On-Campus Composting

Using the ASP Method

US Environmental Protection Agency
Food Waste Challenge

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December 5, 2013

O2Compost
Compost Systems & Training

Raw Feedstocks

Source Separated Organics

Aerated Static Pile Composting

Composting is a Manufacturing Process

A High Quality Finished Product

Common Methods of Composting

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Turned Pile Composting

Small Turned Windrow Composting

Large Turned Windrow Composting

Aerated Static Pile Composting

Free-Standing ASP System

Aerated Static Pile Composting
3-Bin System

3-Bin ASP System – Paragon by Barn Pros

Free-Standing T&G Aerated Bin

O_2Compost Micro-Bin – Perfect for Pilot Projects

Institutional ASP Composting Systems

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Philadelphia Prison, PA

Food Waste Produced by 900 Inmates

Walla Walla State Penitentiary, WA

Food Waste Produced by 2,000 Inmates

Burke Rehabilitation Hospital, NY

Free-Standing ASP System

Joint Base Lewis McCord, WA

Pilot Project – All Feedstocks Produced On-Site

Plywood Aerated Bins

Washington State University – Research Project

Syracuse University, NY

Micro-Bin Pilot Project – Green Campus Initiative

Composting Principles & Parameters

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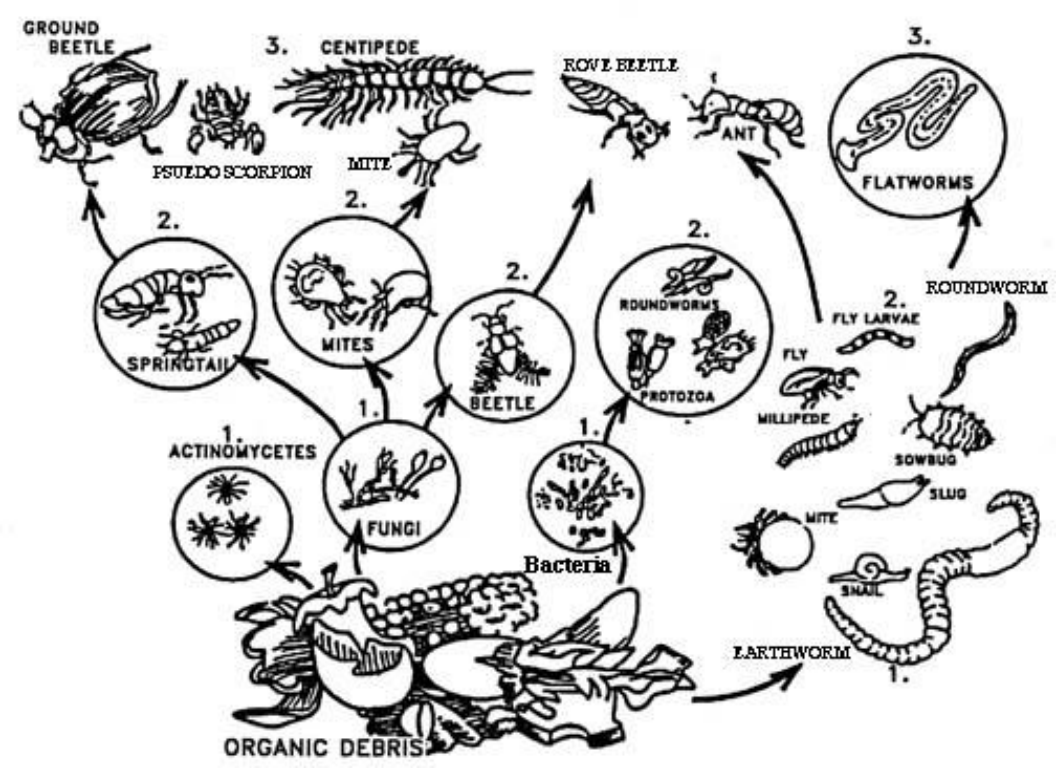
Microbes Break Down Organic Matter to:

Obtain energy to carry on life processes.

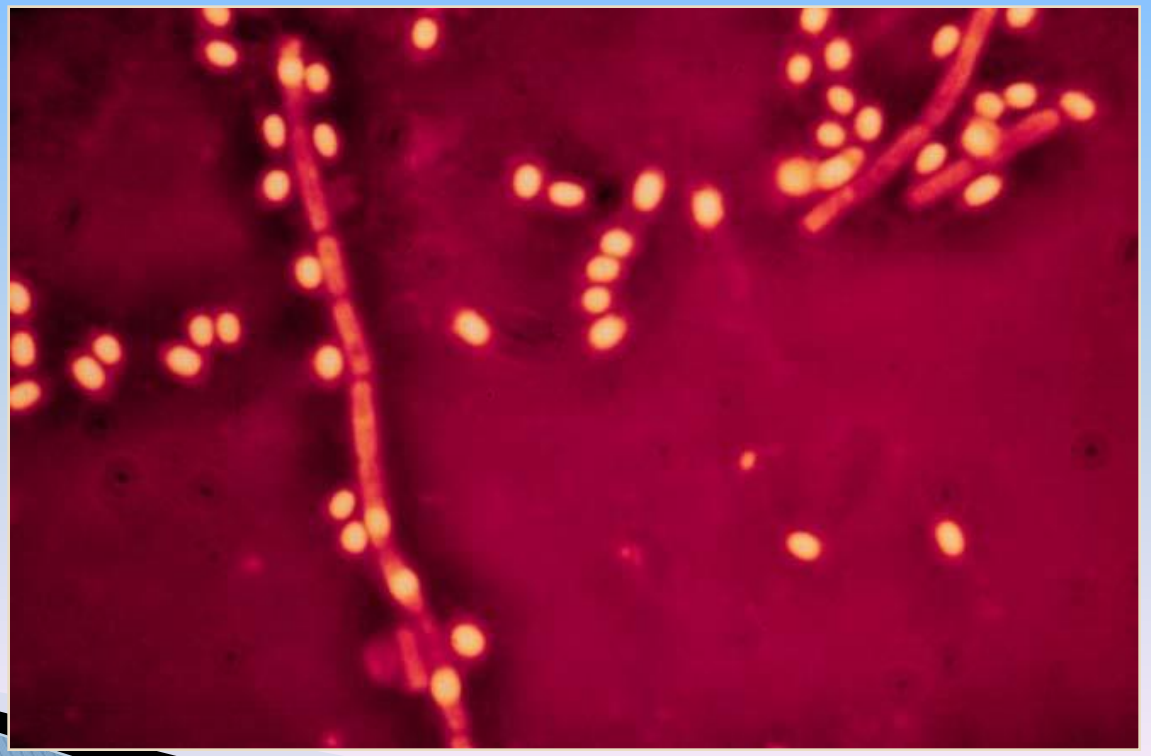
Acquire nutrients (N, P, K) to sustain populations.



ie-horticulture.tamu.edu/publications/landscape/compost/chapter1.html

Succession of Microbial Communities During Composting

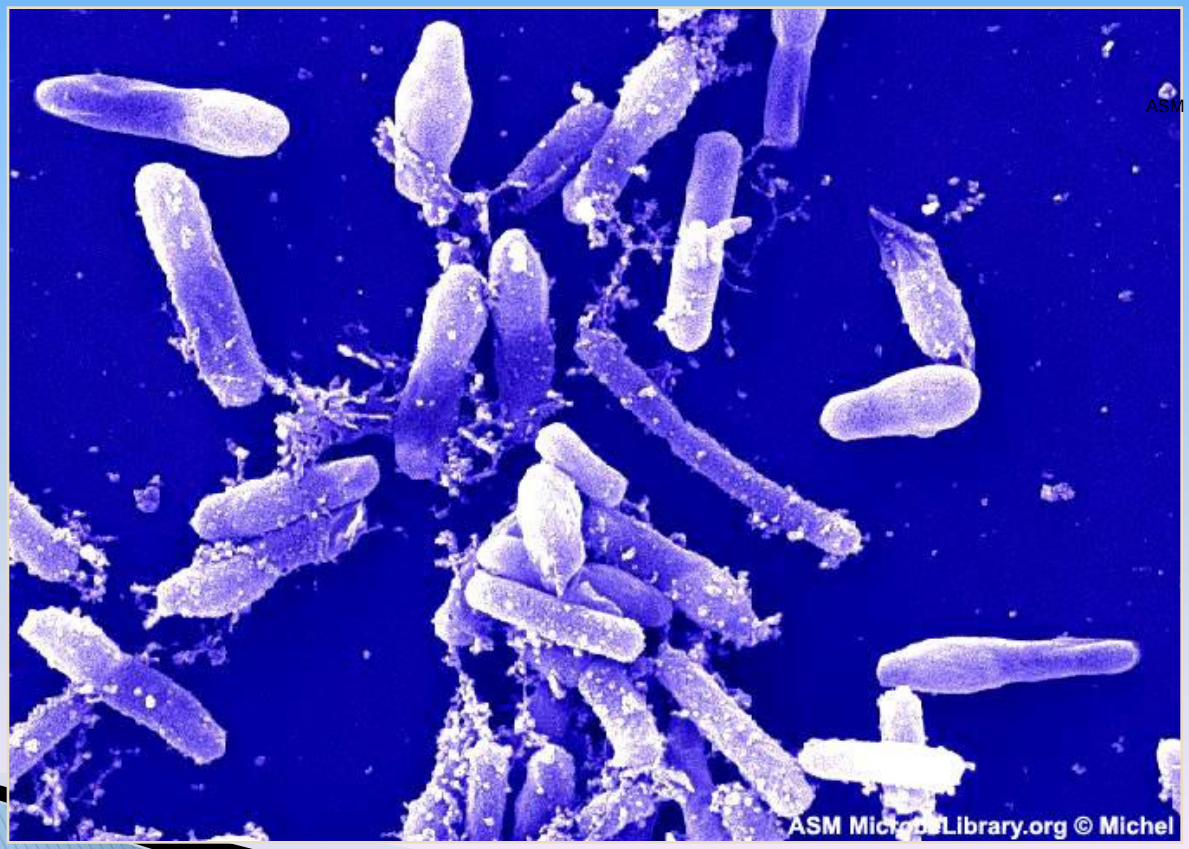
1. Mesophilic bacteria break down soluble, readily degradable compounds (sugars, starches), initiating the compost process



Mary Fauci

Succession of Microbial Communities

2. **Thermophilic bacteria** take over as the temperature increases, breaking down proteins, fats, cellulose, and hemicellulose.

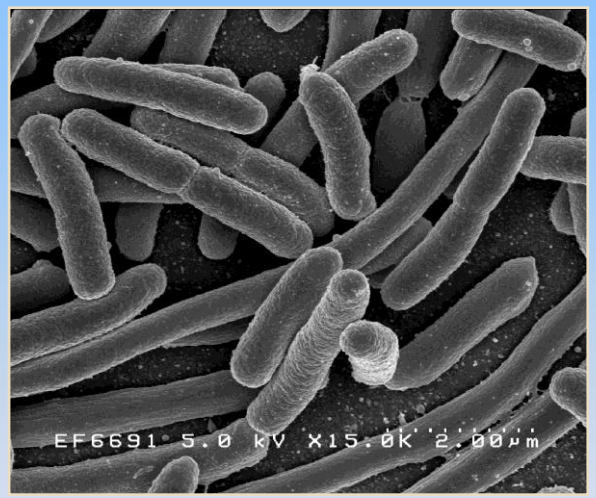


Succession of Microbial Communities

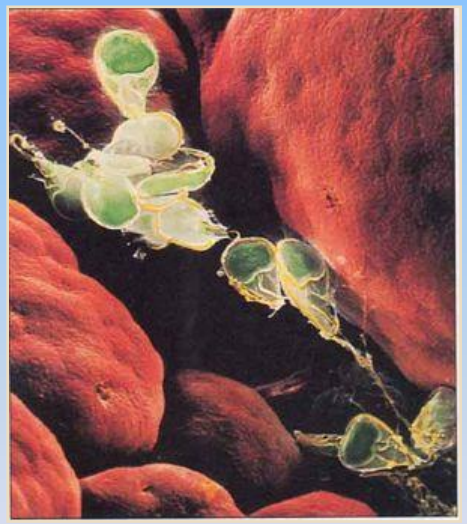
3. Fungi and actinomycetes are important during curing phase in attacking the most resistant compounds.

Pathogens

Escherichia coli, Salmonella spp., Staphylococcus aureus, Bacillus subtillus, Cryptosporidium, and Giardia are most common.

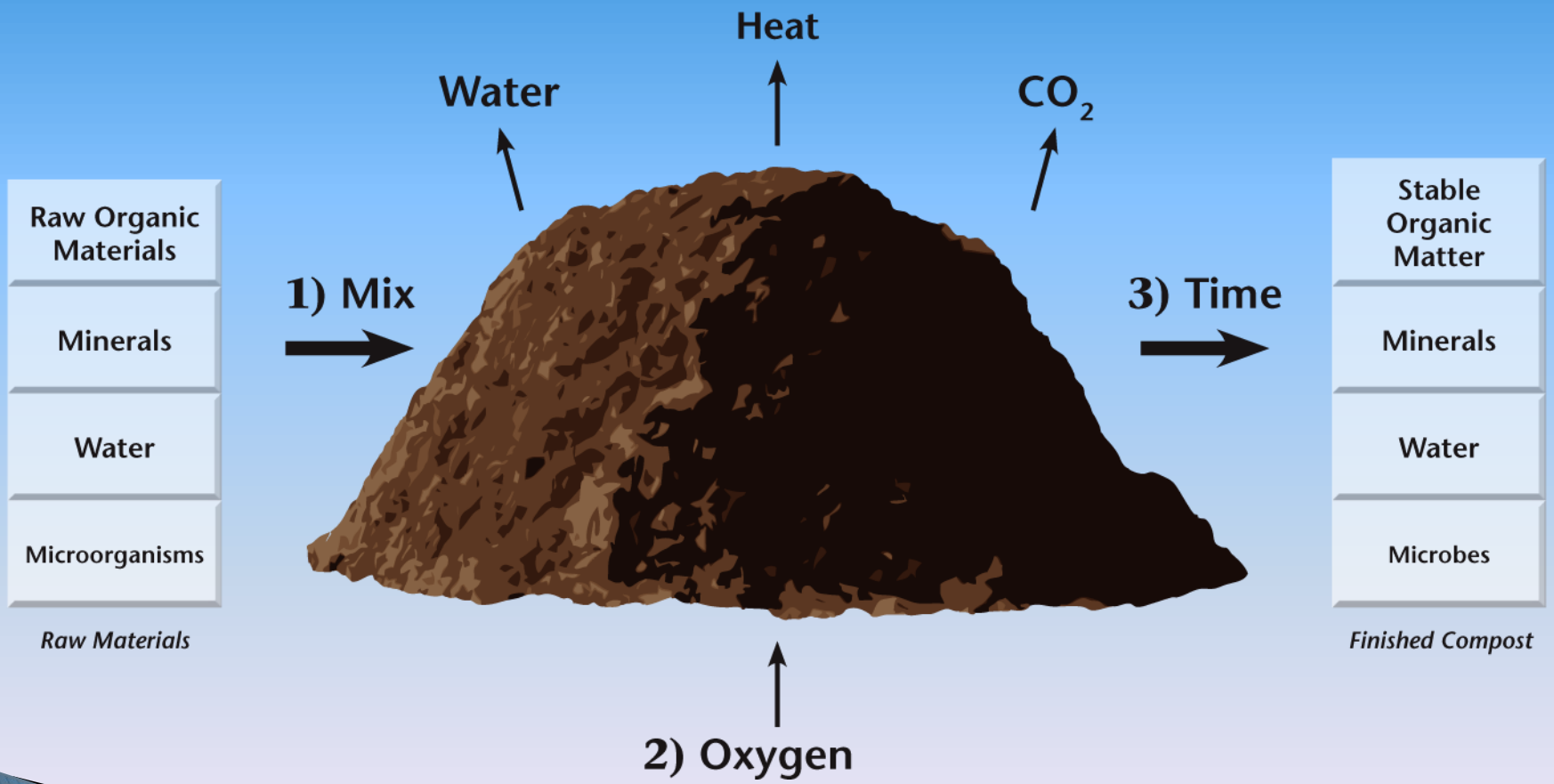


Color-enhanced scanning electron micrograph showing *Salmonella typhimurium* (red) invading cultured human cells



Kevin Sorenson, Snow College

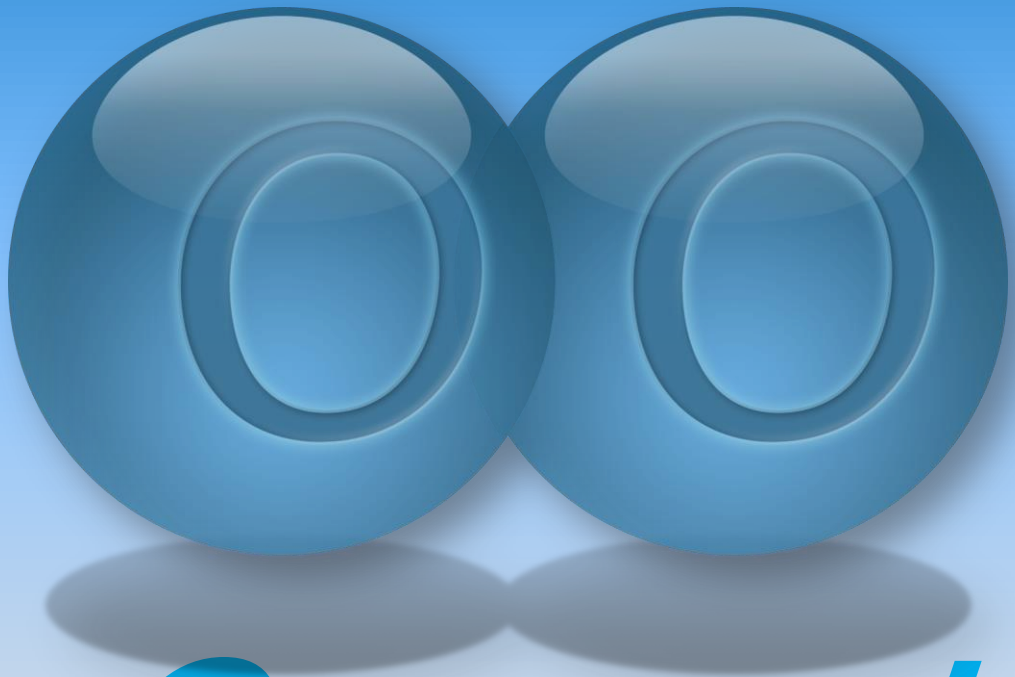
The Composting Process



Compost Mix
4 Critical Parameters

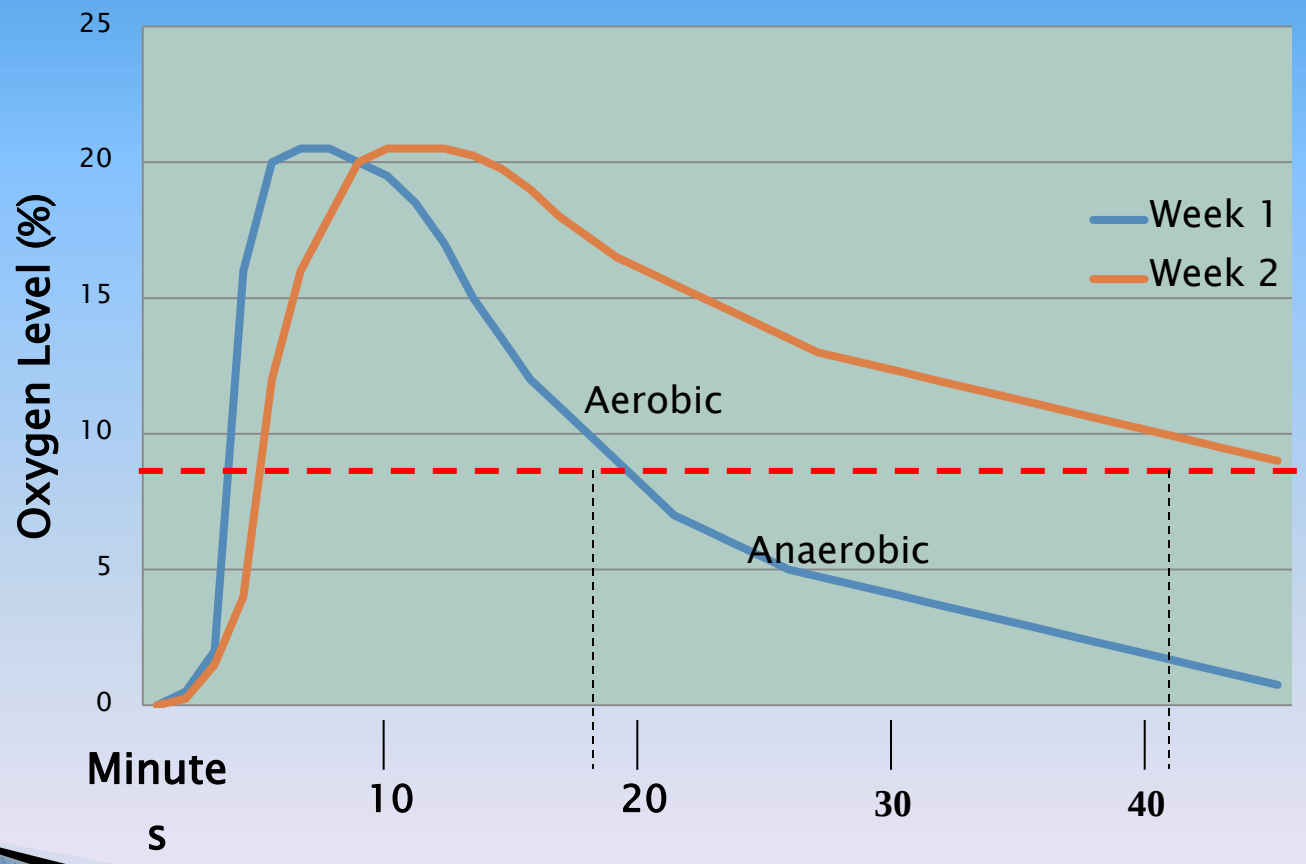
- Carbon to Nitrogen Ratio (C:N ~ 30:1)
- Porosity: Volume of Void Space
  - Bucket Test to Determine Bulk Density and Free Air Space
- Moisture Content (60 – 65%)
  - Squeeze Test to produce a drip or two from a handful of mix
- Homogeneous Blend of Materials

The Secret to Composting is…



Oxygen!

Oxygen Depletion in Compost Pile

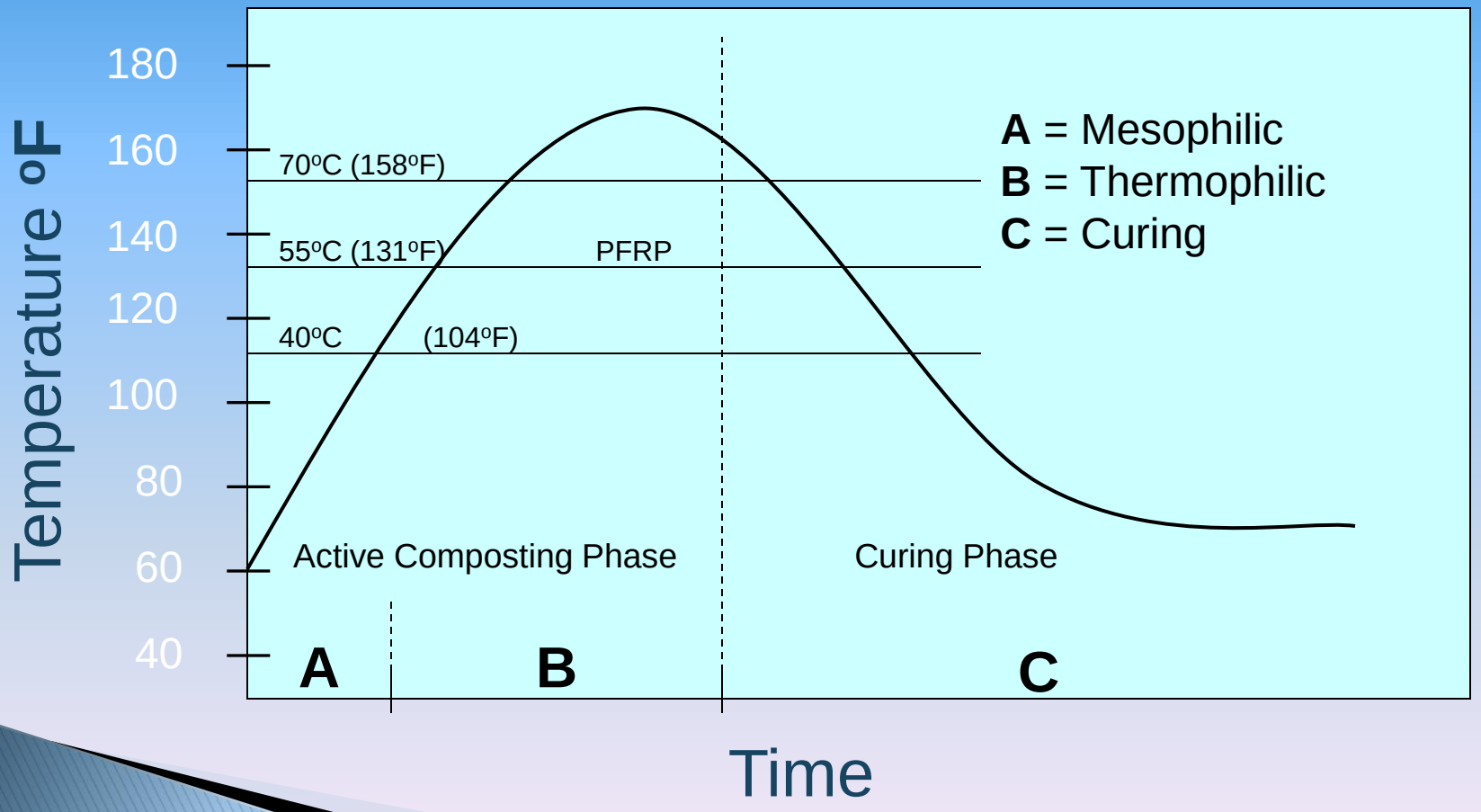


Aeration

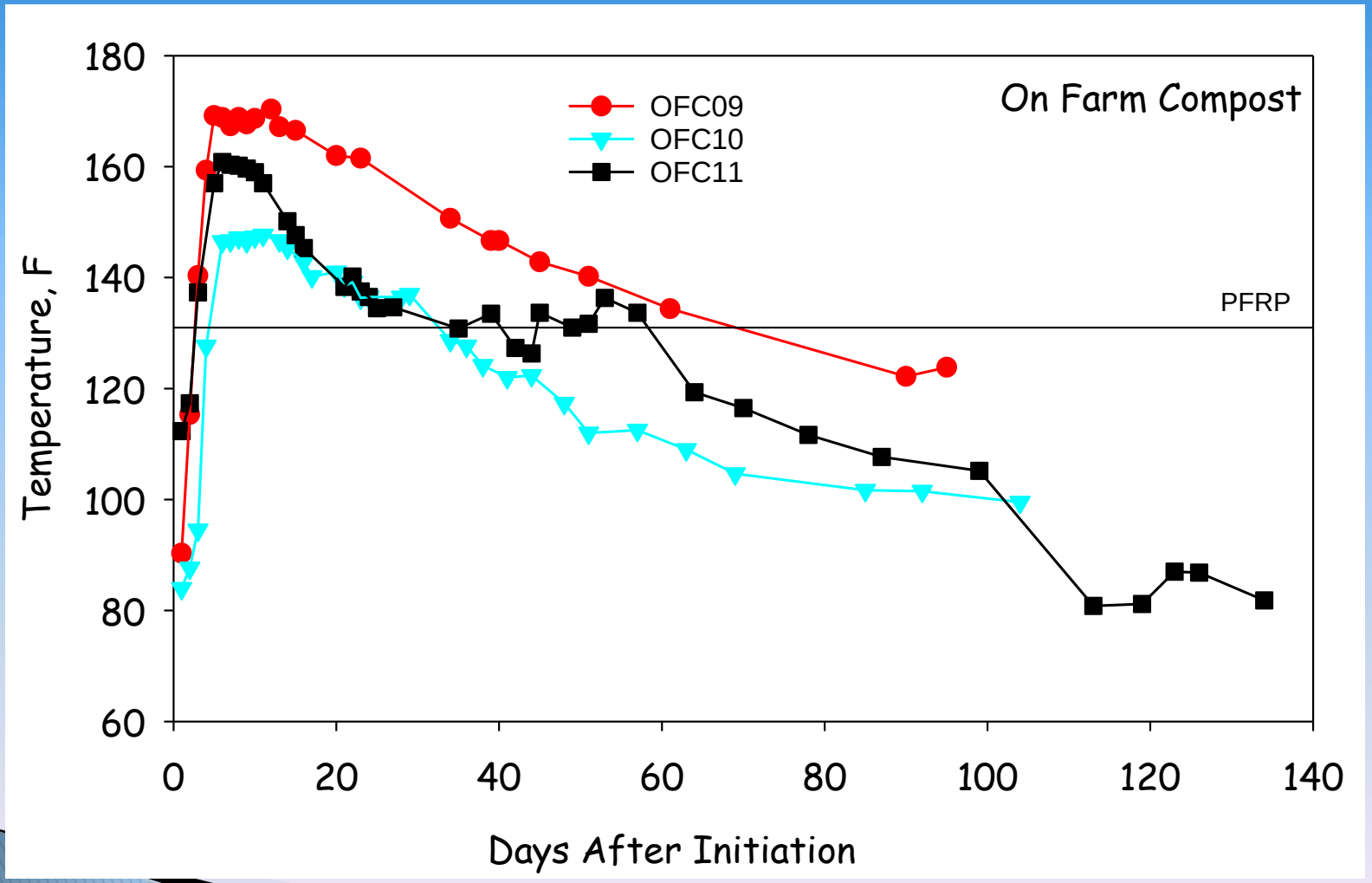
Allows the Operator to:

- Maintain Aerobic Conditions
- Mitigate Impacts from Objectionable Odors
- Manage Pile Temperatures
- Reduce the Loss of Nutrients
- Expedite the Rate of Composting & Curing
- Produce Superior Compost Products

Temperature Change in a Typical Compost Pile



Actual Compost Temperature Data



The ASP Process with a 3-Bin System

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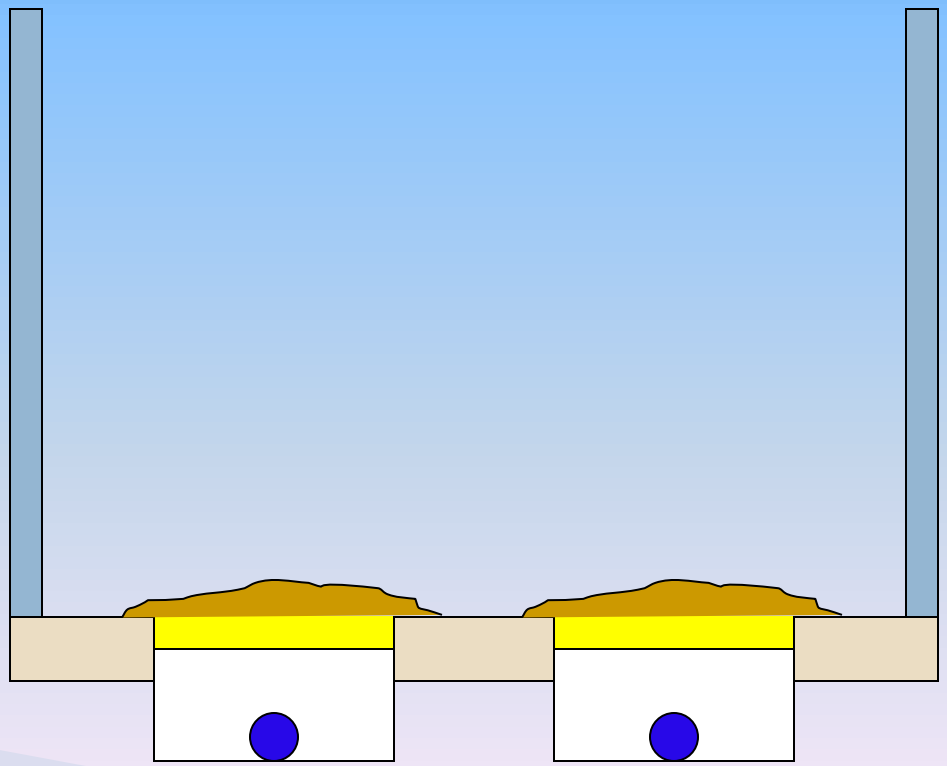
3-Bin Top Down Compost System

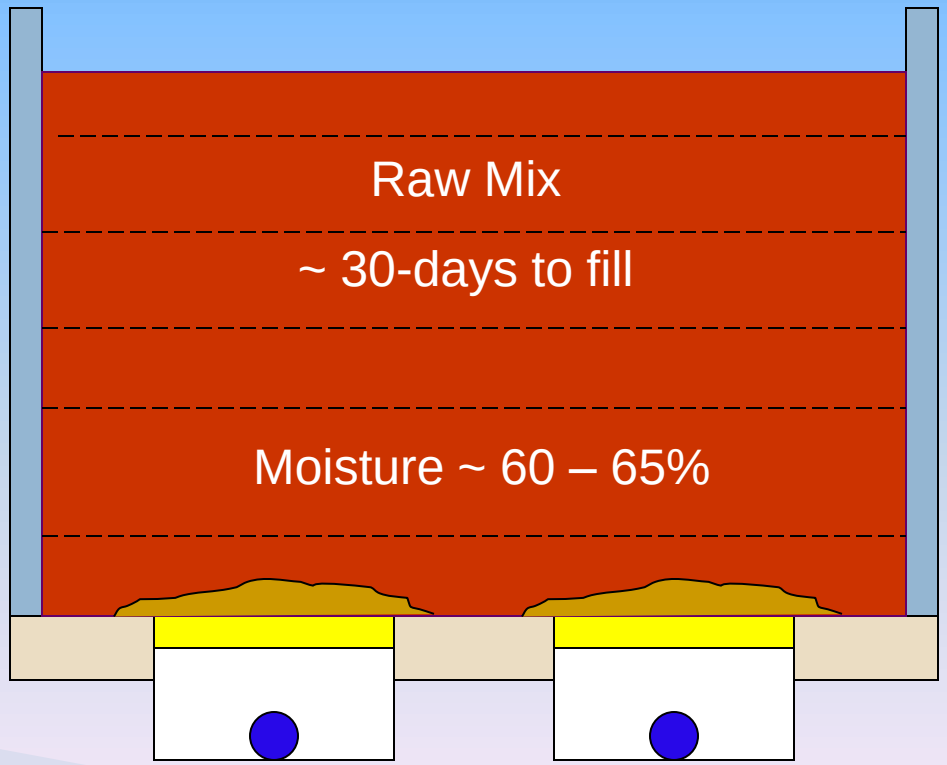
Liberty Bell Farm, Snohomish

Completed Aeration System

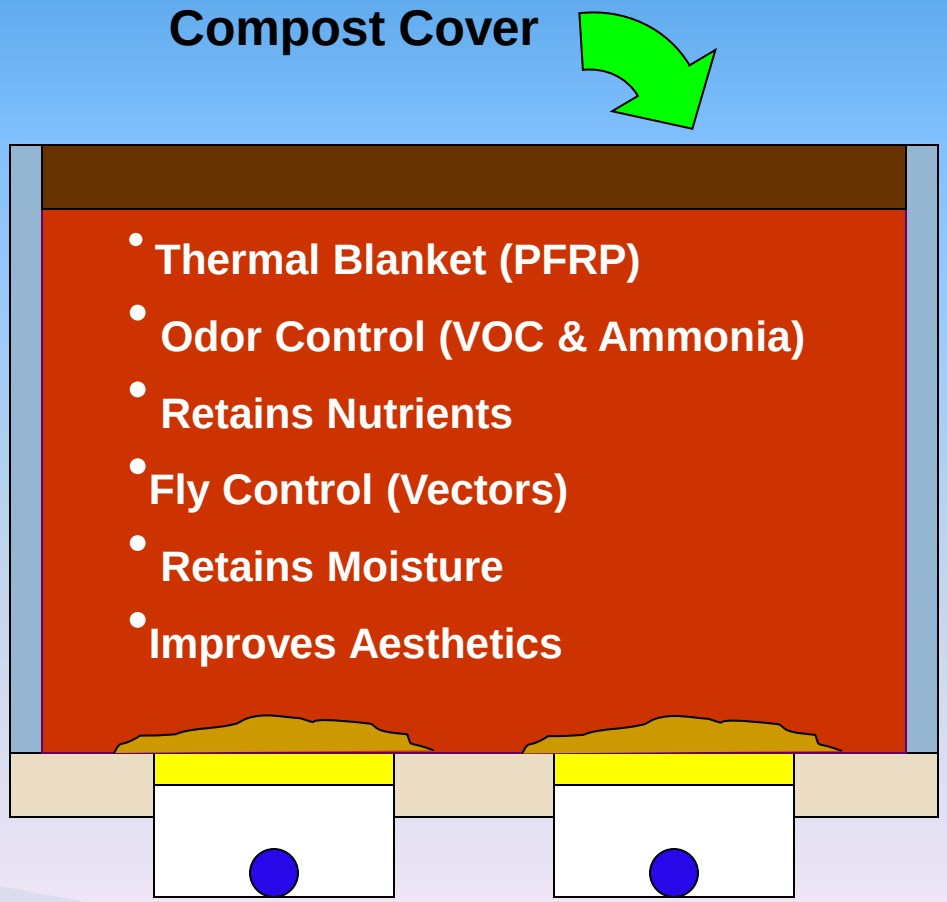
Cross Section of an Aerated Bay



Filling the Bin

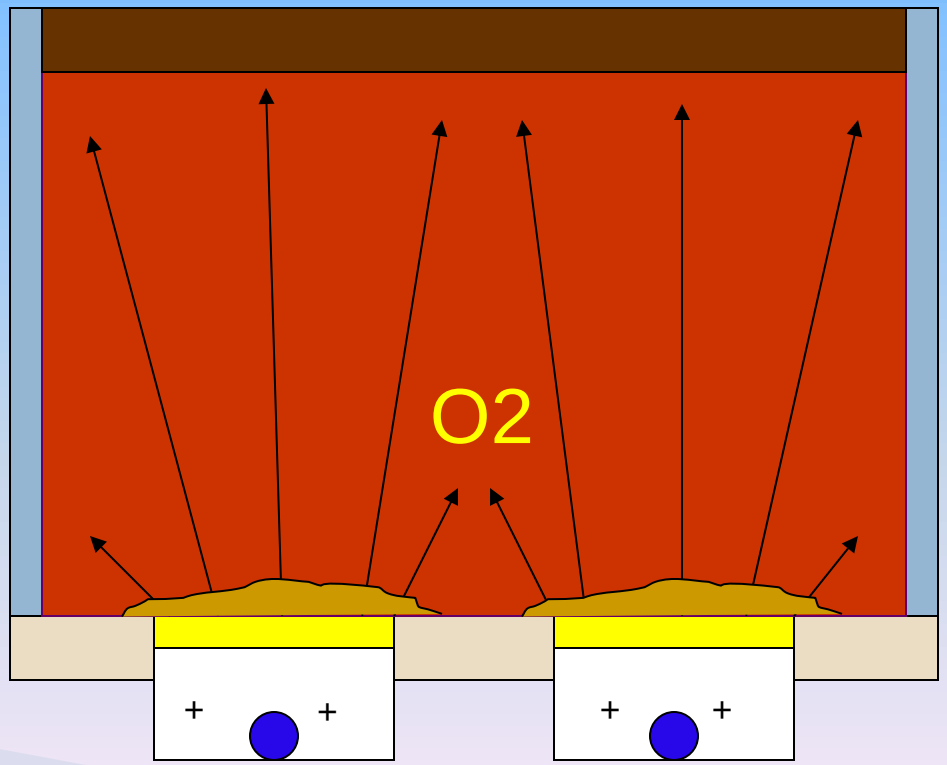


Placing the Compost Cover



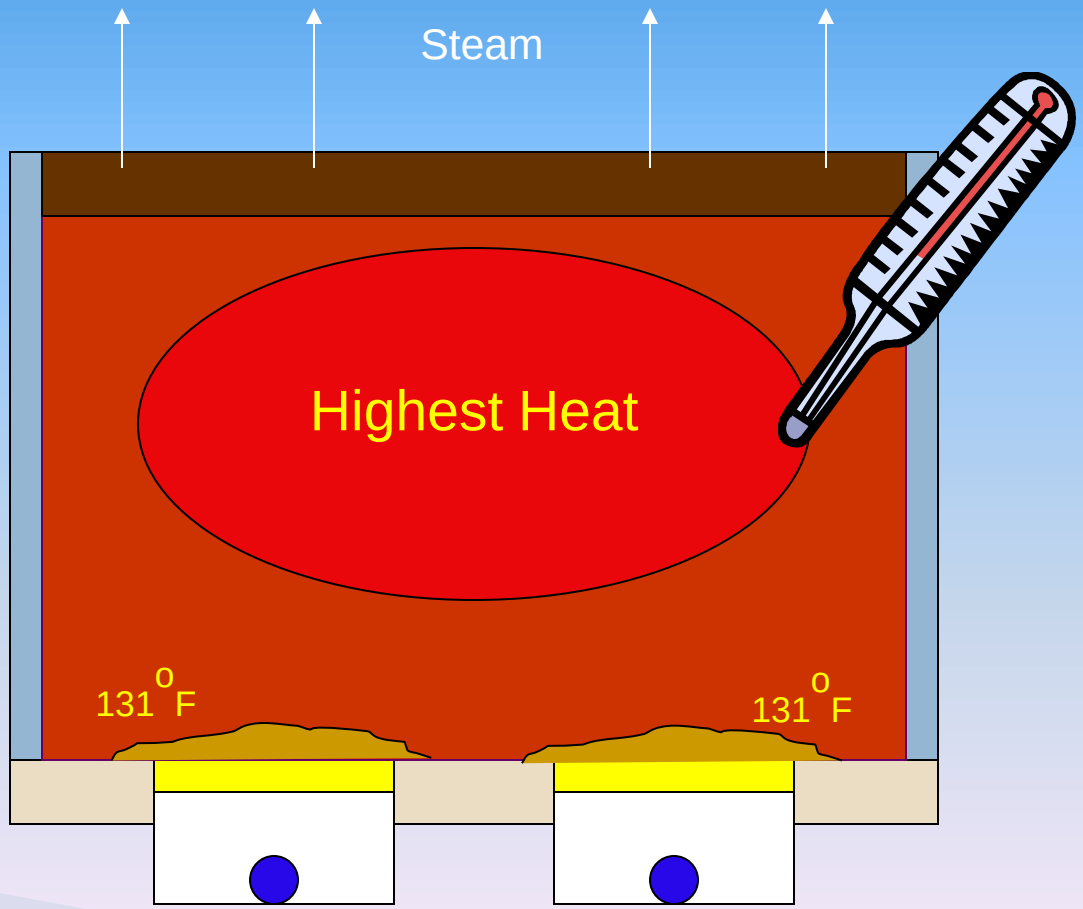
Turning On the Airflow

Typical Aeration Cycle: 2-min ON & 30-min OFF



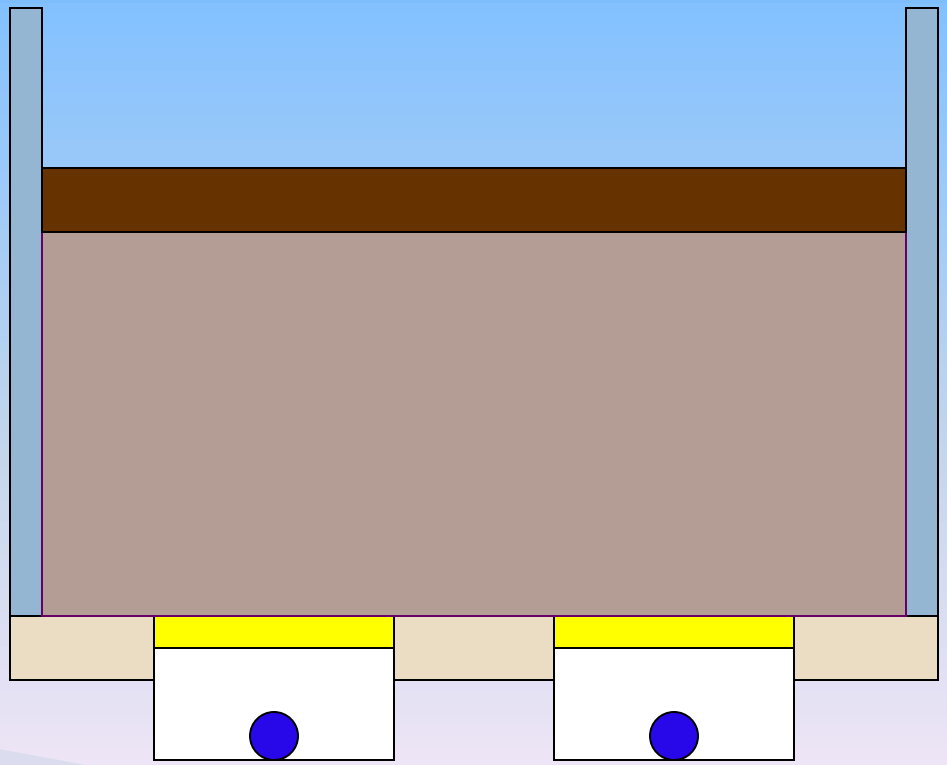
No Turning!

Monitoring Pile Temperatures



Active Composting to Curing

Volume Loss 25% – 40% in 4 weeks



Stall Management

Removing Solid Manure

Moisture Conditioning the Mix

Dumping Cart into Compost System

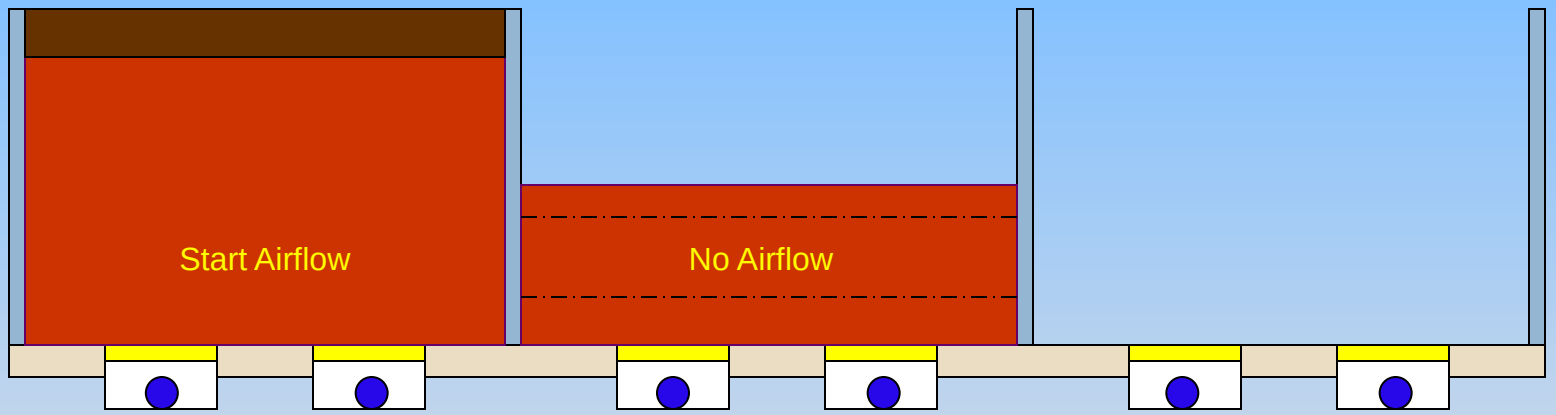
Adding Final Cover Layer

Adding the Final Touch

Monitoring Compost Temperatures

Cross Section of a 3-Bay System

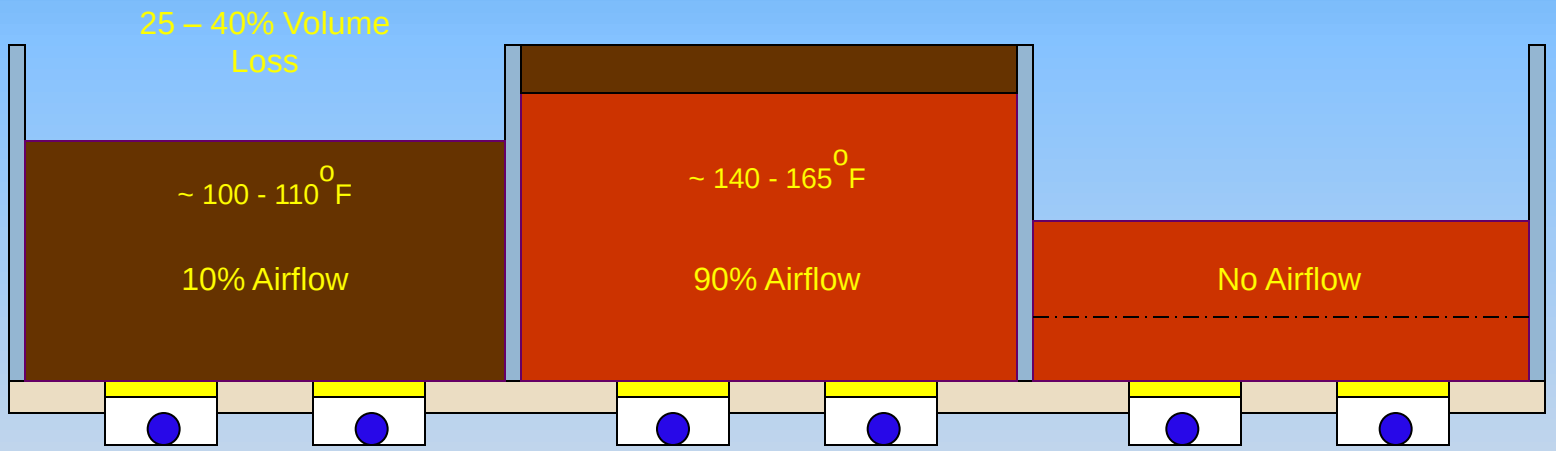
Stage 1



Bin #1	Bin #2	Bin #3
Active Phase	Filling	Empty

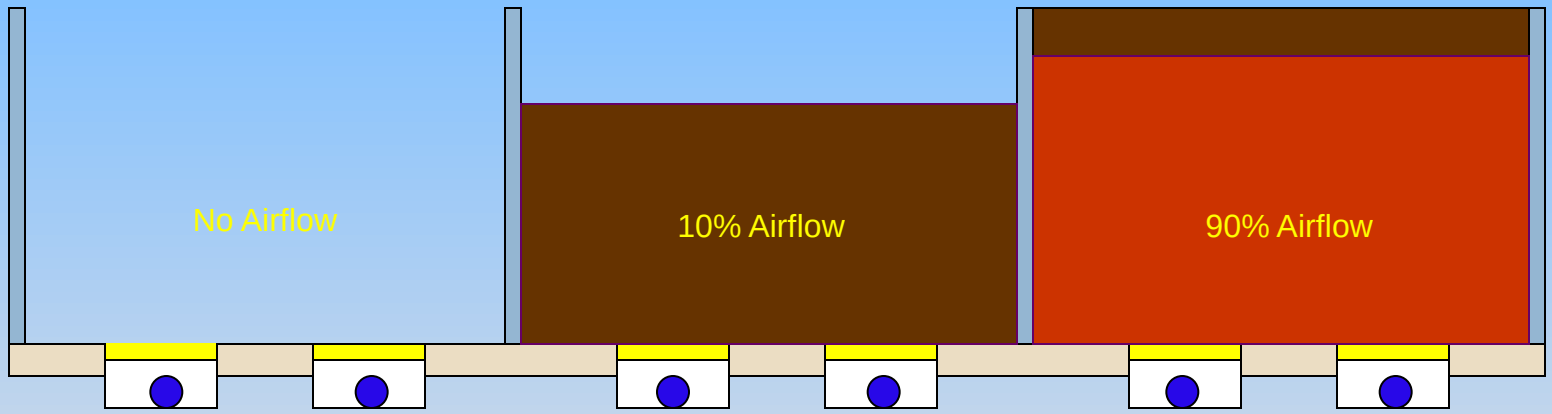
Cross Section of a 3-Bay System

Stage 2



Cross Section of a 3-Bay System

Stage 3



University Composting
Source Separated Organics

st. john's UNIVERSITY

3-Bin Aerated Compost System

Food Waste Produced in Campus Kitchens

And by Food Vendors / Coffee Shops

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Prior Attempts at Composting

Worked Well but Limited Capacity for SJU

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During Construction

Constructed by the Student

Sustainability Coordinators in 2011

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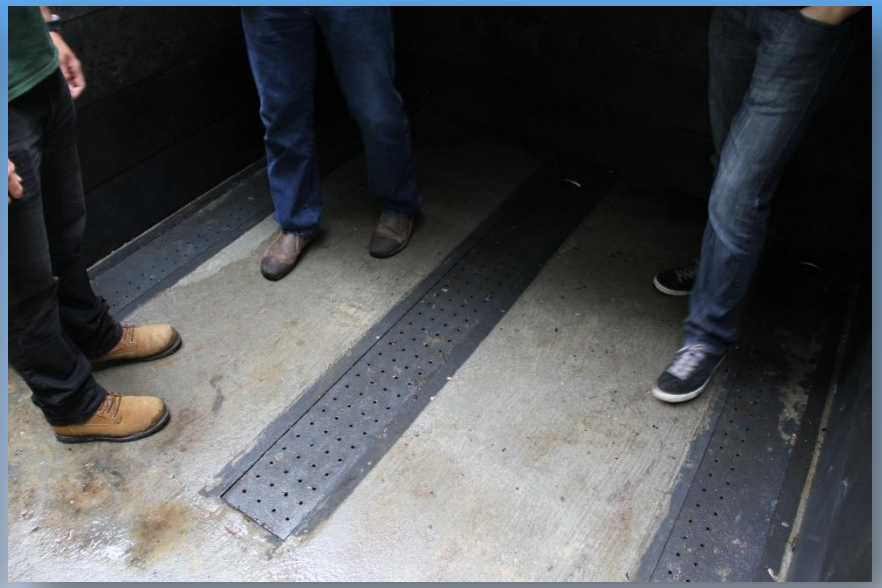
In-Floor Aeration System



Blower / Timer and Aeration Channels

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St. John's University, NY

Collecting and Transporting the SSO

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St. John's University, NY

SSO Mixing Pad

Tom Goldsmith, Facilities Manager

Mix Recipe? The Art of Composting

Mixing Area – Blending Materials

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Mixing and Filling a Bin

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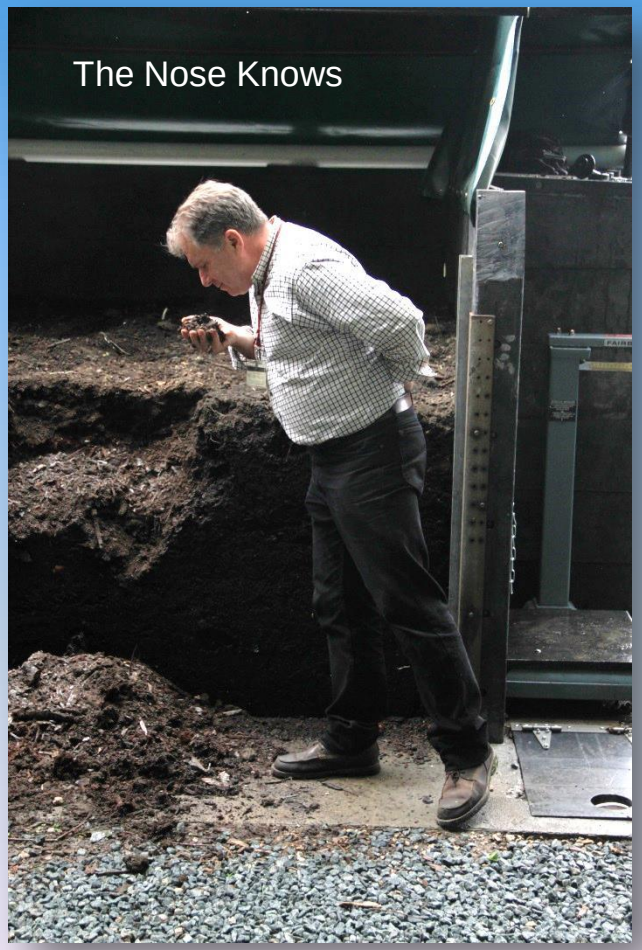

30-Days Active
Composting then Curing

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Curing and then Screening

St. John's University, NY

Student "Pea Patch"
& Biology Instruction

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Sustainability^2

Juniors and Seniors Cross-Training

Freshmen and Sophomores

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Getting Started with a Pilot Project

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Compost Systems & Training

Pilot Project

Plywood Aerated Bins

Very Simple and Inexpensive

Allows the University to:

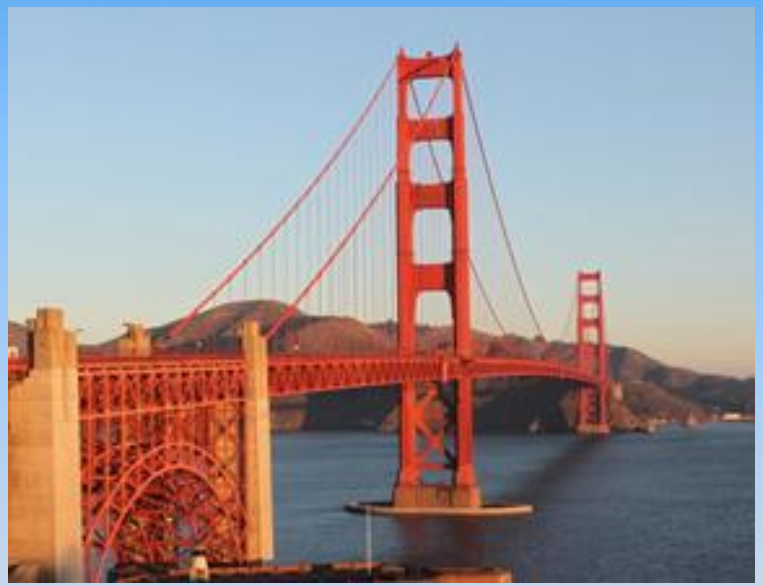
- Quickly and inexpensively test the feasibility of on-campus composting
- Provide hands-on training in the Science and Art of Composting
- Produce finished compost to test in the lab and marketplace
- Identify logistical constraints and propose / test solutions

Student's Take Action

Allows the University to:

- Enroll the participation of Student Sustainability Coordinators.
- Integrate composting into the science and engineering curriculum
- Answer the question, "Is on-campus composting, socially, economically and environmentally sustainable?"

Bridge the Gap Between Theory & Practice



Allows the University to:

- Quantify the reduction in carbon footprint
- Conduct a cost-benefit analysis to determine Return on Investment
- Reach a Go / No-Go decision quickly and at minimal cost
- Establish basis for full scale system design.

US Composting Council's Annual Conference

January 26 – 29, 2014

Oakland, California

www.compostingcouncil.org

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