

A photograph of a garden bed. In the foreground, there are several wooden crates filled with green leafy vegetables, likely kale or chard. The background is a blurred field of green plants and purple flowers, possibly lavender, under a bright sky.

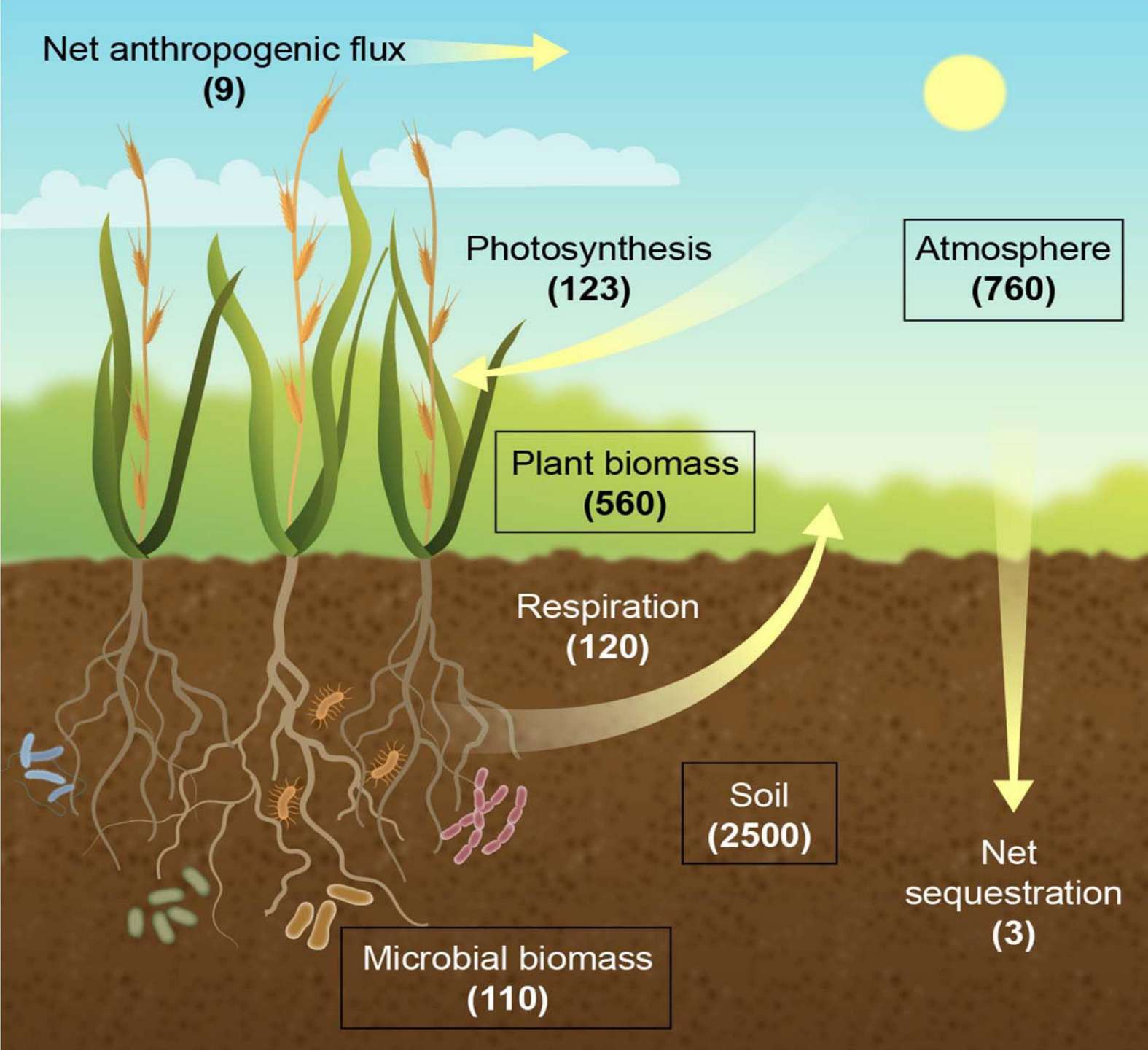
Intro to Composting: an Ecological Perspective

DR. JANE LUCAS, ASSISTANT SCIENTIST

CARY INSTITUTE OF ECOSYSTEM STUDIES



Microbial Ecologist and Soil Scientist



Soils are our
biggest
terrestrial C
pool!

An aerial photograph of a circular garden bed. The garden is filled with green plants, and there is a central white area. The text "Composting provides insight into Global C Cycle" is overlaid on the left side of the image.

**Composting
provides
insight into
Global C Cycle**

Why is
composting
important?



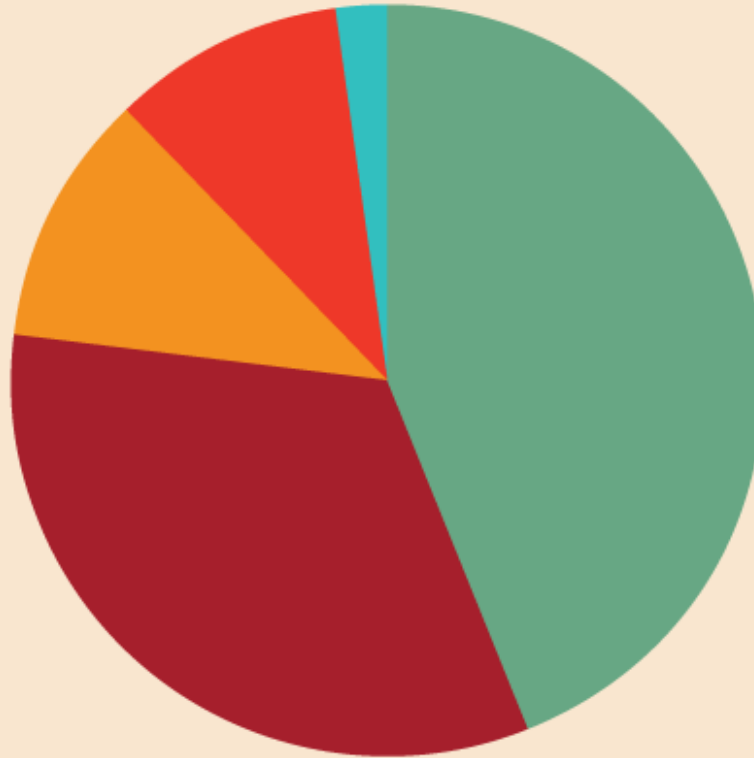
We have a food
waste problem



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

WHO'S WASTING THE MOST FOOD?

ANYWHERE FOOD IS GROWN, SOLD, OR EATEN, FOOD IS WASTED. HOWEVER CONSUMERS ARE DEFINITELY THE BIGGEST SOURCE OF FOOD WASTE



Residential
44%



Restaurants
33%



Grocery Stores
11%



Institutional
10%

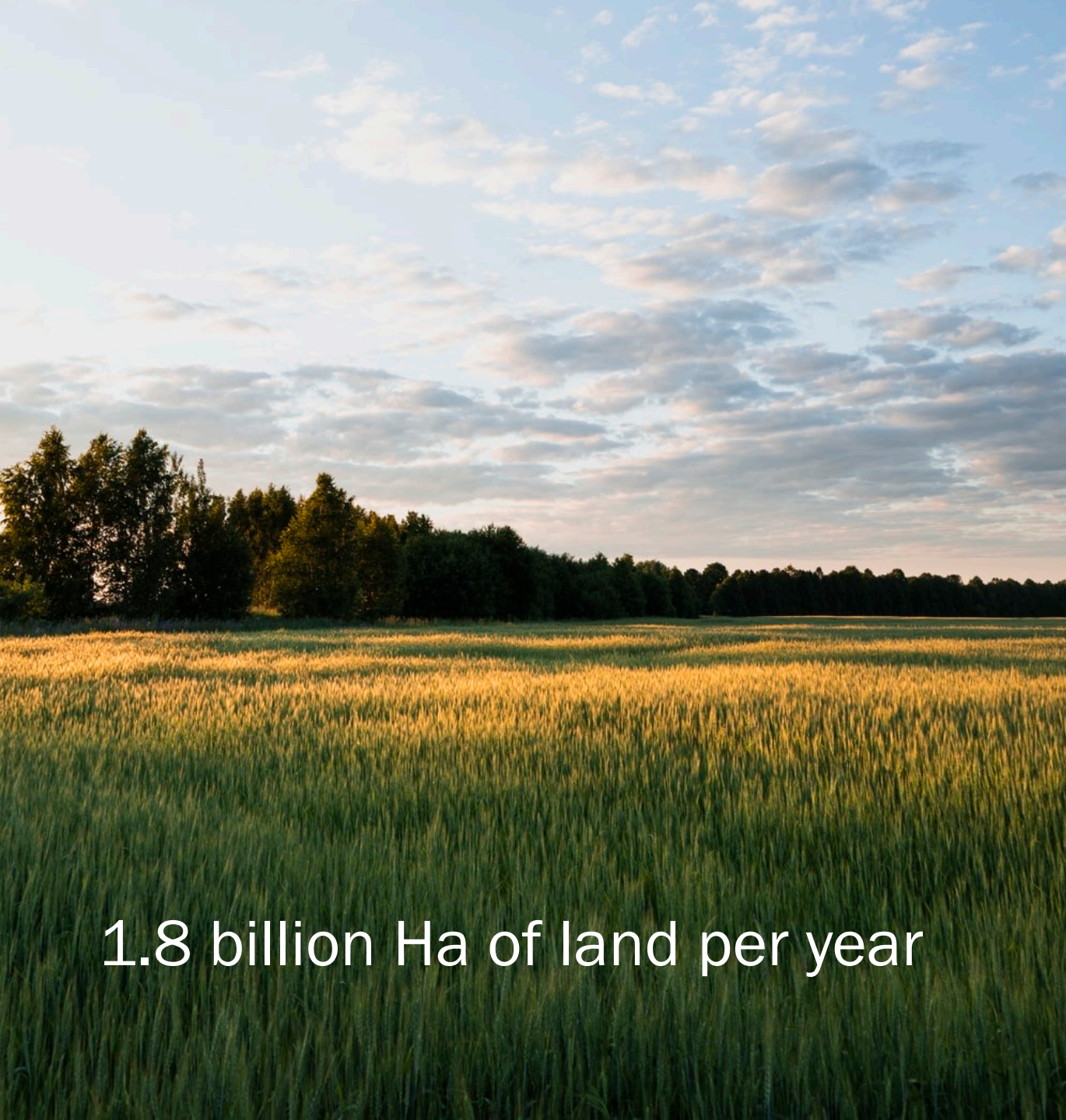


Industrial
2%

Not only is food wasted ...



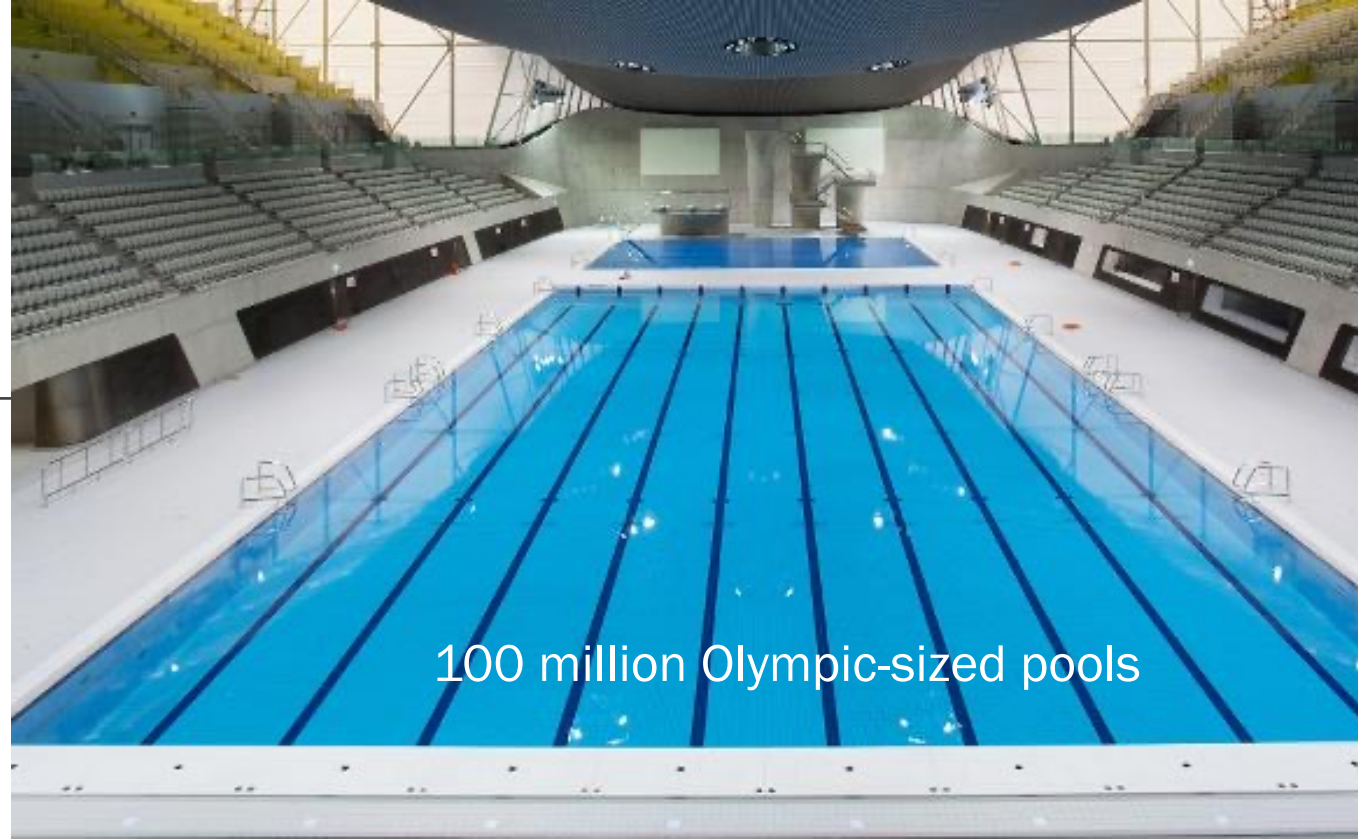
... but the resources to make it are
wasted too



1.8 billion Ha of land per year



250 km³ 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?

A close-up photograph of a pair of hands cupped together, holding a mound of dark, rich, crumbly soil. The background is dark and out of focus, with some bokeh light spots. The overall tone is warm and natural.

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 \neq Soil

Instead, think of it as a great fertilizer

What is
compost made
of?

Organic matter

Microorganisms

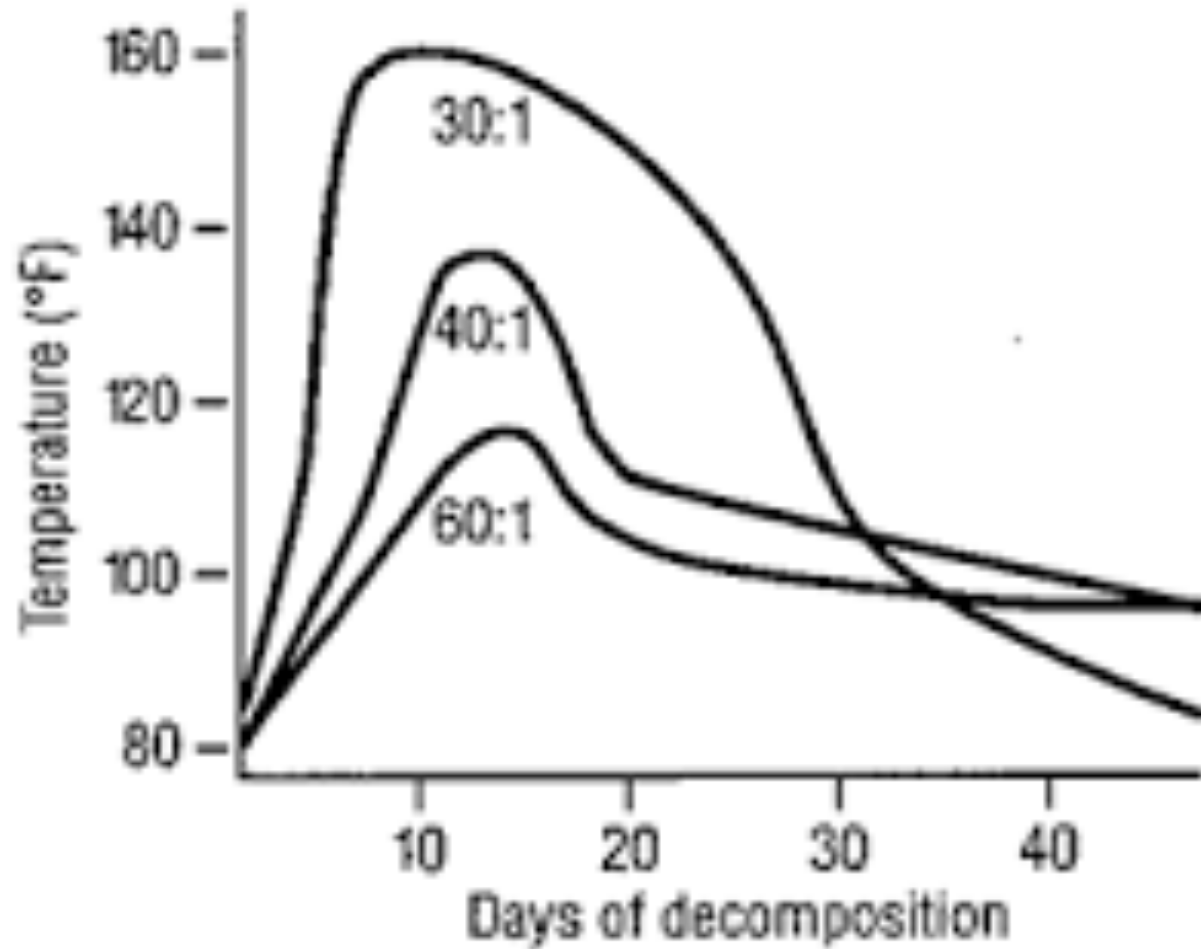
Air

Water



Organic matter

Carbon:Nitrogen Ratio Effects on Composting



Looking
for 30:1
Ratio of
C to N

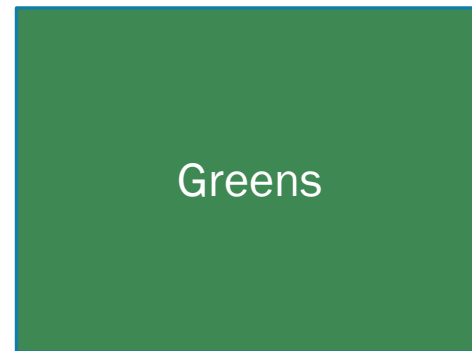
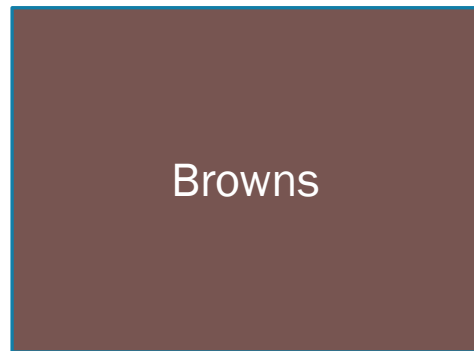
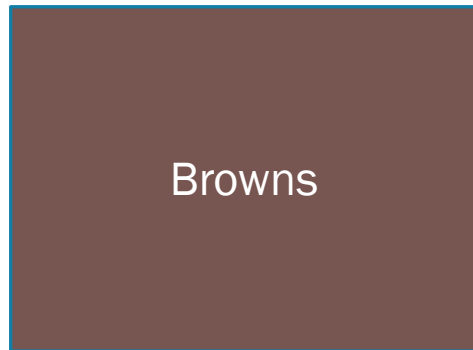
Table 2

*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)



NITROGEN MATERIALS (Greens)



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)



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

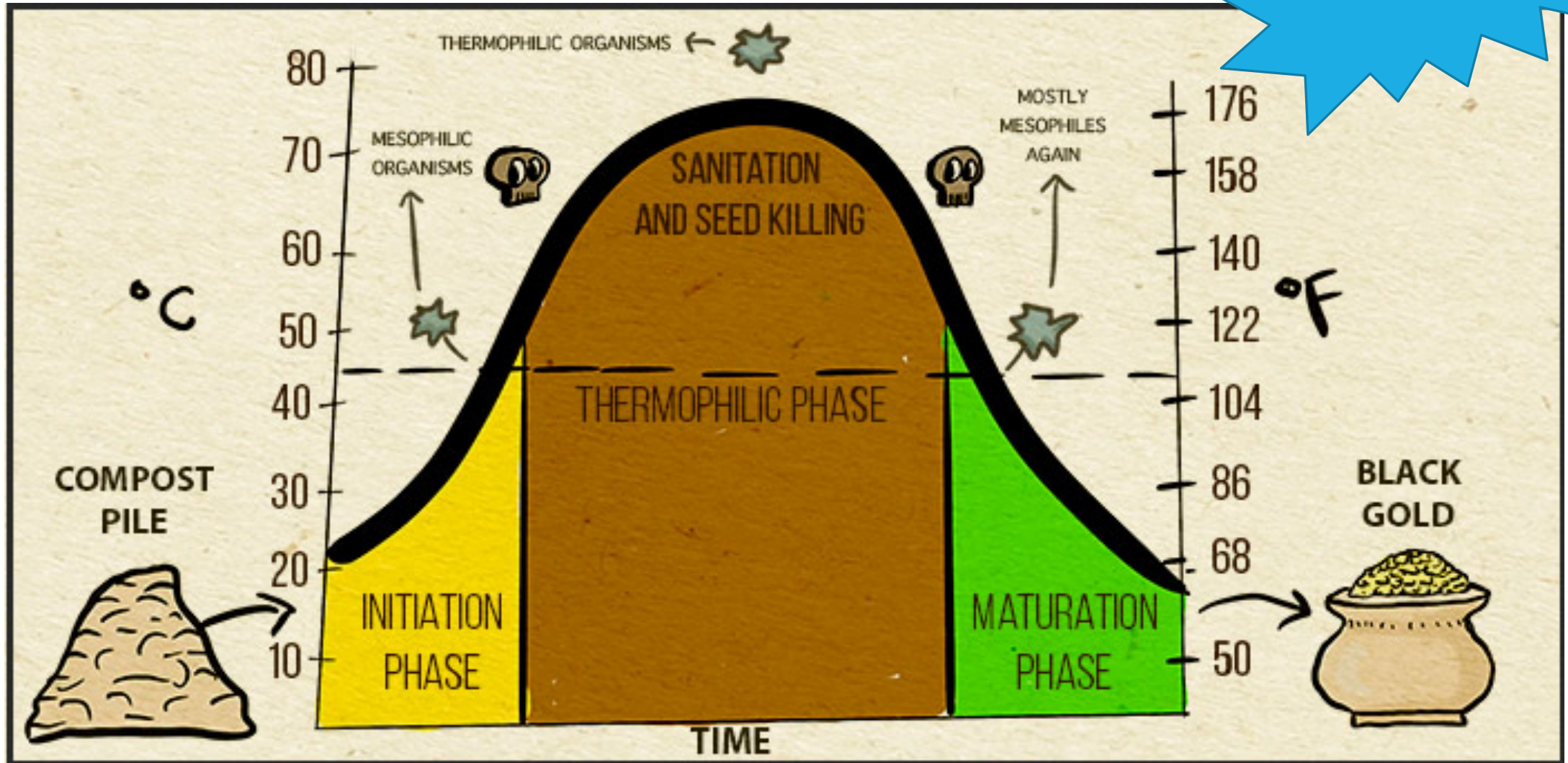
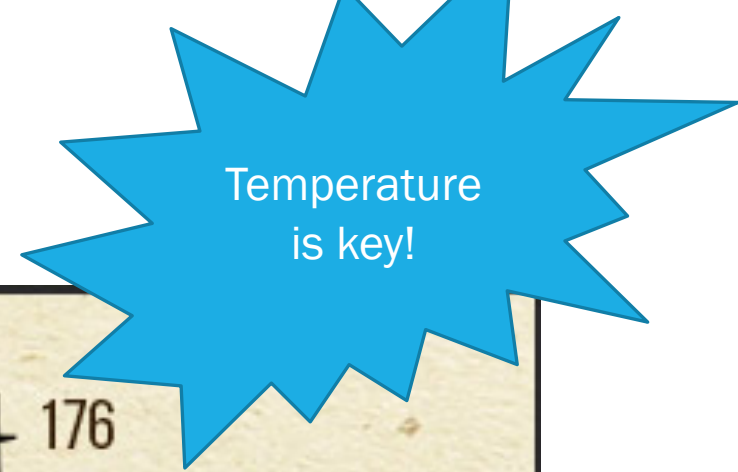
The background of the slide features a dense field of spherical microorganisms, likely algae or bacteria, illuminated with a vibrant green light. The organisms are out of focus, creating a bokeh effect with soft, glowing green circles. The overall color palette is a range of green tones, from deep forest green to bright, almost neon green highlights.

Microorganisms

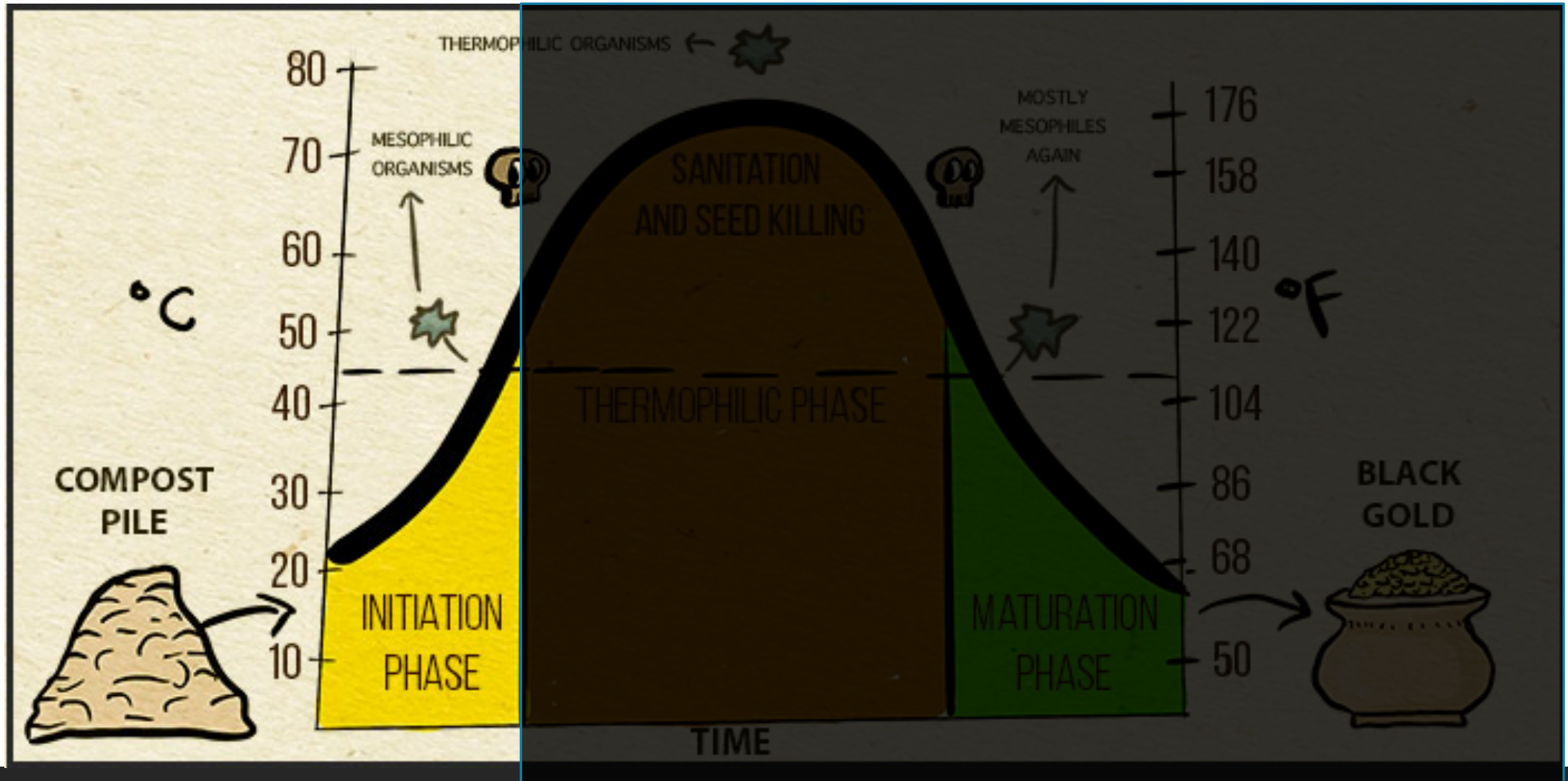


Compost = Farming
Microbes

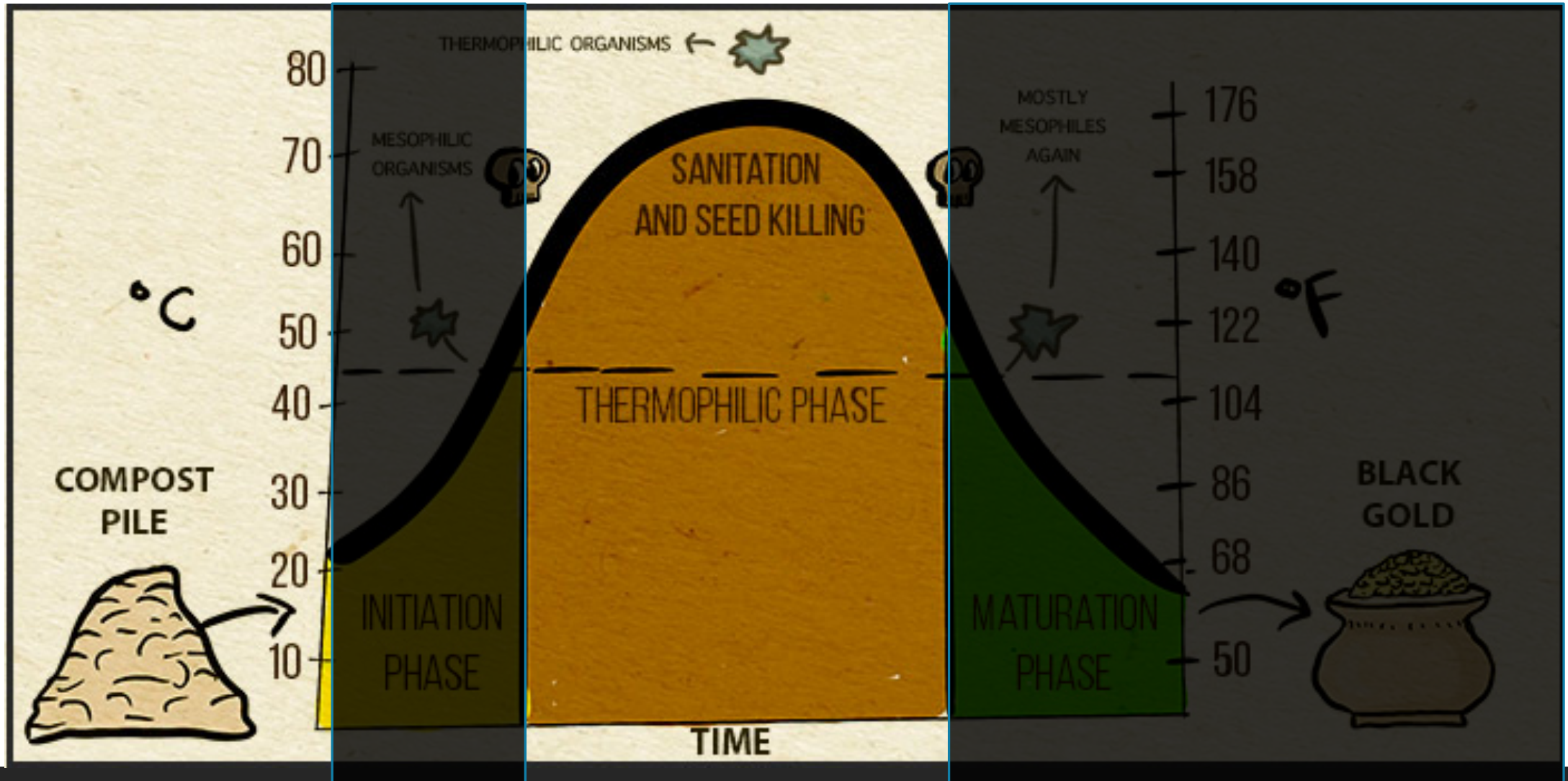
Stages of compost production



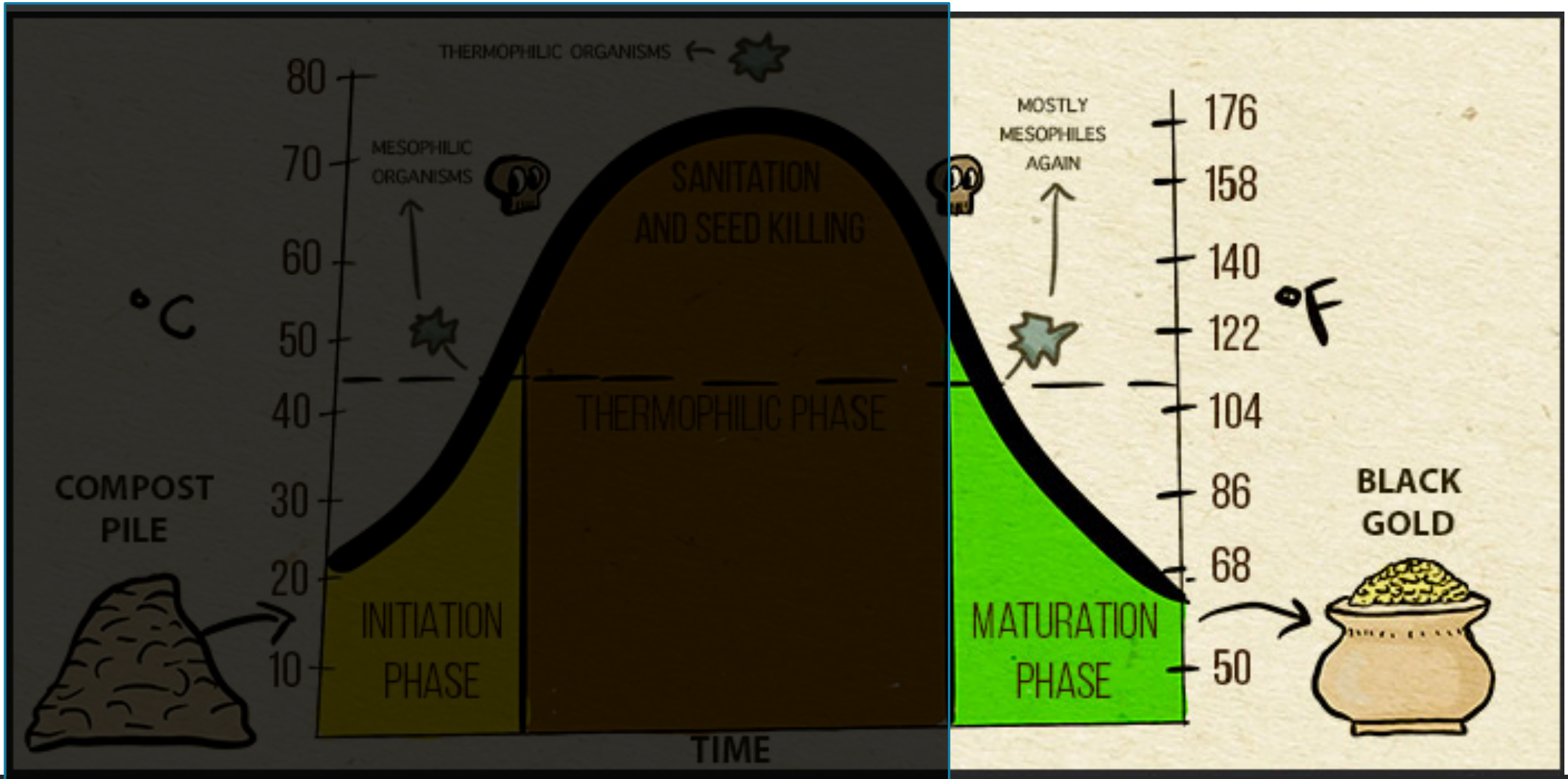
Stages of compost production



Stages of compost production

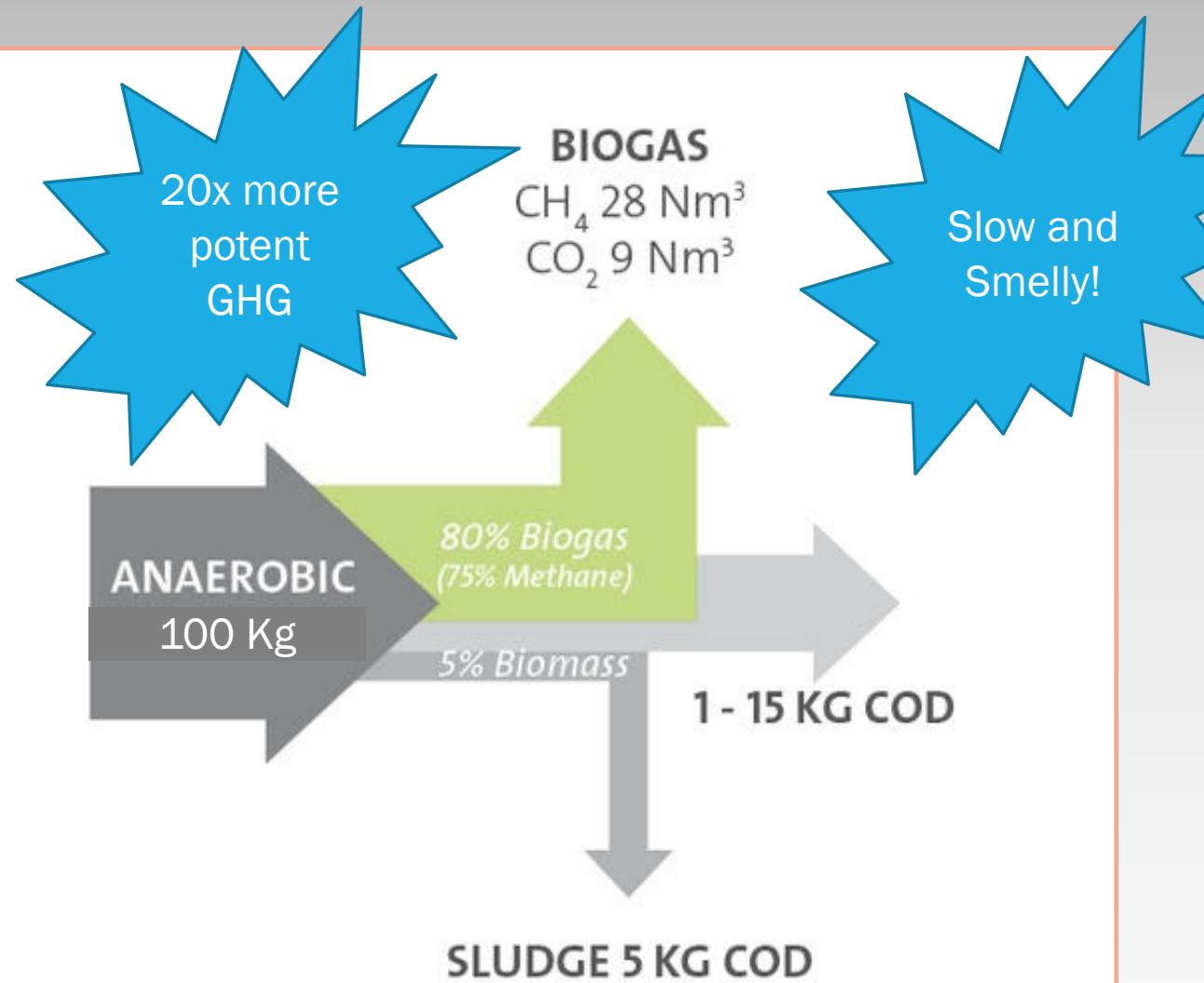
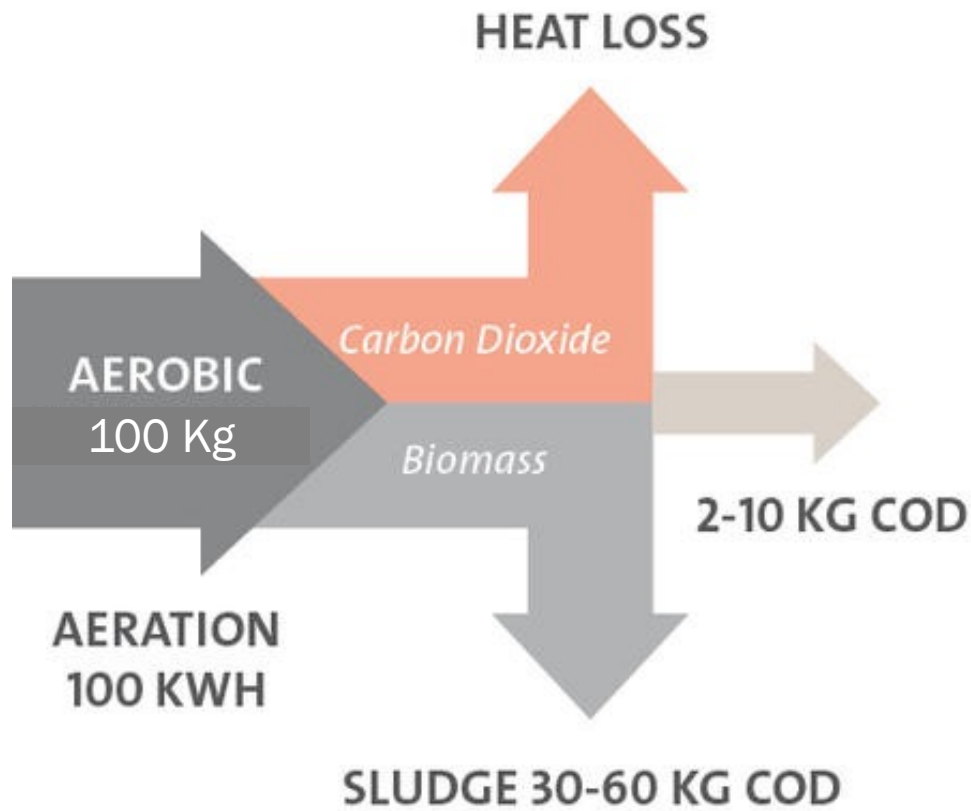


Stages of compost production

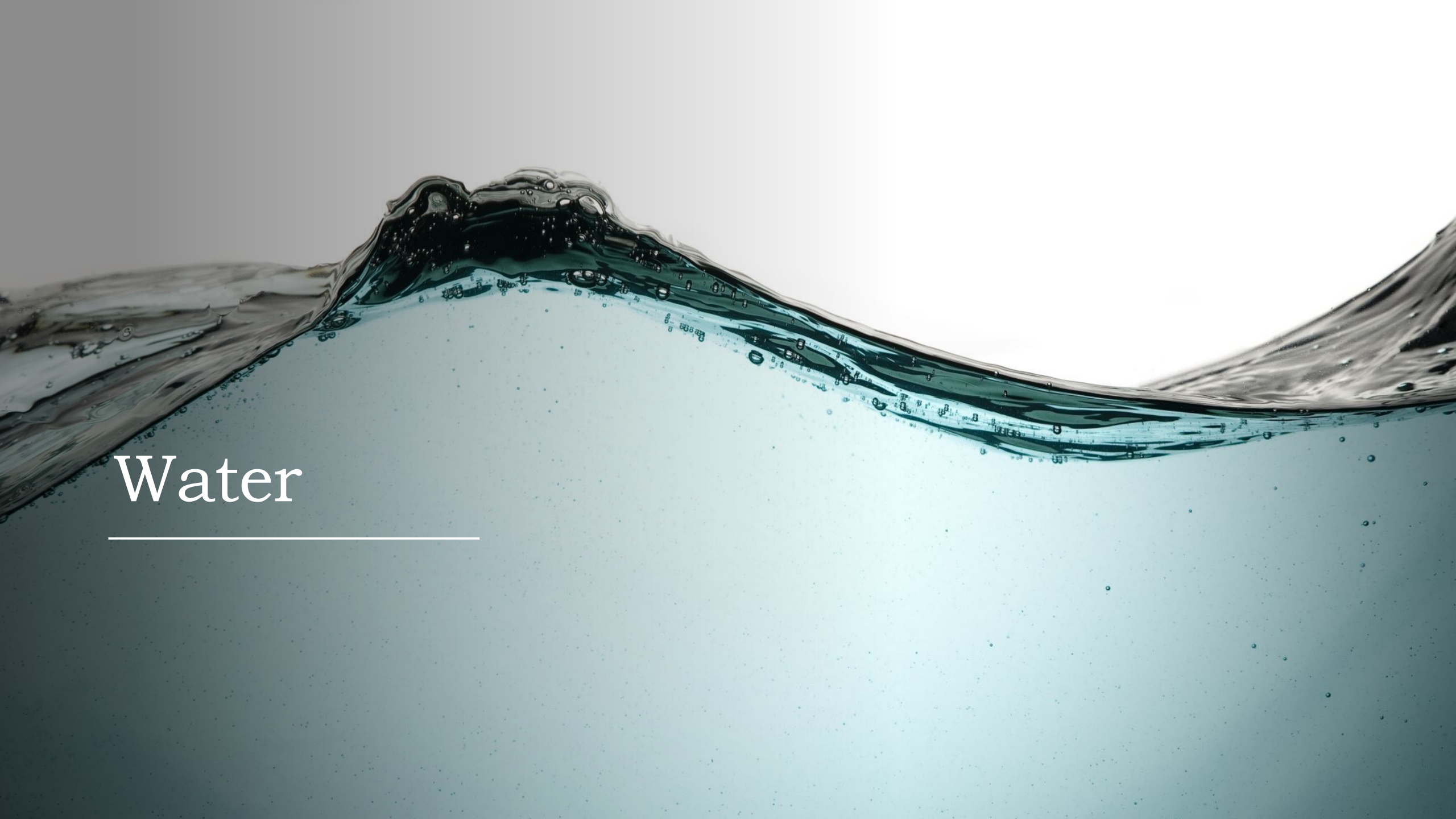


Air





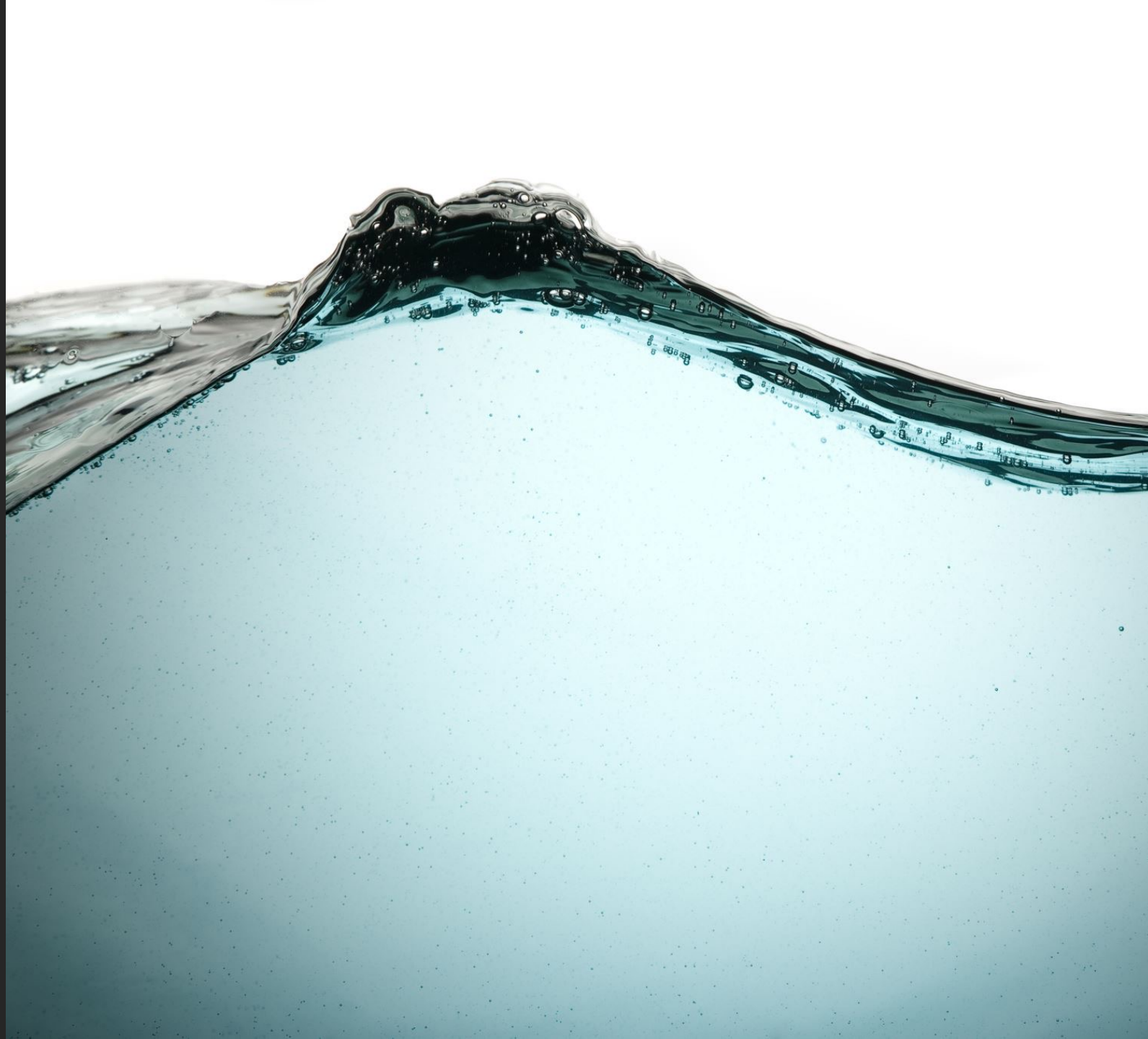
1 kg COD removed = 0.35 Nm³ CH₄ = 3.8 kWh



Water

Water

- Aiming for 40-60% water content
 - Similar to a wrung-out sponge
- Too much H₂O and you create anaerobic conditions
- Too little H₂O 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



A person wearing a grey long-sleeved shirt and dark denim overalls is pouring food waste from a white bucket into a black tumbler compost bin. The bin is a large, octagonal-shaped container with a handle and a lid. The background is a green lawn with some trees and a fence in the distance.

Tumbler Composting

Great at keeping animals out

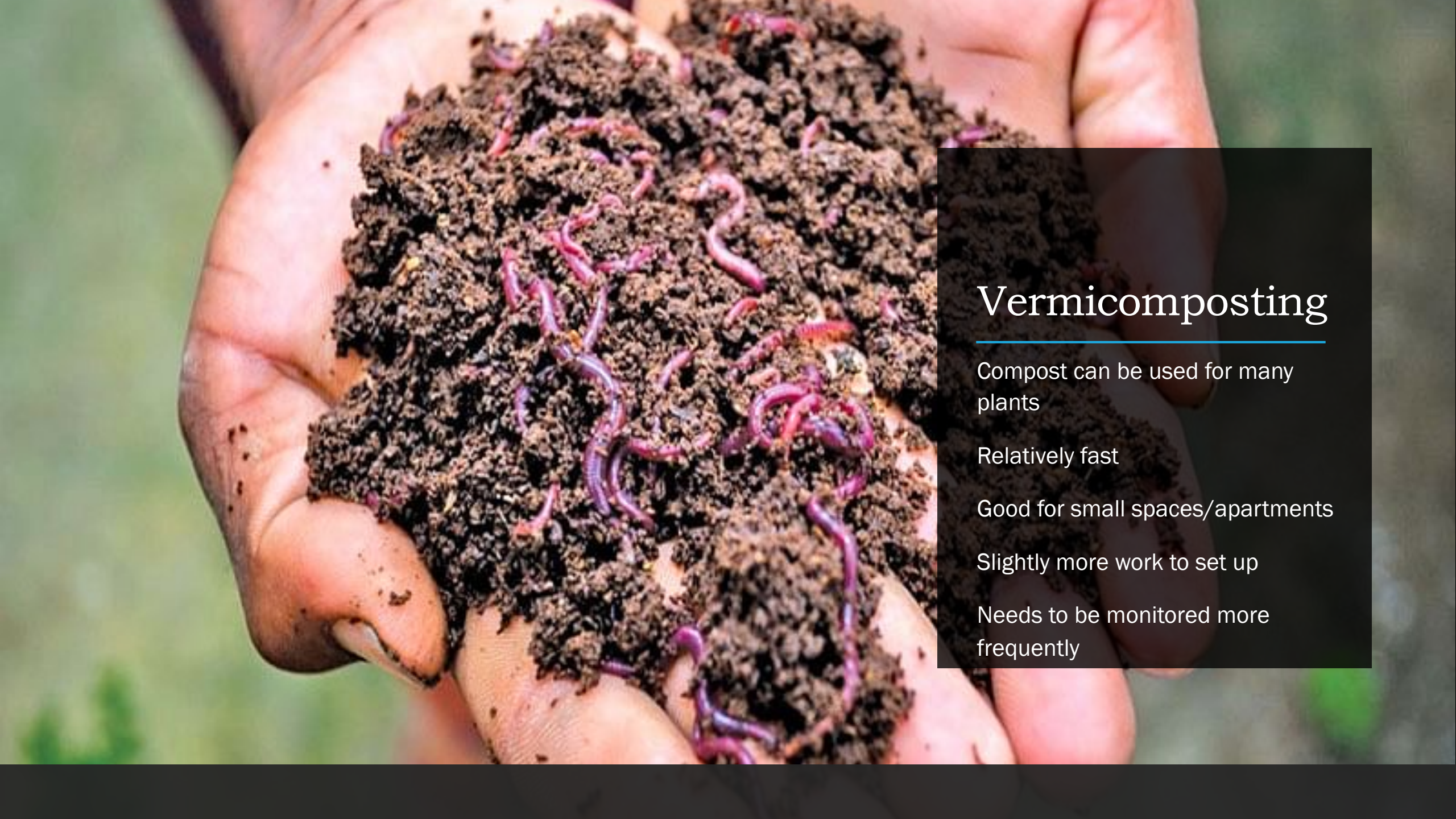
Can compost a more diverse set of food waste

Easy to aerate

Quicker decomposition process

Expensive

Need to watch H₂O 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

A top-down view of a person's hands, wearing a grey ribbed sweater, planting rows of lettuce in a garden bed. The soil is dark and rich. The lettuce plants are arranged in neat rows, with some showing reddish-purple leaves and others being bright green. The person is currently adjusting a green lettuce plant in the middle row.

How to start composting demo