


Composting provides insight into Global C Cycle

Why is composting important?

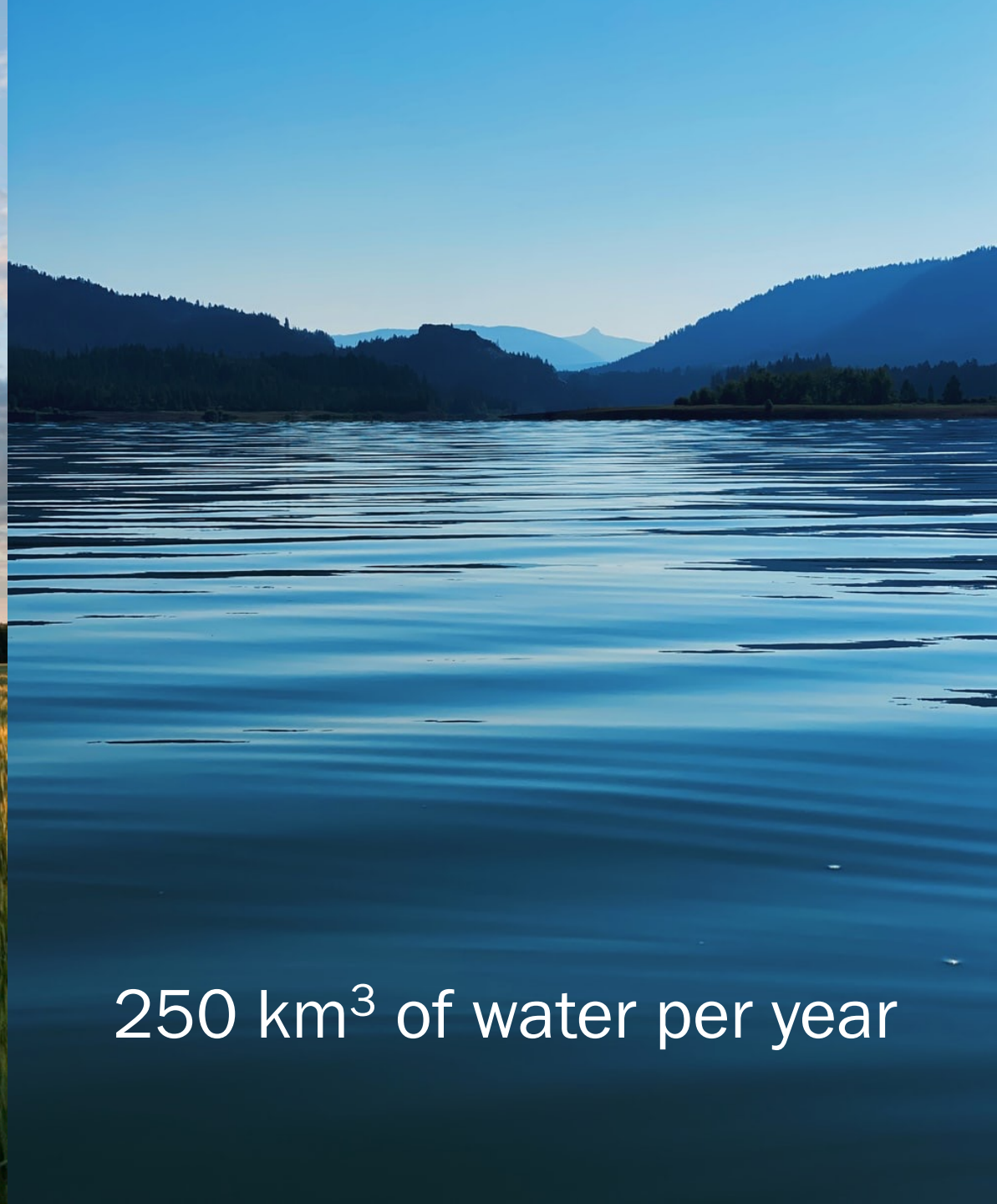
We have a food waste problem

30-40% of all food is wasted (EPA)

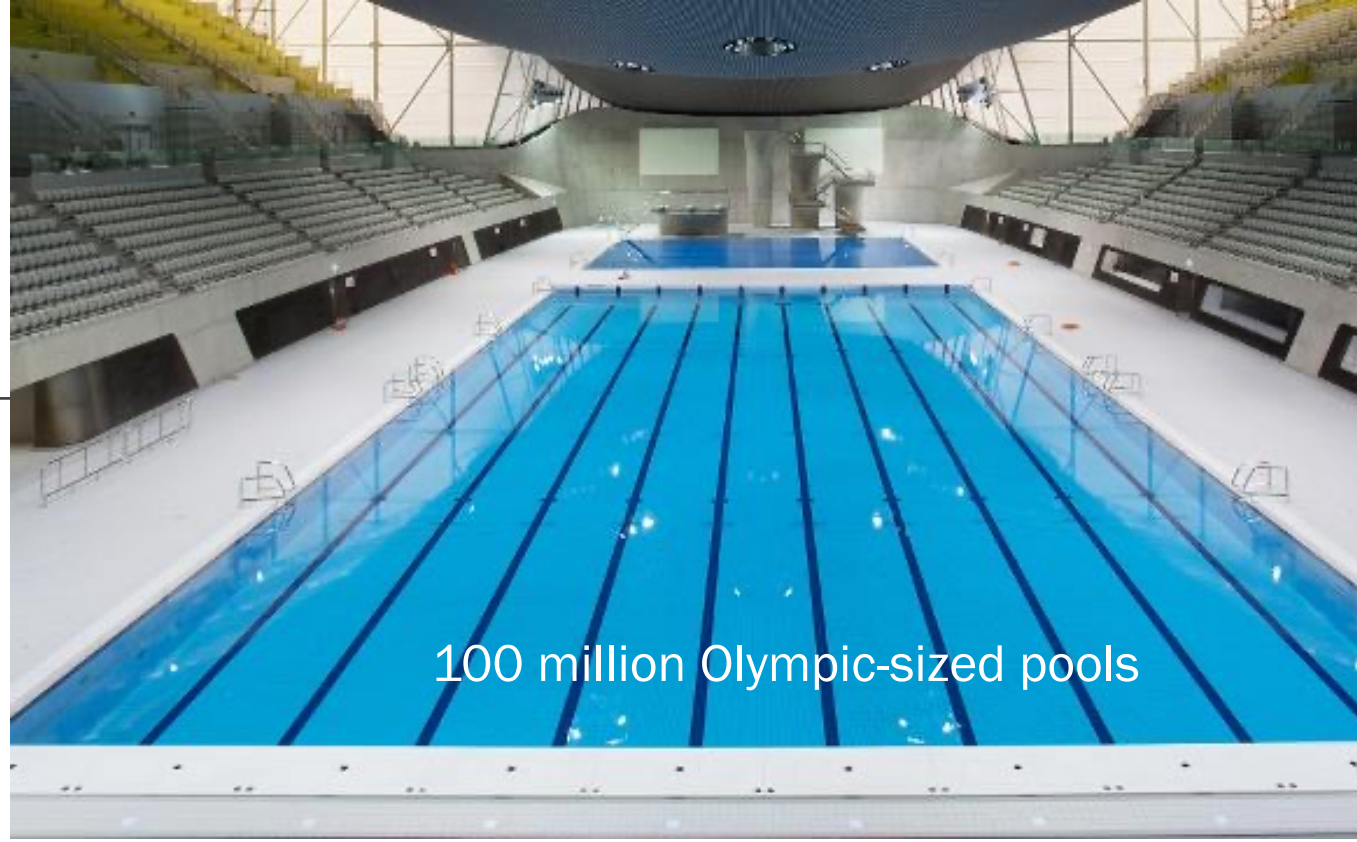
Not only is food wasted …

… but the resources to make it are wasted too

1.8 billion Ha of land per year



250 km^3 of water per year



That is equivalent to:

Landfills produce 15% of Methane

Food loss also generates greenhouse gases


Food waste is a problem we can all help solve!

Compost is an easy way to cut back on food waste

Outline

What is compost?

Principles of composting

Types of composting systems

How to start and troubleshoot your own compost demonstration

What is compost?

What is compost?

Humus-rich material that results from the controlled decomposition of organic materials

What is compost?

Humus = the organic component of soil, made of of plant material and microorganisms

Humus-rich material that results from the controlled decomposition of organic materials

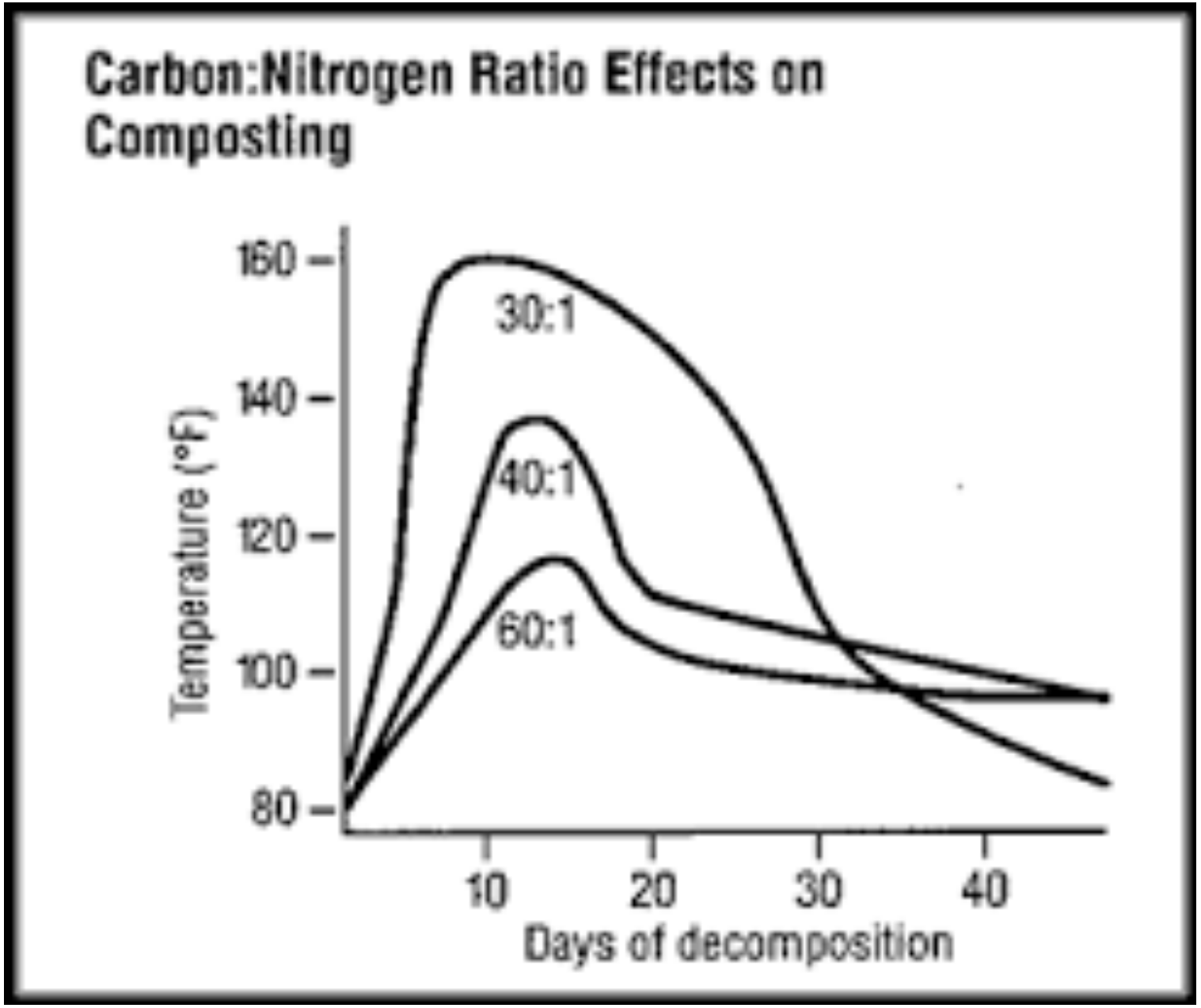
Compost ≠ Soil

Instead, think of it as a great fertilizer

What is compost made of?

- Organic matter
- Microorganisms
- Air
- Water

Organic matter



Looking for 30:1 Ratio of C to N

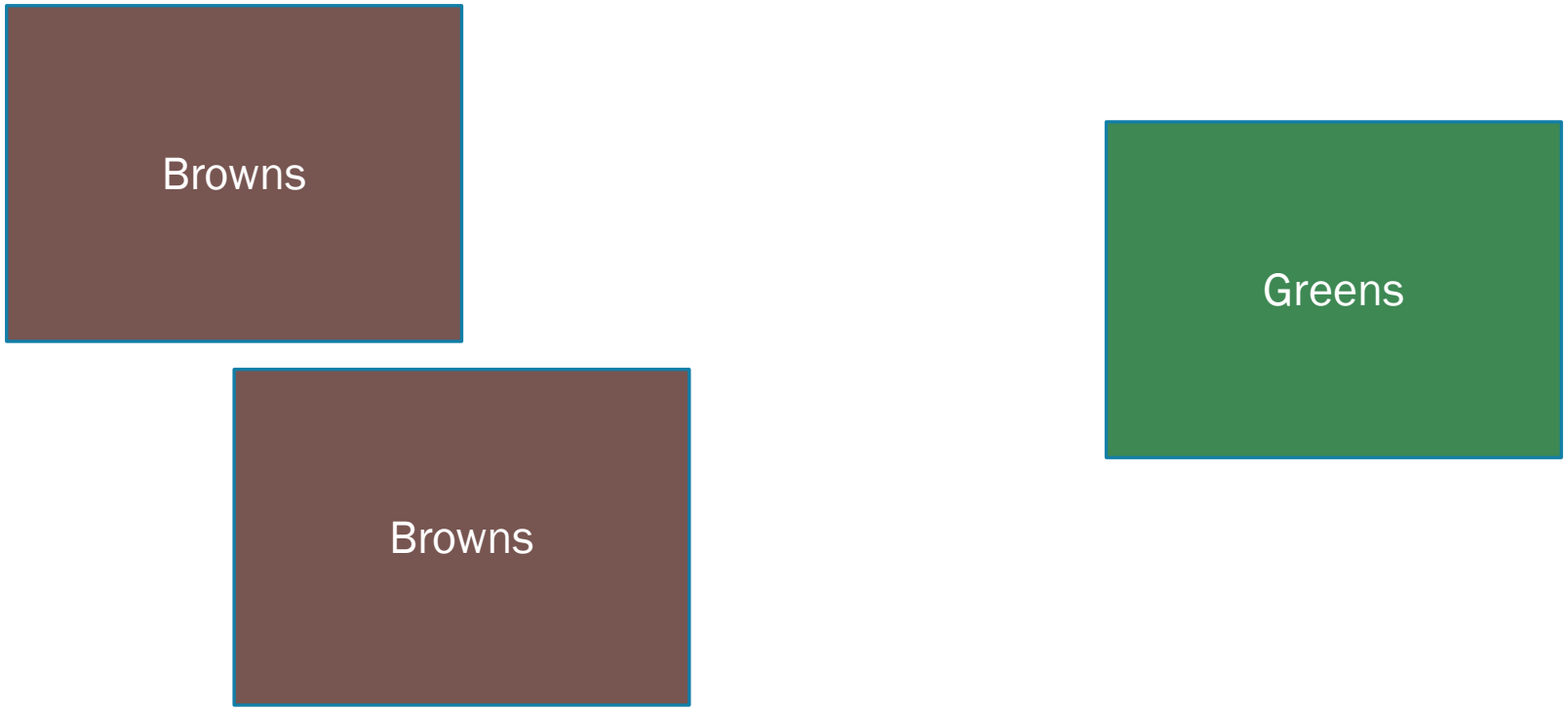
Table 2

Average Carbon/Nitrogen Ratios of Common Materials

Kitchen scraps	15:1
Wood	700:1
Sawdust	500:1
Paper	170:1
Grass clippings	19:1
Leaves	80:1 to 40:1
Fruit	35:1
Rotted manure	20:1
Sugar cane residue	50:1
Cornstalks	60:1
Straw	80:1
Alfalfa	12:1
Sweet clover (green)	16:1
Legume/grass hay	25:1
Oat straw	80:1
Sewage sludge (activated)	6:1
Sewage sludge (digested)	16:1

Looking for 30:1 Ratio of C to N

2 to 1 Browns to Green Ratio



What goes in your backyard compost?

CARBON MATERIALS (Browns)


Shredded cardboard

Dryer and vacuum cleaner lint


Crushed egg shells

Fireplace or wood ash (no coal ash)

Hay and straw


Pinestraw (small amounts)

Nut shells


Household plants and used potting soil

Old brush, shrub trimmings and prunings


Paper towels and towel rolls

Saw dust and wood chips (untreated)



Shredded newspaper

Yard trimmings (dry leaves, clippings and twigs)

NITROGEN MATERIALS (Greens)

Bread & grains



Coffee grounds & paper filters

Fruits (cooked or uncooked – limit citrus)


Green grass clippings

Green leaves


Green shrub prunings

Hair and fur


House plants


Kelp or seaweed

Manure from chickens, rabbits, cows, horses (herbivores)

Old flowers


Tea bags (with tags)


Vegetables (cooked or uncooked)

What goes in your backyard compost?

CARBON MATERIALS (Browns)	NITROGEN MATERIALS (Greens)
Shredded cardboard	Bread & grains
Dryer and vacuum cleaner lint	Coffee grounds & paper filters
Crushed egg shells	Fruits (cooked or uncooked – limit citrus)
Fireplace or wood ash (no coal ash)	Green grass clippings
Hay and straw	Green leaves
Pinestraw (small amounts)	Green shrub prunings
Nut shells	Hair and fur
Household plants and used potting soil	House plants
Old brush, shrub trimmings and prunings	Kelp or seaweed
Paper towels and towel rolls	Manure from chickens, rabbits, cows, horses (herbivores)
Saw dust and wood chips (untreated)	Old flowers
Shredded newspaper	Tea bags (with tags)
Yard trimmings (dry leaves, clippings and twigs)	Vegetables (cooked or uncooked)














Slow Compost

Smelly Compost

DO NOT COMPOST:

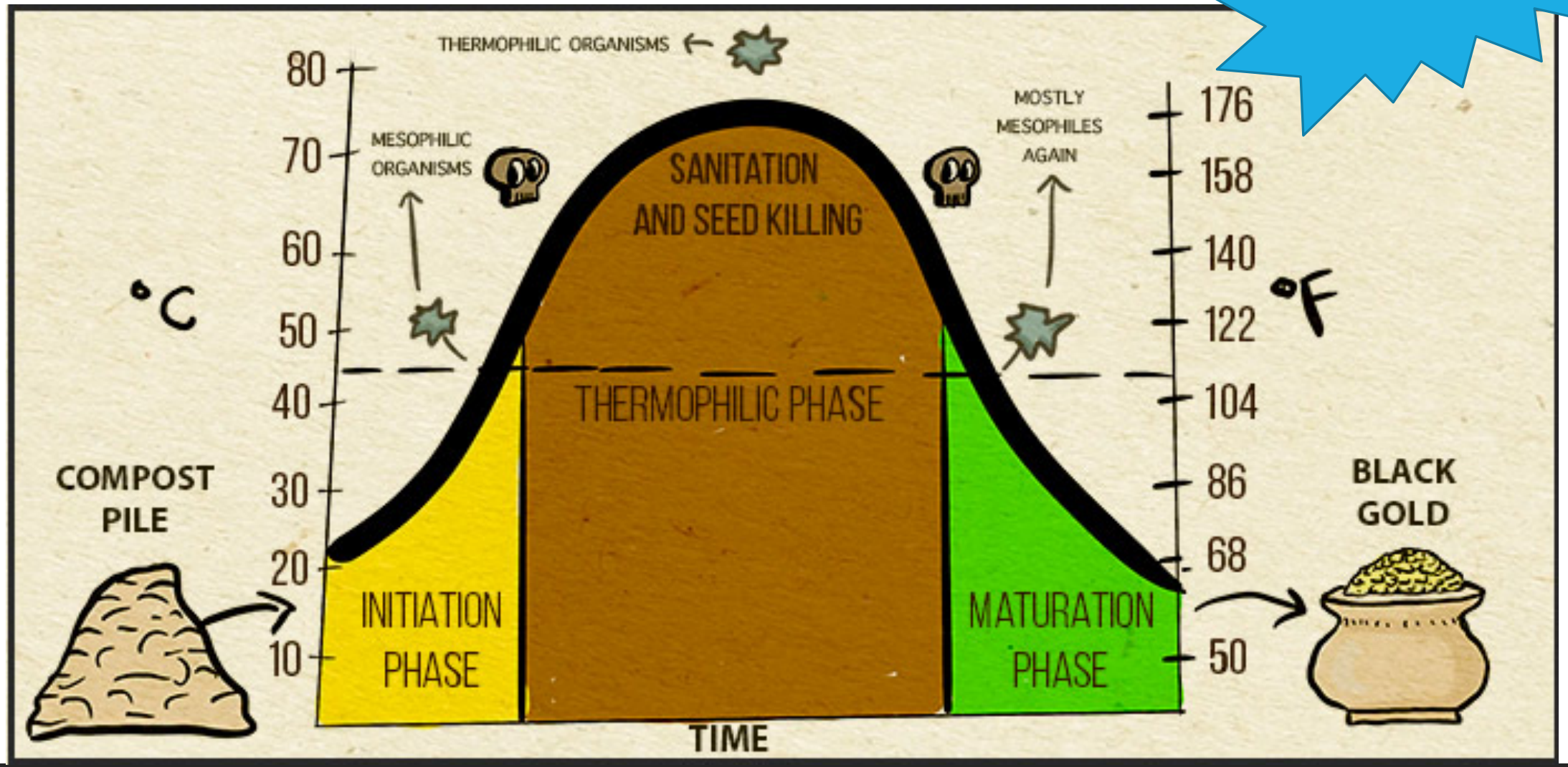
- Fish, meat and whole eggs
- Dairy products
- Citrus peels (too acidic)
- Onions (too acidic)
- Dog and cat poop
- Coated paper products
- Cooking oil
- Stickers (on fruit peels)
- Coal fire ash
- Treated wood
- Large branches
- Synthetic fertilizer


Microorganisms

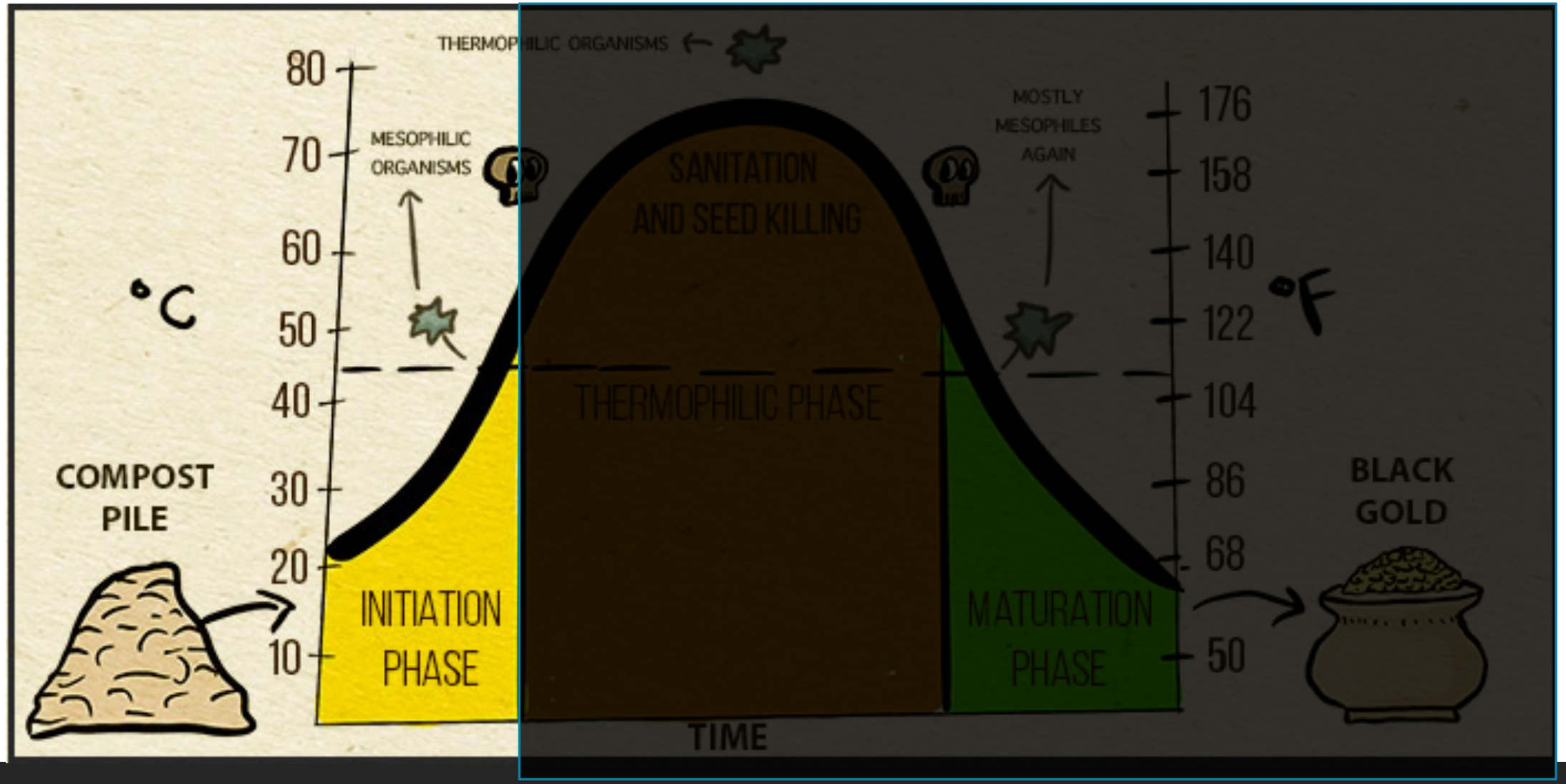
Compost = Farming Microbes

Stages of compost production

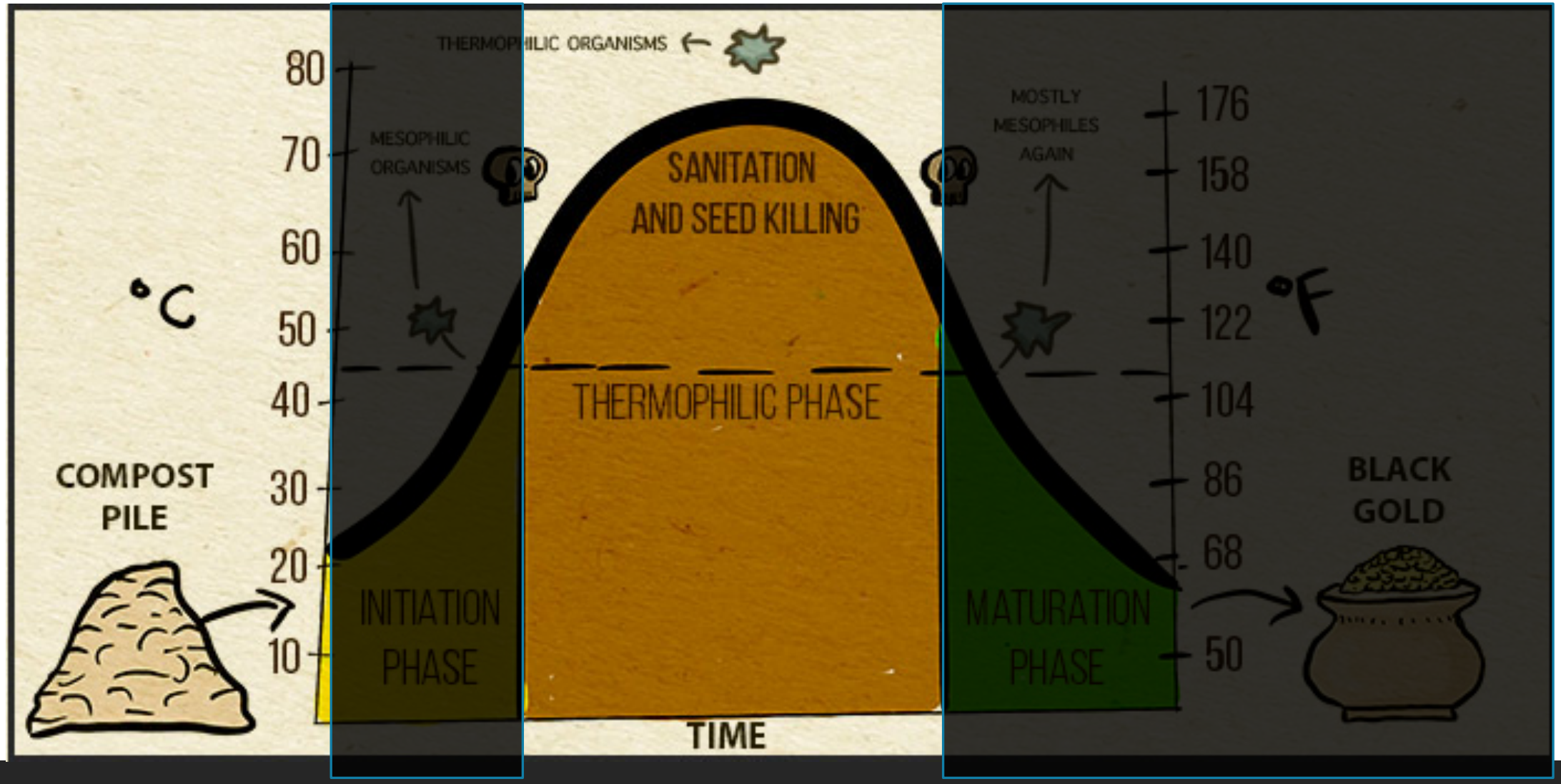
Temperature is key!



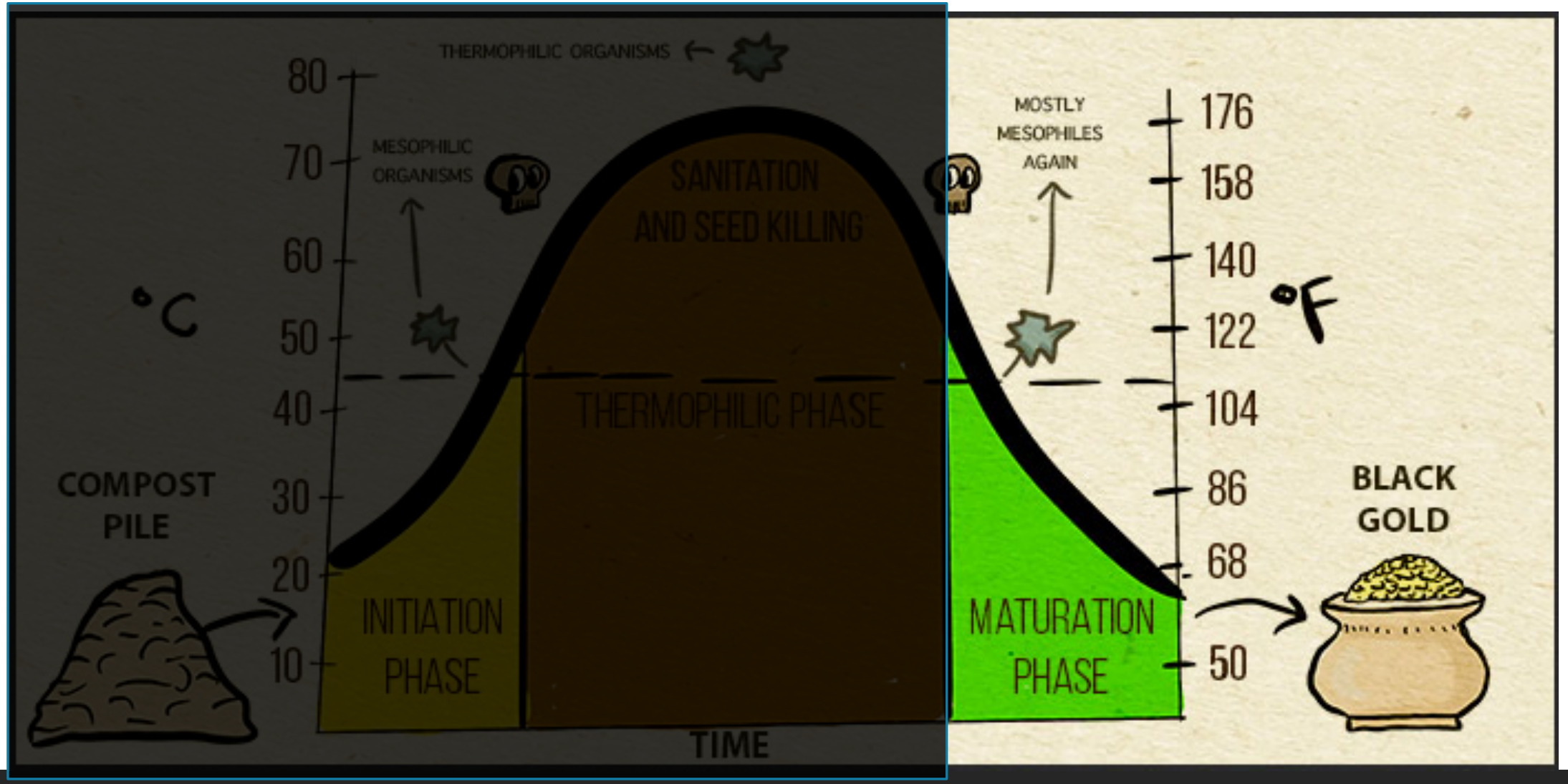
Stages of compost production



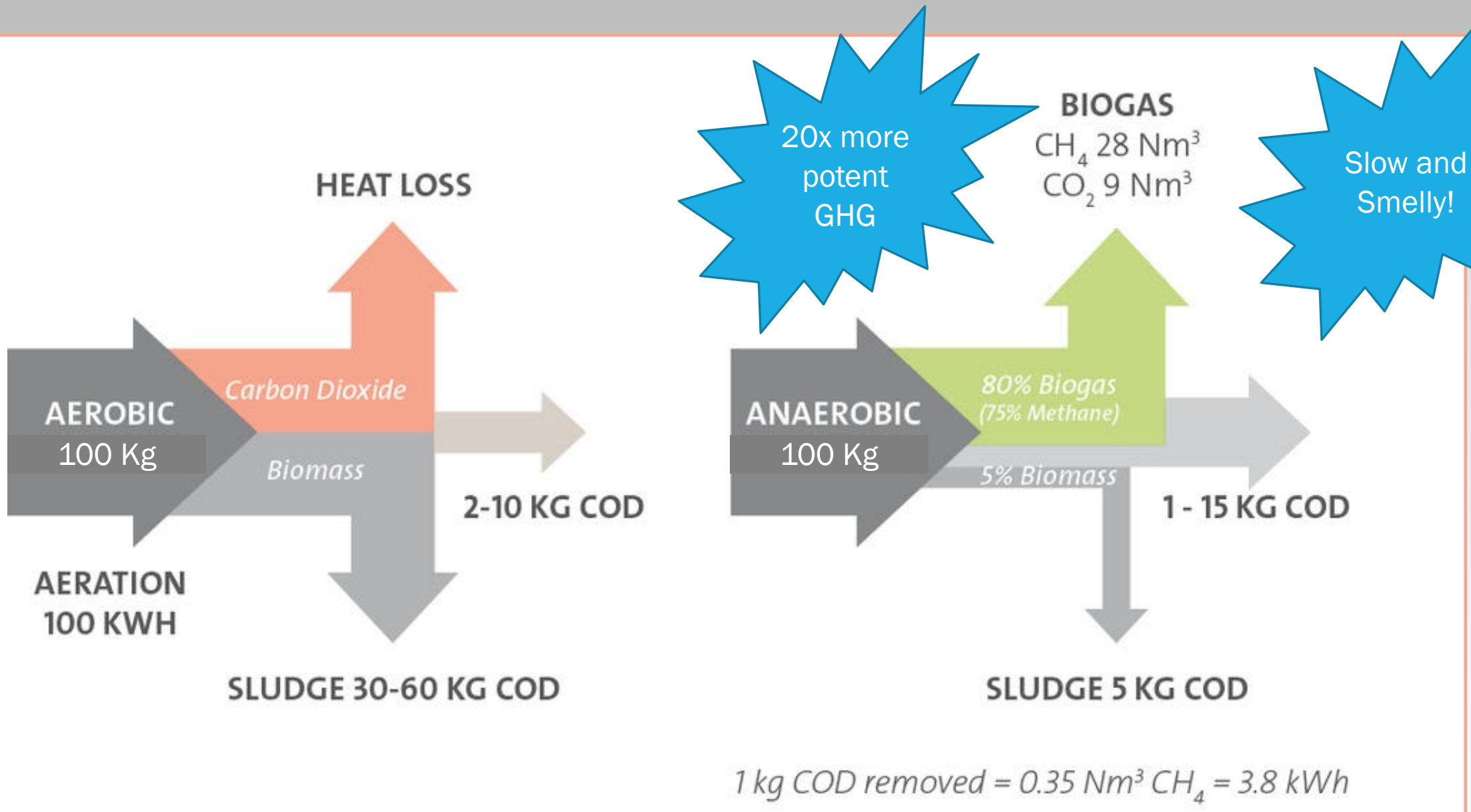
Stages of compost production

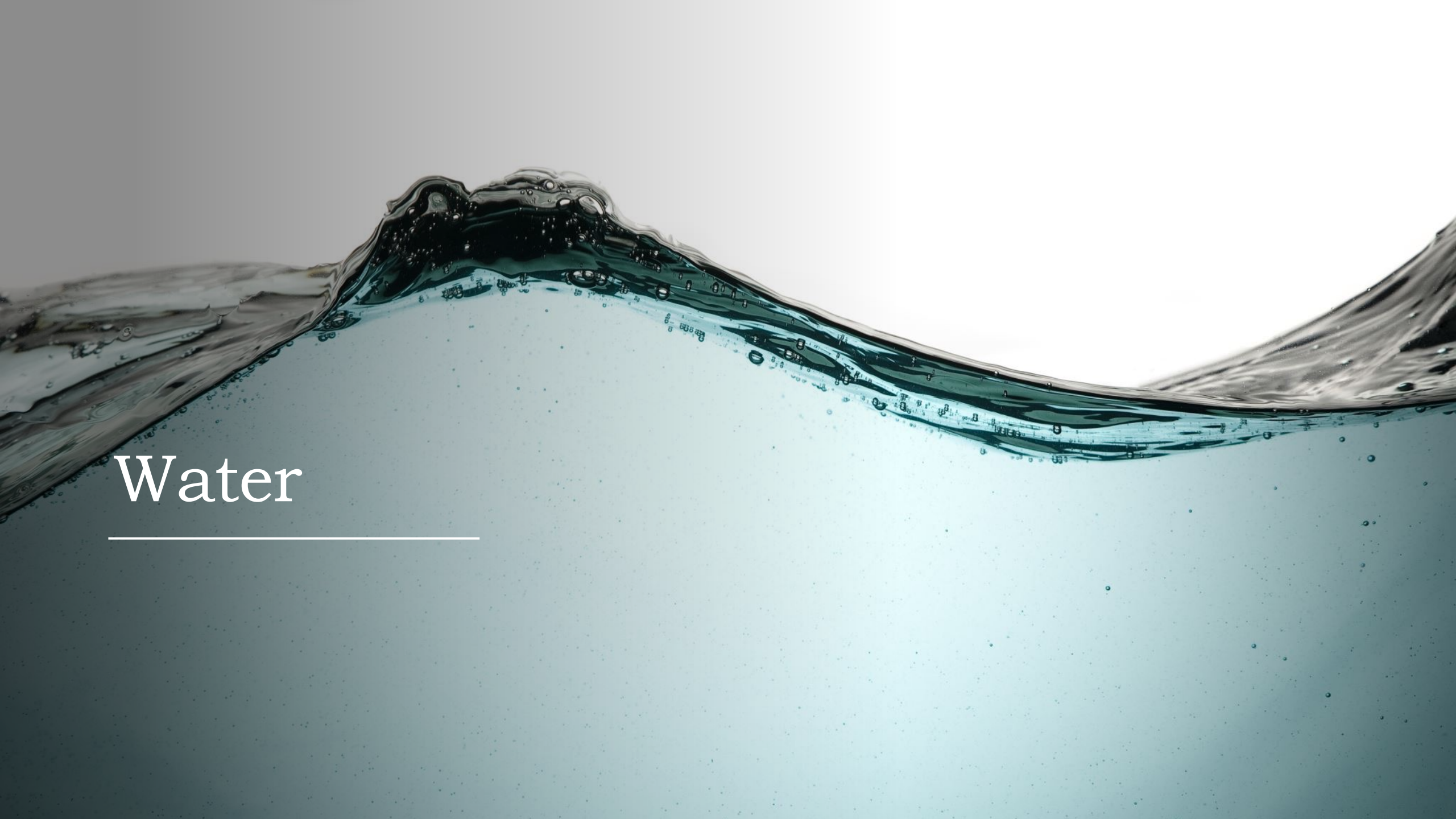


Stages of compost production



Air

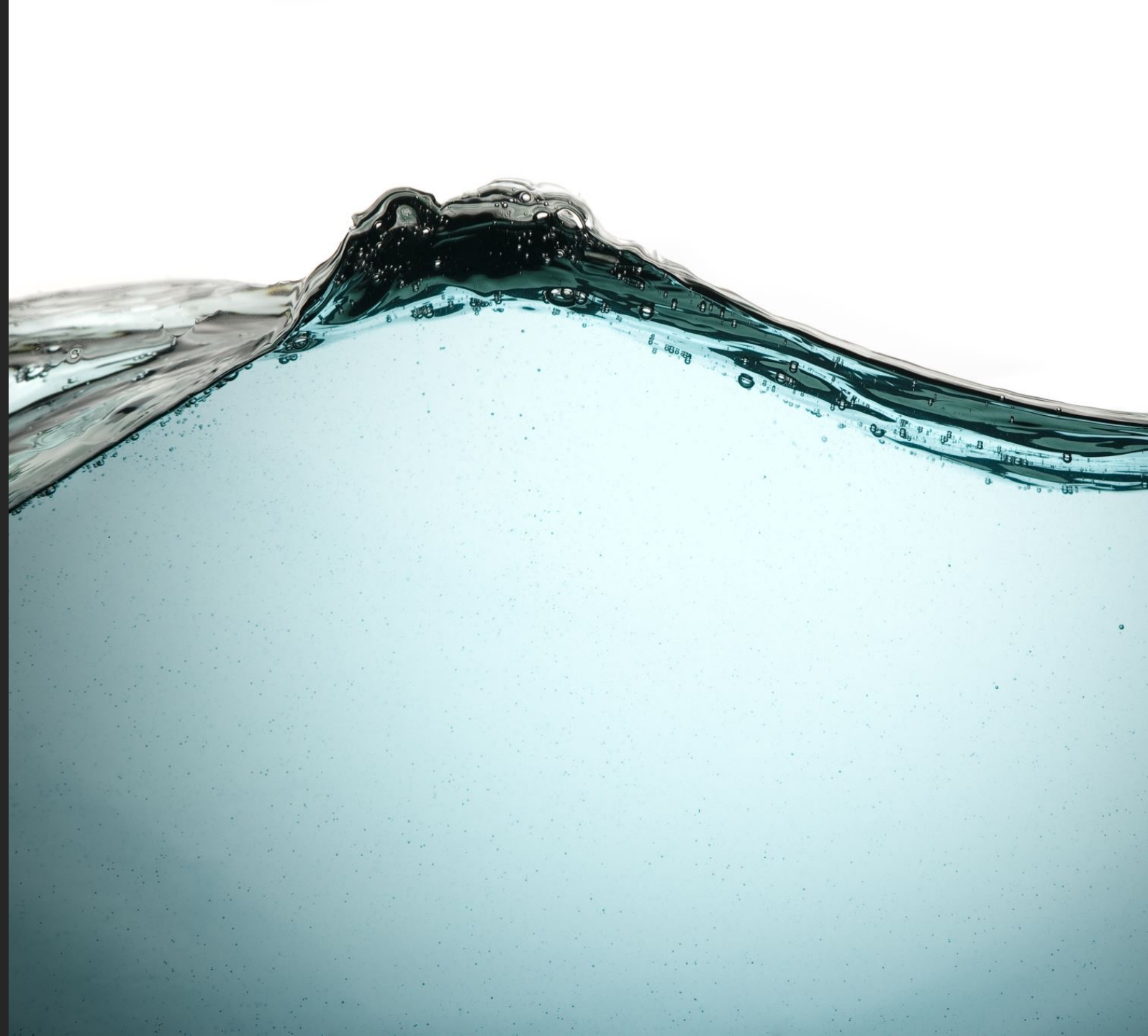

HEAT LOSS
AEROBIC
100 Kg
Carbon Dioxide
Biomass
2-10 KG COD
AERATION
100 KWH
SLUDGE 30-60 KG COD
20x more potent GHG
BIOGAS
CH_4 28 Nm^3
CO_2 9 Nm^3
Slow and Smelly!
ANAEROBIC
100 Kg
80% Biogas
(75% Methane)
5% Biomass
1 - 15 KG COD
SLUDGE 5 KG COD
1 kg COD removed = 0.35 Nm^3 CH_4 = 3.8 kWh



Water

Water

- Aiming for 40-60% water content
  - Similar to a wrung-out sponge
- Too much H_2O and you create anaerobic conditions
- Too little H_2O and you slow decomposition
- Water helps regulate temperature



Types of composting systems

- Open air composting
- Bin composting
- Tumbler composting
- Vermicomposting
- Bokashi composting
- Industrial composting

Open Air Composting

- Least amount of set up
- Good for families/lots of waste
- Need outdoor space
- Can take a while to produce compost
- Highest chance of attracting animals

Bin Composting

- Most common type of compost
- Versatile
- Protects compost from pests
- Can store inside or outside
- Need to turn it manually
- Limited in space

Tumbler Composting

Great at keeping animals out

Can compost a more diverse set of food waste

Easy to aerate

Quicker decomposition process

Expensive

Need to watch H_2O content, no drainage

Vermicomposting

Compost can be used for many plants

Relatively fast

Good for small spaces/apartments

Slightly more work to set up

Needs to be monitored more frequently

Bokashi (EMC) Composting

- Great for small spaces, indoors and apartments
- Relatively quick process
- Focuses just on kitchen scraps
- Needs a starter community
- Can’t compost large amounts of food
- Needs to stay anaerobic

Industrial/Commercial Composting

- Highly controlled process
- Can’t be done at home
- Focused on high volume
- Can process more complex materials

Alternative Composting Resources

- Farmers Market Drop Offs
- Municipal Drop Off
- Municipal Curbside Pickup
- Farming Compost Drop Offs
- Compost Memberships


How to start composting demo