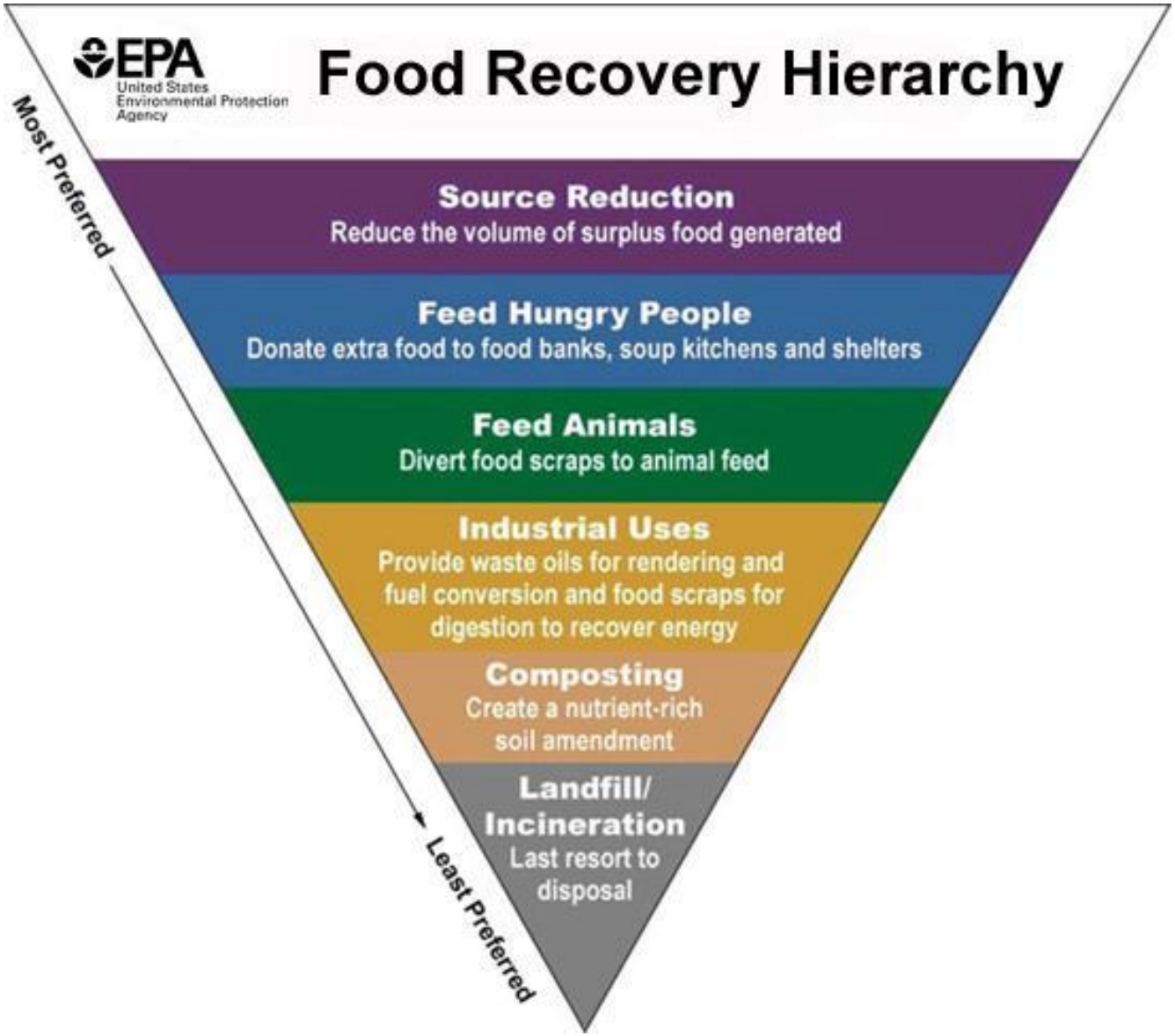
Composting in Your Backyard

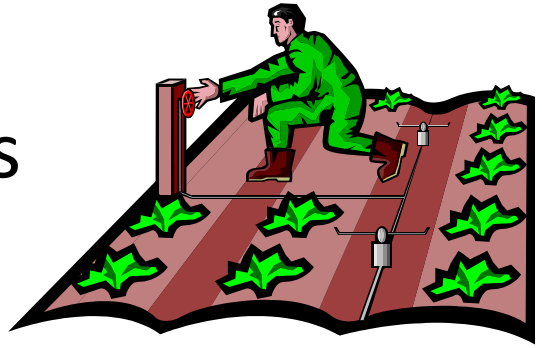
Mark King,
Sustainability Division

Why Do People Want Compost?


EPA
United States
Environmental Protection
Agency
Food Recovery Hierarchy
Most Preferred
Least Preferred
Source Reduction
Reduce the volume of surplus food generated
Feed Hungry People
Donate extra food to food banks, soup kitchens and shelters
Feed Animals
Divert food scraps to animal feed
Industrial Uses
Provide waste oils for rendering and fuel conversion and food scraps for digestion to recover energy
Composting
Create a nutrient-rich soil amendment
Landfill/ Incineration
Last resort to disposal

Benefits of compost

- Add organic matter to soil
- Increase water holding capacity
- Increase infiltration
- Reduce erosion
- Enhance microbial activity
- Soil compaction
- Resistance to disease and insects
- Revolving nutrient bank account

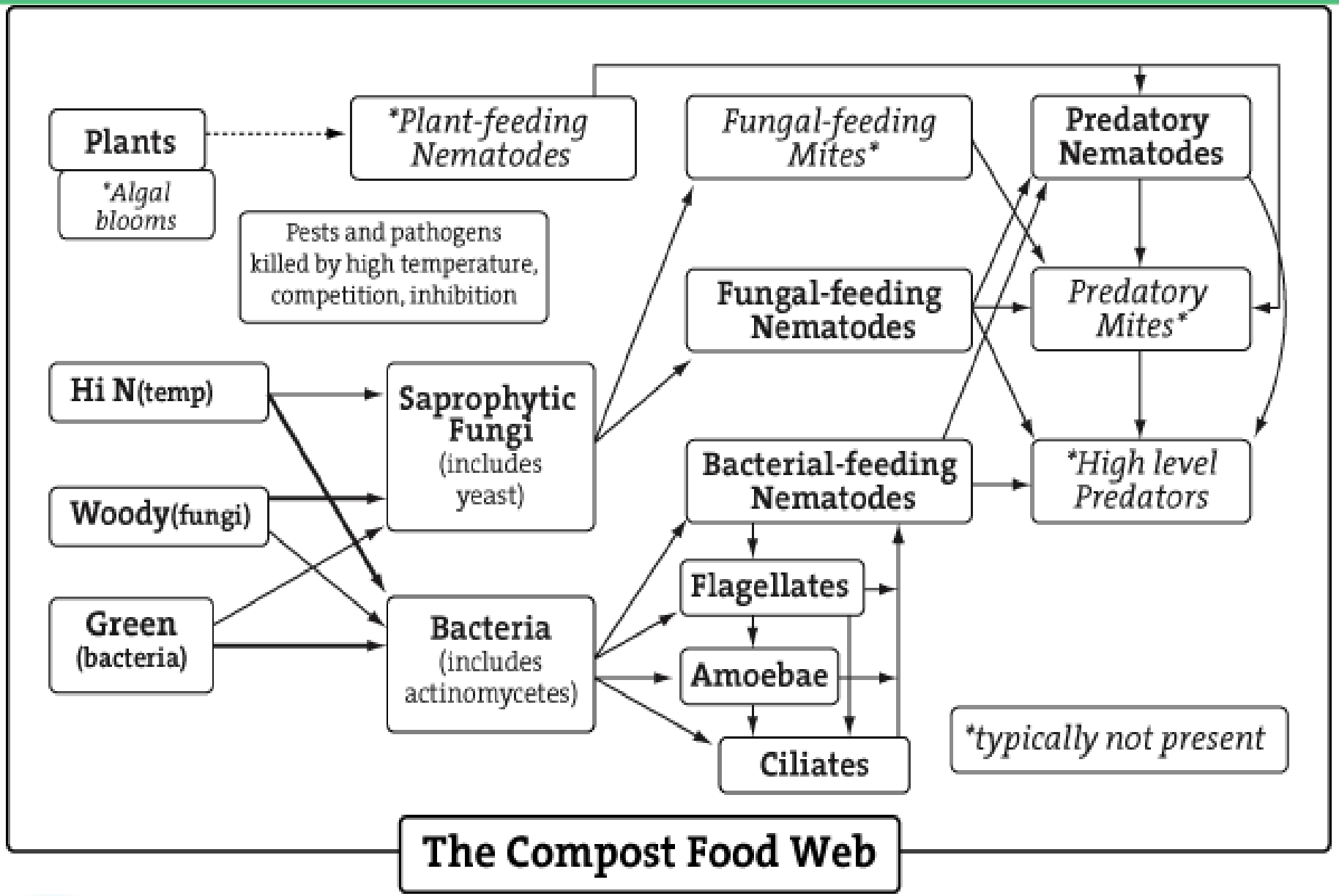


What is Composting?

- A biological process that *transforms* raw organic materials into a nutrient rich, biologically-stable soil additive suitable for plant and crop use.

Compost Community

- Macroscopic Invertebrates-do most of initial mechanical bread-down of organic materials into smaller particles
  - Snails, slugs, mites, sow bugs, worms, ants, centipedes, millipedes, beetles
- Microorganisms-digest and “transform” organic matter into stable humus-like particles
  - Bacteria, fungi, actinomycetes, and protozoa


Plants
*Algal blooms
*Plant-feeding Nematodes
Pests and pathogens killed by high temperature, competition, inhibition
Hi N(temp)
Woody(fungi)
Green (bacteria)
Saprophytic Fungi (includes yeast)
Bacteria (includes actinomycetes)
Fungal-feeding Mites*
Fungal-feeding Nematodes
Bacterial-feeding Nematodes
Flagellates
Amoebae
Ciliates
Predatory Nematodes
Predatory Mites*
*High level Predators
*typically not present
The Compost Food Web

What Makes a Compost Pile Work?

- C:N ratio
- Oxygen content (porosity)
- Moisture content
- pH
- Particle size

So…What is a C:N Ratio?

- Supply of total carbon compared to total nitrogen in compost feedstock
- If C:N is too high the compost process will slow
- If C:N is too low, more likely to lose Nitrogen as ammonia gas or in leachate
- Ideal initial C:N mixture range is 20 – 30:1

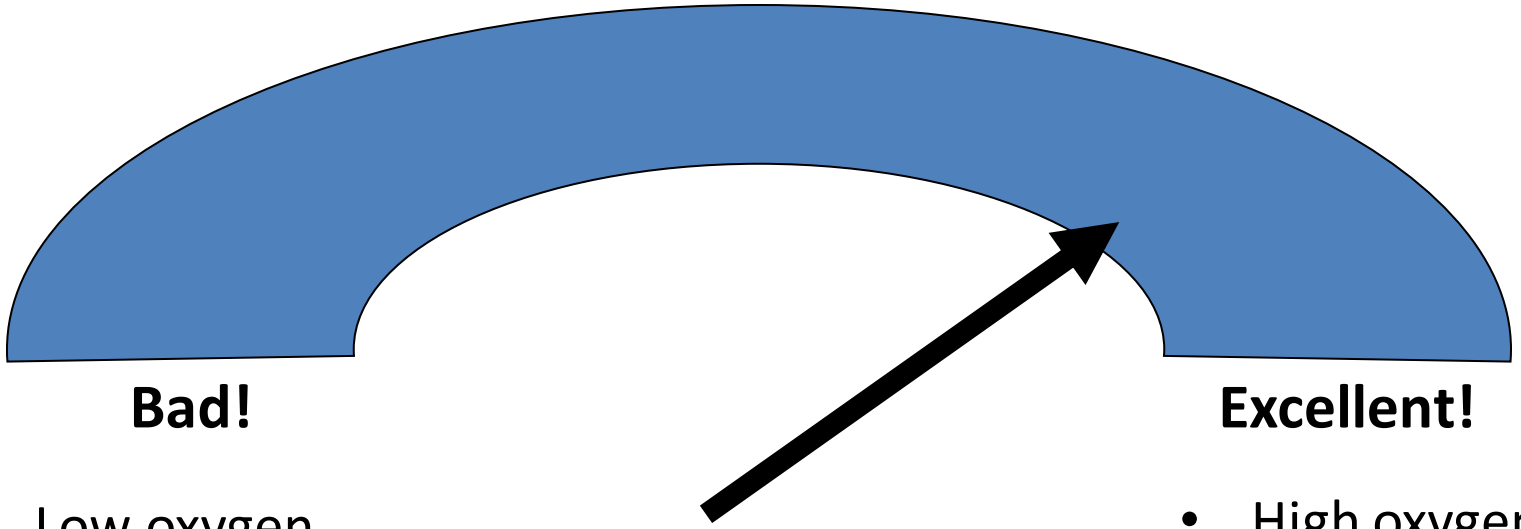
Carbon Feedstocks

- **Carbon: 30:1 or >**
  - **Leaves**
  - **Wood shavings**
  - **Card board: caution**
  - **Shredded Newspaper**
  - **Wood chips**
  - **Corn stalks**
  - **Straw**

Nitrogen Feedstocks

- **Nitrogen: 30:1 or <**
  - **Animal manures**
  - **Food waste**
  - **Lawn clippings: caution**
  - **Fish**
  - **Garden clippings: caution**

Oxygen, We All Need It!!



Bad!

- Low oxygen
- Slows Down
- High odors

Excellent!

- High oxygen
- Efficient
- Low odors

Microbial Classification

- Based on Two factors:
  - –Oxygen Consumption
    - Aerobes (use O_2, largest population)
      - –Facultative-use O_2, but can swap
      - –Obligate-use O_2 only!
    - Anaerobes (mostly killed or inhibited by O_2, but can be facultative

Oxygen!!!

- Aerobic respiration-use O_2 as primary oxidizing agent (most efficient)

- **5%-10% is optimal for compost process**

Aerobic Decomposition is the "quickest" way to achieve biological stability!!

Aerobic Composting and Temperature

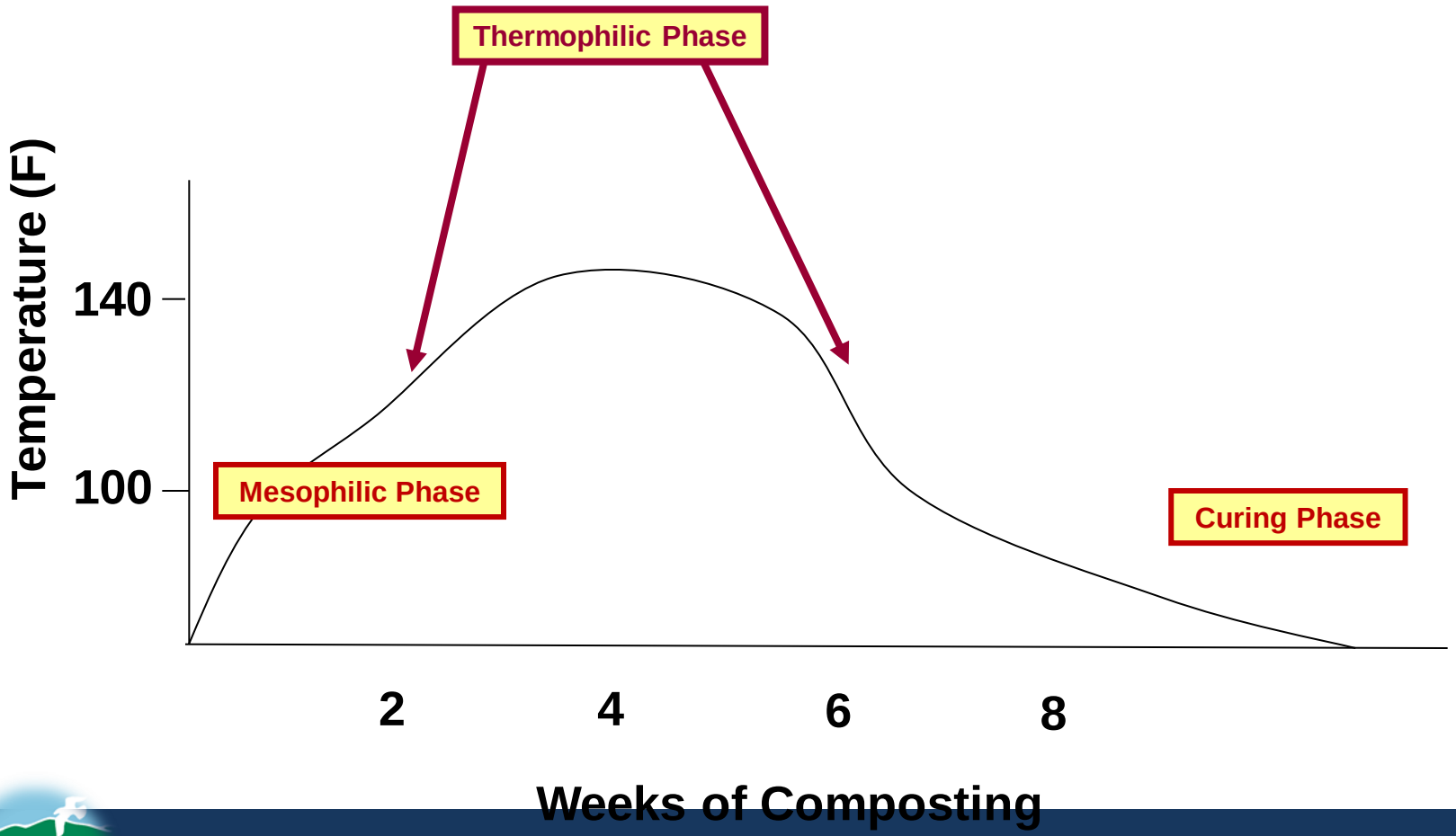
- Active composting occurs in the temperature range of 110°F to 160°F
- Pile temperature may increase above 160°F but this is too hot for most bacteria and decomposition will slow until temperature decreases again

Remember, compost pile heat is the direct result of bacteria working!

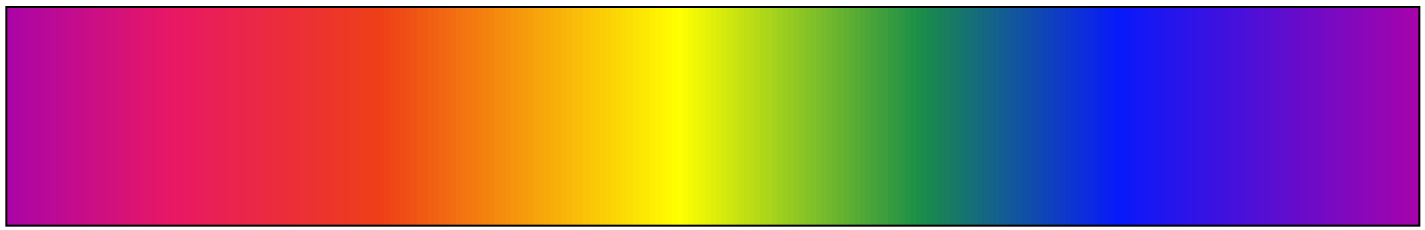
Phases of *Aerobic* Composting

- **Initial Mix-Materials are blended together (day one)**
- **Mesophilic phase-Moderate temperatures (50-110^{o}F) lasts for a few days**
- **Thermophilic phase-High temperatures (110-160^{o}C) lasts for 4-6 weeks**
- **Curing and Maturation phase-Temperature moderate down to ambient lasts for 3-6 months**

Typical Temperature Profile



Compost Moisture



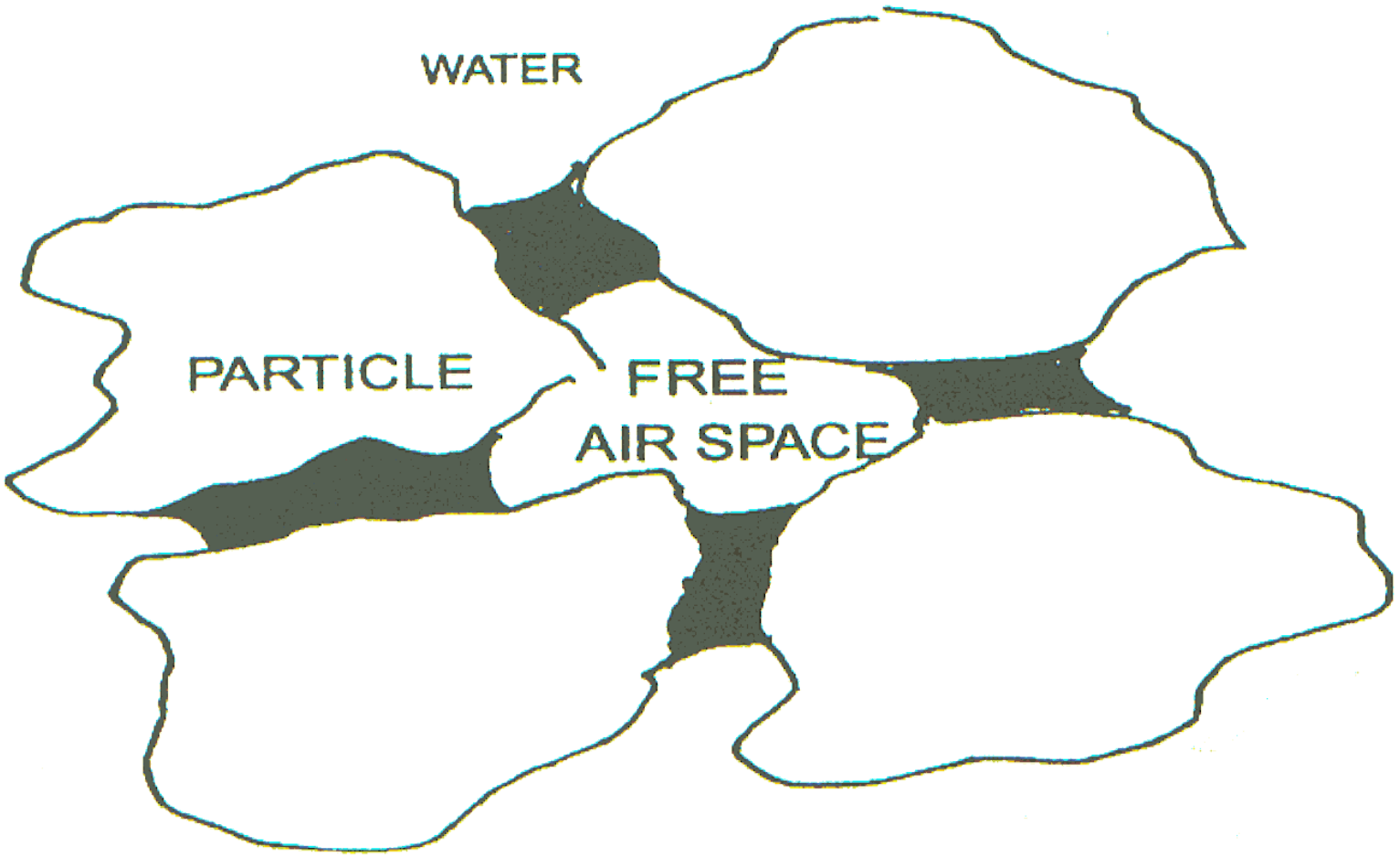
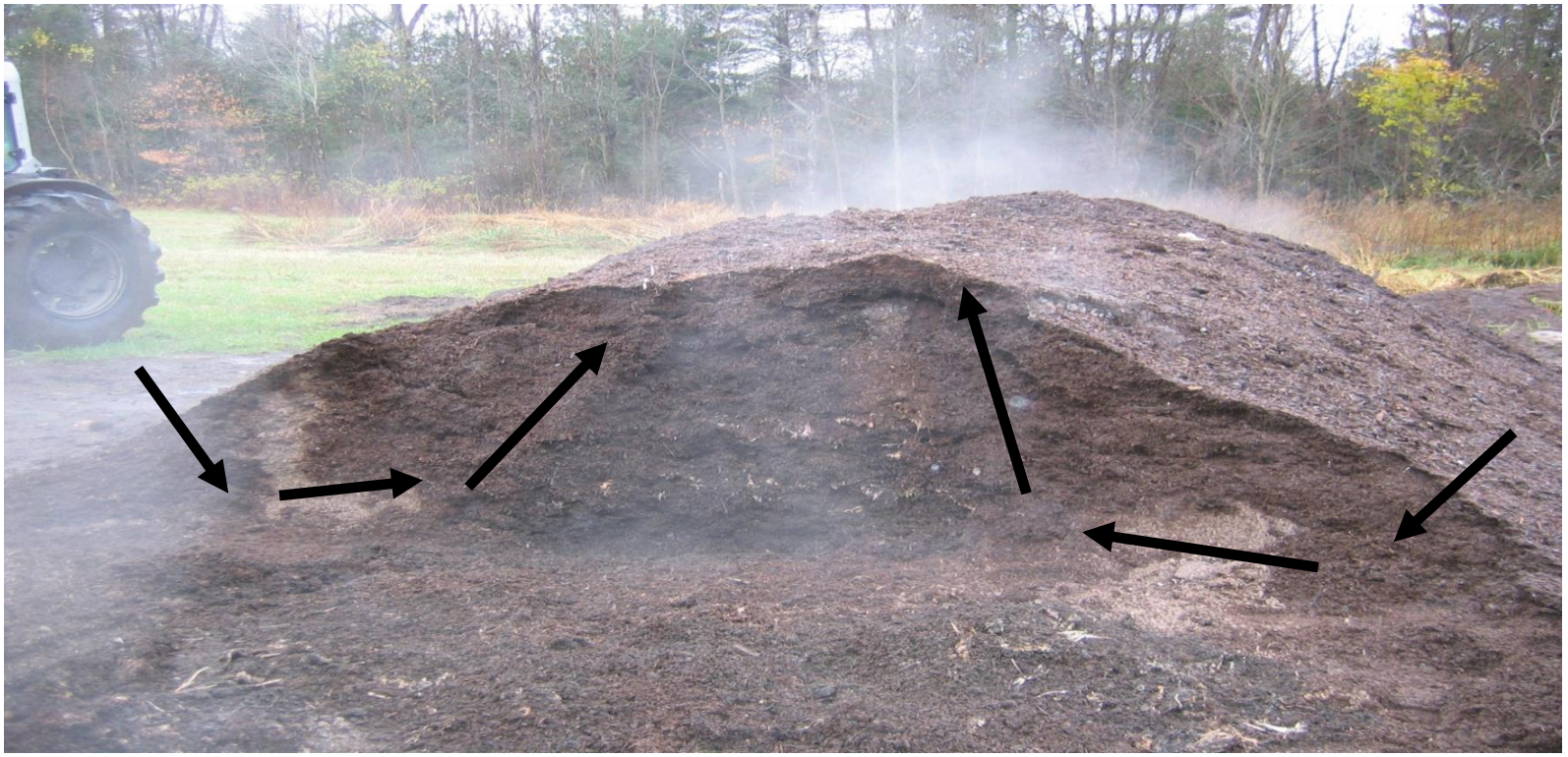


FIGURE 2.10. The relationship of free air space to water and particles in a composting media.

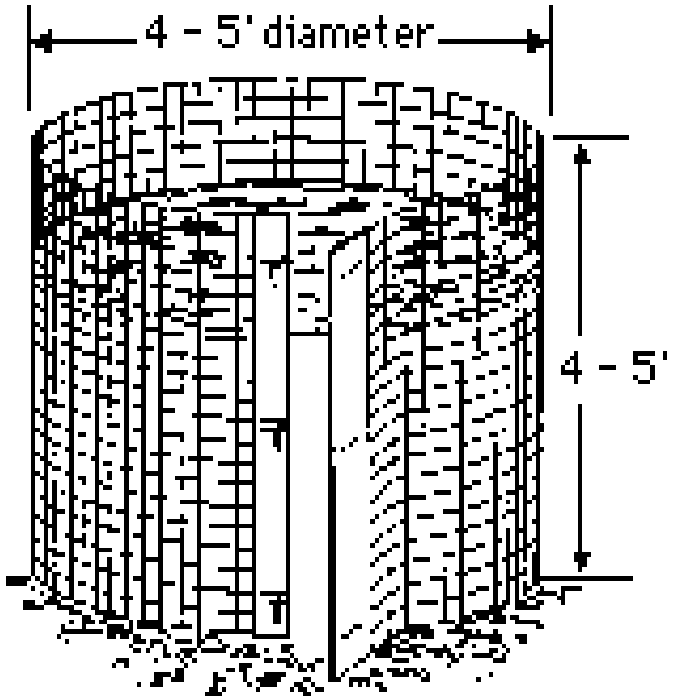
What Does Particle Size Do?

Moisture Distribution vs. Air Flow Through Compost Pile



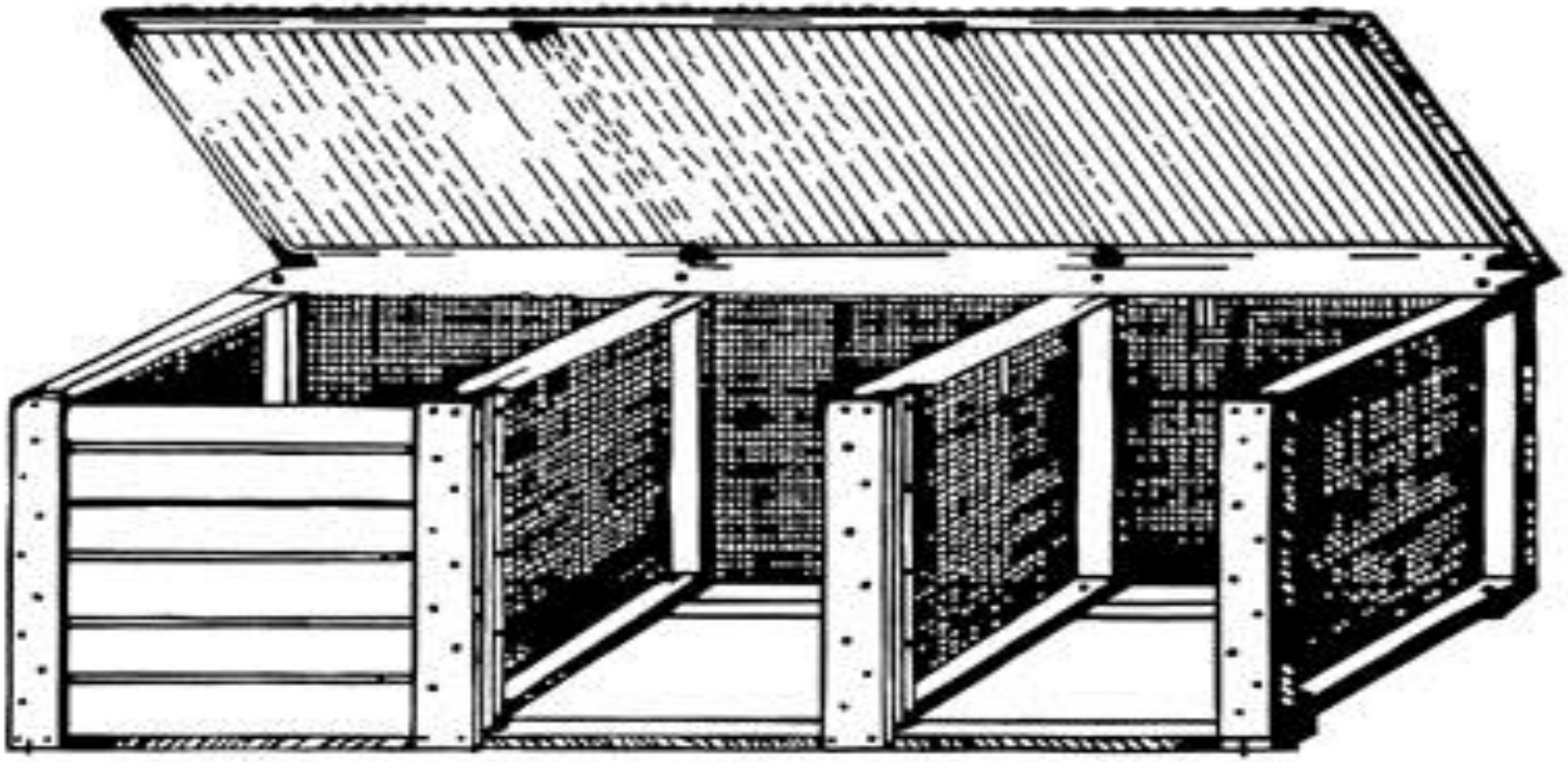
What Compost System Should I Use?

Simple Bins



Backyard Compost Bins

3 Bin System




Cole
Emma
Emily
COMPOST

Backyard Compost Bins
"Tumblers"

Open System

Tools…

- Spade fork
- Kitchen food collector
- Thermometer
- Aerator (Wing-digger)

How Do I Get Started?

The reality:

- Daily task
  ½ hr-1 hr
- Weekly task
  1-2 hrs

Daily task

- Collect compost material
- Weigh compost material (optional)
- Take to compost site
- Take compost temperature

- Mix in new ingredients
- Add bulking material
- Clean up


Trash
PLATE
CUPS

Weekly Task

- Maintenance of bins
- Turn piles
- Troubleshooting
- Supplying bulking material

When is the Compost Finished?

Okay, Now What??

- You now have a collection and compost system, understand how compost works, and have the full support of all involved…

- Let's give it a try!!!
  - Start small (pilot)
  - Success breeds success or as they say in the military…"Slow is smooth and smooth is fast!

Mark A. King
Mark.A.King@maine.gov
207-592-0455
www.maine.gov/dep