**Ecoroofs**

By: Akeberet Zemede, Andrea Garza, Anthony Melton, Brandon Kloosterman

---

**Introduction**

- Though still considered a fairly small city, Portland is on the cutting edge in the way of ecological design and development. Studies are currently being done across the United States to find the potential benefits and downfalls of Eco-roof design. Thus far studies have been successful and allowed for funding for future development.

- Portland has been pegged as one of just a few cities that could be a frontrunner in converting old home roofs to eco-roofs, as well as incorporating this design into new construction. Outlined throughout this presentation you will be shown incentives; both economic as well as ecological for incorporating this roof into your own life.

---

**Green roofs swing temperatures in urban jungles**

This article shows the benefits of building ecoroofs. Ecoroofs are a vegetated roof with a thin layer of soil that can help keep energy costs down while extending the life of your roof. These types of roofs are usually used in moderate climates because they need sun and water to survive. Ecoroofs have been in use in some countries for over 30 years. The main purpose for an ecoroof is to drain water, cool your roof and protect the roof structure from harm. These roofs consist of many layers but usually include plants, drainage, root barriers, and water barriers. They may cost more than the traditional roof but they provide an attractive alternative that helps the environment at your house and as a city by creating more habitat and they slow and store storm water runoff allowing city sewers to cope with added capacity.


Brandon Kloosterman

---

**Benefits of making eco-roofing more widespread**

This article outlines the benefits of making eco-roofing more widespread. Portland is discussed as one of three main cities taking advantage of this design. Experiments are currently being done across the country, which are showing dramatic advantages to this system of living. Included as an advantage is the retention of storm water within the roof itself, which lowers the amount of storm water sent to treatment facilities. The types of plants chosen for green roofs vary based on which plants are native as well as how they withstand heavy rain as well as sun conditions. There is one eco-roof in particular in the Bronx, which has been tested for the last two years. It is doing so well that future research has been funded for the development of more eco-roofs in large urban areas.


Andrea Garza
New options to improve water quality

This article reports new options for storm water and improving water quality by increasing installation of green roofs. Storm water runoff was identified by the U.S. EPA as one of the major sources of water quality. It was emphasize use of best management practices (BMPs) to improve runoff quality developed by EPA’s National Pollutant Discharge Elimination System (NPDES). Green roofs provide peak flow reduction of rooftop runoff and roof surface temperature, it lowers building heating and cooling costs. Also, green roof provides hydrologic control of small, frequently-occurring storms and their effects on ecosystems downstream.


Akeberet Zemede

Why the amount of rain runoff is important to us

• 3 billion gallons of combined sewer overflow are released into the Willamette River each year.
• 70% of all Portland homes are within 20 miles of the Willamette River.
• Runoff is a great threat. Runoff can carry toxins from one place to another.
• If we can reduce the amount of runoff from our rooftops then the amount of polluted water reaching the watersheds is greatly reduced.
• Since in Portland our sewage mixes with our rainwater overflows into the river are common place.
• The less amount of water flowing through illegal dumpsites and other contaminants the safer it is to use our river. 99% of historic Salmon runs are gone due to the toxicity and warmth of the river due to sewage and runoff.
• Fish have high levels of mercury and can be unsafe to eat.
• Several times a year an advisory is sent out stating high levels of sewage have been released into the river and to stay away from those areas.
• Our river is dying and ecoroofs are a way to help keep it healthy.

The Willamette River

• All Portland watersheds eventually flow to the Willamette River
• All Portlanders live in one of five watersheds

http://www.mchealth.org/envirosport/solidwaste.pdf
What is an ecoroof?

- An ecoroof is a lightweight, low-maintenance vegetated roof system used in place of a conventional roof. Ecoroofs fall into two basic design categories: intensive and extensive.

Intensive

Intensive ecoroofs are soil base ranging in depth from 8 to 24 inches with a saturated weight increase between 60 to 200 lbs/sq. ft.; allows for a more diverse plant selection that can include trees and shrubs but can be more demanding with maintenance requirements, especially watering.

Extensive

Extensive ecoroofs use a shallower layer of media usually between 2 to 6 inches with a weight increase of 16 to 35 lbs/sq. ft. when fully saturated. Extensive ecoroof growing media includes a mineral base of sand, gravel, expanded clay or slate, organic matter and some soil. Plants must be low maintenance and hardy as they typically are only watered and fertilized until they are well established.

What are the benefits to an ecoroof?

- It reduces the overall amount of rain water runoff of your roof. 37 inches of rainfall produces 80 to 100 billion gallons of storm water per year in the city.
- It insulates your house. Keeping energy usage down.
- It improves outdoor air quality. Dirty air can cause disease and respiratory illness.
- It increases habitat. More habitat allows biodiversity.
- It looks cool.
- It lasts twice as long as a conventional roof. Saving you money and keeping trash out of the landfill.
What are the costs?

- The cost of installing an ecoroof can vary but averages $10-$15 a square foot for new installation and $15-$25 a square foot for re-roofing.
- The cost includes all materials and labor.
- Conventional roofing costs $10-$15 for new construction and $3-$9 for re-roofing.

Who can use an ecoroof?

- An ecoroof can be used on existing roofs or in new construction
- The roof must be flat or at a pitch no greater than 40 percent

Locations in Portland

- Hawthorne Hostel 3031 SE Hawthorne Blvd
- Hamilton West Apartments SW 12th and Clay
- Buckman Terrace Apartments NE 16th and Sandy
- Jean Vollum Natural Capital Center 721 NW 9th Avenue
- Native American Student and Community Center 710 SW Jackson St
- Columbia Boulevard Treatment Plant 5001 N Columbia Blvd
- Multnomah County Building 501 SE Hawthorne Blvd
- B&O Building NE Washington St and 2nd Ave
- People’s Food Co-op 3039 SE 21st Ave

Hawthorne Hostel

- The most visible ecoroof in Portland. Visible from

www.portlandhostel.org
Hamilton West Apartments
- Built in cooperation with the City of Portland and the Housing Authority of Portland.
- The west half of the ecoroof has 4 to 5 inches of top soil and the east half has 2 to 3 (they wanted to know if it made a difference in runoff flows).
- There are two drains (east and west) with flow meters to calculate runoff.
- This is the only ecoroof the city is monitoring at this time for water quality.
- Almost an inch of topsoil was lost to wind erosion.
- Portland’s first ecoroof installed September 1999.

Buckman Terrace Apartments
- It has 2 ecoroofs one is 1500 square feet and the other is 750 square feet.
- Both ecoroofs were planted with native plants (Oregon Sedum, various wildflowers and native grasses) and most plants come back each year without reseeding.
- The ecoroofs have the appearance of a Midwestern American Prairie.
- During winter storms the ecoroofs are able to absorb rainfall and release runoff more slowly than a impervious surface.

Multnomah County Building

What goes into making an ecoroof?
- Structure stability
  - It is necessary to make sure the structure can handle the added weight
- Waterproof membrane
  - So water cannot damage the underlying roof
- Root barrier
  - May be needed depending on what product is used as the membrane
What goes into making an ecoroof?

- **Drainage layer**
  - May be needed depending on roof size and shape to relieve excess water
- **Soil or other growth medium**
  - This is so your plants will grow
- **Plants**
  - Drought-tolerant, low maintenance, fire resistant, and local vegetation
- **Gravel ballast**
  - May be needed around vertical roof elements like pipes and vents.

What goes into making an ecoroof?

- **Drains**
  - As with traditional roofs excess rain runoff needs to be safely drained from the roof. Preferably into a rain collection system like a cistern or into planters and swales
- **Irrigation**
  - May be needed during extreme conditions. Can be done with simple methods like soaker hoses, spray heads or hand watering.

Maintenance needs

- **Access**
  - In order to facilitate repairs access to the roof is necessary
- **Fire safety**
  - Some plants may be a fire hazard and must be water mowed or maintained for safety
- **Plants**
  - The plants should be checked on at least twice a year to insure proper coverage and to make sure drains aren't being blocked/plugged. Weeding may also need to be done.
- **Replacement**
  - They typical life of an ecoroof is 40 years.

Additional needs for an ecoroof?

- **City permits *existing homes***
  - A structural engineer is needed to prove the structure is sound enough for the weight. Then a building permit is needed as well as possible alteration of downspouts or other piping, requiring a plumbing permit
How to get people to go green

• Build test projects
• Leverage resources: DEQ, EPA, community volunteers
• Provide technical assistance to owners, contractors and consultants.
• Presentations to developers, consultants, and conferences.
• Provide Tours of ecoroofs, rain gardens and other storm water projects.
• Partner with the public, academia and business to promote understanding, interest, and improvement.
• Provide financial incentives; grant funds awarded since 1998.

Incentives

• Portland, Oregon Ecoroof incentive program
• History:
  1996 - First ecoroof installed on a residential garage
  1999 - Ecoroof is officially recognized as a storm water management technique
  1999 - Funding made available, monitoring and evaluation
  2001 - Incentive introduced - floor to area ratio bonus

Incentives

• Section 33.510.10 of the Zoning Code
• 10. Eco-roof bonus option. Ecoroofs are encouraged in the Central City because they reduce storm water run-off, counter the increased heat of urban areas, and provide habitat for birds. An eco-roof is a rooftop storm water facility that has been certified by the Bureau of Environmental Services (BES). Proposals that include eco-roofs receive bonus floor area. A proposal may not earn bonus floor area for both the eco-roof option and the rooftop gardens option; only one of these options may be used:
  a. Bonus. Proposals that include eco-roofs receive bonus floor area as follows:
    (1) Where the total area of eco-roof is at least 10 percent but less than 30 percent of the building’s footprint, each square foot of eco-roof earns one square foot of additional floor area.
    (2) Where the total area of eco-roof is at least 30 percent but less than 60 percent of the building’s footprint, each square foot of eco-roof earns two square feet of additional floor area.
    (3) Where the total area of eco-roof is at least 60 percent of the building’s footprint, each square foot of eco-roof earns three square feet of additional floor area.

Incentives

• Watershed Stewardship Grant Funds $35,000 available annually.
• Green Investment Grant Funds: $500,000 available annually.
• Storm water Drainage Fee Discounts
• City Bureau of Environmental Services and Office of Sustainable Development provide technical assistance at no charge.
Conclusion

The City of Portland has undertaken the Big Pipe project to deal with the combined sewage overflow that is created during heavy rains. This will only work if we manage our storm water runoff better. By building ecoroofs and disconnecting downspouts we can slow down the amount of water that reaches sewers by letting water absorb into the ground. As the population grows and more impervious surfaces are added to Portland ecoroofs offer the best solution to building a viable ecosystem in a urban setting.

Ecoroof contacts

<table>
<thead>
<tr>
<th>Ecoroof Program (Bureau of Environmental Services):</th>
<th>503-823-7267 or 503-823-7740</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stormwater design techniques (Bureau of Environmental Services):</td>
<td>call 503-823-7740 or <a href="http://www.cleanrivers-pdx.org">http://www.cleanrivers-pdx.org</a></td>
</tr>
<tr>
<td>Green building approaches (Office of Sustainable Development):</td>
<td>call 503-823-7222 or <a href="http://www.sustainableportland.org">http://www.sustainableportland.org</a></td>
</tr>
<tr>
<td>Building code and permitting information (Office of Planning and Development Review):</td>
<td><a href="http://www.opdr.ci.portland.or.us">http://www.opdr.ci.portland.or.us</a> or call 503-823-7310 (for building code information) or 503-823-PLAN (for zoning information)</td>
</tr>
</tbody>
</table>

References

http://www.lgc.org/freepub/PDF/Land_Use/presentations/yosemite2006/adams_yosemite06.pdf