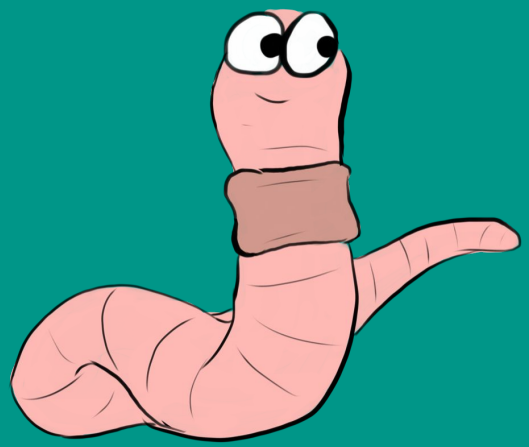
Composting with ThINCpod

August 2021

ThINC
THETIS ISLAND NATURE CONSERVANCY

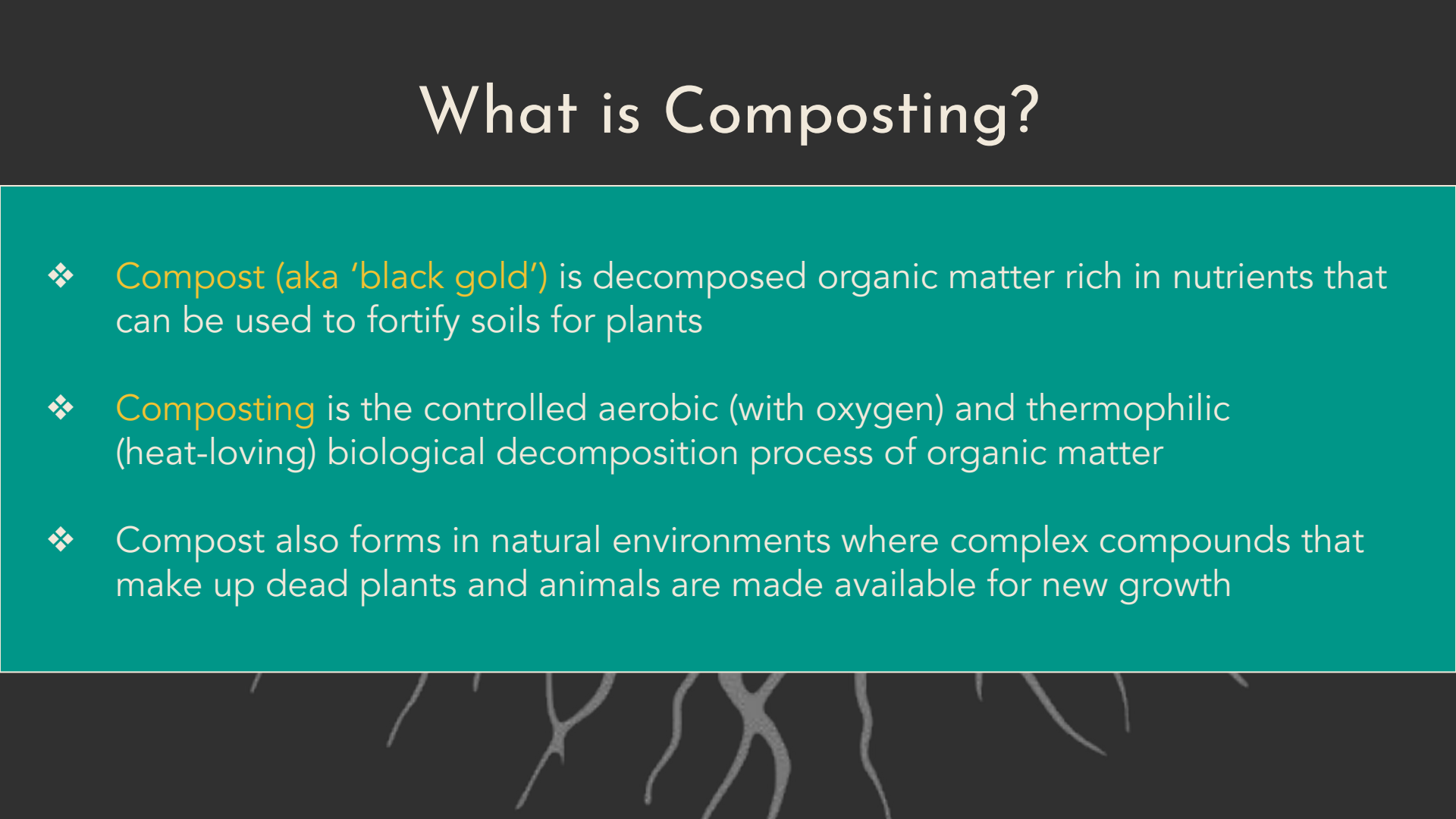
In this presentation, we will:



- Explain what composting is and why it is important
- Breakdown the composting process
- Describe the dirty details on how to compost

What is Composting?

- Compost (aka 'black gold') is decomposed organic matter rich in nutrients that can be used to fortify soils for plants
- Composting is the controlled aerobic (with oxygen) and thermophilic (heat-loving) biological decomposition process of organic matter
- Compost also forms in natural environments where complex compounds that make up dead plants and animals are made available for new growth



Why Compost?

Benefits to Gardeners/Farmers:

- Reduces need to import compost
- Reduces need for chemical fertilizers
- Enrichens soil and helps retain moisture
- Produces higher and healthier yields
- Natural weed suppressant (like mulch)

Benefits to the Environment:

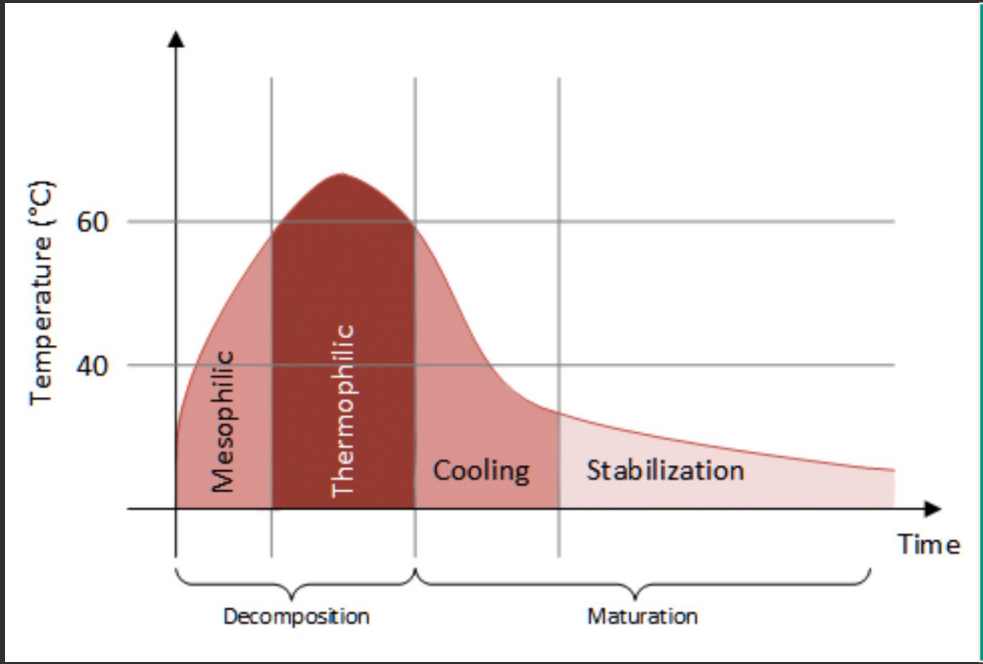
- Reduces methane emissions in landfills
- Improves soil biodiversity
- Restores marginalized soils
- Sequesters carbon
- Reduces pollutants

How Does Compost Work?

The composting process can be broken down into 3 phases:

Mesophilic	Thermophilic	Maturation
Invertebrates, mesophilic bacteria, and fungi (molds and yeasts)	High heat resistant bacteria and fungi	Mesophilic organisms return
20-45 ^{0}C	50-70 ^{0}C	<45 ^{0}C
Rapidly breaking down soluble, readily degradable compounds	Breaking down proteins, fats, and complex carbohydrates (e.g. cellulose, hemicellulose)	Final decomposition of compost (cooling / curing)

The Temperature Evolution of Composting



Decomposition occurs rapidly during the thermophilic phase of composting (45-60 °C). This phase is important for destroying harmful pathogens, fly larvae, and weed seeds.

Most microorganisms cannot survive temperatures + 60°C, and so it is important to aerate to bring the temperature down.

Creepy Crawlies

A healthy compost heap is teeming with invertebrates whose primary job is to digest the plant debris, kitchen waste, and animal matter that you throw into it.

Organic Material
leaves, grass, food scraps, manure

→

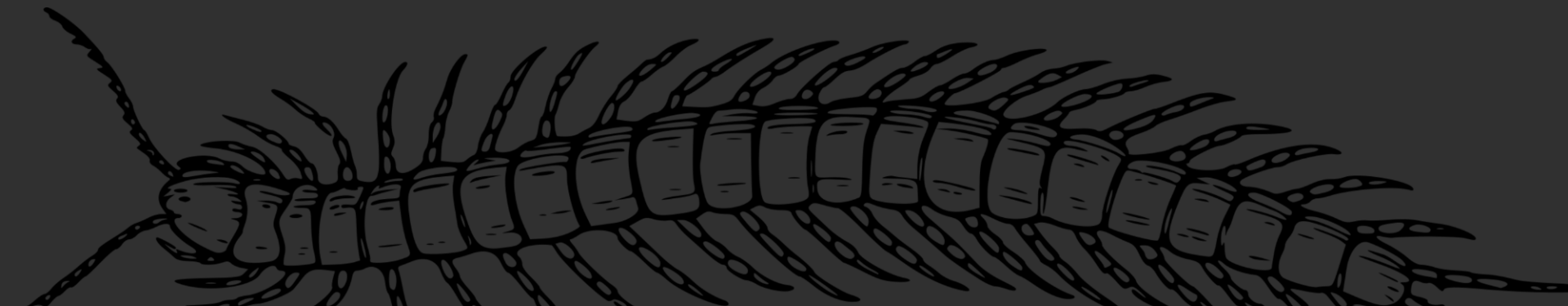
Primary Consumers
worms, nematodes, slugs, mites

→

Secondary Consumers
springtails, beetles, flatworms, nematodes

→

Tertiary Consumers
centipedes, mites, beetles, pseudoscorpions



Bacteria and Fungi

The majority of the composting process is conducted by microorganisms invisible to the naked eye. These microbes occur naturally in our soils and will arrive to the compost heap from the soil below or via the garden waste put into it.

- Billions of microscopic organisms work together to digest your organic waste
- A diverse colony of beneficial bacteria (and fungi!) is key to healthy soils
- For all the work they do, they only ask for air, water, and food.
  Talk about a fair trade!

Fungi
10,000 - 1 million / gram of compost!

Bacteria
100 million - 1 billion / gram of compost!

Starting a Compost

There's no perfect composting method, it is all about what works best for you and your specific situation.

Factors to keep in mind when starting your own compost:

- Available space
- Desired materials to be composted
- Volume of organics
- Degree of management
- Planned use for finished compost

Choosing a Composting System

There is a fierce debate between Hectic Heapers, Balling Binners, and the Turbulent Tumblers about which is better, but each has its pros and cons.

	Pile (heap)	Bin	Tumbler
Pros	• Simple • Direct access to soil • Ease for beneficial decomposers	• Self contained • Resists vermin • Shelters against rain • Retains heat	• Self contained • Easy to manage • Resists vermin / pest proof • Shelters against rain • Faster composting rate • Significant heat generated
Cons	• Minimal shelter • Vermin can access • Untidy looking • Subject to changes in weather • Requires flipping	• Difficult to flip • Rigid and often breaks down • Can be difficult for beneficial decomposers to enter	• Costs can vary • Difficult for beneficial decomposers to enter from external environment

Other Methods of Organic Waste Diversion

There are many other forms of organic waste diversion, including vermicomposting (composting using worms), Bokashi, and digesters.

Vermicompost

The worms produce castings concentrated with nutrients lower in nitrogen compared to other composting methods.

Bokashi (anaerobic)

Uses a substance, usually some form of bran/chaff, inoculated with microorganisms to decompose organic materials.

Digester (anaerobic)

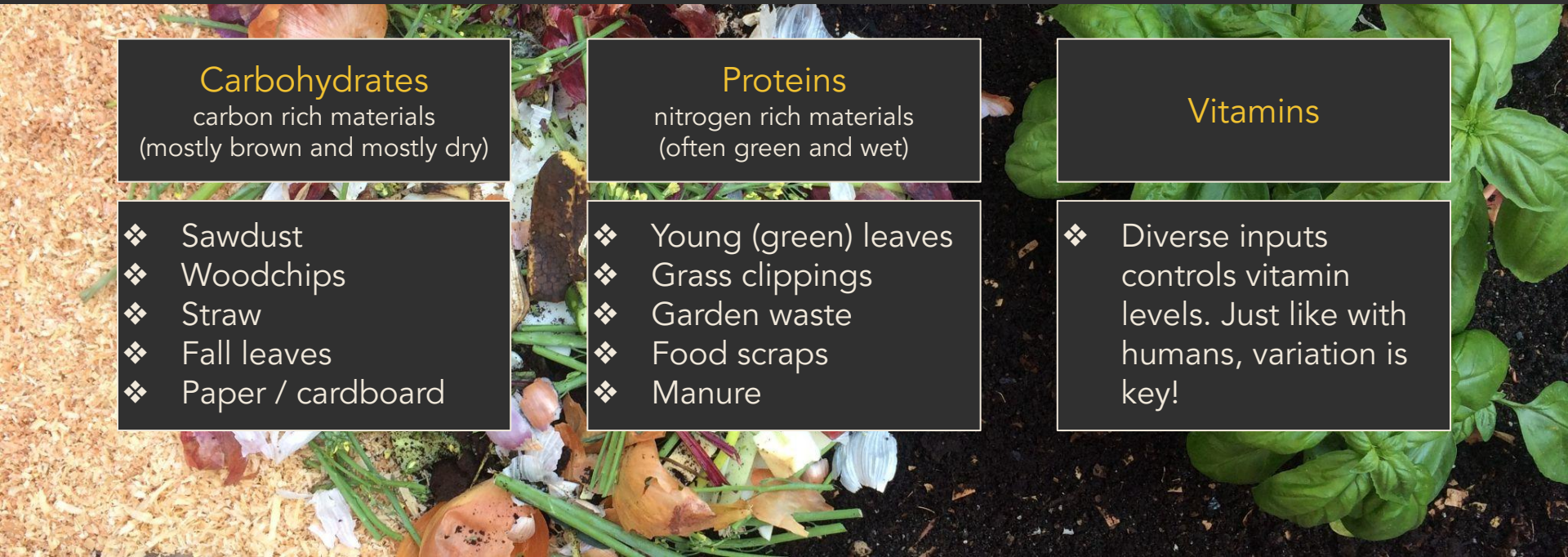
Enclosed or nearly enclosed systems that reduce organic material to mush. Some are partly buried.

Selecting a Site

When selecting a site for a composter one must take care to consider how much space you have, the amount of sunlight it will receive, and how to shelter from rain and wind.

- Indoor and outdoor composters are available as well as composters of various sizes.
- Too much sunlight can literally cook the compost, causing the composting process to stall.
- Inadequate shelter can result in excess moisture, which can suffocate your pile stopping the composting process.

Feeding the BEAST



Carbohydrates
carbon rich materials
(mostly brown and mostly dry)

- Sawdust
- Woodchips
- Straw
- Fall leaves
- Paper / cardboard

Proteins
nitrogen rich materials
(often green and wet)

- Young (green) leaves
- Grass clippings
- Garden waste
- Food scraps
- Manure

Vitamins

- Diverse inputs controls vitamin levels. Just like with humans, variation is key!

It's all about Ratios

Compost experts often talk about the carbon-to-nitrogen ratio. This ratio is abbreviated to the C:N Ratio.

Each input has its own C:N ration, which must be considered when building up your compost. For example, grass clippings have 20:1 ratio, and sawdust has a 500:1 ratio! Therefore, the grass clippings are considered high in nitrogen content (or green materials), and the sawdust is considered (very) high in carbon content (or brown materials).

A healthy compost pile has a C:N Ratio of 30:1, so try to get that balance in your pile!

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

Using Manure in Your Compost

Manure has many benefits for compost, but not all manures are created equal!

- Chicken manure is the best manure for growing plants. It is nitrogen-rich and carries other important nutrients, such as potassium and phosphorous. But since it has a very high content of nitrogen, it must be composted well and aged to prevent burning plants.
- Cow manure is another popular choice, but must also be composted for best results.
- Horse manure has similar content to cow manure, but may carry weed seeds if not properly composted.

What Not to Include

Some materials cannot be processed in the compost or might hinder the composting process. As well, some foodstuffs attract pests, such as rats.

Things to avoid and/or to be mindful of:

- Non-biodegradable or treated materials (introduces chemicals; doesn't break down)
  - E.g. painted wood, plastic coatings, etc.
- Meat, fish, dairy or eggs (will attract vermin, but can be added to some closed systems)
- Vegetable oils and other liquids (depends on system; can create excess moisture)
- Charcoal/ash from BBQ (high sulfur content = high acidity; some charcoal is treated)
- Human, dog, and cat feces (can be composted, but should not be applied to food crops)

Air and Water

The decomposers in our compost heaps need plenty of water and air to remain healthy and active.

Without a sufficient oxygen the aerobic bacteria is replaced by their anaerobic cousins. These anaerobic bacteria produce methane and carbon dioxide during the decomposition process.
Note: to aerate, flip the compost.

Too little water and our decomposers will become too thirsty to work efficiently. But too much water and the microbes will drown!
Note: shelter the compost during the rainier seasons and water during the drier seasons. Also, balance wet ingredients with drier carbon rich materials.

Particle Size

An additional factor to consider is the particle size of organic materials going into the compost.

Reducing the size of organic materials - by chopping, grinding, pulverizing - increases the surface area, which speeds up the rate of the composting process.

Remember!
You are feeding organisms with very tiny mouths!

Troubleshooting Your Compost

Problem	Reason	Remedy
Weak heat / no heat	1. Too dry 2. Too wet 3. Winter wind / chill factor	1. Add water to balance mixture 2. Add carbon to balance mixture, aerate 3. Insulate / build mass
Maggots	Too wet/weak heat	Balance C:N ratio / dry:wet
Mushrooms	Natural occurrence	None
Big lumps	Too wet	Add carbon and mix well Break up lumps
Odour: Ammonia	Intensive process, high pH	Add carbon and mix well
Odour: Rotting	Waste too wet Too little carbon	Add carbon and mix well
Odour: Pungent, acidy smell (cheesy)	Oxygen deficiency Waste too wet	Aerate Add carbon and mix well Add some ready-made compost and mix well

Summary

1. Compost is decomposed organic matter rich in nutrients that can be used to fortify soils
2. Composting provides numerous benefits to people and the environment
3. The composting process involves billions of organisms - invertebrates, microbes, and fungi
4. There are diverse composting systems, all of which that have their pros and cons
5. The decomposers that are responsible for composting require a balance of food (carbon and nitrogen), air, and water
6. Carbon is found in many dry ‘brown’ materials such as straw, wood chips, and dried leaves
7. Nitrogen is found in many wetter ‘green’ materials such as grass, food scraps, and manure
8. The ideal C:N ratio is 30:1
9. Reducing particle size increases surface area which increases the rate of composting
10. All composting problems can be remedied with the proper care!

On-Island Composting Resources

Learn from your fellow Thetisians about the following organic waste diversion systems:

Brushwood composting: Matthias Zapletal
Agricultural composting: Noah Bond at Jollity Farm
Vermicomposting: Solar Bud (Bud Hnetka)
Jora in-vessel composting: Charlotte Fesnoux and Ann Eriksson
Digester: Veronica and Graeme Shelford

see Thetis Island phone book for contact info

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