

A photograph of a green roof with various plants and a city skyline in the background. The green roof is in the foreground, featuring a variety of plants including yellow flowers, green grasses, and white flowers. The city skyline is visible in the background, with several tall buildings. The text "Trends in Philadelphia Green Roofs" is overlaid on the image.

Trends in Philadelphia Green Roofs

Stephanie Alarcon
10/23/2007

What is a Green Roof?

- Vegetated rooftop
- Contiguous vegetation, not just potted plants
- Short, herbaceous to thick shrubs, even trees
- Very popular in Germany

Benefits of Green Roofs

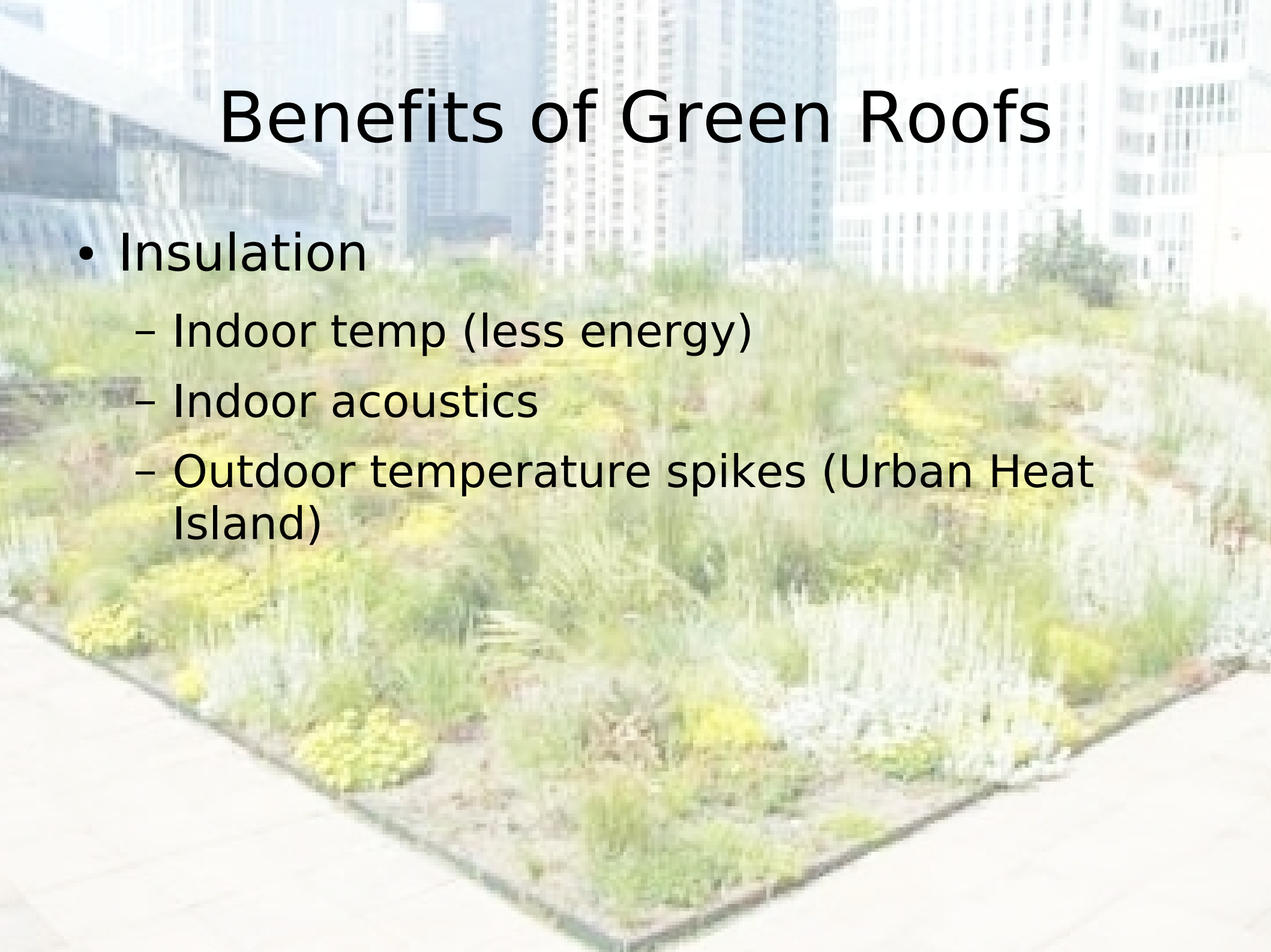
- Stormwater management
 - Less runoff, lower velocity
 - Water filtration
 - Helps with NPDES requirements!



Source: Penn State Green Roof Research

Benefits of Green Roofs

- Insulation
 - Indoor temp (less energy)
 - Indoor acoustics
 - Outdoor temperature spikes (Urban Heat Island)



Benefits of Green Roofs

- Re-vegetates building footprint
 - Protects roof from UV damage, extends life
 - Provides habitat
 - Pretty!



A family home in Wales

Source: <http://www.simondale.net/house/>

Structure: Major types

- Intensive
 - Thin medium, < 6 inches
- Extensive
 - Thicker, can support shrubs, trees
- Flat or Sloped
 - May need structures to prevent slide
- Modular
 - Containers

Structure: Modular

- Very simple to somewhat complex
 - Modular containers of plants



*Green Roof Blocks system with modular
2 x 2 aluminum planters.
Source: <http://www.apartmenttherapy.com>*

Structure: KISS

- Possible to “*Keep it simple, stupid*”
- Moisture barrier, plywood, early successional thin soil species
- Taught at Yestermorrow



Mill Creek Urban Farm

Source: Mac And Cheese Review

Structure: Components

- Extensive
 - Steel base
 - Insulation
 - Membrane
 - Root barrier
 - Drainage layer
 - Separation Layer
 - Growth medium
 - Foliage

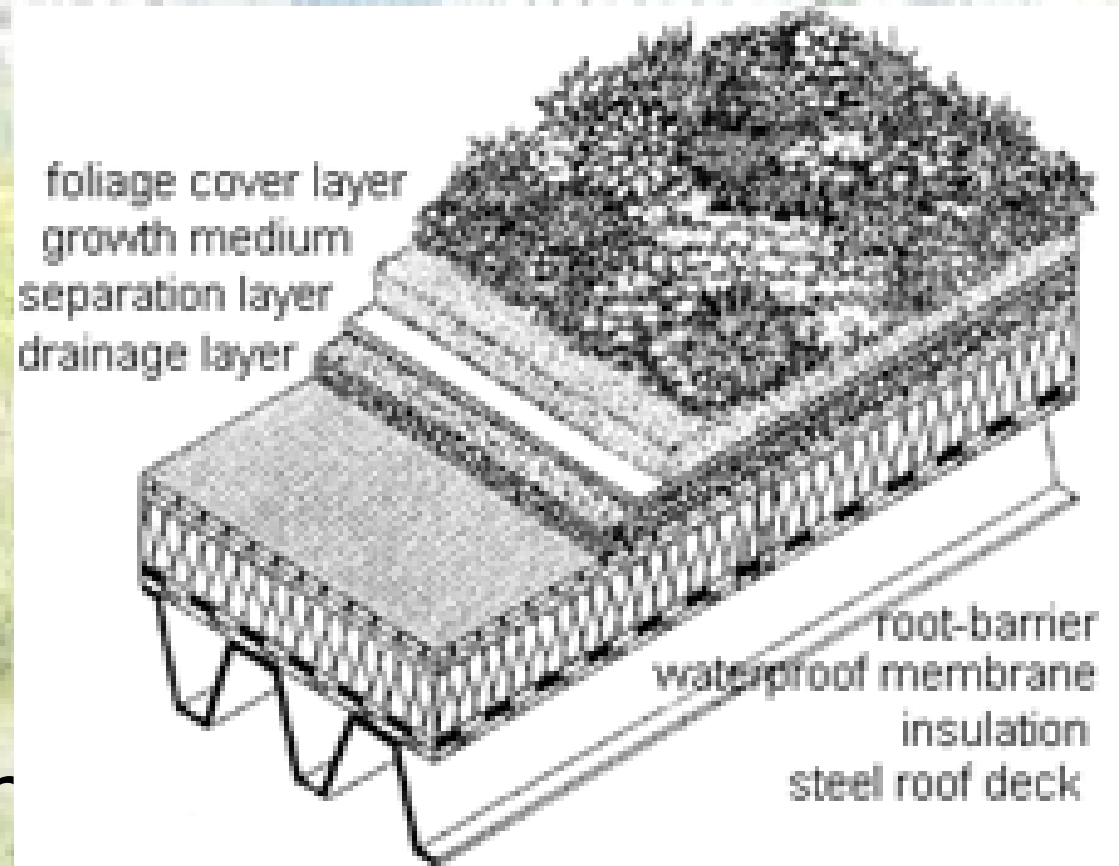


Figure 2. Generic Extensive Green Roof. Courtesy of Optigrün Intl. AG

Structure: Weight

- Weight:
 - Low: 5 (dry) / 17 (wet) pounds per square foot
 - High > 100 pounds
- What can roof support?
- What can walls support?
 - May need structural engineer

Structure: Layers

- Waterproofing
- Root barrier
- Separation layer
- Etc
- Insulation can do double (triple?) duty
 - Foil-backed hard foam is very effective

Structure: Growing Medium

- Not just dirt!
- Not just soil, either
- Low organic, high mineral content for best filtration
- Very light
- Extra high water retention qualities
- Perlite, expanded clay mixes
- Most mixes are proprietary

Structure: Plants

- Extensive: lots of variety
- Intensive:
 - Low growing
 - Hardy
 - Drought-tolerant
 - Native
- Ex: *Sedum*, herbs, wildflower



Source: <http://www.greenspec.co.uk>

PA Stormwater Draft BMPs

- My favorite document ever!
- Prepared by Cahill, Assoc. in West Chester, PA
- Chapter six: vegetated roof guide, helpful to do-it-yourselfers
- Check PA DEP website

Standards

- Exist in Germany
- In US, most use German standards
- American Society for Testing and Materials (ASTM): Green Roof Task Force
- National Roofing Contractors Association: Green Roof Systems Manual

Standards Should Consider:

- “Building technique (e.g. load bearing capacity, wind uplift protection, fire protection, temperature, noise protection, etc); and the roof technique (waterproofing material and installation, upstands, slope, drainage, etc.)
- Existing regulations and guidelines for garden and landscape architecture (e.g. soil and plants, lawn, seed mixture, upkeep and maintenance works, etc.).
- High buildings, according to the particular country, require various regulations regarding the security and fall protection on roofs.”

-International Green Roof Association

Costs per square feet

- Cool roof: \$1.25-\$1.50
- Rubber: \$4
- Green: \$8-10
- Clay/concrete tile: \$150-\$240
- Slate: \$300-\$600
- Sources: EPA, Lancaster County planner, E-How roofing guide

Savings and Benefits

- Increased roof life (2-3 times)
- Reduce stormwater burden
- Chicago City Hall has saved over \$25,000 since 2001
- Street on Green Plan Philadelphia, about South Philly:
 - “If 25 percent of the properties in the area installed green roofs, the cost would be \$220,000. The annual benefits however in energy savings and pollution reduction would be \$860,000, a net benefit of \$640,000.”

International Examples

- Germany leads
- Netherlands
- Canada
- Japan



The Netherlands



Schiphol International Airport, Amsterdam

Source: Michigan State University

Canada



Coast Plaza Hotel, Vancouver, BC

Source: Michigan State University

Chicago

- 2001: Pilot Program on top of City Hall
- 20,000 sq feet
- \$25,000 in utilities saved
- Bird habitat

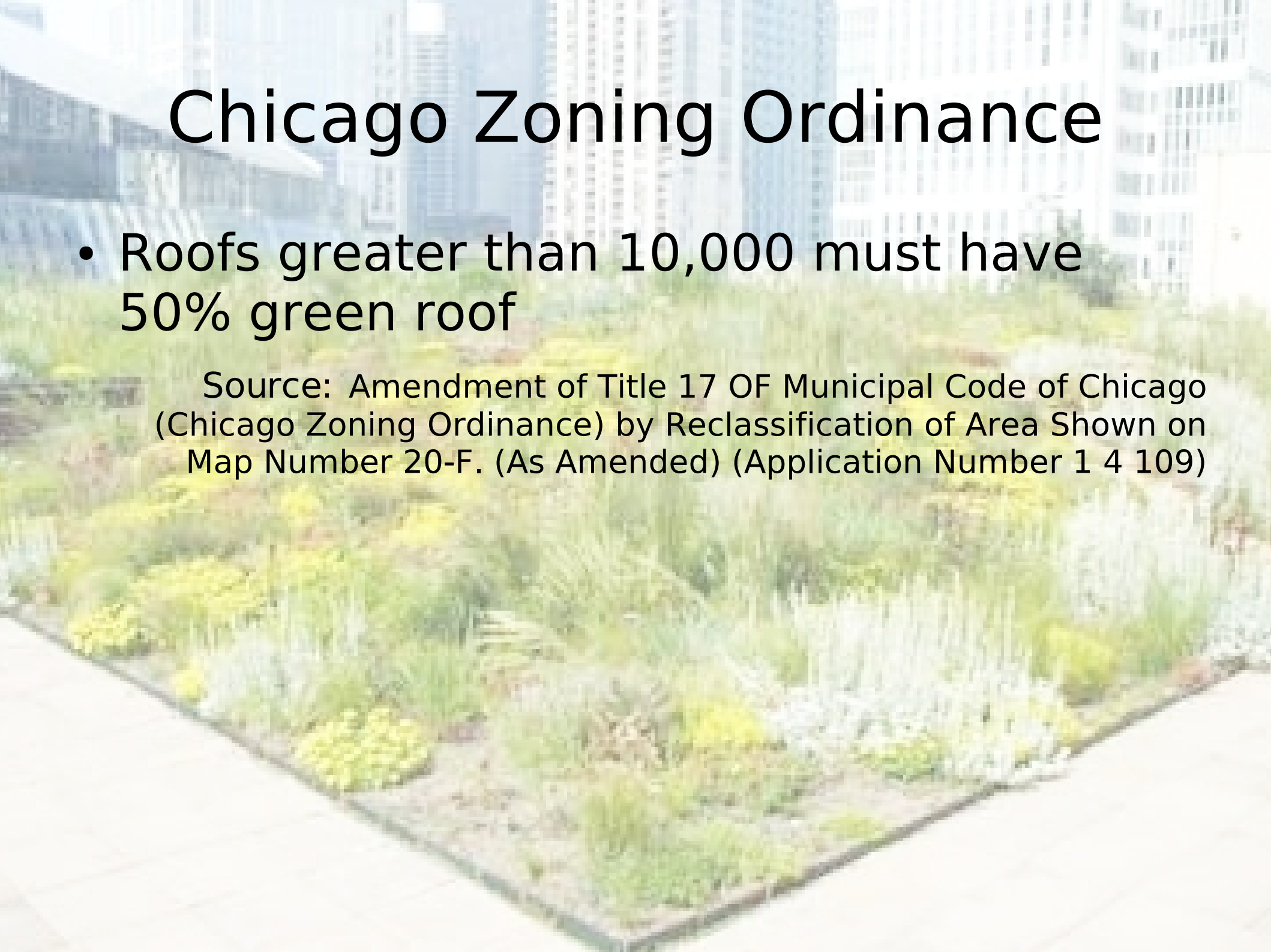


Source: Inhabitat.com

Chicago Zoning Ordinance

- Roofs greater than 10,000 must have 50% green roof

Source: Amendment of Title 17 OF Municipal Code of Chicago (Chicago Zoning Ordinance) by Reclassification of Area Shown on Map Number 20-F. (As Amended) (Application Number 1 4 109)



In Philly

- Roofscapes in leading provider
- Chicago City Hall
- Heinz Corporate Headquarters, Pittsburgh
- Fencing Academy of Philadelphia
- Schuylkill Education Center
- Swarthmore College
- Temple Ambler
- Friends Center

Friends Center

- Major green renovations: “Quaker Gray to Quaker Green”
- \$300,000 green roof, PA-DEP grant



Source: Friends Center Corp

Friends Center

- Peace, equality, integrity, simplicity
 - “The wars of the 21st century are predicted to be over fossil fuel reserves and water resources. These wars have already begun in various parts of the world including the Middle East. Continued overconsumption of energy resources is a 'seed of war that finds nourishment' in our way of living. By creating a fossil fuel free building Friends Center will remove this seed of war from our way of living.”

Residential

- Roofscapes no longer does less than 5000 square feet
- BioNeighbors: Cory Suter
- Bancroft Green luxury homes
 - Opening Spring 2008, \$560,000
 - Natural light, solar hot water, part green roof, dual flush, paperstone countertops, bamboo/mesquite floors, radiant heat, 1 year free PCS, 2 pods, 10 year tax abatement

Before City Council

- Jim Kenney – Bill 070072
- Green Roofs Tax Credit
 - 25% of cost of green roof up to \$100,000 against Business Privilege Tax
- City Controller Alan Butkovitz: heating and cooling cost savings estimated at 20%-30%
- Possible green roof requirement for big boxes?
- Rules committee hearing 10/30/2007

Conclusions

- Many options, many benefits
- Possible at residential scale
- PA-DEP grants and other incentives help
- Philly is in a good position to try
 - Stormwater needs
 - Roofscapes
 - Street and Rendell talking green