

Composting : Product, Tool, Opportunity

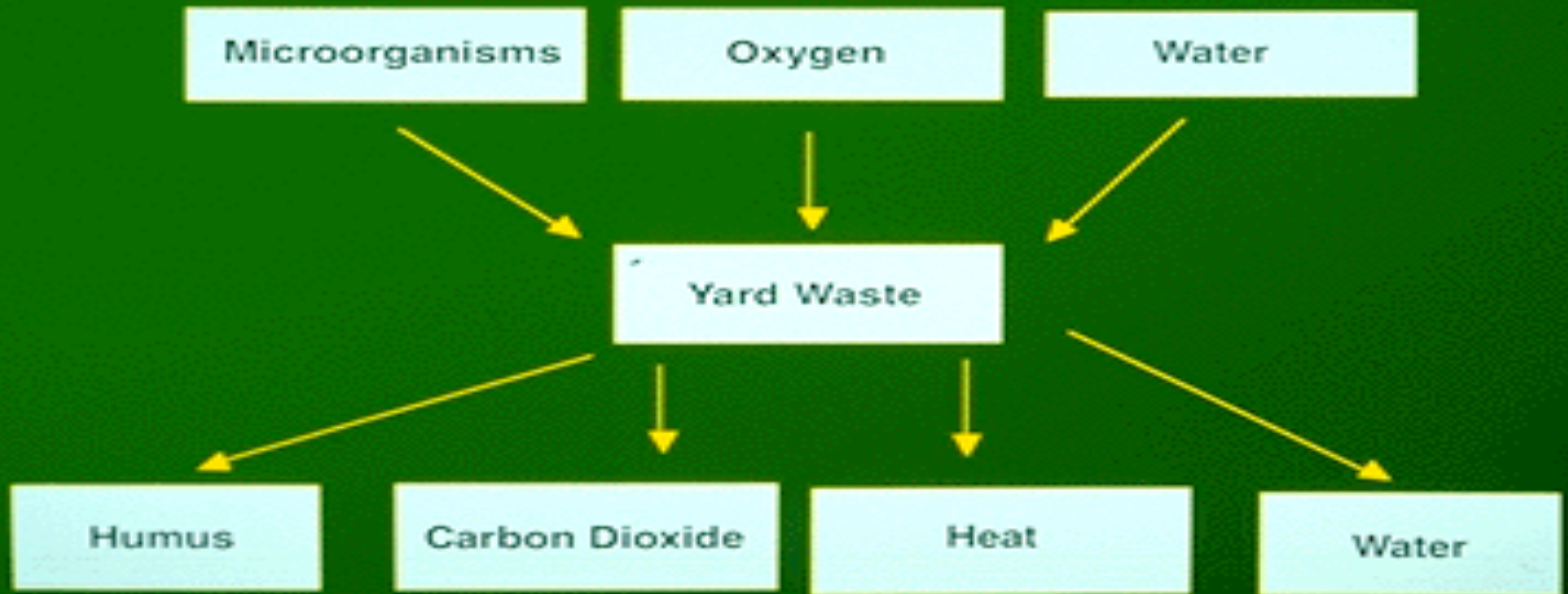


Cornell Waste Management Institute

<http://cwmi.css.cornell.edu>

Jean Bonhotal

THE COMPOSTING PROCESS



The natural process of decomposition occurs without any assistance, however factors can be managed to accelerate the compost process.

Compost Feed Stock

- Livestock Manures
- Leaf and Yard Wastes
- Food Processing Residuals
- Sludge
- Lake Plant Harvest
- Industrial Wastes
- Fish



Carbon Source: Surface area is another key factor to consider.

Materials with High Nitrogen Value

| <u>Material</u> | <u>C:N</u> |
|------------------------|-------------|
| <u>Humus</u> | <u>10:1</u> |
| <u>Food Residuals</u> | <u>15:1</u> |
| <u>Grass Clippings</u> | <u>20:1</u> |
| <u>Cow Manure</u> | <u>20:1</u> |
| <u>Horse Manure</u> | <u>25:1</u> |

The optimum C:N ratio is about 30 to 1. This will make fast, hot compost. Grass, animal manures and fresh green plants are high in nitrogen.



Moisture: The process will slow down with too much or too little water. 40-60%



Microorganisms require oxygen to live.
Their "aerobic" activity forms carbon dioxide and heat.

Temperature Probe





Dan Dindel

Organisms in Compost

Improving Soils with Compost

HEALTHY SOILS =

HEALTHY PLANTS =

HEALTHY FOOD AND FEED = ??

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Composting

- Organic materials blended to provide the nutrients that support microbial
- activity and growth, including a balanced supply of carbon and nitrogen (C:N ratio)
- Sufficient oxygen to support aerobic organisms
- Moisture levels that uphold biological activity without hindering aeration
- Temperatures needed by microorganisms that grow best in a warm environment.

Remember

Garbage input = Garbage Output

Compost Methods

- Static Pile- passively aerated
- Forced Air
- Turned Windrow
- In-Vessel- contained in some way employing mixed technologies
- Rotating Drum

Considerations

- Distance to Closest Neighbors/Houses/
Businesses
- Population Density
- Dust
- Traffic/ Noise
- Wind Direction
- Slope
- Wind Direction
- Ground and Surface Water- potential
flooding?

Onondaga County, Yard Waste



Leaf and Yard Waste



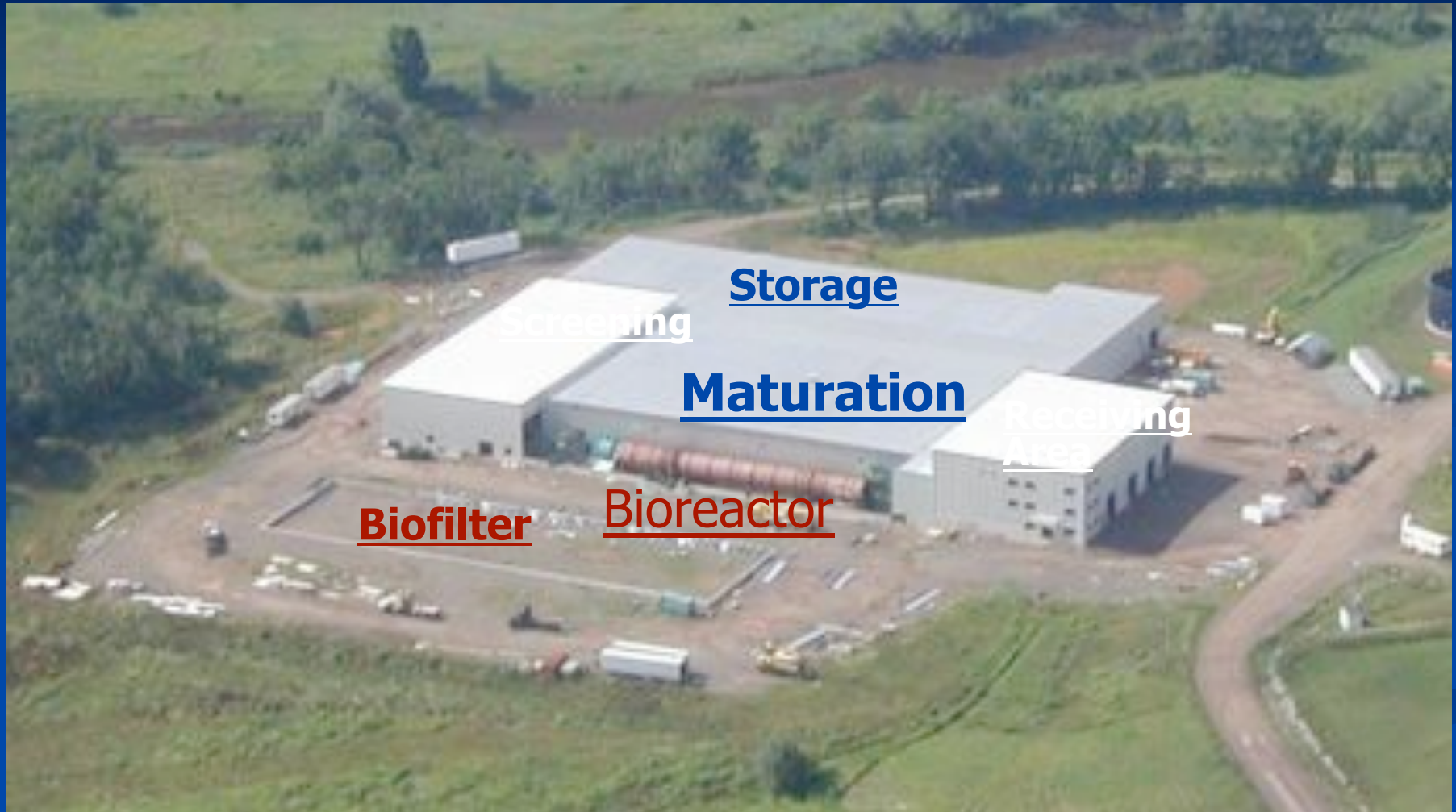
Fish Waste Composting



Rockland County Biosolids



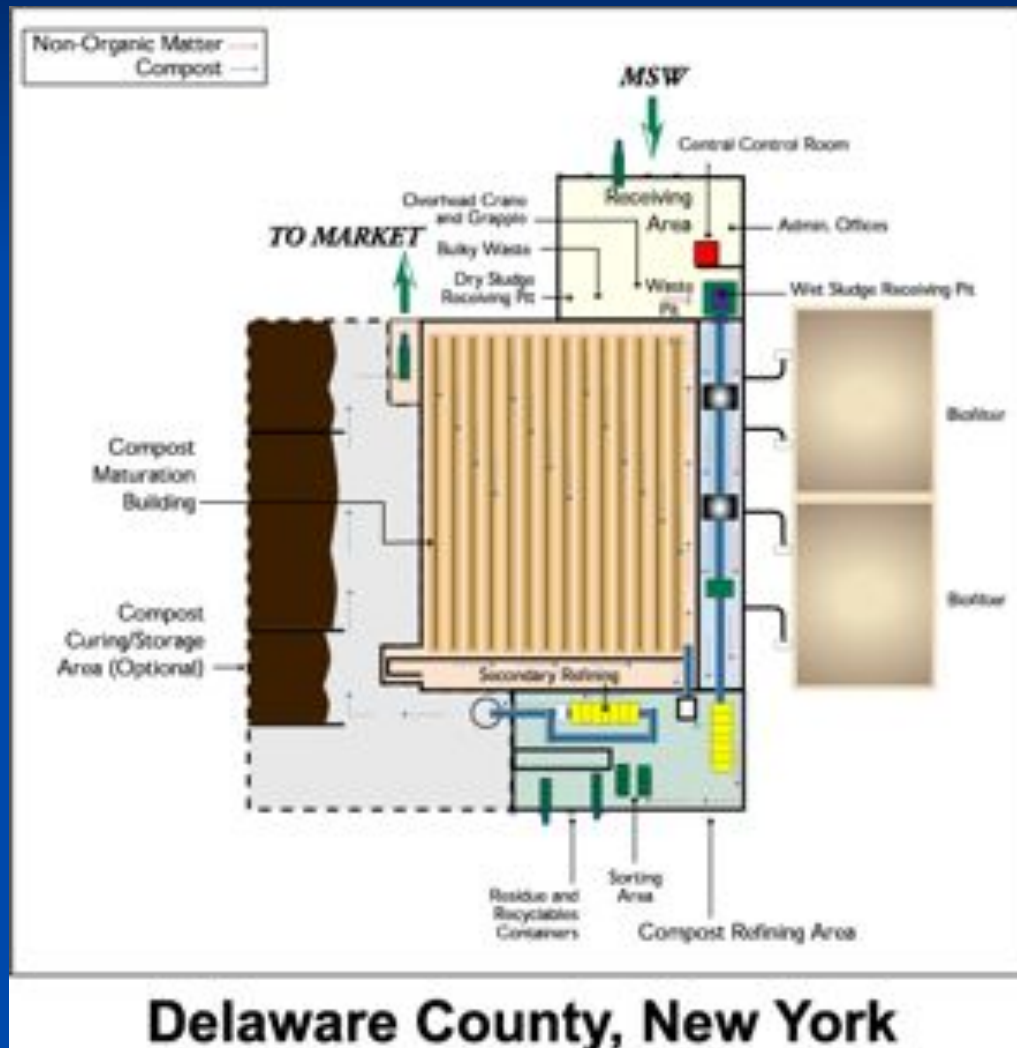
During Construction



Summer 2004

Facility Site Plan

Design by Groupe Conporec, Inc. and S&W Services, Inc.



- Centralized separation of organic wastes.
- Fully enclosed tip floor and process buildings.
- Odor control.
- Aerated indoor product storage.
- Multiple material quality control.
- Process and stormwater controls – No SPDES.

Energy in Ag and Organic Residuals



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Capturing Heat & Gas From Organics

- Digesters- On-farm and Off
- Chip Burners -Producing Energy
- Compost Heat Recovery
- Bio-Diesel



Endless Feedstock That might have Energy Potential

Wood Chips

Used Animal Bedding

Food Processing Waste

Spoiled Feed

Recalled Organics

Bio-Diesel Residual

Digested Solids

Feedstock Continued

Food Prep

Trimming & Spoilage

Produce

Pressings & Pummace

Butcher Waste

Whole Animals

Dairy Processing

Residuals

Sludges

How Do We Determine the Best
Uses for Residuals?

Use Our “Waste” as the
Resource It Is!



4.6 million tons of
garbage has
produced nearly
3 billion kilowatt-
hours of

Waste-to-Energy

In 1987, *waste-to-energy facilities*
accounted for 64 percent of
all dioxin .



Landfills

Digester ?
Methane Recovery

Digester, Liquid Storage Tanks



Digester



Parallel Digesters



Solids---
What Now?

- Manure Solids or DMS
- Supply Crop Nutrients
- Further Stabilize



Billions of Tons of Carbon





Composting Bedded Pack



Research on
Air Flow ,
Moisture &
Gas Generation

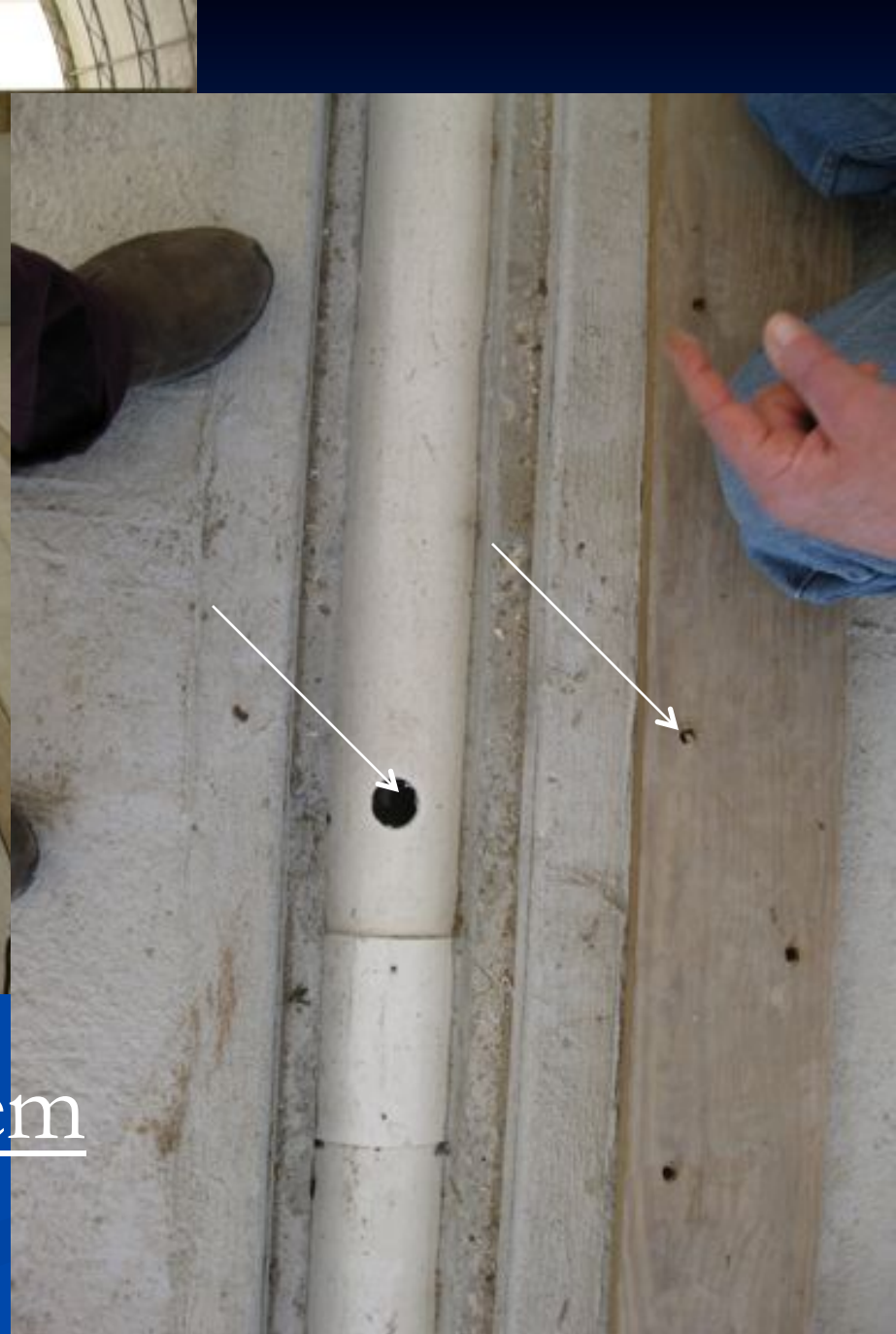
Compost Heat



- Temperature 104-170 degrees F

Heat Transfer





Simple Aeration System

Sunset View Acres

Adding Manure Bank



Diamond Hill Custom Heifers
4-5 million BTU/day



Fan- Only Moving Part in System





Isobars- Allow for heat Exchange Filled with Freon



Stainless Steel Tubes within
an Insulated Pipe

Spreading Compost Product



System Yield

- Compost Product for Sale or Use
- 1,464,000,000 Btu/4 months of winter
- 366,000,000 Btu/2 months of fall/spring

How is Energy Used

- Hot water for Cleaning
- Run Through Pipes to heat Floors
- Converted to Electricity
- Heat Greenhouses

Waste Products

Delmonte

Breyers

Stonyfield

Waste onions

Tabacco Trimmings

Manure

Pummace

Pressings

Sludges

Yard Waste, Woodchips

Cotton, Wool

Waste Exchange

One Entities Trash is Another Entites Resource

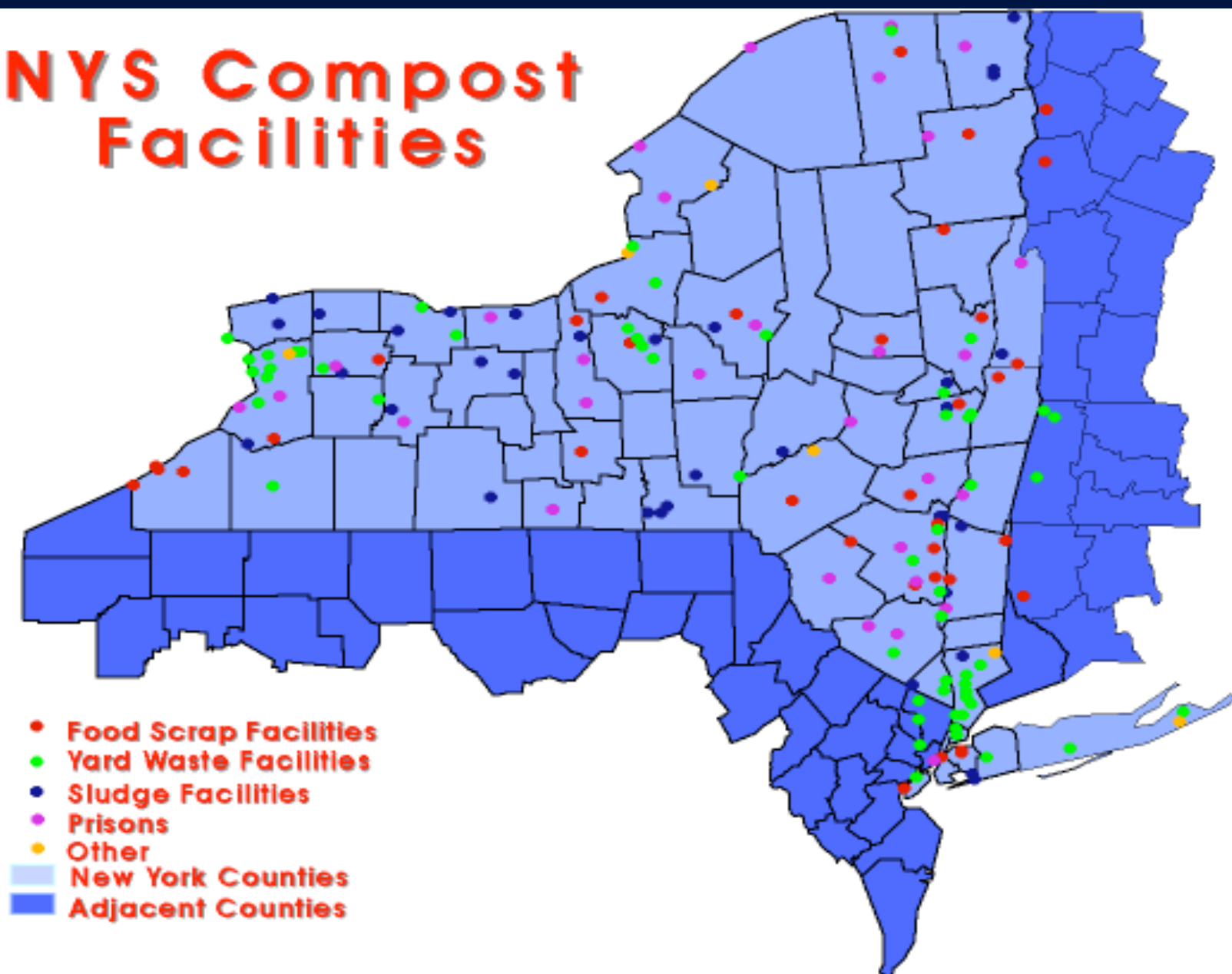
Craig' s List

Amazon

E-Bay

Market Maker

NYS Compost Facilities



Circular Pod-Shaped Tea House is Heated by Compost



Diane Pham, 02/11/10

This heated air is
in turn emitted
through a central
vent that releases
into the
structure's
interior.





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