GPEC 2009 Conference, Orlando, February 27, 2009
"Plastics: The Wonderful World of Sustainability and Recycling"

Sustainable Communities Need Sustainable Biomaterials

Brenda Platt
Institute for Local Self-Reliance
Sustainable Biomaterials Collaborative
www.ilsr.org

Outline

- What's wrong with fossil-fuel-based plastics?
- Are biomaterials sustainable?
- Sustainable Biomaterials Collaborative and sustainability framework
- Purchasing specifications for sustainable biomaterials
- Survey of biobased food service ware
- Working Landscape Certificates

What's wrong with fossil-fuel-based plastics?

Fossil-Fuel-Plastic Woes

- Non-renewable (geological timeframes to produce but consume in 1 to 10 years)
- Health impacts (polymers differ)
- Generally nonbiodegradable with devastating affects on ocean life
- Demand and production skyrocketing
- Plastics industry supports more drilling
- Recycling and reuse low
- Plastics industry supports incineration

Petro-Plastics & Health

Polymer	Common Applications	Health Issues
Polycarbonate (PC)	baby bottles, sports water bottles	can leach out bisphenol A, a hormone disruptor
Polystyrene (PS)	foam insulation, packaging peanuts, plastic utensils, meat trays, egg cartons, take-out containers, single-use disposable cups	uses benzene, styrene and 1,3-butadiene. Styrene is a neurotoxin and is known to be toxic to the reproductive system. PS releases toxic chemicals when burned.
Polyvinyl Chloride (PVC or vinyl)	building pipes, siding, membrane roofing, flooring, and window frame; shower curtains, beach balls, credit cards, cooking oil bottles	made from the vinyl chloride monomer; high chlorine and additive content. Toxic additives such as phthalate softeners leach out. PVC releases dioxin and other persistent organic pollutants.

24 January 2006

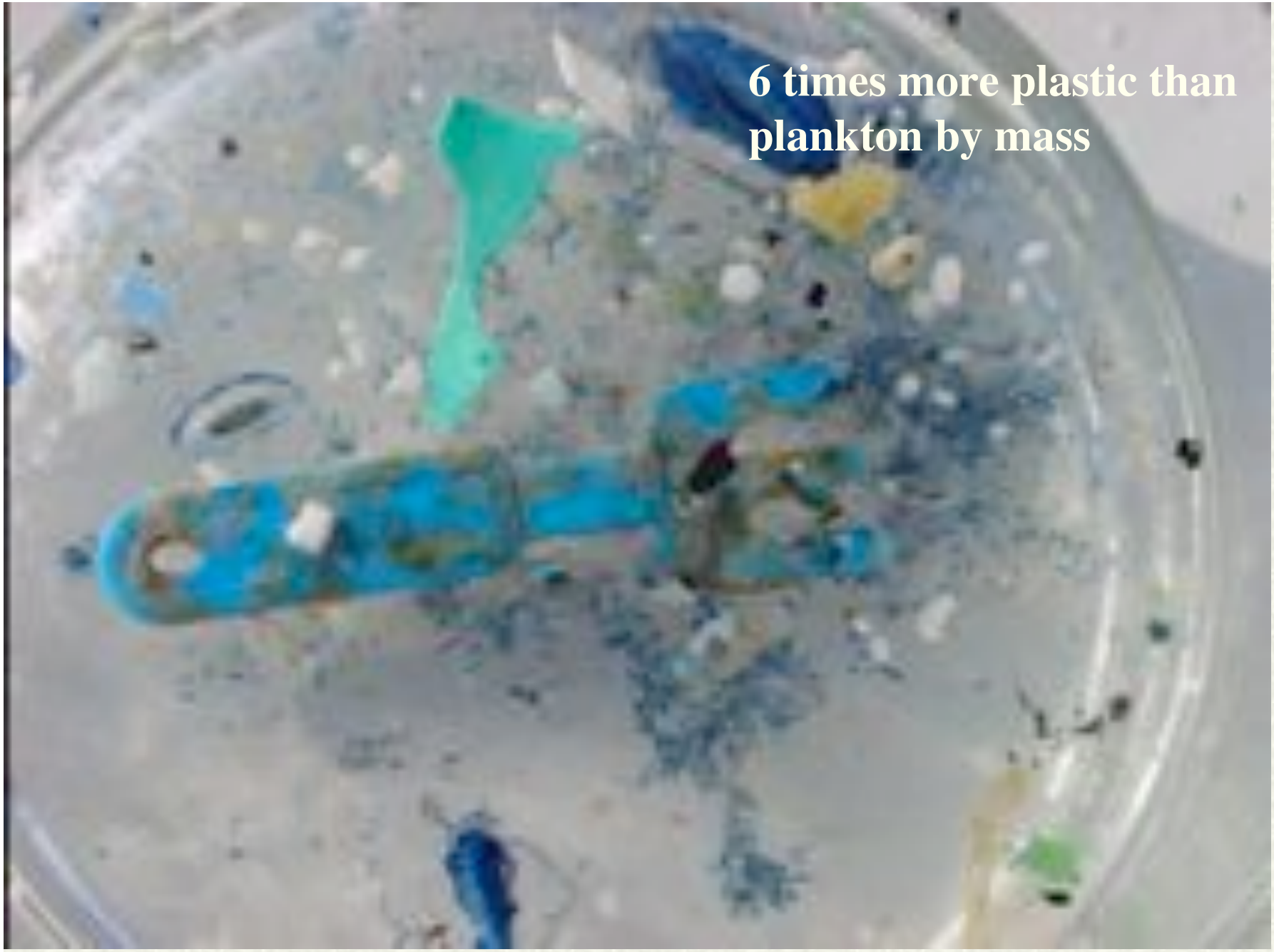
Bottled Waters Contaminated with Antimony from PET

Prof. William Shotyk and co-workers at the Institute of Environmental Geochemistry, University of Heidelberg, measured the abundance of antimony in fifteen brands of bottled water from Canada and forty-eight from across Europe

Bottled waters in PET containers are contaminated with antimony (Sb), a potentially toxic heavy metal with no known physiological function. Antimony trioxide is used as a catalyst in the manufacture of PET (polyethylene terephthalate), and PET typically contains several hundred mg/kg of Sb. For comparison, most of the rocks and soils at the surface of the earth contain less than 1 mg/kg Sb.

Prof. William Shotyk and co-workers at the Institute of Environmental Geochemistry, University of Heidelberg, measured the abundance of Sb in fifteen brands of bottled water from Canada and forty-eight from across Europe. His team also measured Sb in a pristine groundwater from a rural region of Canada, three brands of deionized water in PET bottles, as well as a new brand of water from Canada bottled commercially in polypropylene. Measuring Sb in pristine waters is quite a challenge because of the very low natural abundance of this element. This was not a problem for Dr. Michael Krachler, a leading expert for the analysis of Sb in environmental samples. Dr. Krachler used the unique clean laboratory facilities available at the University of Heidelberg which had earlier allowed him to measure Sb in polar snow and ice from the Canadian arctic.

The pristine groundwater was found to contain only two parts per trillion of Sb, with the bottled waters typically showing values a few hundred times greater. The water in polypropylene was



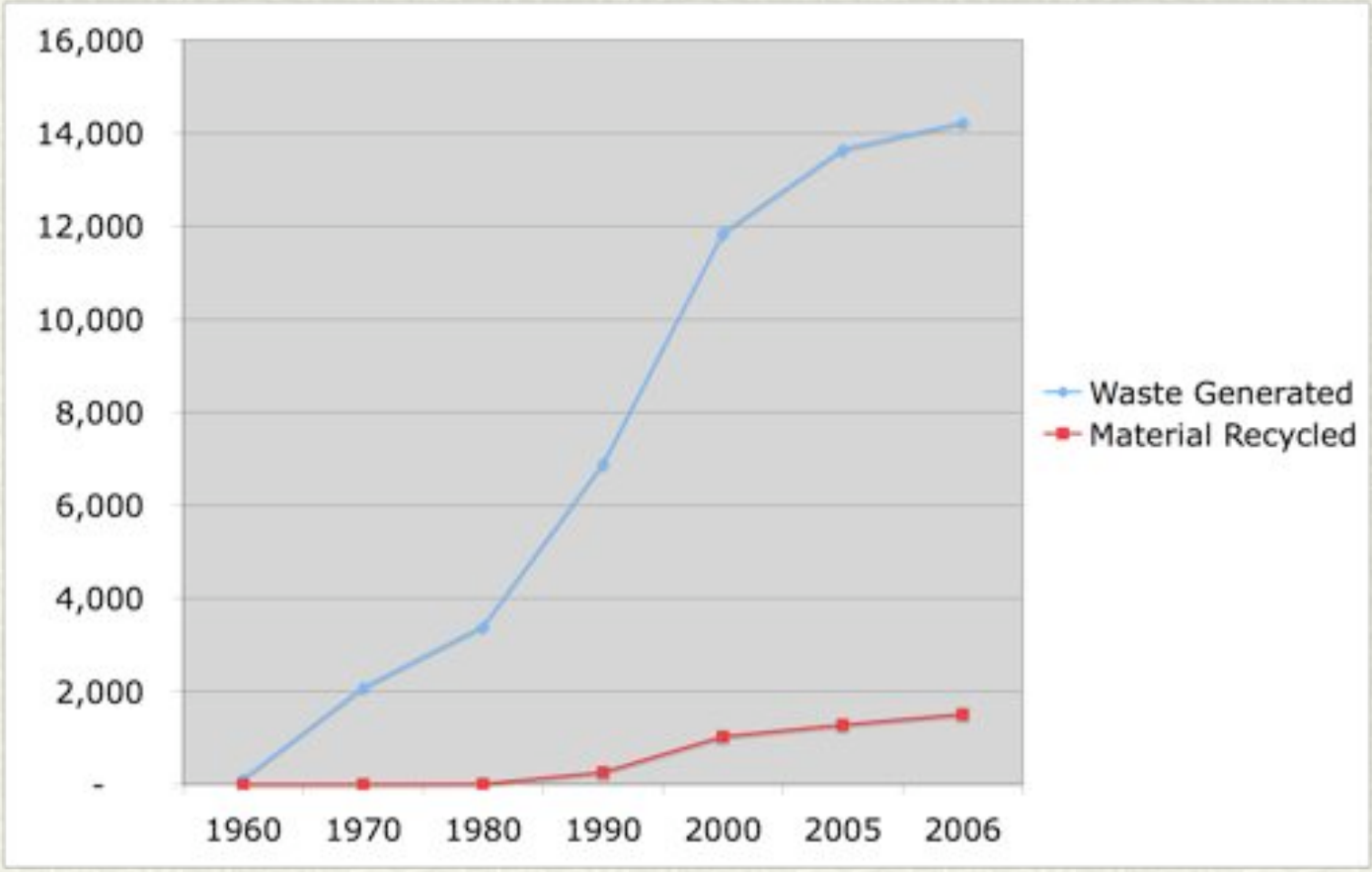
Source: Captain Charles Moore, Agalita Marine Research Foundation

Source: Captain Charles Moore, Agalita Marine Research Foundation


WHAT YOU CAN DO
The average AMERICAN throws away 29,700 pounds of plastic packaging each

Plastic Packaging Discarded

Thousands of tons



Source: US EPA, 2006 data (http://www.epa.gov/epaoswer/non-hw/muncpl/msw99.htm)

Benefits of Bioplastics

- Can replace many harmful conventional plastics
- Can be fully biodegradable (capable of being utilized by living matter)
- Can be made from a variety of renewable resources
- Can be composted locally into a soil amendment
- Can help capture food discards and thus reduce methane from landfills
- Can contribute to healthier rural economies
- Can complement zero waste goals

Biomaterial – wonder material?

- “renewable”
- “green”
- “eco-friendly”
- “sustainable”
- “environmentally neutral”
- “safe and better”
- “easy on the environment”
- “return to nature without a trace”

Not all bioproducts created equal

- Biobased content
- Material feedstock type
- Feedstock location
- Biodegradability
  - Commercial compost sites
  - Home composting
  - Marine environment
  - Anaerobic digestion
- Additives and blends
- Recyclability
- Performance
- Products

Challenges with Bioplastics

- Concern over genetically modified organisms (GMOs)
- Desire for sustainably grown biomass
- Need to develop composting programs
- Concern with nanocomposites and fossil-fuel-plastic blends
- Lack of adequate labeling
- Concern over contamination of recycling systems

What We Put Into Corn…

- Average of over 120 lbs. nitrogen fertilizer per acre
- Among the highest levels of herbicide and pesticide use for conventional crops
- Irrigation water
- Proprietary hybrids

Institute for Agriculture and Trade Policy

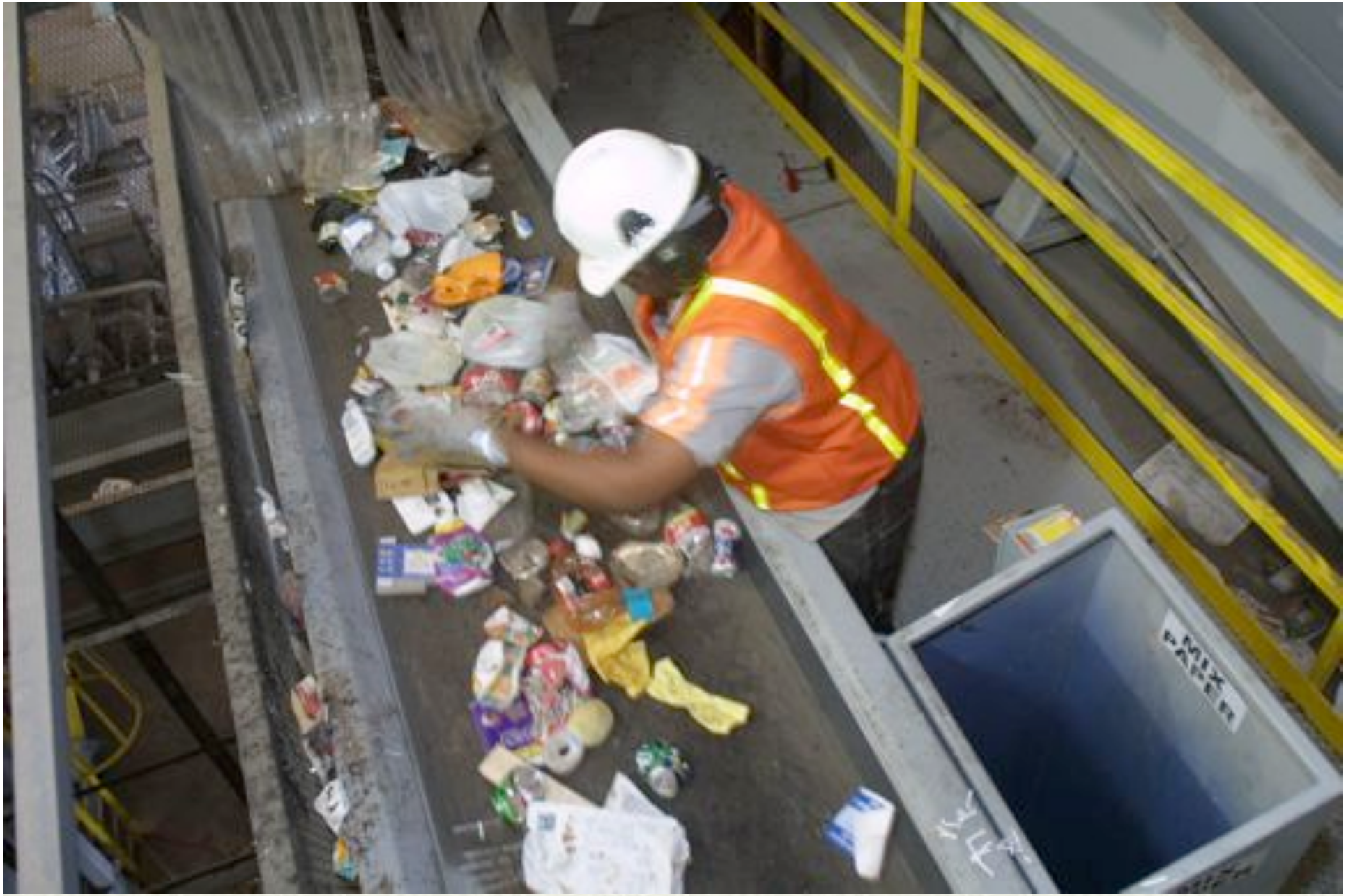
What Else is Produced

- Soil erosion and nutrient run-off and leaching
- Water, air, soil, health and biodiversity impacts of chemical use
- Pressure on alternate land uses
- Reduced rural economic benefit from agricultural production

Tiny #7 & PLA

Photo courtesy of Sunset Scavenger, San Francisco

Noble Juice Bottle


MIX

Where's Waldo?

Identifying and Sorting Bio-Bottles

Courtesy of Eureka Recycling, Minneapolis, MN (www.eurekarecycling.org)

EUREKA! RECYCLING

Tricky?

At 120 feet per minute on a 30" wide conveyor line – It sure is!

Courtesy of Eureka Recycling, Minneapolis, MN (www.eurekarecycling.org)

Path from field to producer

"The source product is from Brazil,
then turned into cornstarch in China,
then the starch is used in
our manufacturer's facility."

"Feedstocks grown in Midwestern US.
Manufacture the resin
in Hawthorne, CA today,
but plan to manufacture
in Seymour, IN shortly."

Sustainable Biomaterials Collaborative

The Sustainable Biomaterials Collaborative is a network of organizations working together to spur the introduction and use of biomaterials that are sustainable from cradle to cradle. The Collaborative is creating sustainability guidelines, engaging markets, and promoting policy initiatives.

As You Sow
Center for Health, Environment and Justice
Clean Production Action *
Environmental Health Fund *
Green Harvest Technologies
Health Care Without Harm
Healthy Building Network
Institute for Agriculture and Trade Policy *
Institute for Local Self-Reliance*
Lowell Center for Sustainable Production *
Sustainable Research Group
Pure Strategies
RecycleWorld Consulting
Science & Environmental Health Network
Seventh Generation
National Campaign for Sustainable Ag.

* Steering committee

SBC
SUSTAINABLE BIOMATERIALS COLLABORATIVE

The Framework for Sustainable Biomaterials

- Sustainably grown feedstocks
- No hazardous inputs and impacts during production
- Healthy and safe during use
- Recyclable or compostable and actually recycled and composted

SBC
SUSTAINABLE BIOMATERIALS COLLABORATIVE

Blends: Steps to Best Practices

Avoid	Plastics w/POPs in life cycle or manufactured w/high hazard chems (PVC, PS, ABS, PC, PU)
OK	Blend with more preferable plastics (e.g., PE, PP, PET)
Improving	Compostable
Better	Blend only bioplastics
Best	**Pure bioplastic** **Fully compostable & recyclable**

Choosing Environmentally Preferable Food Service Ware

Reusable and Sustainable Biobased Products

Health Care Without Harm

HCWH Food Service Ware Materials: Environmentally Preferable Purchasing Hierarchy	
Preference Hierarchy	**Criteria**
Most Preferred	Reusable
More Preferred	Biobased products - **Beyond Baseline**
Preferred	Biobased products - **Baseline Sustainability Criteria**
Less Preferred	Biobased products (do not meet sustainability criteria)
Least Preferred	Fossil fuel & disposable

Baseline Sustainability Criteria for "Preferred" Biobased Products

Feedstock Production Criteria
1. Maximize use of organic carbon content derived from biobased materials (food ware min. 95% biobased carbon content)
2. Use GMO-free feedstock (certified GMO-free) OR sustainable agriculture offset program that includes GMO offset program.
3. For wood-based feedstocks, product must maximize post-consumer recycled content and, when using virgin fiber, must meet be FSC certified

Baseline Sustainability Criteria for "Preferred" Biobased Products

Manufacturing & Use Criteria
4. No chlorine or chlorine compounds in production processes
5. No highly hazardous additives (eg., PBTs, carcinogens)
6. No untested engineered nanomaterials
7. No organohalogens intentionally added to the product
8. Avoid unhealthy exposure: a. Limit VOC emissions to meet strictest applicable STDs b. Use no materials that emit highly hazardous organic compounds into the environment

Baseline Sustainability Criteria for "Preferred" Biobased Products

End of Life Criteria
9. Product must be: a. certified as compostable by an acceptable certification organization or program, OR b. recyclable (where claims of recyclability must be qualified)

Beyond Baseline

Feedstock Production & Manufacturing Criteria
1. Maximize use of organic carbon content derived from biobased materials
2. (a) Must be GMO-free and (b) agricultural feedstocks must be sustainably grown; (c) wood-based feedstocks must meet higher post-consumer recycled content
3. Must protect worker health and safety in feedstock production and manufacturing

Beyond Baseline

End of Life
4. Marine biodegradable
Other Life Cycle Criteria (must meet one)
5. (a) Feedstocks should be grown regionally
5. (b) Final product should be produced regionally
5. (c) All chemical inputs must be comprehensively tested for the hazards they post to human health and the environment
5. (d) Clearly labeled as compostable when composting infrastructure exists.

Food Service Ware Survey

- Hot cups
- Cutlery
- Plates
- Salad containers
- Plates
- Trays
- Hot food containers
- Clamshells
- Straws
- Flower pots
- Sheets
- Bags
- Take-out containers
- Deli-ware
- Pie/muffin pans
- Trays

Survey Data: feedstock types and sources

- China
  - Bulrush
  - Bagasse
  - PSM (Plastarch Material)
  - Corn
  - Chinese PLA
  - PHBV*
  - PBS**
  - Cornstarch
- India
  - Fallen palm leaves
- Thailand/Vietnam
  - Tapioca starch
  - Grass fiber
  - Bagasse
- Malaysia
  - Palm fiber
- USA
  - NatureWorks PLA
  - "Natural total chlorine-free pulp"
  - Recycled wood fiber

*polyhydroxybutyrate-polyhydroxyvalerate

**polybutylene succinate (petrochemical + succinic acid)

Observations: End-of-Life

- Conformance with compostability STDs is common
- Referenced STDs are not limited to ASTM D6400
- Need to verify that product is fully meeting requirements of STD
- Certification of compliance is commonplace
- Need to verify that it is the final product that is in compliance (not the resin)
- Ability to backyard compost is not commonplace, partly due to lack of recognized STD
- Ability to biodegrade in marine environment is not commonplace, partly due to lack of recognized STD

Color-coded compostable design for 400k at SF Festival

Courtesy of City of San Francisco

Institute for Agriculture and Trade Policy

Where global and local meet sustainability

green harvest TECHNOLOGIES

Working Landscape Certificates

GAIA HERBS

WORKING LANDSCAPES CERTIFICATE

www.workinglandscapes.org

Support existing family farmers economically to transition to sustainable farming practices

- Farmers receive a higher and more stable price for sustainable crop production
- Expanded production of sustainable feedstocks
- Do not require “identity-preserve” infrastructure and additional transaction costs

Institute for Agriculture and Trade Policy

WLC Corn Production Criteria

- No GMO varieties
- No continuous cropping
- Soil testing and fertilization according to state criteria and test results
- No use of known human or animal carcinogenic chemicals
- Use of cover crops or at least 70% of residues left on entire field
- Creation of whole farm plan that includes biodiversity and energy aspects

WLC available to companies

Joe , WLC Farmer

- A pound for pound answer to food vs. materials
- Assisting businesses to transition to truly green materials and products
- Enable bioplastic customers to support more sustainable crop production

greenharvest TECHNOLOGIES

Contact: david.levine@greenharvesttechnologies.com

A Sustainable Bioeconomy

- Provides the food, fuel, fiber and materials we need
- Protects and enhances the environment
- Benefits family farms, rural communities and society
- Is fair and responsive

Institute for Agriculture and Trade Policy