ADDRESSING ENVIRONMENTAL HEALTH ISSUES FACING BOSTON-AREA GARDENERS

USING SCIENCE AND PARTNERSHIPS TO GUIDE RISK MANAGEMENT

PRESENTED BY W. HEIGER-BERNAYS
BU SRP RESEARCH TRANSLATION CORE

BOSTON UNIVERSITY SCHOOL of Public Health

Boston University Superfund Research Program

MAKING PROGRESS
ZONING FOR GROWING

"Urban agriculture improves access to fresh, healthy, affordable food, with decreased transportation costs and lower carbon emissions."

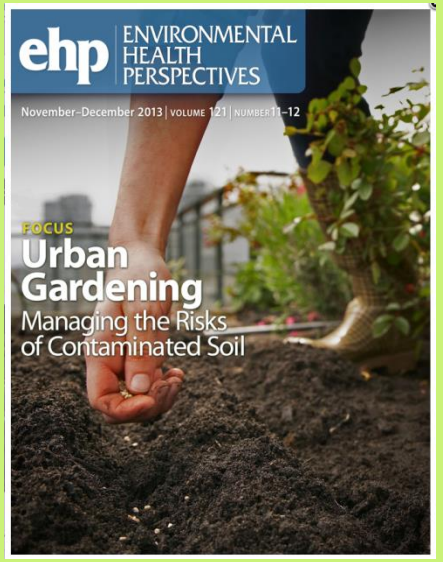
http://www.cityofboston.gov/food/urbanag/

Gardening and Farming – Is the difference the size of the plot?

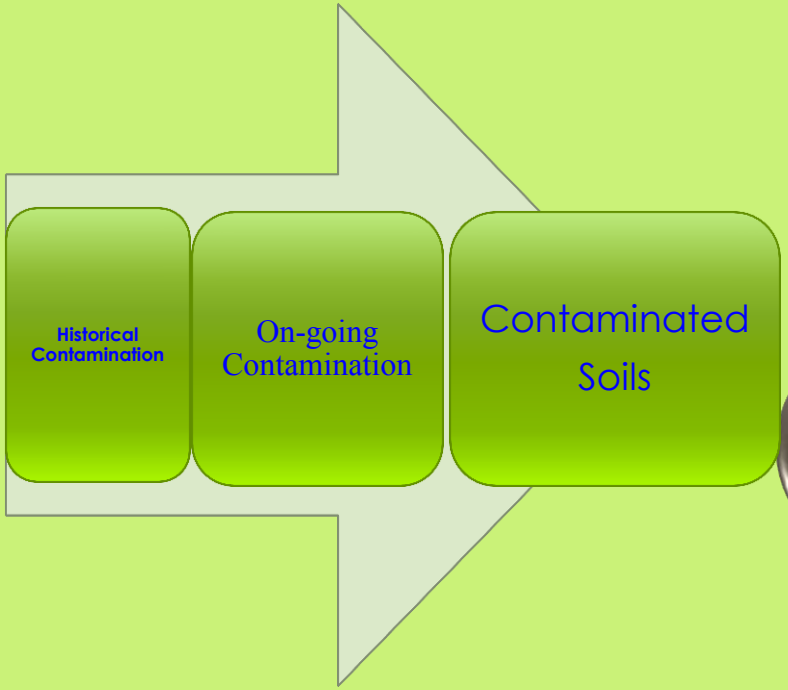
Urban Agriculture Zoning – Boston Article 89

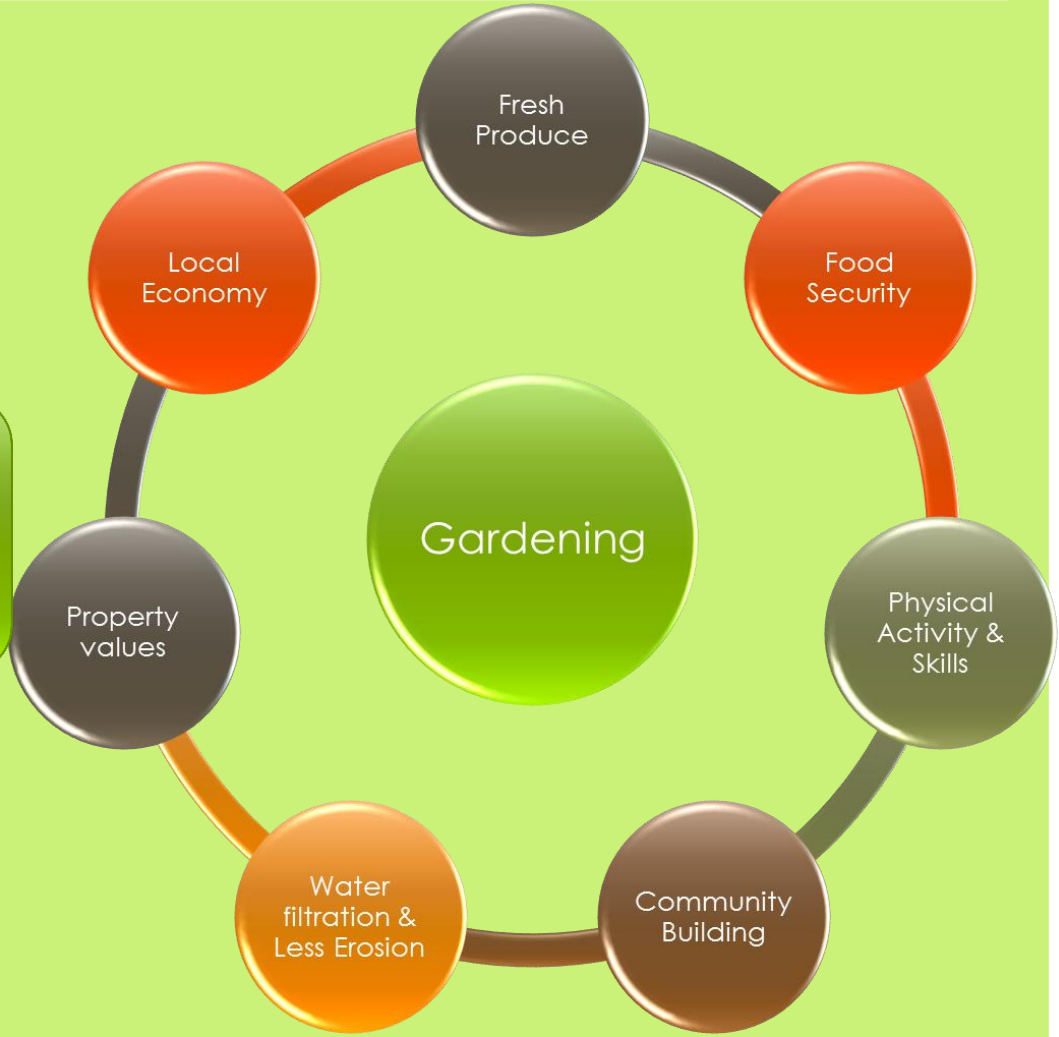
- Ground-Level Farms – based on their size and location.
- Roof-Level Farms
- Freight Container Growing

- Animals
  - Hens
  - Bees
  - Goats



GARDENING **RISKS** AND **BENEFITS**





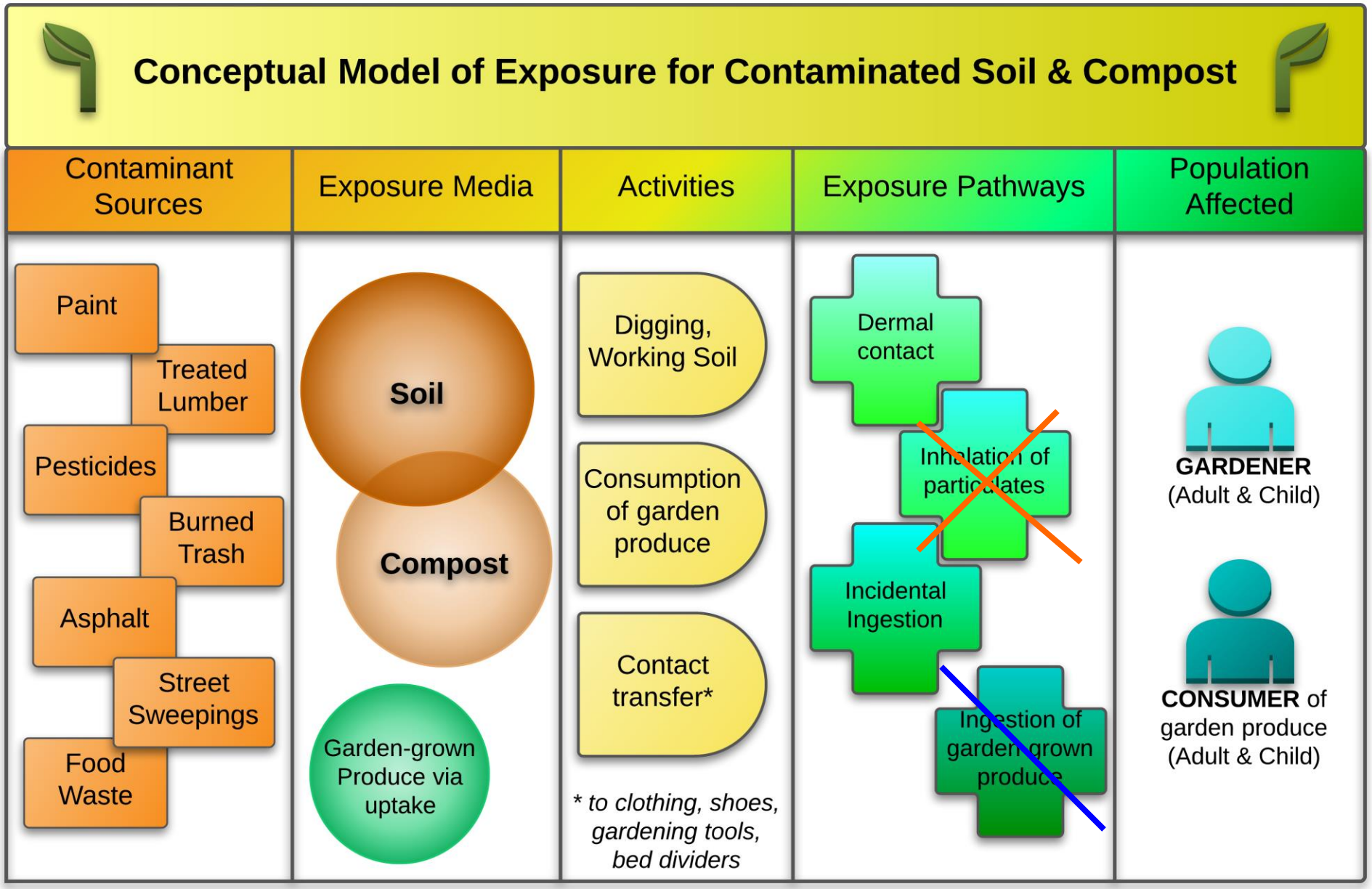
COMMUNITY VS BACKYARD GARDENS

GARDENS AND FARMS

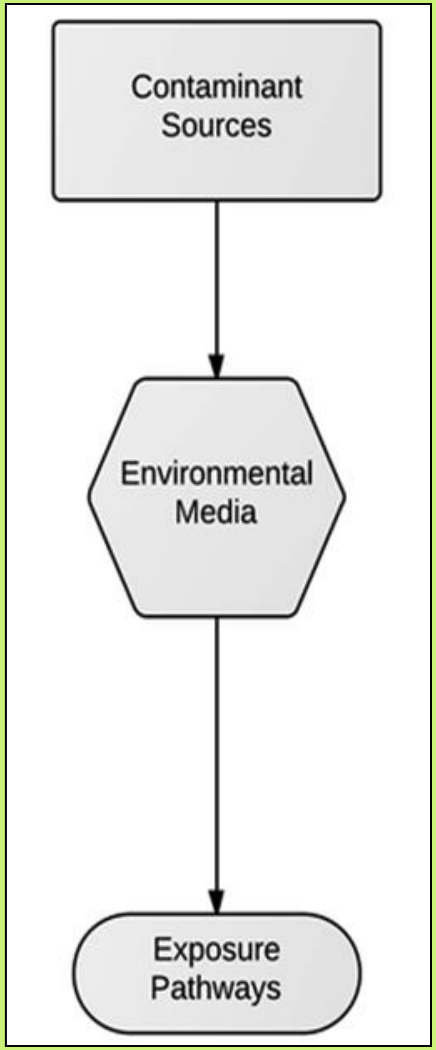
Boston Community Gardens

"Backyard" Gardens

Conceptual Model of Exposure for Contaminated Soil & Compost



HUMAN SOIL EXPOSURES
DIRECT AND INDIRECT



Ingestion of Soils

Inhalation of Dust

Uptake into Plants

Deposition on Plants

Concentrations of Select Contaminants Commonly in Urban Soils

	Common Sources	Concentration Range
Lead	Paint on Houses (pre 1978)	400 - > 2000 mg/kg[1]
	Leaded Gasoline	
Arsenic	Pressure Treated Lumber (CCA)	0.1 – 99 mg/kg[2]
	Pesticides (Pb.arsenate)	
Total PAHs; n=16	Burned Trash or Coal	2.2 – 167 mg/kg[3]
	Street Sweepings	

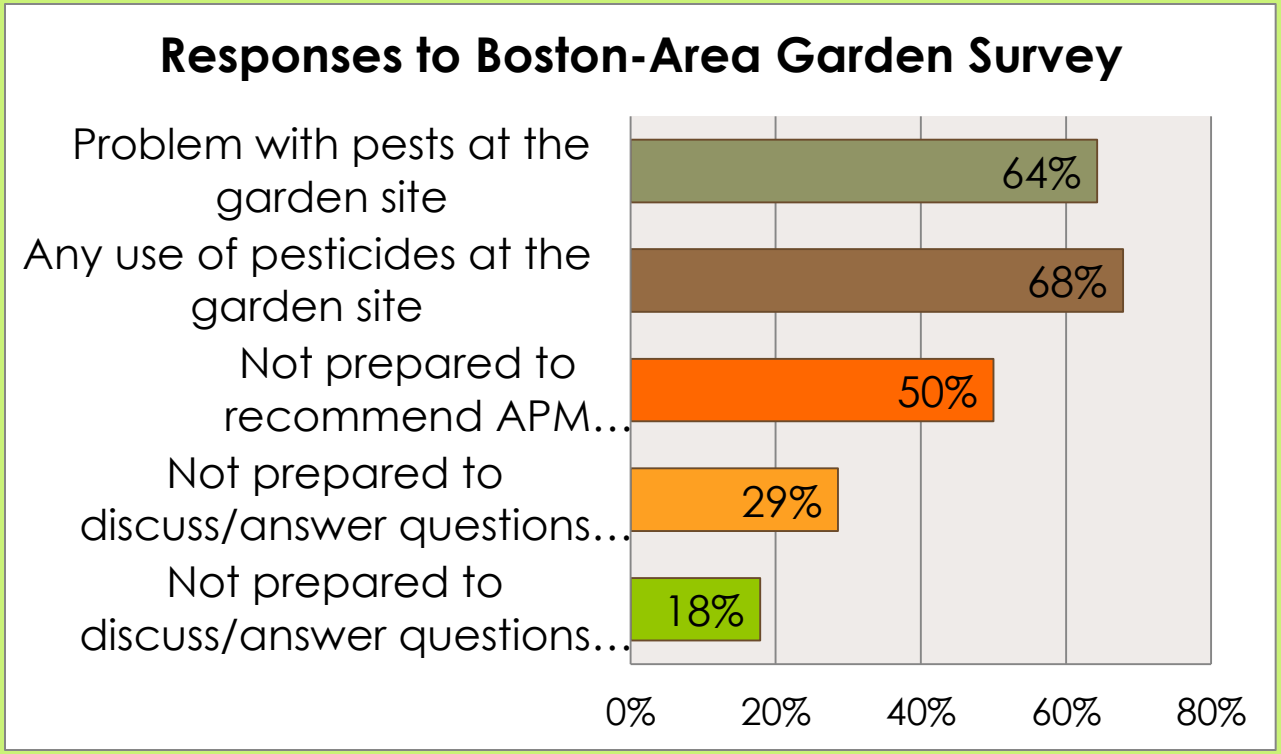
[1]USEPA, Lead Safe Yards Program (2001).

[2]MassDEP, (2002). Technical Update: Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil

[3]Bradley, L.J.N., et al., (1994). Journal of Soil Contamination, 3(4):349-361

ON-GOING CONTAMINATION

Cat Poop – biological Hazard (Toxoplasmosis)



On-going Use of Chemical Pesticides (Labeled & Unlabeled)

GOOD GARDENING PRACTICES

- Wear gloves while gardening
- Wash hands before eating
- Wash and scrub vegetables before cooking and/or eating
- Leave shoes outdoors or at the door so as not to track excessive dirt inside
- Try not to let children eat soil

Developed to protect people from exposures to contaminants in urban soils

But realistic? Are these practiced?

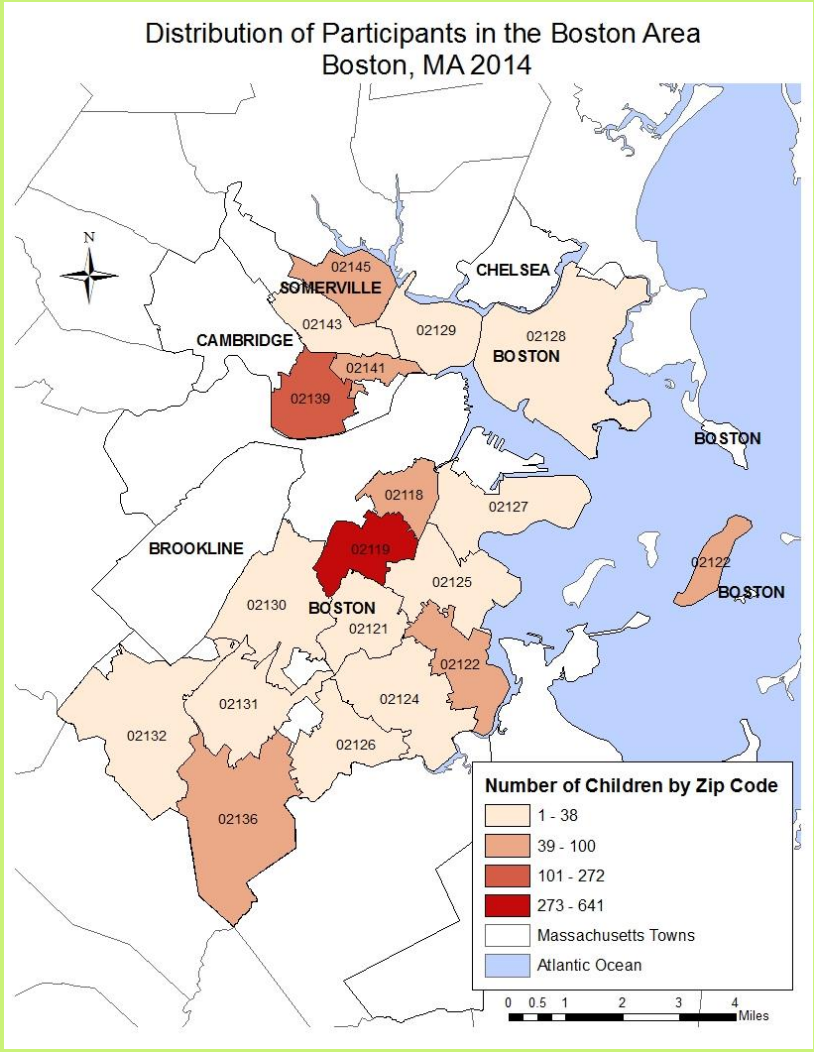
COMMUNITY CONCERNS
INFORMAL CONVERSATIONS

- Gardens will become re-contaminated so why bother raising beds and adding clean soil?
- *Recontamination of the upper micro-layer may occur, but this can be decreased by covering bare soil around the beds with mulch, straw, stone*

- We've heard that breathing the lead contaminated soil in the garden is just as important as ingestion.
- Pilot studies of simulated garden activity have measured negligible, if detectable PM/lead

- What happens if we don't wear gloves?

  Pilot studies on-going using hand-wipes to try to answer this question with data.



Boston Children Engaged in Gardening

Schools, camps and community gardens
Frequency? Glove Wearing? Hand Washing?

Age Group (Years Old)	Number of Children	% of Children	Hours Per Day	Days Per week
0 to 6	402	26.8%	0.6	1.0
7 to 12	917	61.2%	0.9	1.0
13 to 18	180	12.0%	2.6	3.3

Parikh, B., DiPerna, A., Wyner, Z., Heiger-Bernays, W. Manuscript in Preparation

GARDEN PLANNING & MAINTENANCE

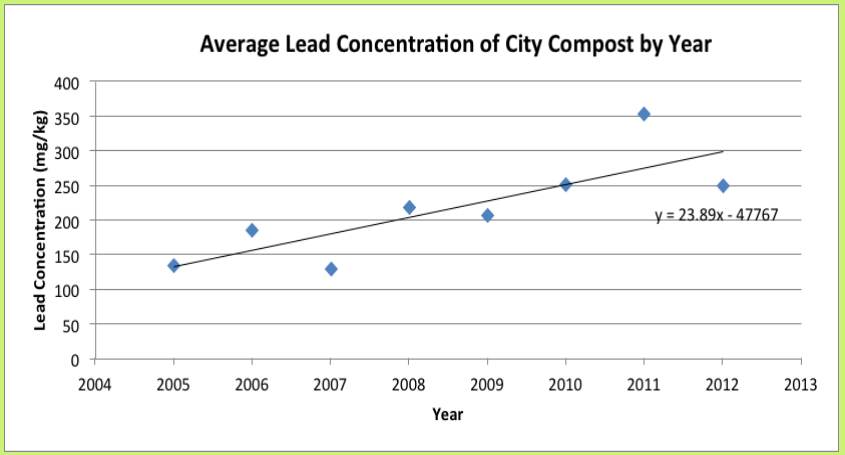
1. Budget
2. Historical review (multi-source)
3. Gardener Preferences
4. ***Sources of loam & compost***

5. WATER SOURCE

Build raised beds, cover old soil with [geotextile cap] and import soil for planting

Best Management Plans (BMPs)

BOSTON MUNICIPAL COMPOST IMPROVES IN QUALITY (2006-2015)



Annual Testing – Delivery to Gardens

LEAD (MG/KG) IN MULTIPLE COMPOSTS

NOT EQUIVALENT BIOAVAILABILITY

Lead (mg/kg) Measured in Multiple Compost Sources					
	Boston City Compost (mg/kg)		Source A	Source B	Source C
n	3	24	28	30	24
Mean	220	283	92	122	105
SD			20	30	25
Median	220	277	87	113	104
Maximum	240	413	134	198	152
Minimum	200	192	57	83	62
Source A; farm waste Source B; unknown Source C; food waste					

HOW ABOUT THE LOAM?

WHERE ARE THE KNOWLEDGE GAPS?

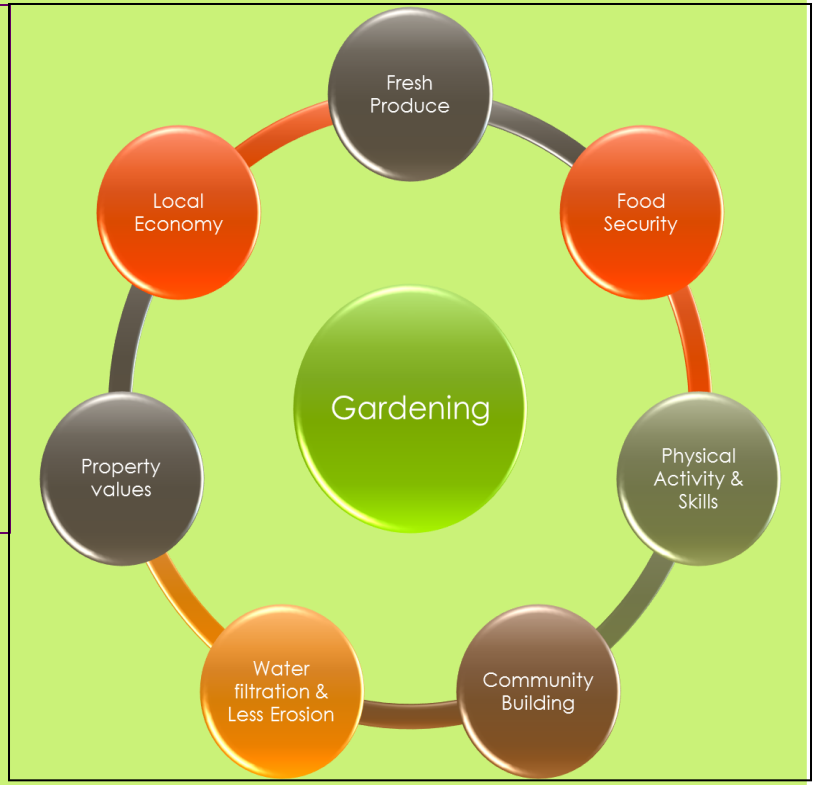
LEARNING FROM OUR PARTNERS

Risks

- Assume that young children are <u>always</u> in the garden;
  Good Assumption?
- *Assume 60-100% bioavailability;*
  NEED VALIDATED, INEXPENSIVE METHODS
- *No requirement for testing of incoming soils/composts*

Commercial farms are NOT held to same standards as urban gardens/farms

Benefits



SHOULD I CONTINUE GARDENING? YES, YES, YES

- Follow Best Management Practices to start the garden;
- Learn what's in your "clean" loam and composts;
- Develop meaningful approaches to deal with chemical pesticide use;
- Do not leave food/water for cats;
- Wash your hands!

LEARNING FROM OUR PARTNERS
NEW CHALLENGES & OPPORTUNITIES

WATER COLLECTED FROM STORM SEWER

Gardener to Gardener

Backyard Gardening
Biochar?

<u>Healthy Housing</u> –
Includes food gardens
Elder housing
Public housing

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Valerie Burns & Jeremy Dick

Food Corp (US Americorp)

The Food Project, Boston

Boston Community Gardeners

http://sites.bu.edu/sciencegardenercollaborative/

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ADDITIONAL RESOURCES

- Healthy Urban Gardens: Your Soil Health and You. The Collaborative for Health and Environment SRP Partnership Calls.
- Healthy Gardening in Urban, Brownfields and Superfund gardens