

Urban Agriculture is good



Human Health

Food Security

Increased physical activity

Improved diets

Community strength

Sowing Seeds in the City, Human Dimensions, Hodges - Snyder, MacIvor, and Brown



Ecosystem Services

- Habitat
- Primary productivity
- Gas regulation
- Waste treatment



Sowing Seeds in the City, Ecosystem and Municipal Services,
Brown, MacIvor, and Hodges - Snyder

Primary benefit

You get more food



And urban farmers get it



Compost 101: Growing Power Style

Food Waste

It all starts with food waste – food waste literally by the truck load. Not only does Growing Power compost all of our farm waste in Milwaukee, Merton, and Chicago, but we also pick-up food waste from Maglio's Produce, Beans and Barley, Garden Fresh, and Outpost Natural Foods Cooperative in Milwaukee, just to name a few.



Secondary benefits

Biosolids GHG spreadsheet calculator tool

Brown et al, 2010 ES&T

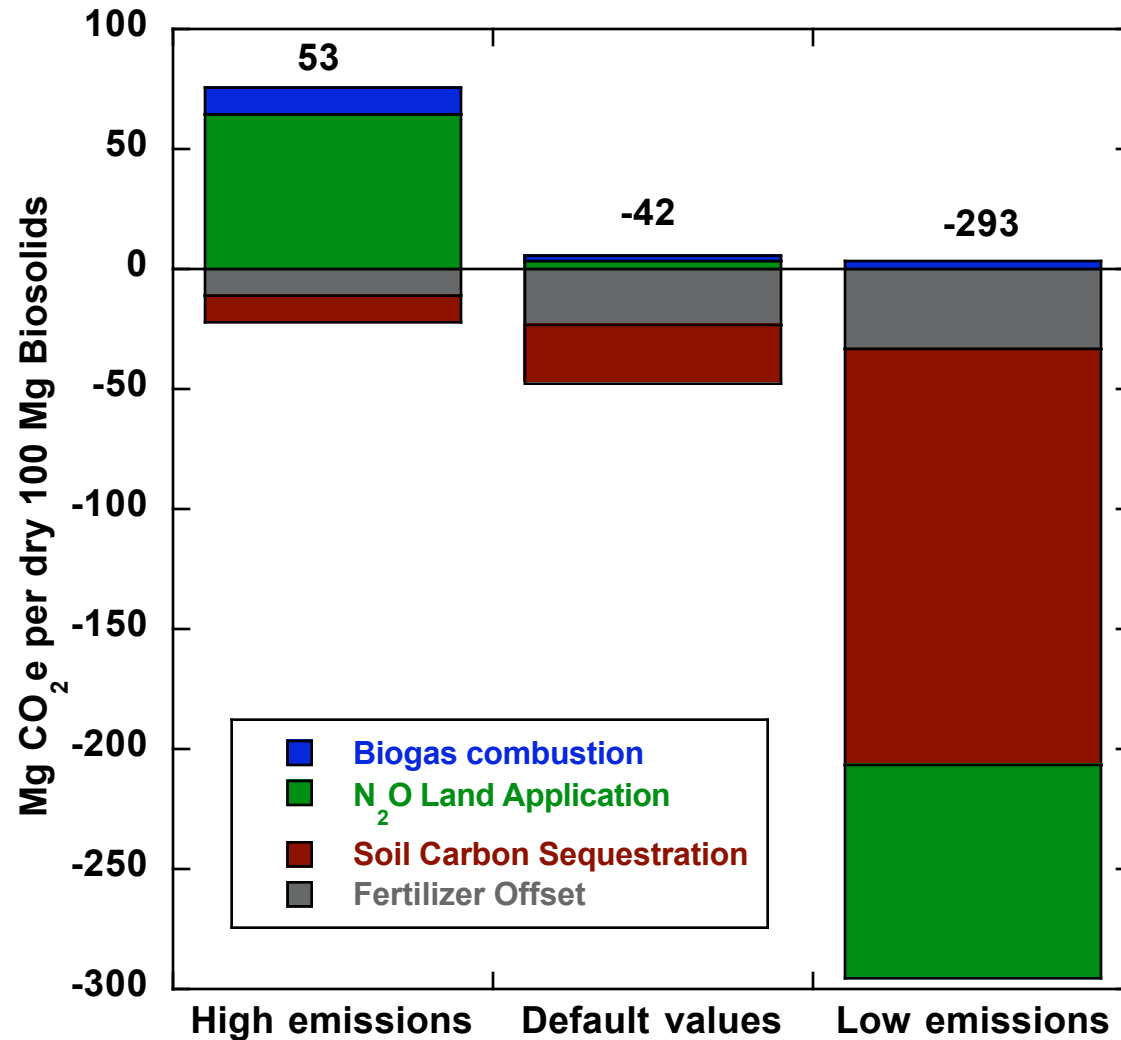
- Andrew Carpenter, Northern Tilth
- Ned Beecher, NEBRA



- Funded by the Canadian Council Ministers on the Environment
- http://www.ccme.ca/ourwork/waste.html?category_id=137

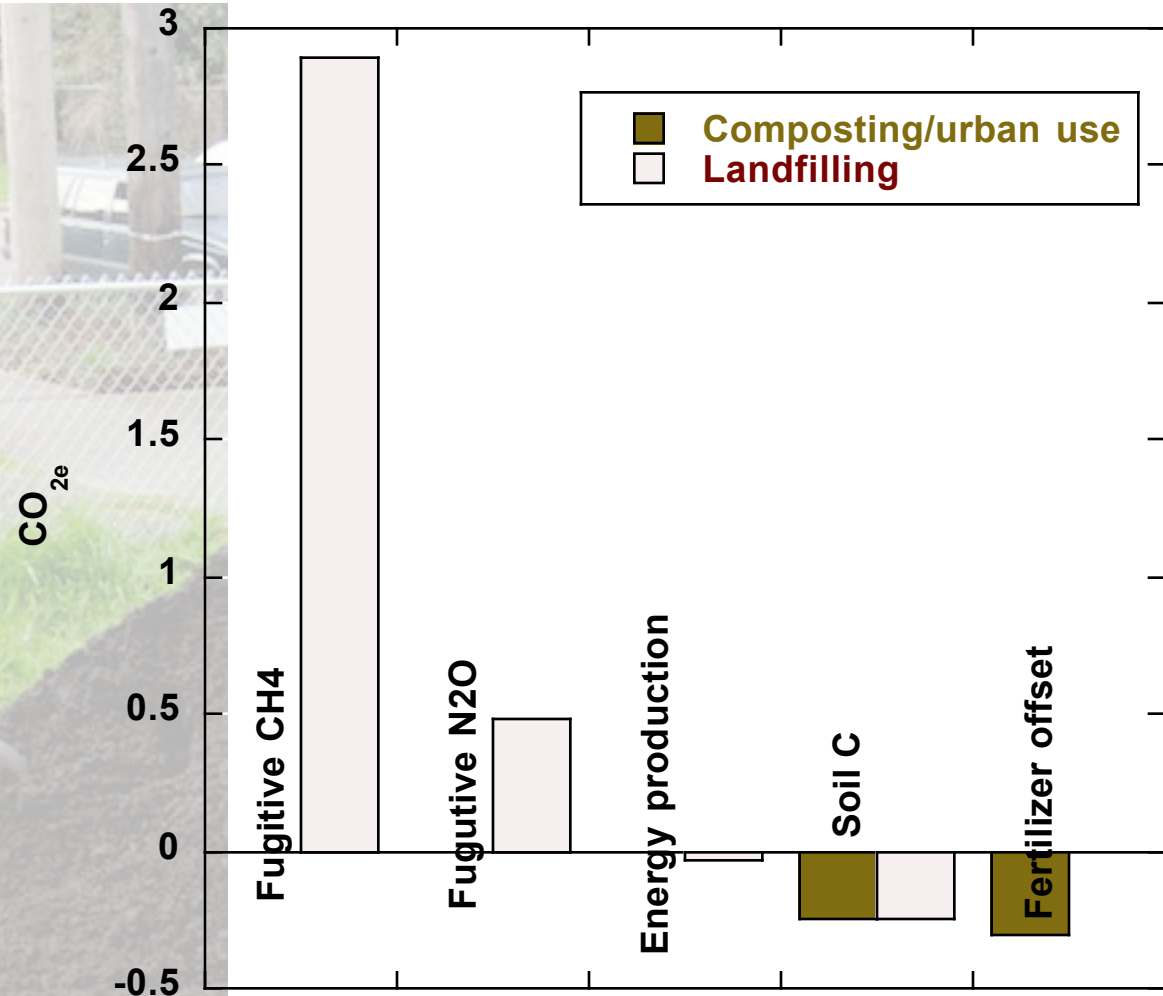
Factors considered

Model uses conservative assumptions



1 ton biosolids (similar for food waste)

3.23 versus -0.38 ton CO₂e



Brown et al., 2007; 2010

Additional Data

Brown et al., 2011



Biosolids to dryland wheat



Composts and biosolids to turf grass



Compost to orchards

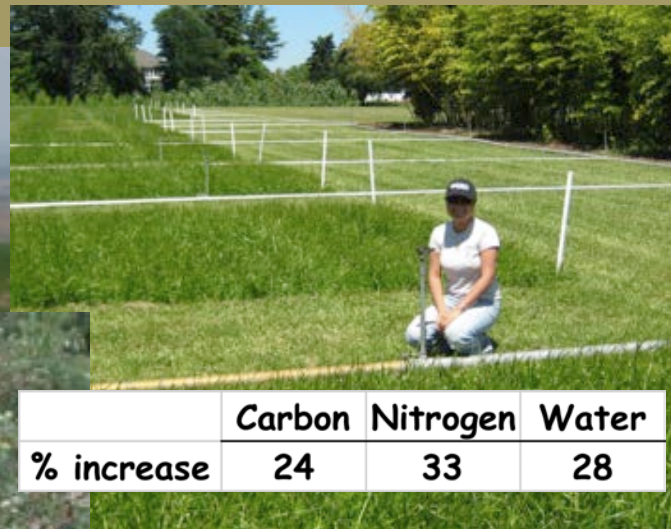
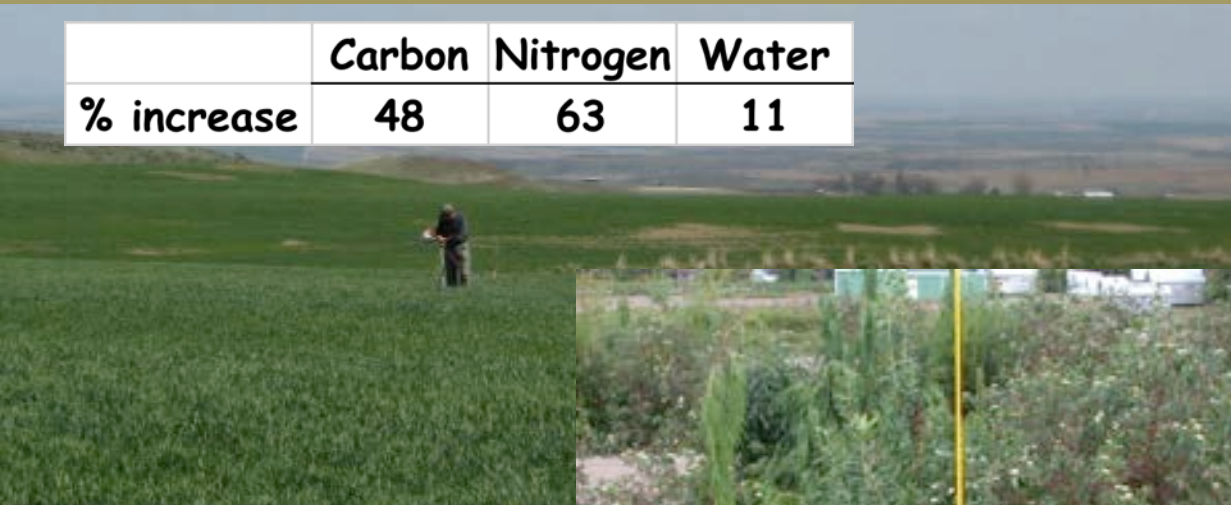


Composts to landscape

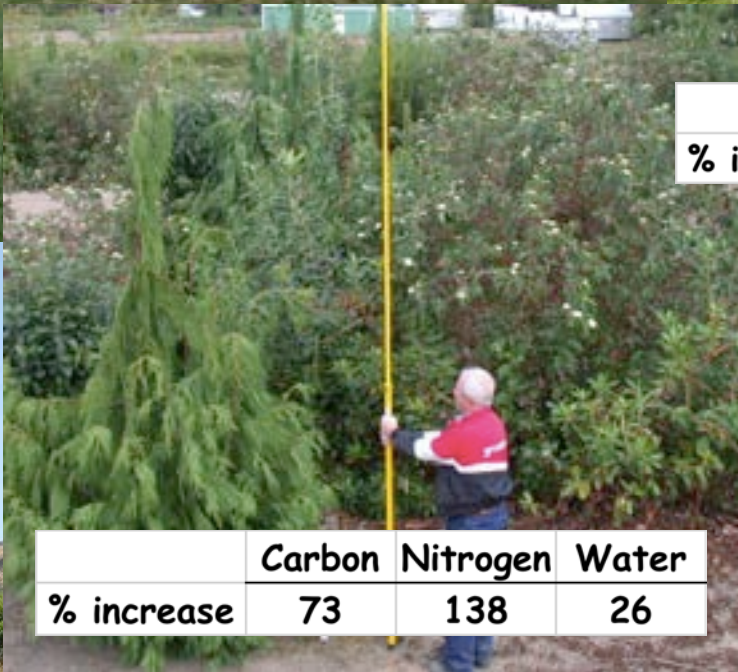
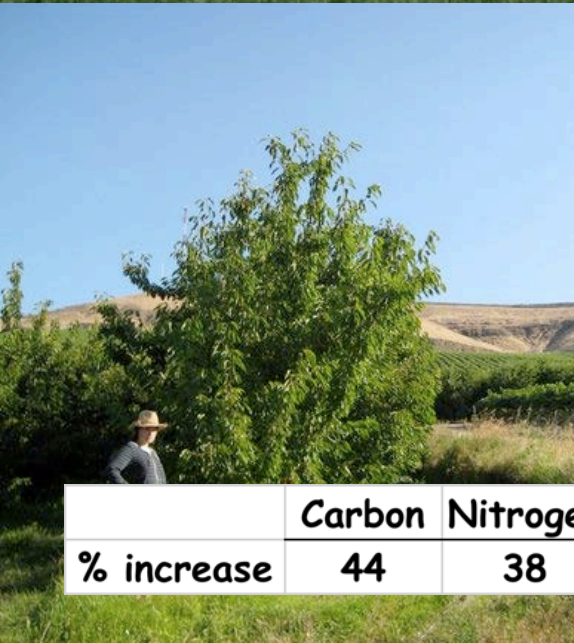


Biosolids and composts to roadside

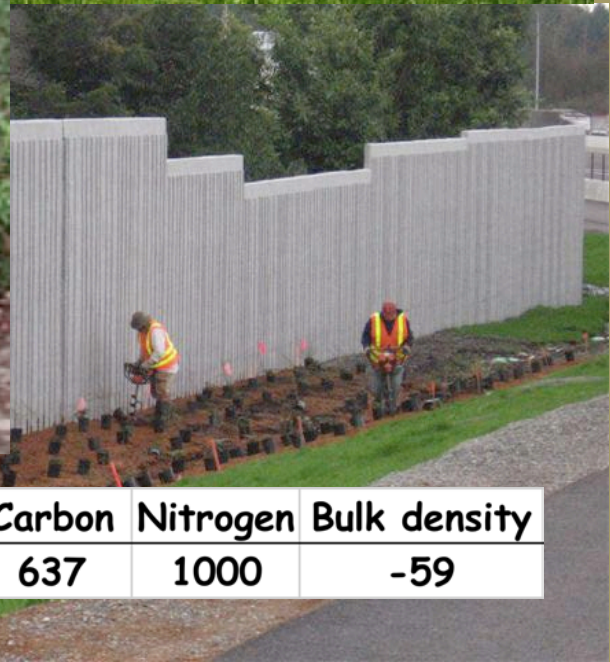
	Carbon	Nitrogen	Water
% increase	48	63	11



	Carbon	Nitrogen	Water
% increase	24	33	28



	Carbon	Nitrogen	Water
% increase	73	138	26



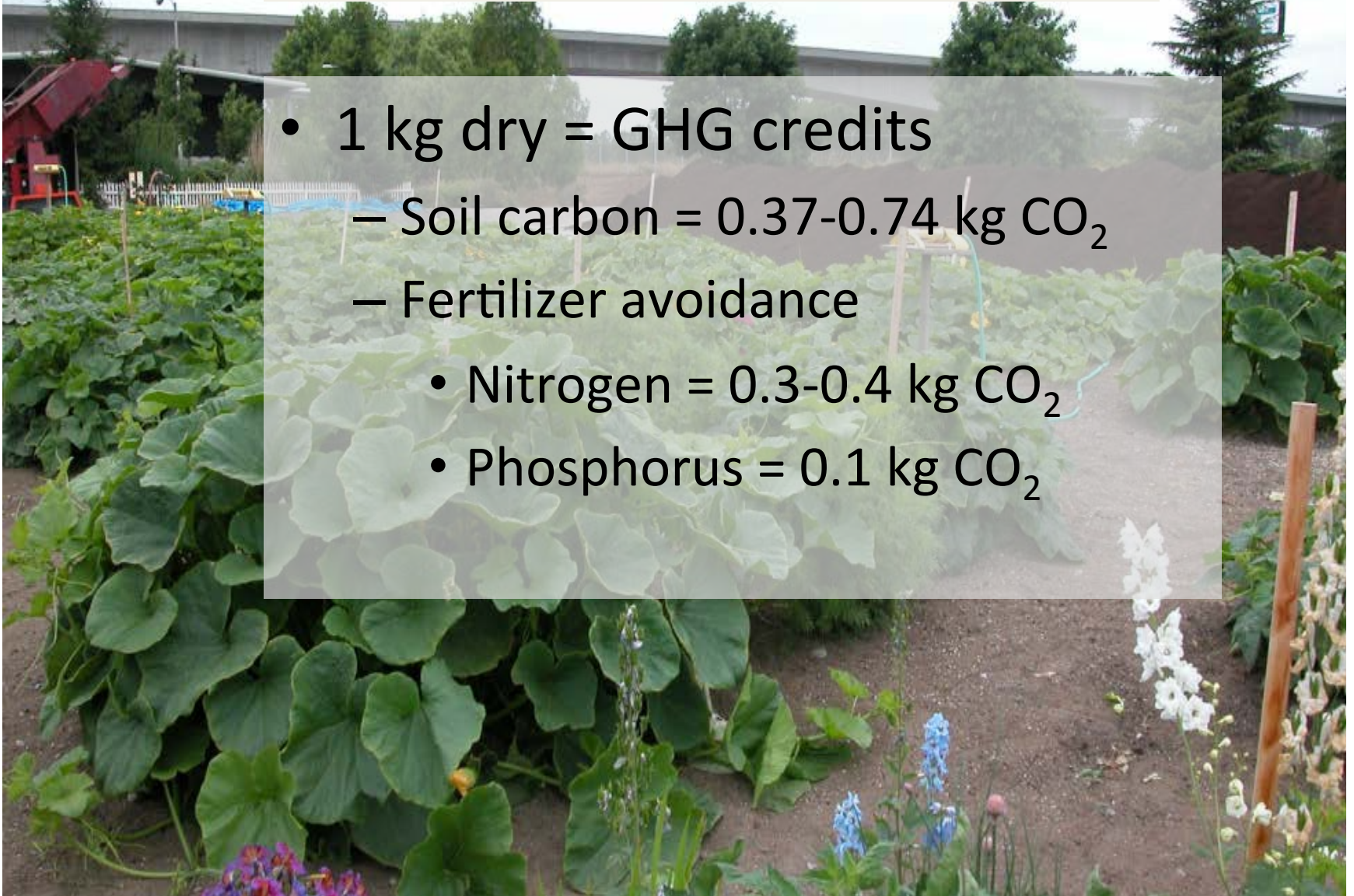
	Carbon	Nitrogen	Bulk density
% increase	637	1000	-59

	Carbon	Nitrogen	Water
% increase	44	38	55

Soil Value

(Brown et al., 2010, 2011)

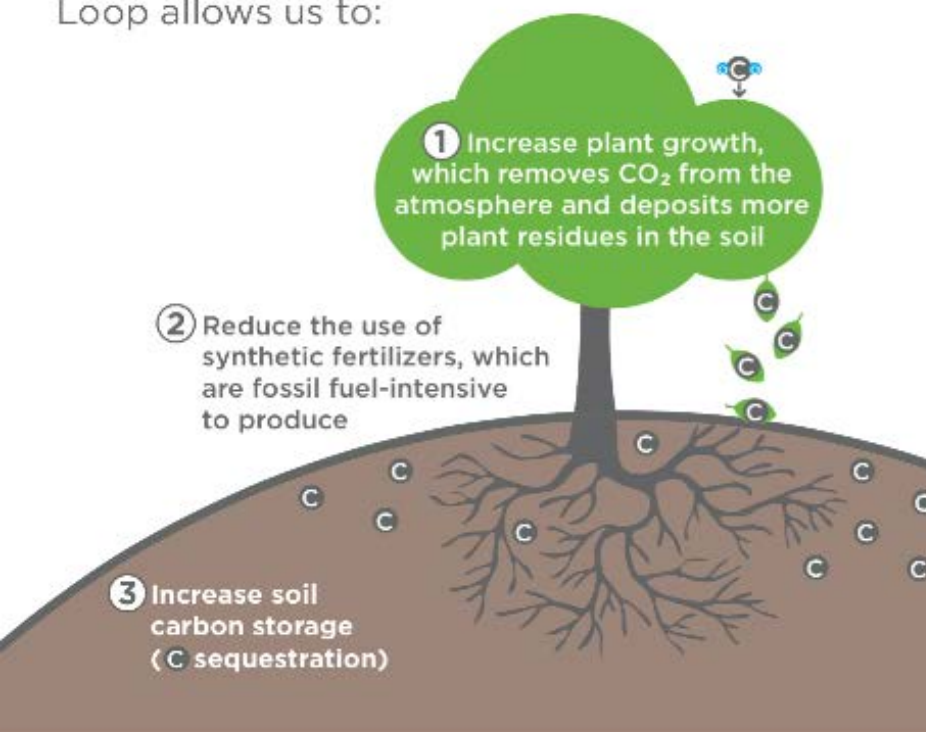
- 1 kg dry = GHG credits
 - Soil carbon = 0.37-0.74 kg CO₂
 - Fertilizer avoidance
 - Nitrogen = 0.3-0.4 kg CO₂
 - Phosphorus = 0.1 kg CO₂





Sequestering Carbon with King County's Loop® Biosolids

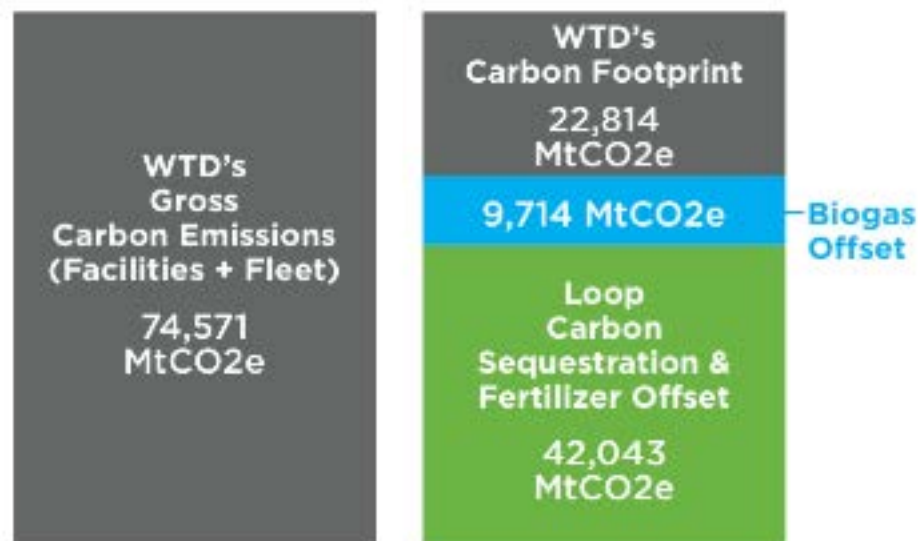
Fertilizing with carbon-rich Loop allows us to:



We offset over 42,000 tons of CO₂ equivalents in 2012

That's like taking **8,000** cars off the road!

King County Wastewater Treatment Division (WTD) 2012 Carbon Impact

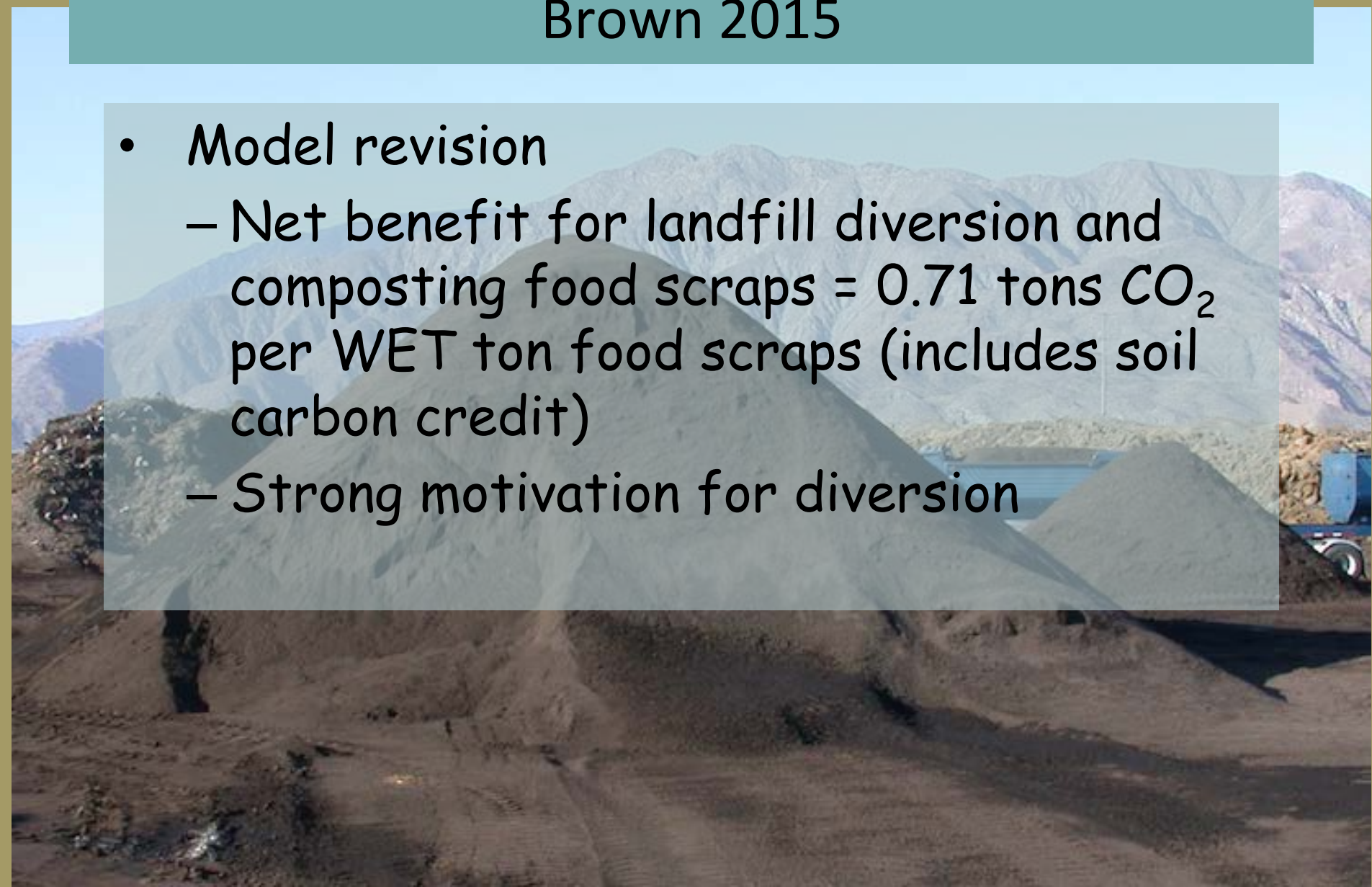


MtCO₂e = Metric Tons of Carbon Dioxide Equivalents

EPA WASTE Reduction Model

Brown 2015

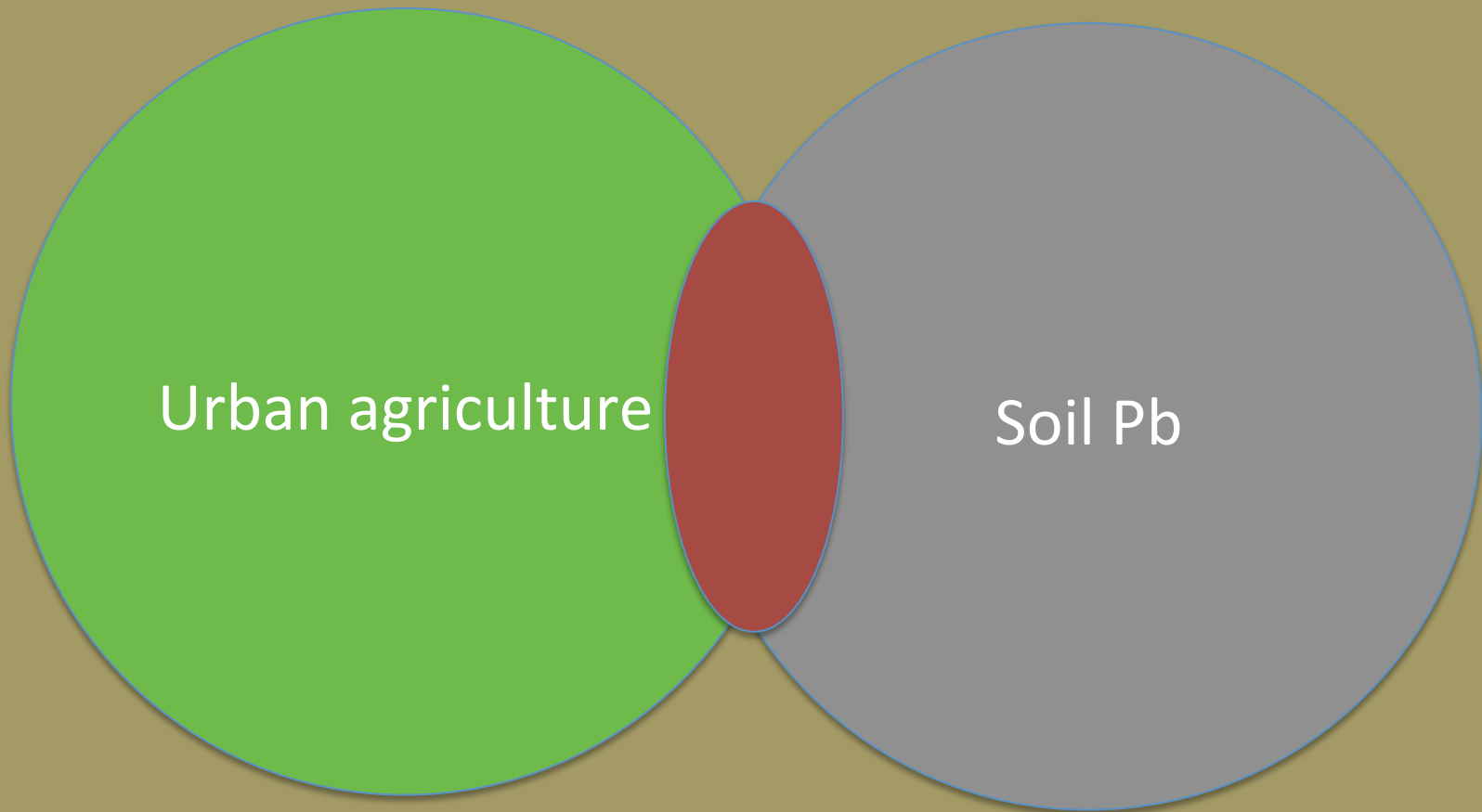
- Model revision
 - Net benefit for landfill diversion and composting food scraps = 0.71 tons CO_2 per WET ton food scraps (includes soil carbon credit)
 - Strong motivation for diversion



Lead is Bad



What is the significance of the intersection?



Safety of urban soils

EXCLUSIVE METRO



Why NYC's toxic community gardens may give you cancer

By Gary Buiso

May 4, 2014 |



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The New York Times

Dining & Wine

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High Lead Found in City-Sourced Eggs



Michelle V. Agra/The New York Times

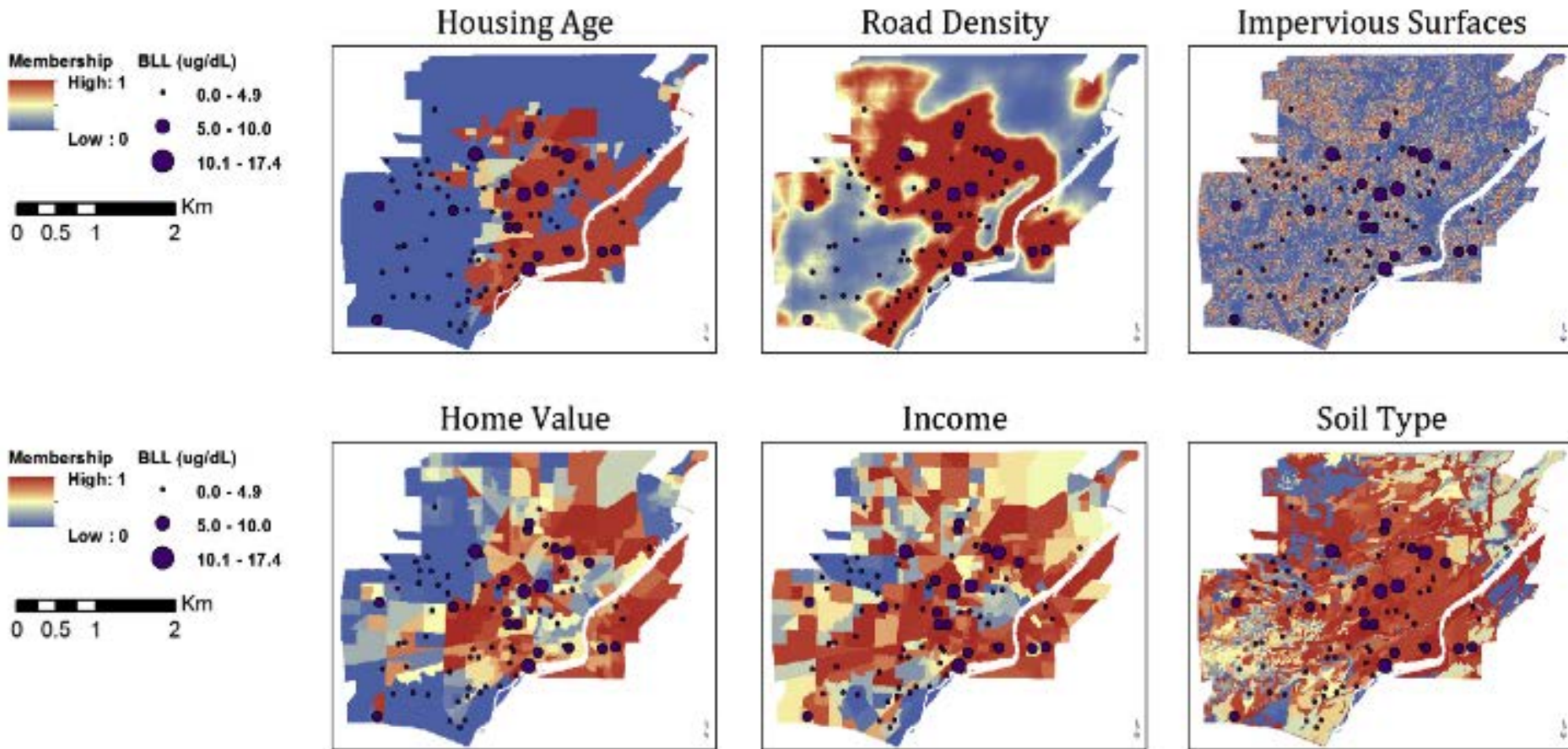
Homeowners who keep chickens in their backyards have little way of knowing whether their eggs might be contaminated unless they have them tested themselves.

Direct ingestion



How is soil Pb related to blood Pb in urban areas?

- Stewart et al., 2014 – fuzzy sets



Safe= useless guidance

- EPA
 - 1200 ppm in general
 - 400 ppm bare children's play areas
- California
 - 80 ppm for residential areas
- Howard Mielke
 - Way less

Pb

- Will be present whether or not you grow vegetables
- Is growing vegetables going to increase the hazards associated with this contaminant?



- Is this site any more hazardous as an urban farm?



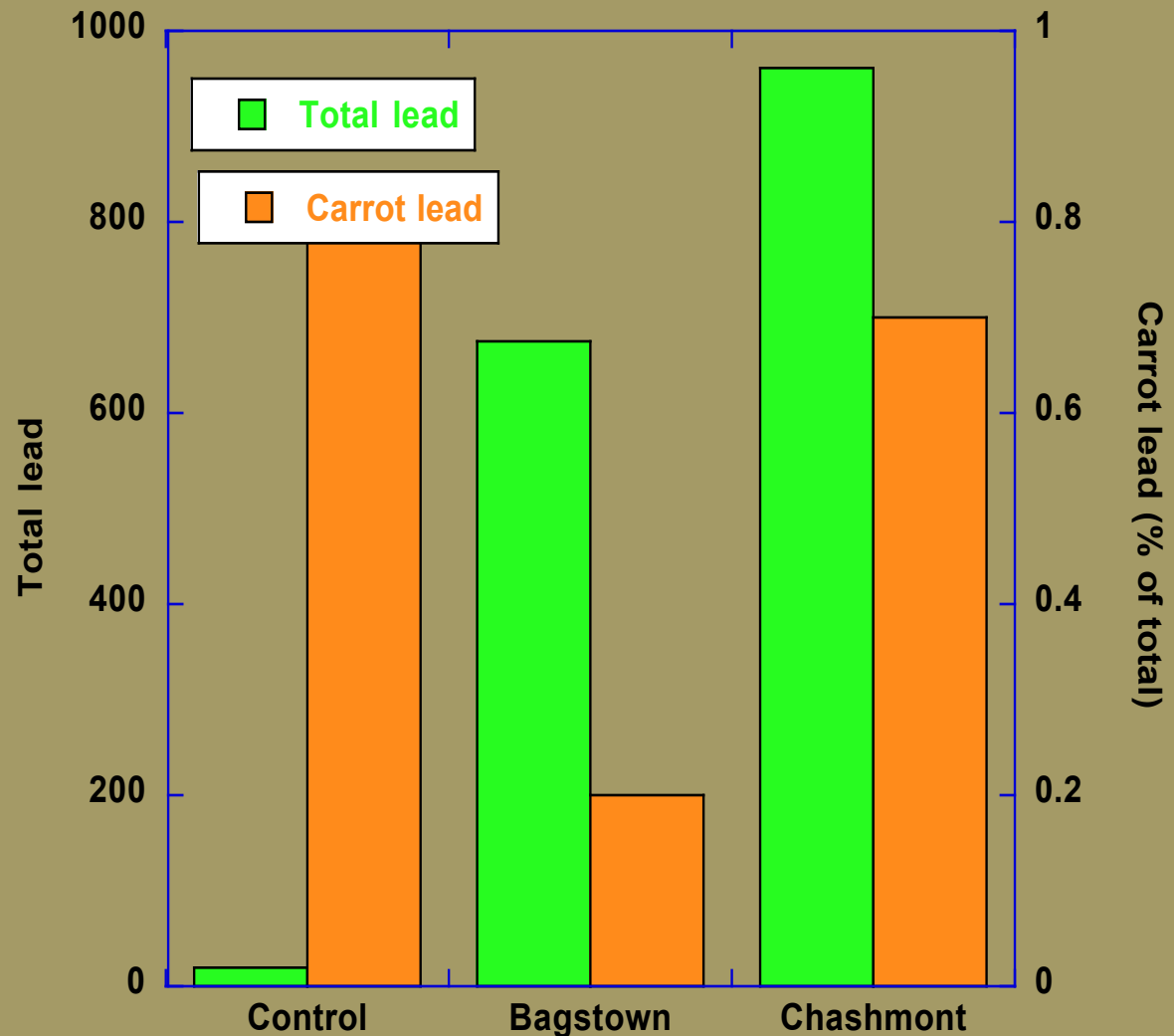
What happens when you eat food instead of dirt-



- Three factors
 - How much Pb will the plant take up?
 - How much of the Pb in the food will be absorbed in the stomach?
 - How much of the diet consists of home grown food?

Plants take up very little Pb (remember soil IEUBK 30% available)

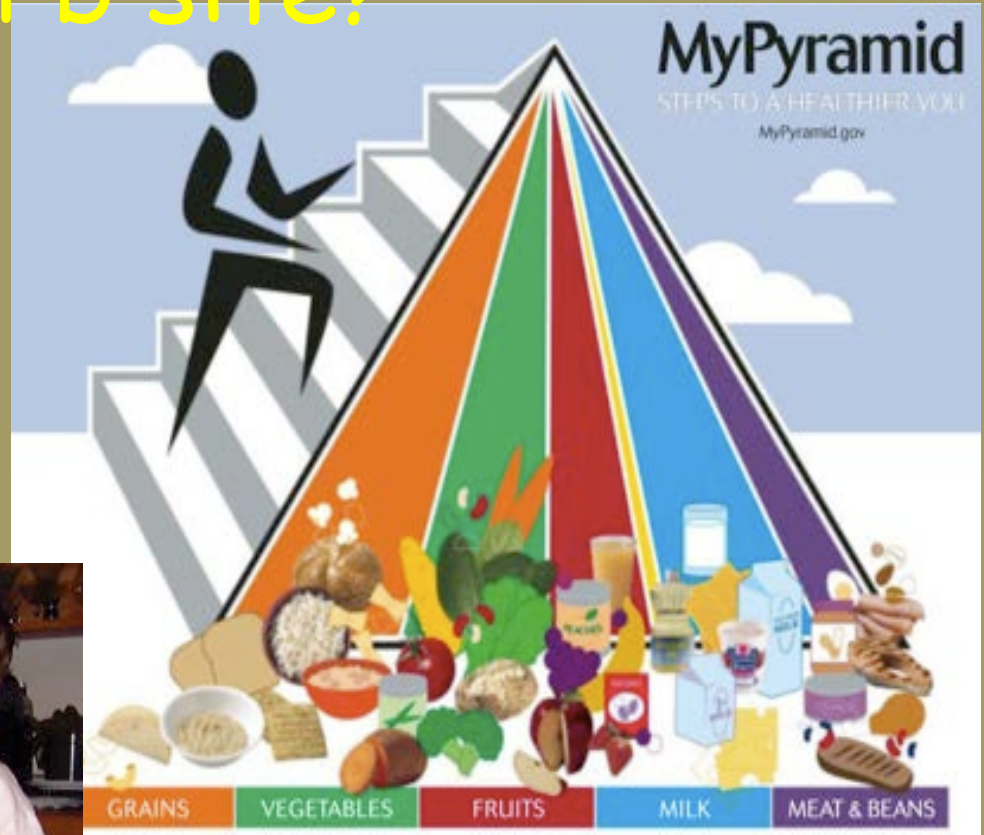
Codling et al
Total carrot Pb
0.2-7.3 ppm



In vitro testing for soil Pb

- Done at very acidic pH
 - Maximize lead absorption
- When you eat
 - Stomach pH gets less acid
 - Reduces absorption
 - Competing beneficial ions in food
 - Reduced absorption
 - Pb is not similar and does not compete with ions that are nutrients

What portion of diet over what time period will come from the high Pb site?



And what about those other benefits?



So if you are still concerned about soil contamination -



- You can garden in a box filled with commercial topsoil
- With brick walkways in between the boxes
- OR

You can use compost - More than just Growing Power

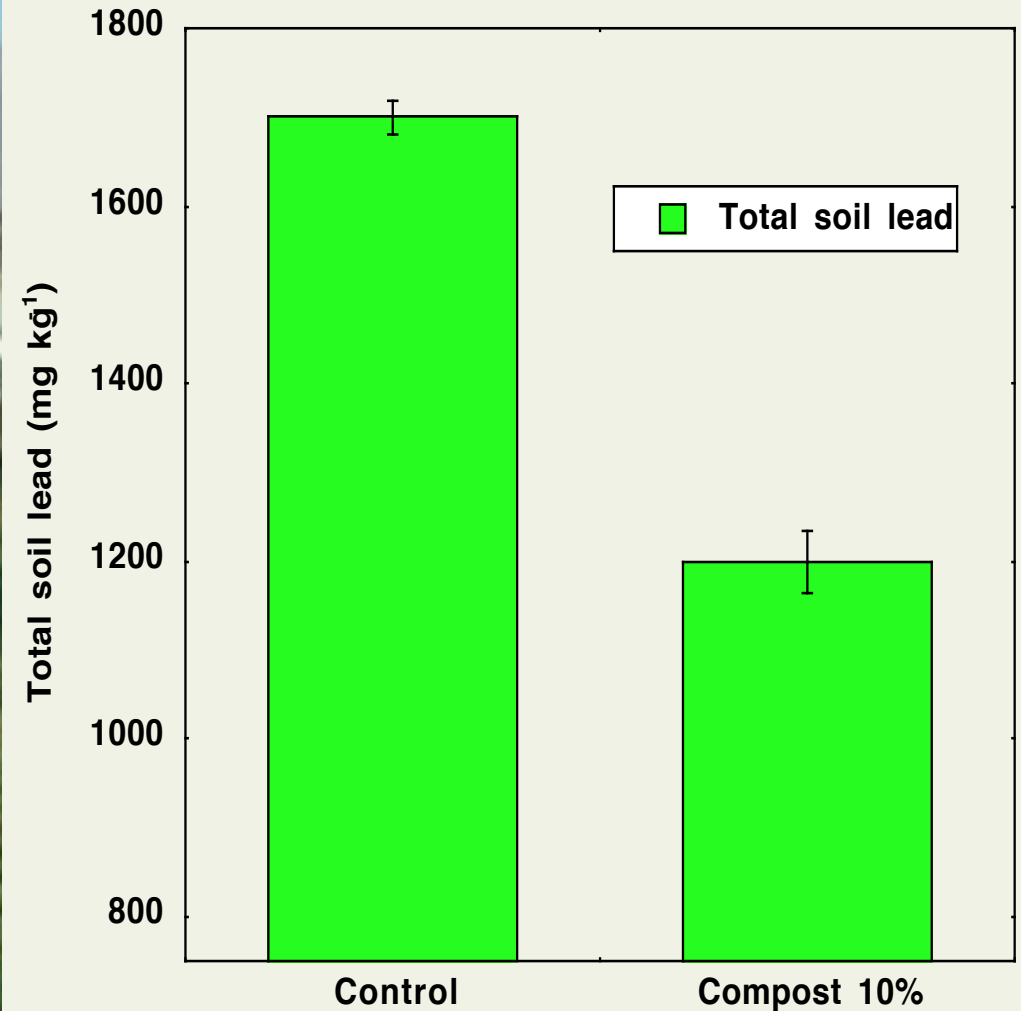


Does this approach work in an urban garden?



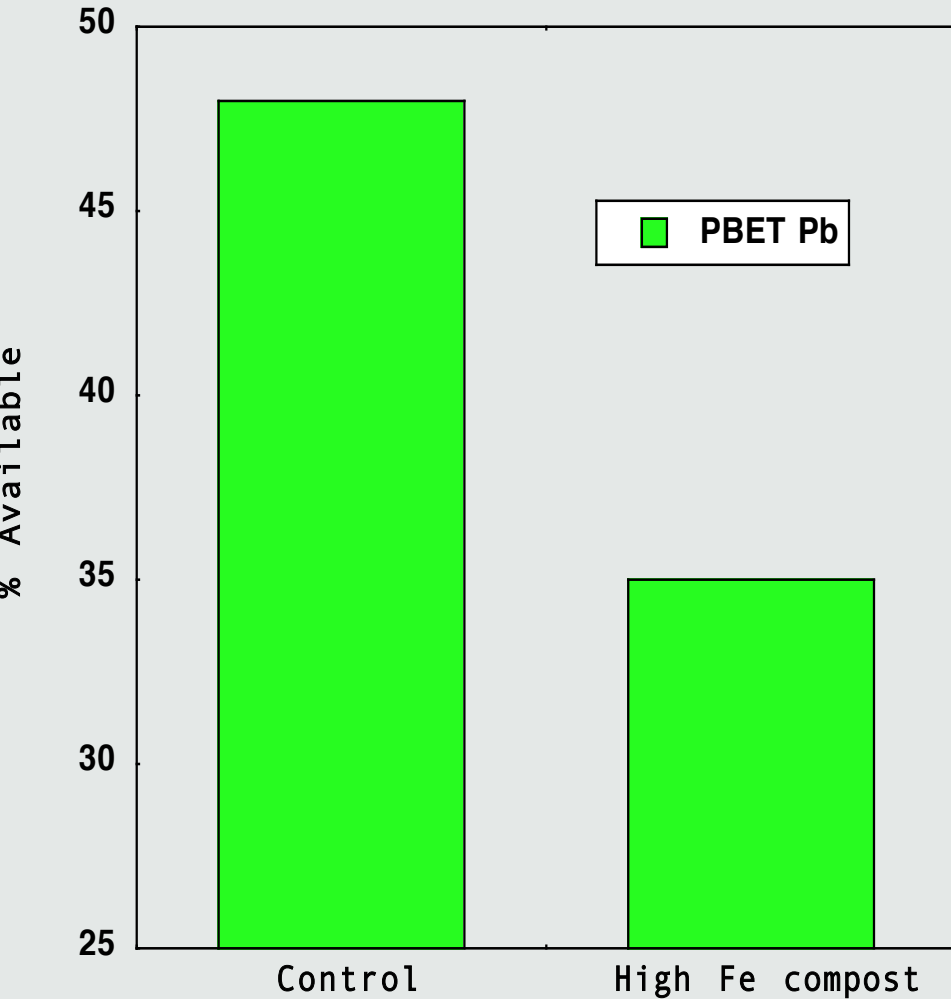
Compost dilutes soil Pb concentrations

Brown et al., 2012



In certain cases, compost can also reduce absolute availability Pb

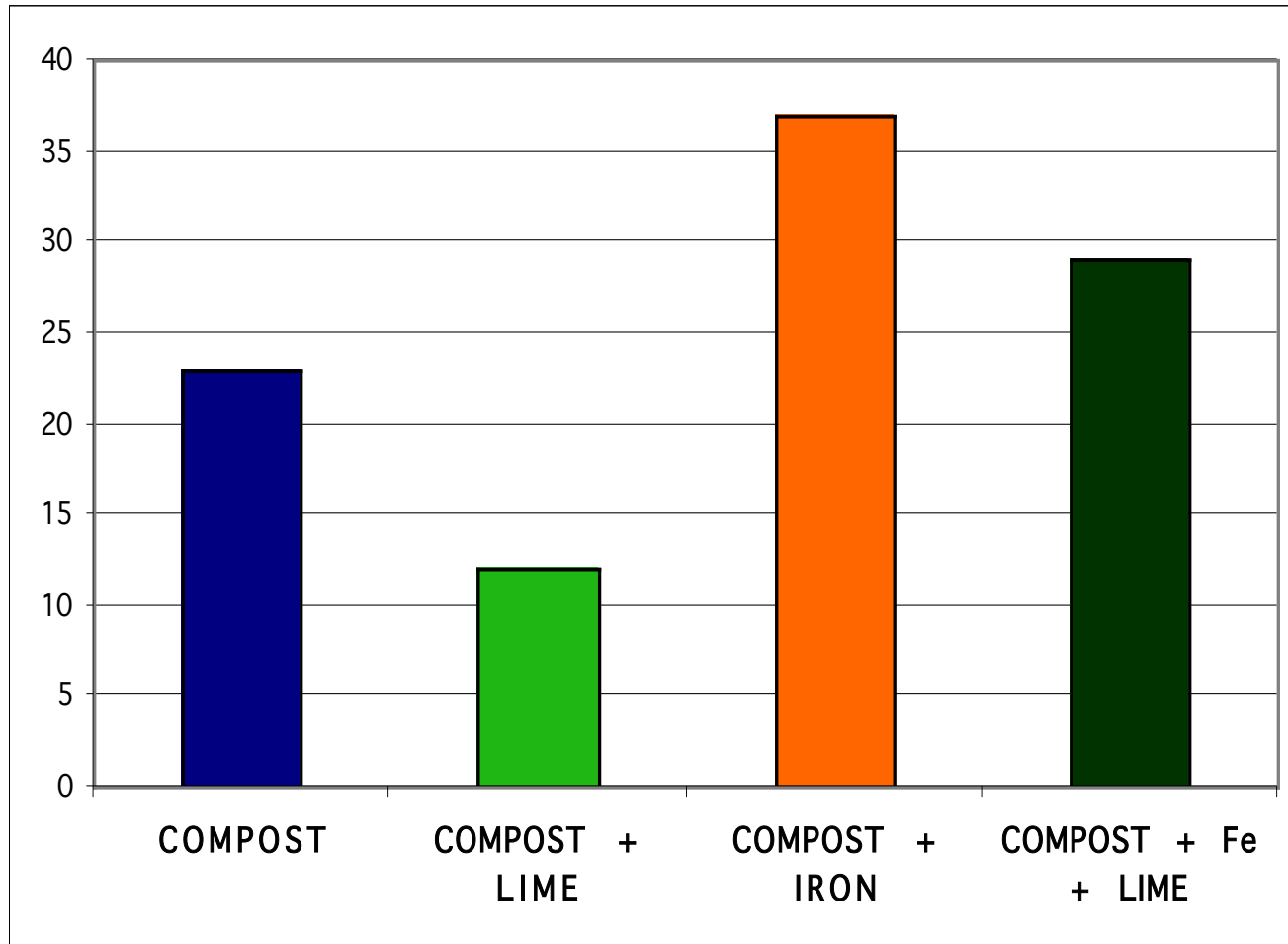
Brown et al., 2012



Baltimore soil

% Reduction in Bioavailability

Different Composts



Brown et al., 2003

Joplin Field Test

Absolute bioavailability

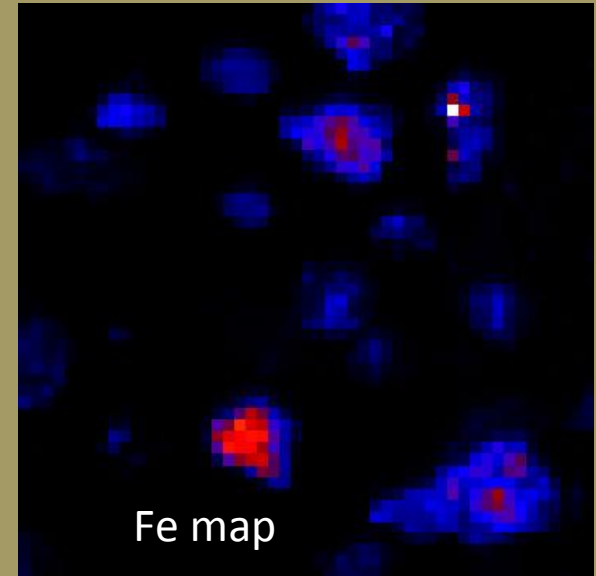
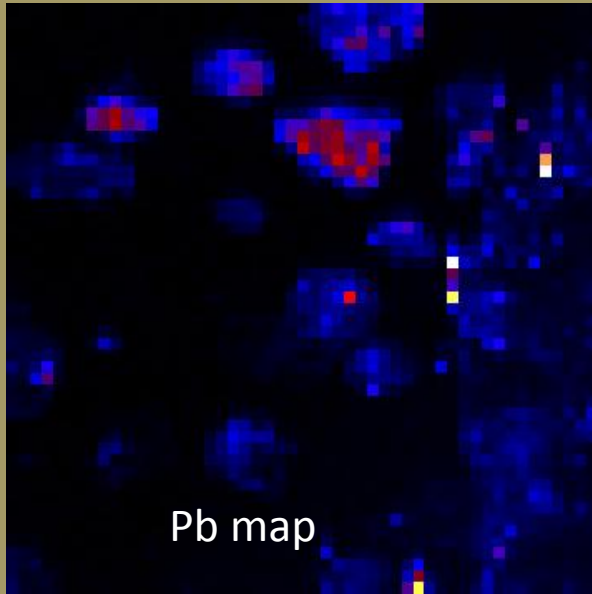


Biosolids compost (high Fe + lime)



Similar efficacy to P addition (in vitro and in vivo)
Ryan et al., 2004, Brown et al., 2004

XAS- x-ray absorption spectroscopy



Bulk spectra of control showed a mix of anglesite, cerrusite and leadhillite

High Fe compost showed significant conversion (up to 100%) to sorbed Pb

Benefit: Reduces
availability of
contaminants in soils
Attanayake et al., 2014



Tagro+
dolomite
added

Control

Responsible solution

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Dedicated to helping Pierce County residents since 1949.



We create a community of abundance through gardening, gleanings, sharing, and educating Pierce County about their food and food systems.

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<https://www.youtube.com/watch?v=3k-zLe4Wn4I>