

The Art of Composting: Many Benefits Available Products Quality and Safety

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Russ Lanoie

Thursday, May 23

Tin Mountain Conservation Center

Many benefits of *composting*:

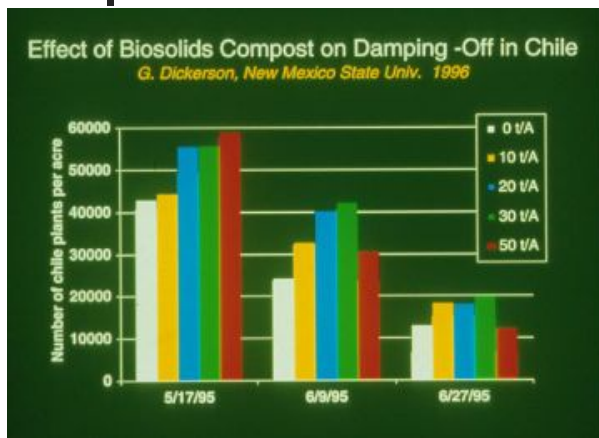
- Stable product from “wastes” = diverse uses
- Using nutrients & organic matter
- Reduces disposal; saves landfill space
- Usually cheaper than landfilling (in Northeast)
- Creates local jobs



Floor
aerated
windrow

Images this & other slides
courtesy WSU: [http://organic.tfrec.wsu.edu/compost/
ImagesWeb/CompImages.html](http://organic.tfrec.wsu.edu/compost/ImagesWeb/CompImages.html)

Benefits of *using compost*:



- Suppress plant diseases and pests.
- Reduce the need for chemical fertilizers.
- Promote higher yields of agricultural crops.
- Facilitate reforestation, wetlands restoration, and habitat revitalization efforts by amending contaminated, compacted, and marginal soils.



More benefits of *using* compost...

- Cost-effectively remediate soils contaminated by hazardous waste.
- Remove solids, oil, grease, and heavy metals from stormwater runoff.
- Capture and destroy 99.6 percent of industrial volatile organic chemicals (VOCs) in contaminated air (biofiltration of air).
- Provide cost savings of at least 50 percent over conventional soil, water, and air pollution remediation technologies, where applicable.

Text on this and prior slide from: <http://www.epa.gov/waste/conserve/rrr/composting/basic.htm>



Billerica, MA biosolids compost applied on a golf green.



Merrimack, NH biosolids compost helps keep this central MA golf course green.



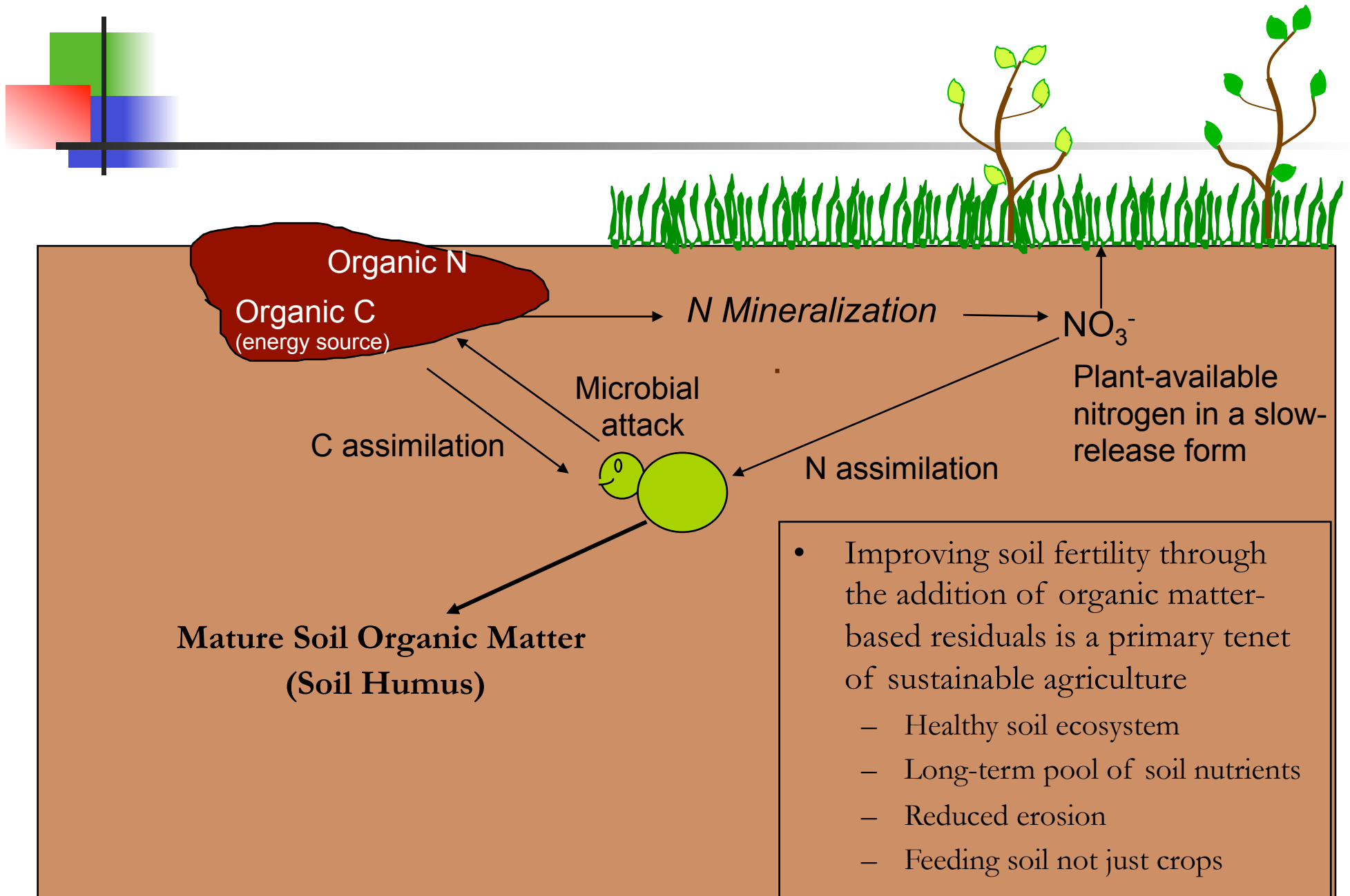
Compost for wildflowers along a NH interstate.

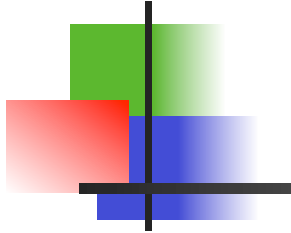


And more benefits of *using* compost...

- Improved crop nutritional value (micronutrients)
- Reduced use of pesticides / fungicides (due to improved biological richness in soil & healthier plants)
- It's a sponge! Improved water holding capacity of soil, reducing irrigation needs (30% compost in soil = an additional 1.9 gallons/cubic foot)
- Slow release of nutrients = less nutrient pollution of ground & surface waters

Organic matter transformations in soil.





Maine's
Colby
College uses
biosolids
compost on
sports turf,
improving
safety for
players.



The Great Lawn in New York's
Central Park is growing on
Merrimack, NH biosolids compost.



More & more & more benefits...

- “In general, N-rich, well-matured composts were good media for sod growth” (Barker, Univ. of MA, 2001).
- “The severity of leaf rust caused by *Puccinia sp.* was significantly less on perennial ryegrass seeded on compost-amended soils” (Loschinkol & Boehm, Ohio State, 2001)
- Re greenhouse gas emissions: “intensive management systems that result in increased soil organic matter are a significant part of the solution” (Wright et al., OK State, 2001).





greenhouse gas
Other[^] benefits of *using* compost

- Replacing chemical fertilizers
 - ~ 4 kg CO₂ / kg N (Recycled Organics Unit, 2006)
 - ~ 2 kg CO₂ / kg P (Recycled Organics Unit, 2006)
- Improved soil tilth / workability = less fuel for working soil
- Replacing peat (mining peat releases copious fossil C to the atmosphere! Bad!)



More C in soil = less CO₂ in atmosphere

- “Soils can contain as much as or more carbon than living vegetation. For example, 97 percent of the 335 billion tons (304 billion metric tonnes) of carbon stored in grassland ecosystems is held in the soil” (Amthor et al, Oak Ridge National Lab, 1998, as quoted at <http://www.sustainablesites.org>).
- “Some cultivated soils have lost one-half to two-thirds of the original SOC* poolThe soil C sequestration is a truly win–win strategy. It restores degraded soils, enhances biomass production, purifies surface and ground waters, and reduces the rate of enrichment of atmospheric CO₂ by offsetting emissions due to fossil fuel” (R. Lal, Ohio State, 2004).

*soil organic carbon

Compost has that “C” for soils...

- Food waste
- Yard trimmings
- Manures / biosolids

Compost them! Return them to soils!



Univ. of WA Study

- 2008 look at value of composts
- Compost amended vs. control
 - 2-3 complete sets of samples per site per treatment
 - Composite of 4+ cores for chemical analysis
 - Water infiltration - 2 runs per sample site
 - Bulk density, intact core

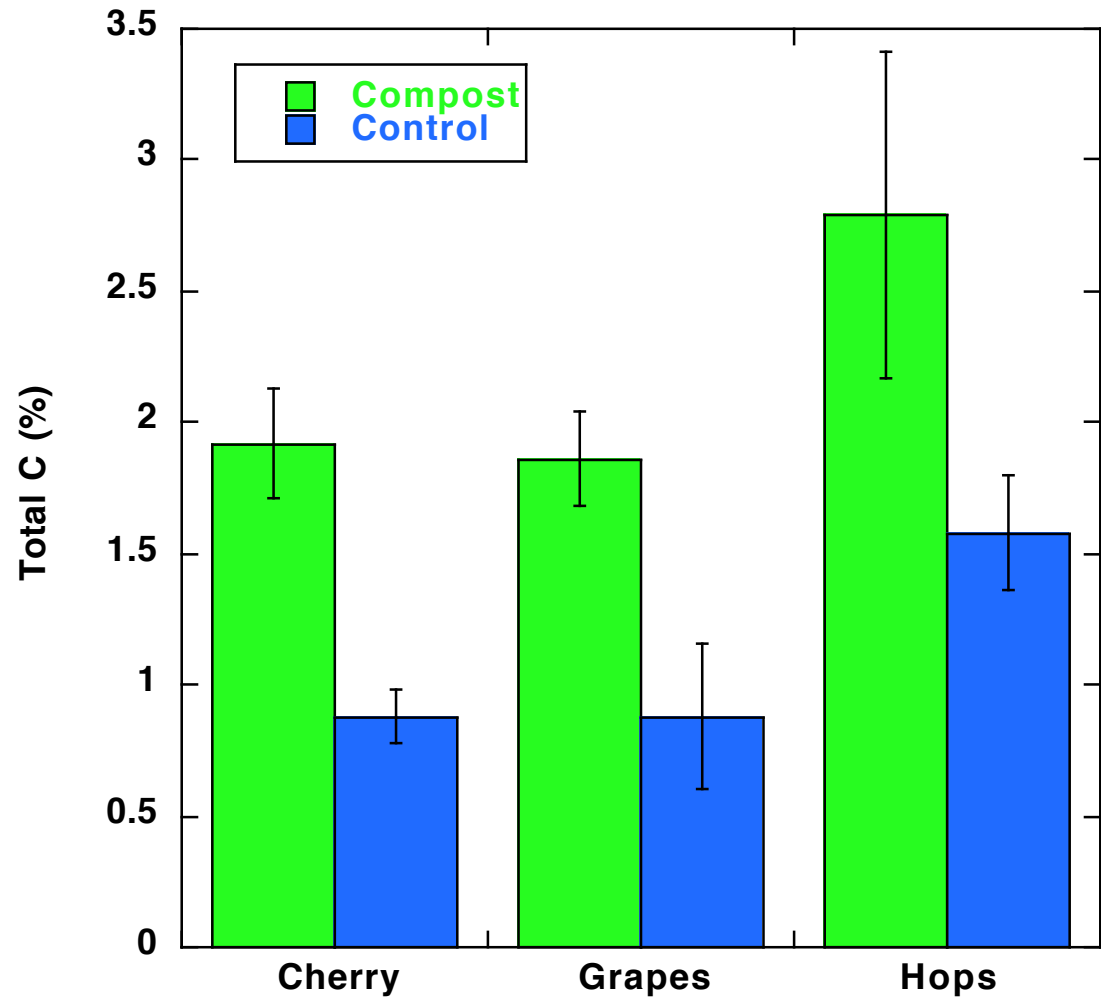
*Slide courtesy of
Sally Brown, PhD
Univ. of WA*



WA compost - cherries, hops, grapes



*Slide courtesy of
Sally Brown, PhD
Univ. of WA*



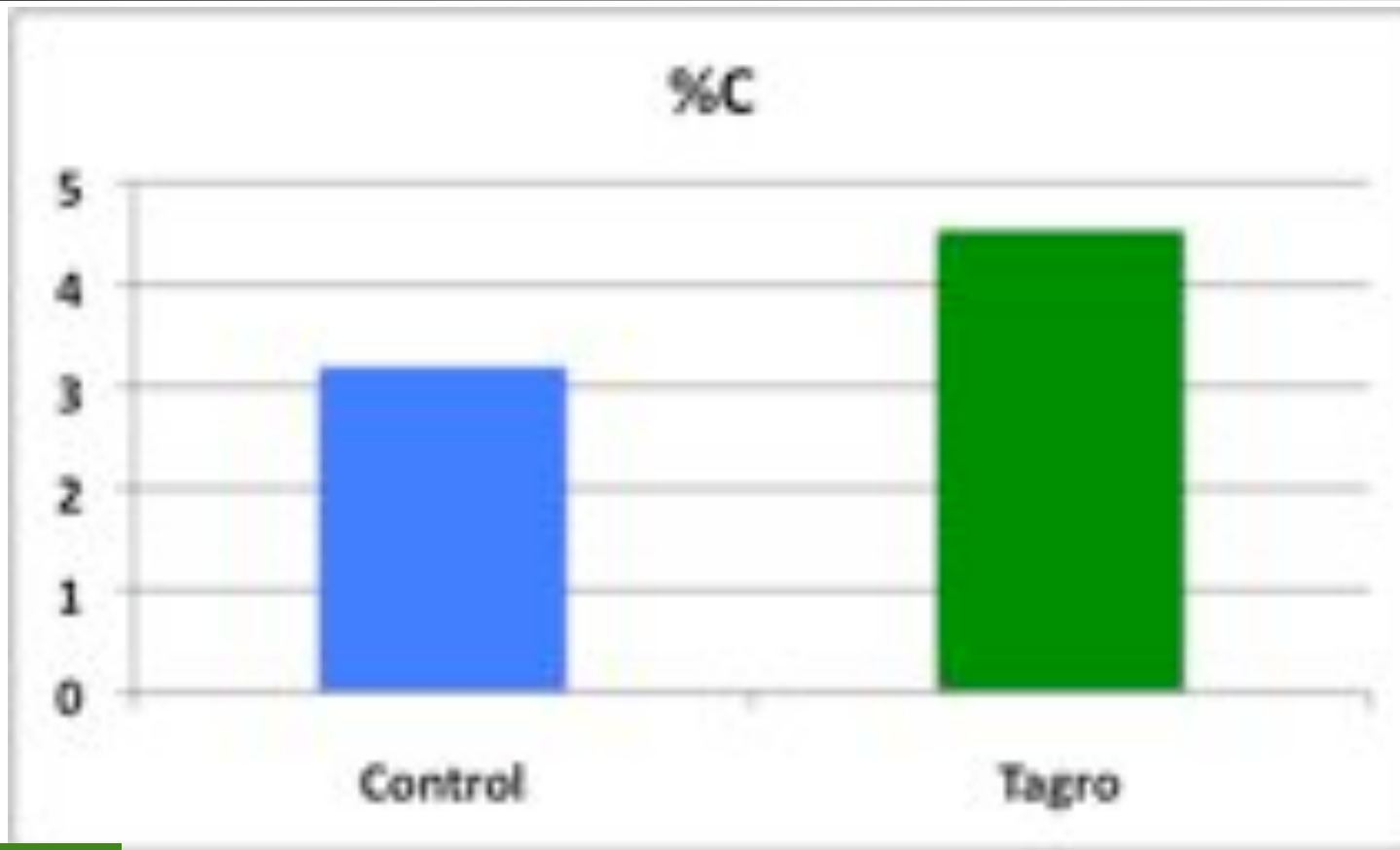
Urban agriculture

- Community garden plots
- Tacoma WA
- Biosolids/
woody debris
soil product

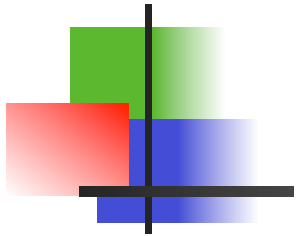


*Slide courtesy of
Sally Brown, PhD
Univ. of WA*

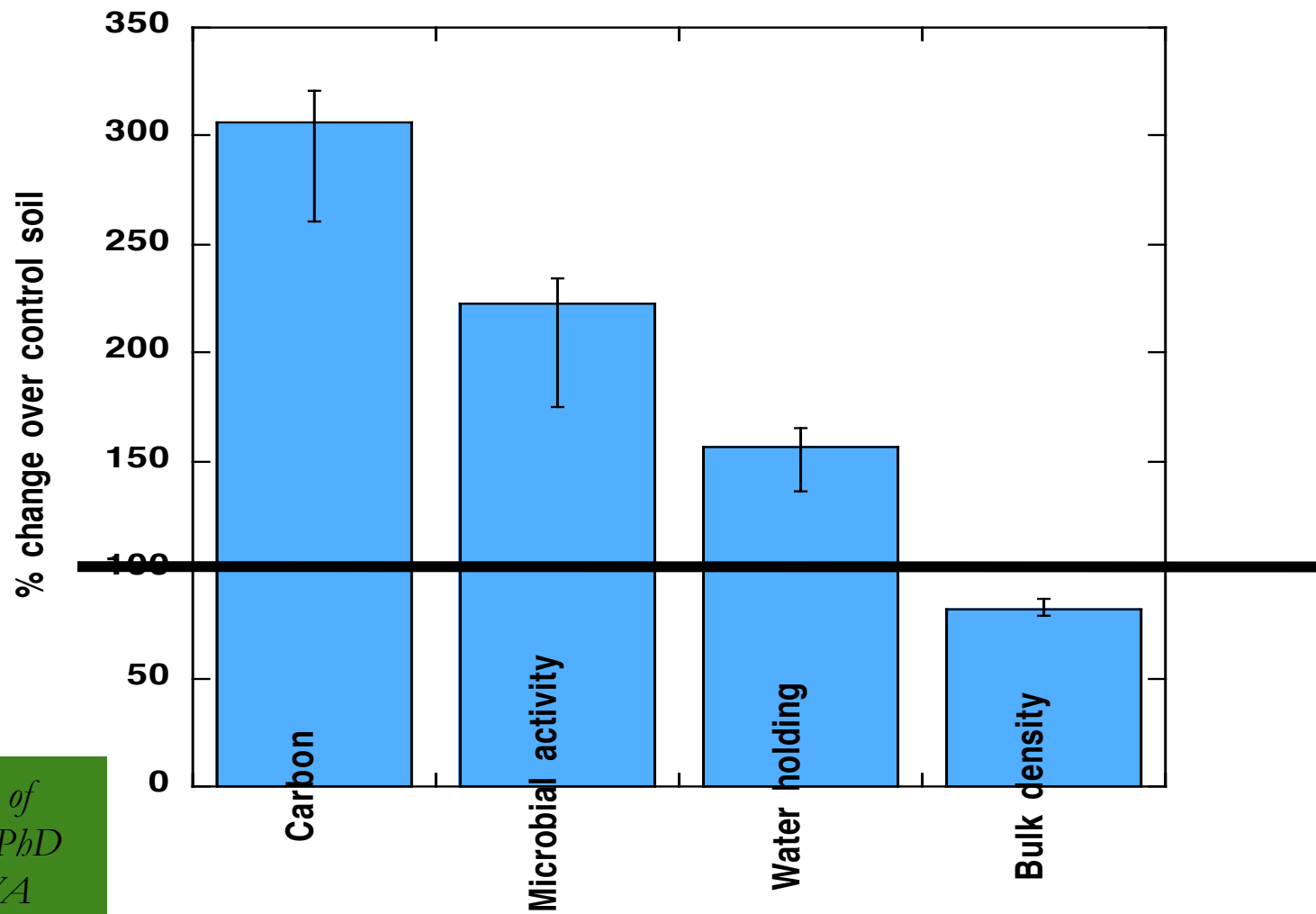
After 10 years of gardening



*Slide courtesy of
Sally Brown, PhD
Univ. of WA*



Univ. of WA study: across all sites



*Slide courtesy of
Sally Brown, PhD
Univ. of WA*

This is what adding organic matter does:
Betty Site, PA: control plot



This is what adding organic matter does:
Betty Site, PA:
biosolids added once, 18 years ago....

Soil is dark
and rich for
about 6
inches. The
grass cover
remains
dense, and
root growth
is vigorous.



Using compost: Liberty Park, NJ...



before



after

photos courtesy of Eliot Epstein, Ph.D., and Orgro

Using compost: White House lawn...



before



after

photos courtesy of Eliot Epstein, Ph.D., and Orgro



My garden: biosolids compost



April 2012



May 2, 2013


**Governor's
house,
Augusta, ME**



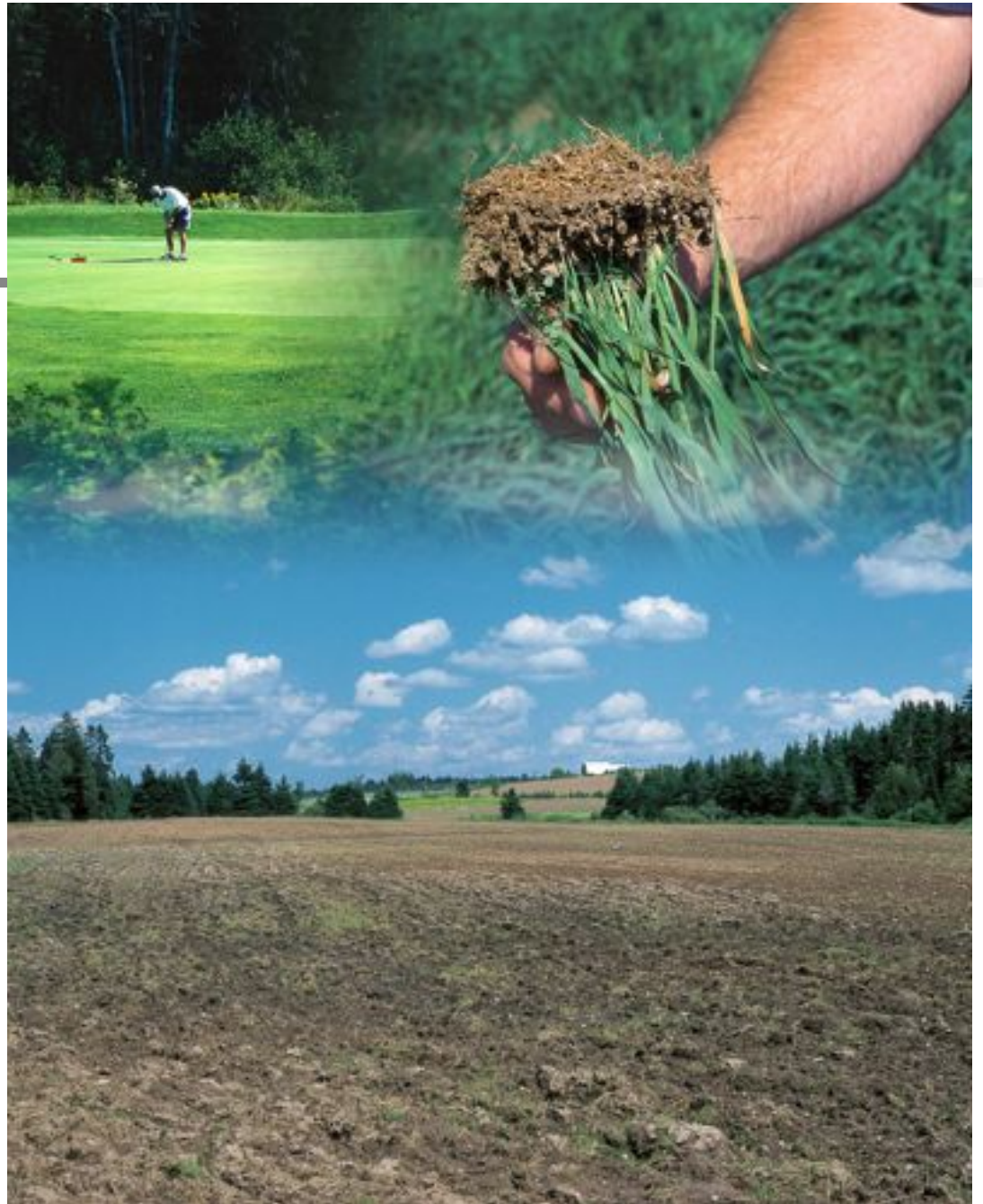
After:

The green strip of lawn, where the heavier dose of **biosolids compost** was applied, stands out 3 weeks later.





Moncton
biosolids
compost used
for golf course
establishment



...for landscaping...



Billerica WWTf used biosolids compost.



The Great Lawn in New York's Central Park is growing on Merrimack, NH biosolids compost.



A central MA home lawn and garden.

Using biosolids compost for stream-side stabilization



Spectacle Island, Boston Harbor Islands National Park



Before
reshaping
and compost
application



After





Available Compost Products

- Leaf compost
- Commercial bagged
 - Can include all of above, plus seafood and other commercial wastes
- Biosolids composts
- Mixed yard, leaf, crop, food waste
 - White Gates Farm
 - You can do it at home!

Organic* matter is organic matter...

- Food waste
- Animal manures
- Wastewater solids
- Grass, green crop waste
- Leaves, stalks

Composting requires proper C:N ratio



more putrescible
lower C:N ratio

less putrescible
higher C : N ratio

* containing carbon (C)





Leaf compost

- Produced locally by Russ Lanoie
- Don't throw away leaves; they make nice compost.
- Russ will gladly accept more:
986-8809

Commercial bagged products

Example: Coast of Maine

Feedstocks are residuals from:

- blueberry production
- salmon aquaculture
- lobster & mussel processing
- kelp
- hen manure
- sphagnum peat
- wood products waste, aspen bark, etc.



Organic.

Coast of Maine

Soils & composts • Mulches • Fertilizers • Master Nursery

The Coast of Maine Story

There is a long composting tradition in Maine and Maritime Canada, especially among the region's salmon, wild blueberry and shellfish processors. In the late 1980's the State formed the Maine Compost Team - a group of specialists from the State Departments of Agriculture and Environmental Protection and the University of Maine Cooperative Extension Service - to help many of these processors set up successful composting programs.

Coast of Maine Organic Products was founded in early 1996 together with Great Eastern Mussel Farms (an early convert to composting) to better coordinate these efforts by investing in quality, capacity and the development of new markets for these truly exceptional composts.

By late 1996, we had taken over the management of a salmon composting facility in Marion Township, Maine owned by Washington County. The Marion site is located in easternmost Downeast, Maine, about 20 miles from the border town of Calais and a good four-hour drive to the north and east of Portland. The site is convenient to the region's salmon aquaculture farms, wild blueberry barrens and vast softwood forests that together yield the ingredients needed for

Look for our products at your favorite garden center

Where to find us

About us

Blog

Compost cam

In the news

bi♻️s♻️lids compost



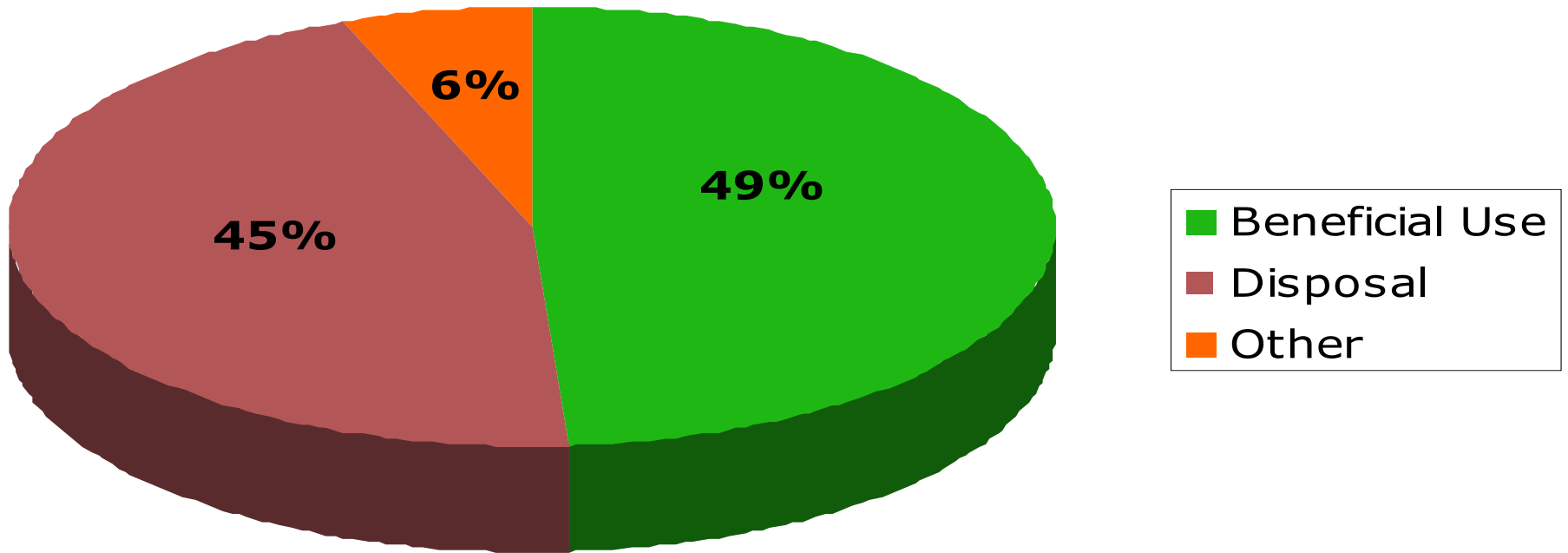
NOTE: Biosolids are not approved fertilizers/soil amendments in certified Organic agriculture, according to the USDA National Organic Program.



Operating U. S. Biosolids Composting Facilities

U. S. EPA Region	States with Biosolids Composting Facilities	Number of Facilities
1	New England (CT, MA, ME, NH, RI, VT)	35
2	New York, New Jersey, Puerto Rico	30
3	Delaware, Maryland, Penn, Virginia, W. Virginia	26
4	Florida, Georgia, Kentucky, N & S Carolina, Tenn	32
5	Indiana, Michigan, Ohio, Wisconsin	10
6	Arkansas, New Mexico, Oklahoma, Texas	31
7	Iowa, Kansas, Missouri, Nebraska	14
8	Colorado, Montana, S. Dakota, Utah, Wyoming	38
9	Arizona, California, Hawaii, Nevada	20
10	Alaska, Idaho, Oregon, Washington	30
None:	Alabama, Illinois, Louisiana, Minnesota, Mississippi, N. Dakota	
	TOTAL	266

Biosolids Use and Disposal Practices 2004 U.S. Totals



Static pile compost

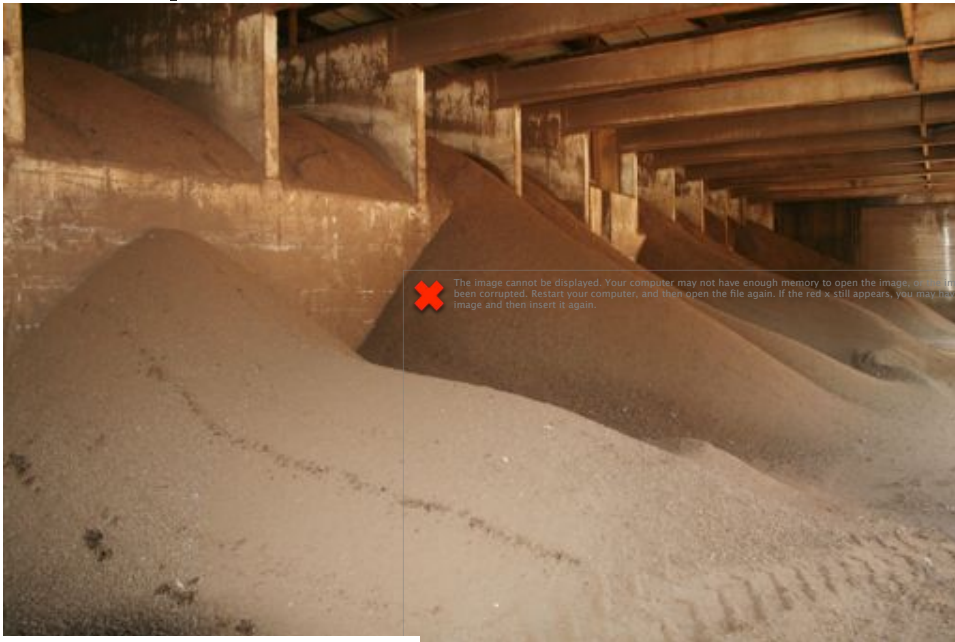
Southboro, Massachusetts



Gore system aerated static piles (Moncton, NB)



Biosolids composting Merrimack, NH



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**~1,700 dry tons
biosolids,
amended with
sawdust**





LAWPCA Compost Facility

Auburn, ME
1988 - present

Sited with plenty of space around it, this biosolids compost facility has operated steadily since the late 1980s.



Lewiston-Auburn Water
Pollution Control Authority
Lewiston-Auburn, ME

Nantucket Island



Waste Options Nantucket, LLC

Composter (“Bedminster”)



Compost Curing



Hawk Ridge Compost Facility

Unity, Maine



- **largest private composting operation in New England**
- **biosolids, paper mill residuals, food waste, restaurant waste,**
- **Earthlife line of products**

~Produces 90,000 cubic yards of compost / yr with biosolids from ~35 communities & other feedstocks



Pumpkins...



<http://damariscottapumpkinfest.com/>



Congratulations to Elroy Morgan of Bradford, **Maine**! He used **earthlife™ Compost** to grow **Maine's** largest **pumpkin**, weighing in at 1200 lbs!

This spring, Elroy Morgan filled his pick-up truck with **earthlife™ Compost** from New England Organics' Hawk Ridge **Compost Facility** in Unity, ME. On October 12, he stopped by the Hawk Ridge sign with his giant pumpkin on his way home from the Damariscotta **Pumpkin Fest** where he was recognized as **Maine's** 2009 State Champion **Pumpkin Grower**.

Mixed yard, leaf, crop, food waste White Gates Farm, Tamworth



**Permit by
notification from
DES; processes
restaurant
vegetable waste,
ag waste, etc.**

Photos courtesy Russ Lanoie





Compost Quality & Safety

- Most researched = biosolids compost; it sets the standards for what is safe in soils
- Federal biosolids standards = 20 years of effective protection
- States have additional biosolids regulations (including for biosolids composting)
- Other composts follow suit
- All composts have heavy metals, chemicals, and pathogens; the levels are what counts!



Wastewater

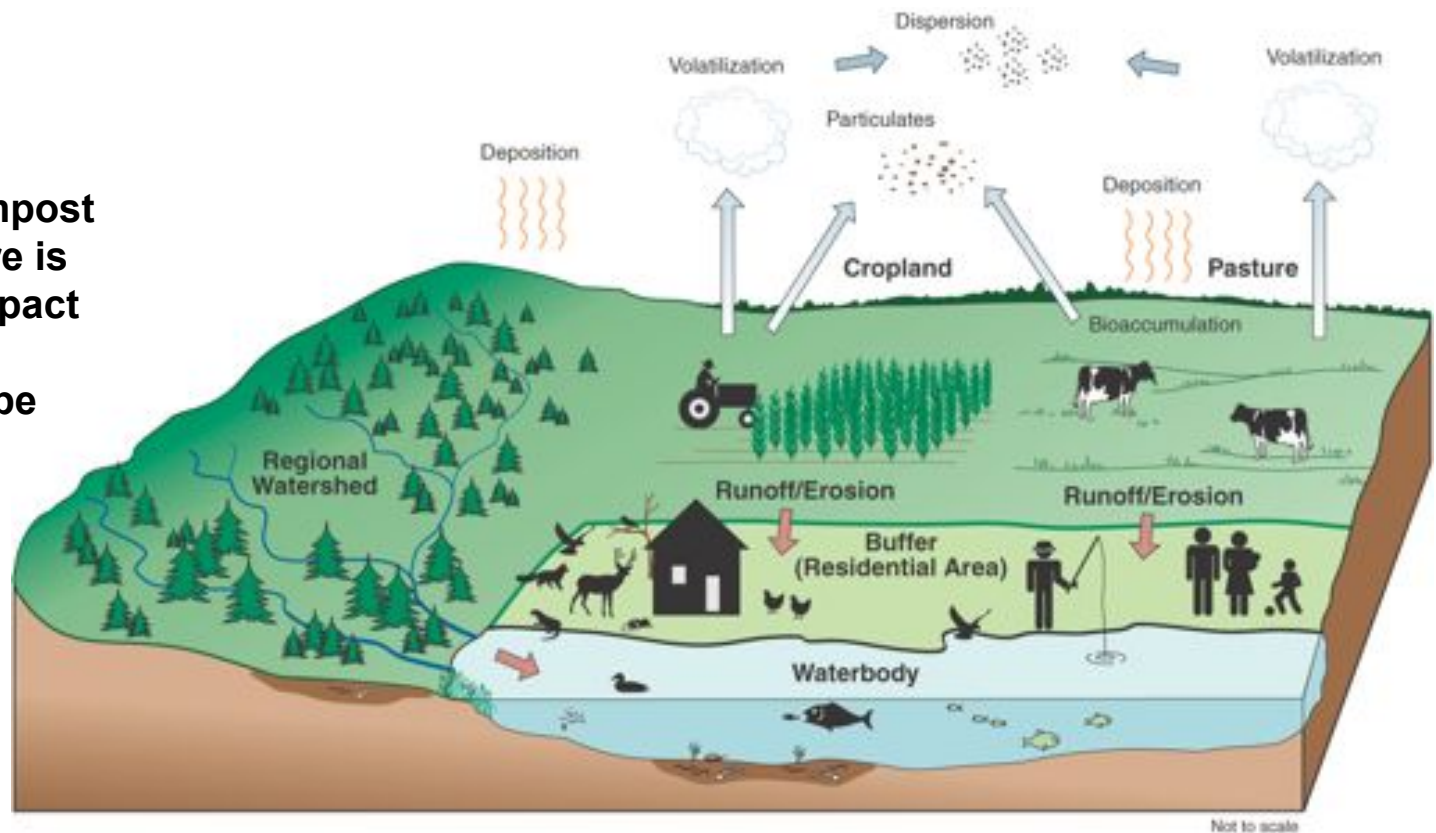
source control / pretreatment

- Very important for beneficial use of biosolids & biosolids composts
- Control points:
 - local discharge permits
 - control of septage / other waste receiving
 - maintenance of sewers
 - pollution prevention programs
 - public education (e.g. toilets are not for trash)

Risk Assessment

EPA Risk Assessment for U. S. EPA regulations (Part 503):
Exposure Pathways Assessed
Agricultural Land Application Scenario to Assess Human Exposure

The presence of a contaminant in compost does not mean there is risk; its fate and impact on humans and the environment must be evaluated.



3 topics of greatest concern re biosolids or other composts

- **“heavy” metals:** regulated, non-regulated
- **chemicals:** PCBs, legacy, priority pollutants, microconstituents, PPCPs, radioactivity, chlorpyralid
- **pathogens:** traditional, “emerging,” endotoxin, prions, antibiotic resistance, reactivation & regrowth, *Aspergillus fumigatus*...





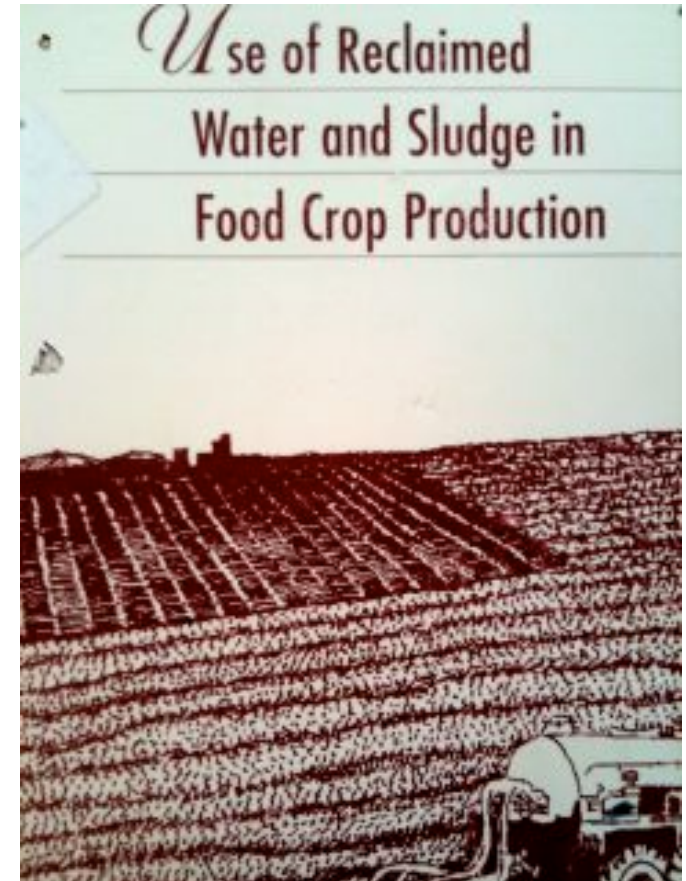
45+ years of research

- Treatment processes
- Beneficial use options
- Potential impacts on environment, soils, crops, & public health
 - Trace elements / heavy metals
 - Synthetic chemicals
 - Pathogens
- Research continues: e.g. chlorpyralid

Bottom line: When trying to set **policy** on a complex matter, it helps to look at major expert

scientific reviews: In 1996, the nation's premier scientific body, the National Academy of Sciences, concluded:

“In summary, society produces large volumes of treated municipal wastewater and sewage sludge that must be either disposed of or reused. While no disposal or reuse option can guarantee complete safety, the use of these materials in the production of crops for human consumption, when practiced in accordance with existing federal guidelines and regulations, present negligible risk to the consumer, to crop production, and to the environment.”

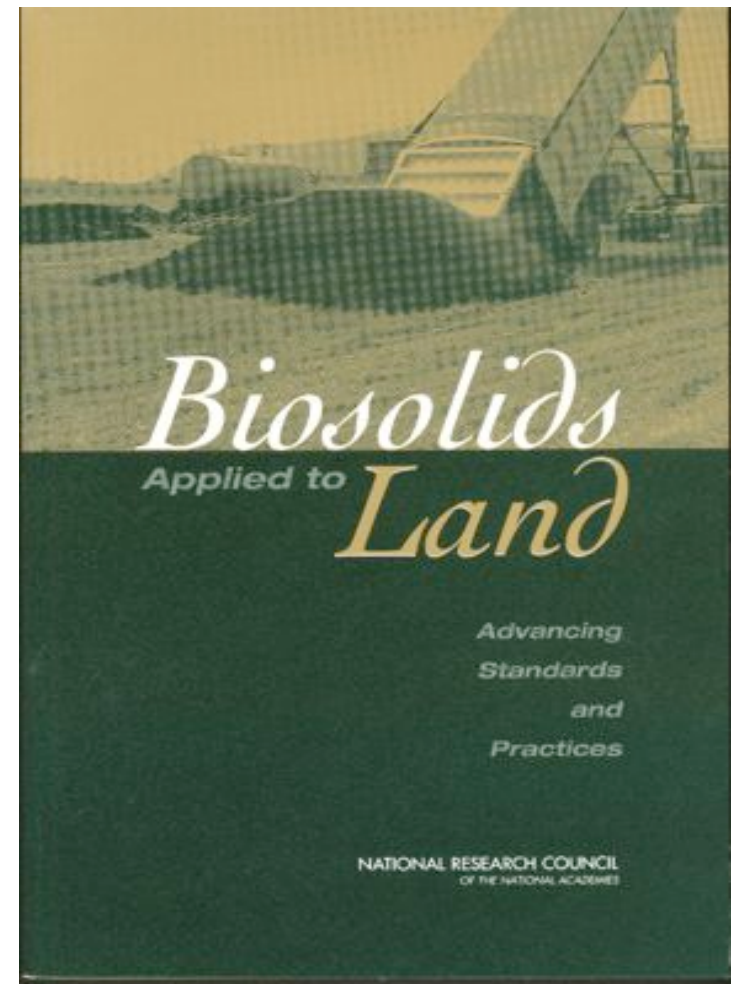




A second review by the NAS in 2002...

The finding:

”There is no documented scientific evidence that the Part 503 rule has failed to protect public health. However, additional scientific work is needed to reduce persistent uncertainty about the potential for adverse human health effects from exposure to biosolids.”

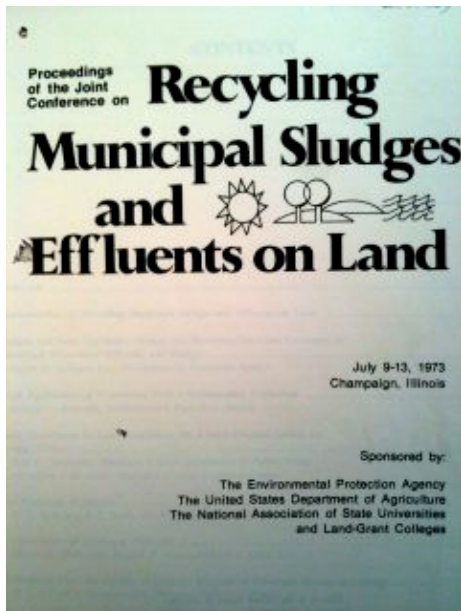
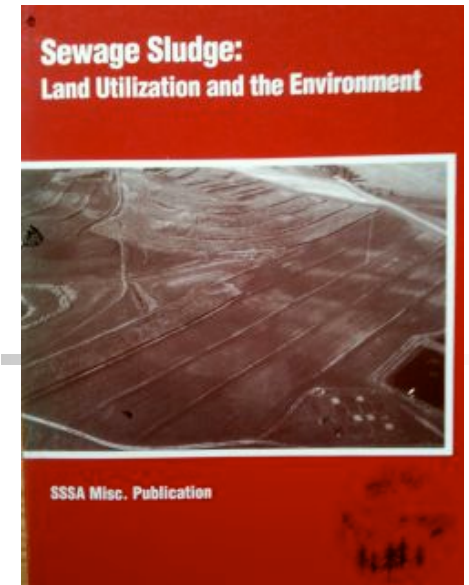


State of the science...

Every 10 years –

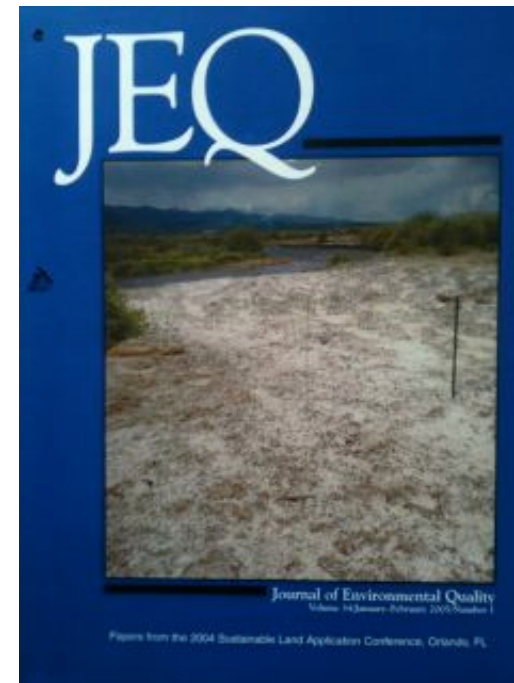
The EPA and major universities hold a conference on the state of the science of adding biosolids & other wastes to soils.

1993 – Univ. of Minnesota – proceedings published by Soil Science Society of America



1973 – Univ. of Illinois

1983 – Colorado



2004 – Univ. of Florida – proceedings in *Journal of Environmental Quality*

If you're concerned, see test results...

U. S. Composting Council Seal of Testing Assurance

Required analytes:

- pH
- soluble salts
- nutrient content (total N, P₂O₅, K₂O, Ca, Mg)
- moisture content
- organic matter content
- bioassay (maturity)
- stability (respirometry)
- particle size
- pathogen (fecal coliform or *Salmonella*) & weed seeds
- trace metals (Part 503 biosolids regulated metals)

<http://compostingcouncil.org/seal-of-testing-assurance/>

Tamworth Brett School Composting

- 3 years old
- Set up and run by community members led by Mark Albee
- Volunteer “decomposers” mix in school food waste daily
- Winner NH School Composting Program in 2011

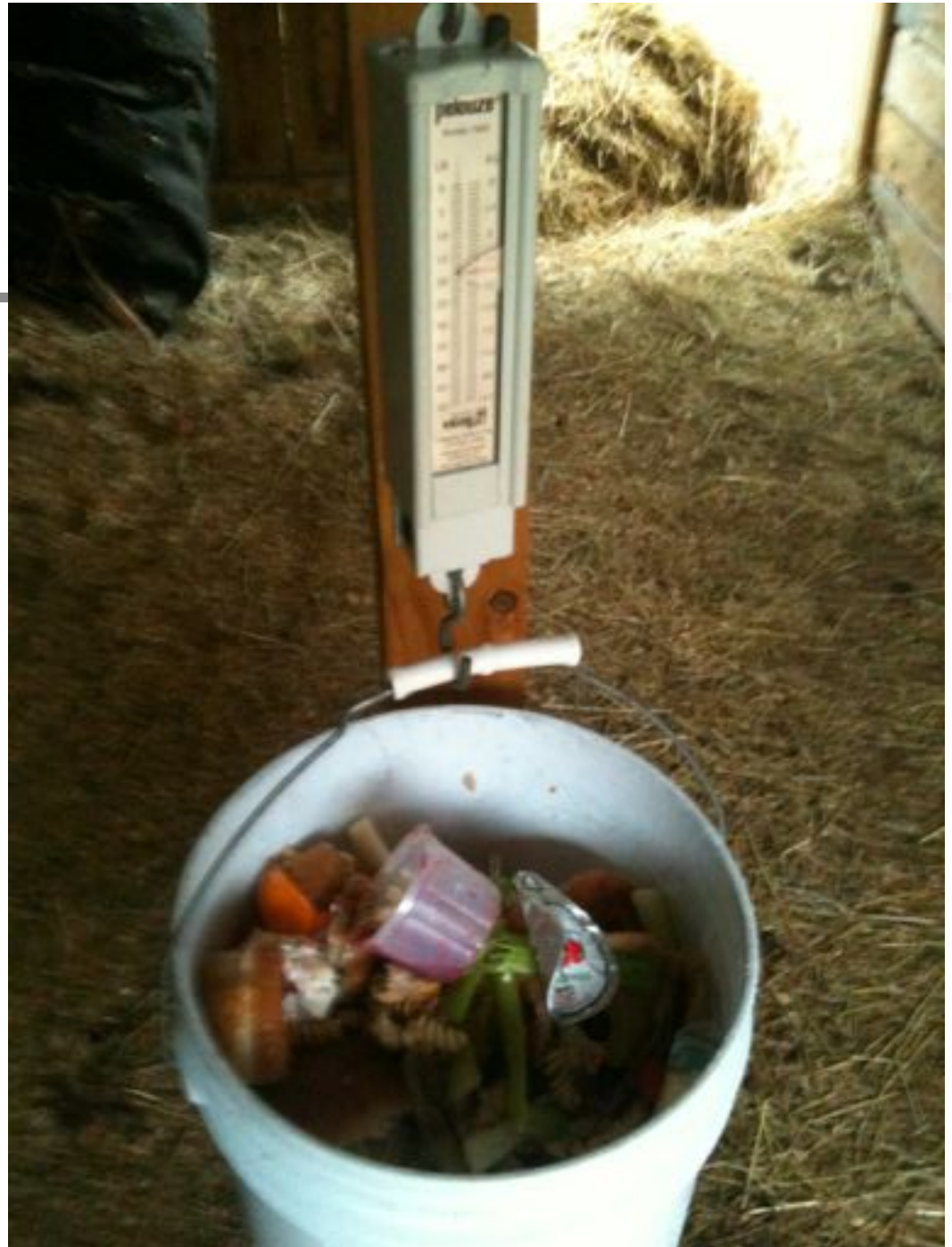


Tracking temperature

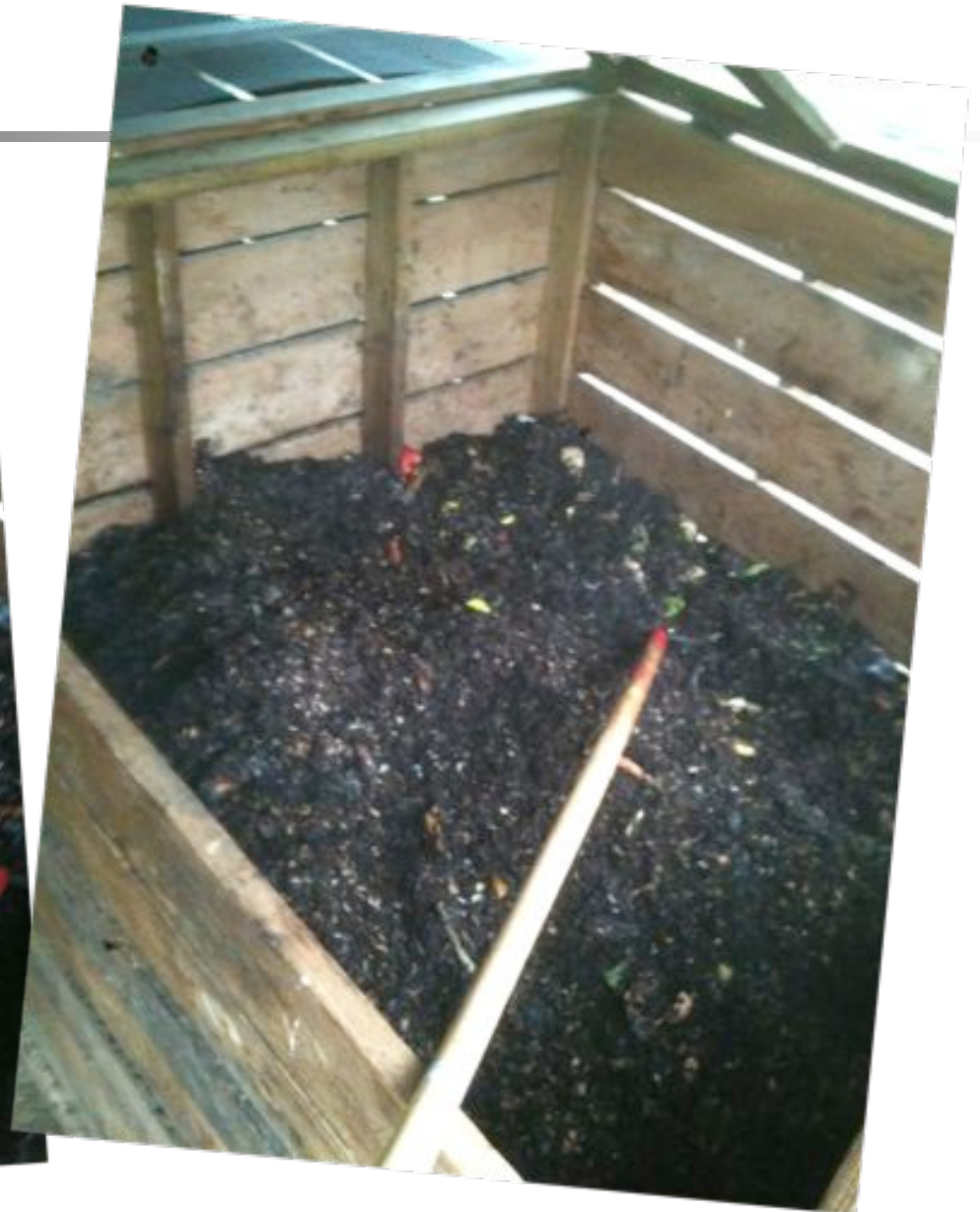




Weighing
daily inputs...



Mixing / turning...



Record-keeping...



Brett School Compost Record

Date	Temp Bin 1	Temp Bin 2	Temp Bin 3	Food Waste	Sawdust	Comments	Decomposition
05/13/13	105°			45#		like bird nests or cat feces	Margaret
05/14/13	95°			33 lb			Jan S
05/15/13	90°			50#			Ned
05/16/13	100°			29 1/2			
05/17/13	96° F			61 lb	20 lb water 5 ft	TOO MANY FLIES (not that many)	Margaret
05/20/13	140° - 120°			50#			Agnes & Ned
05/21/13	103° F			37 lbs			Ned
05/22/13	110° F			41 #			
05/23/13							
05/24/13							
05/27/13							
05/28/13							
05/29/13							
05/30/13							
05/31/13							

Using it on school gardens...





What you can do...

- Keep food and other organic wastes out of trash: compost at home or send to a local composter.
- Buy & use compost
 - Helps recycling/composting efforts
 - Reduces need for chemical fertilizers
 - Builds healthier soils
- These efforts reduce use of non-renewable resources and greenhouse gas emissions while helping the local economy and local recycling



Contact information

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BioCycle

<http://www.jgpress.com>

