GREENING MEASURES FOR HAWAII’S HERITAGE HOMES

CLASS 2: WATER

MASON ARCHITECTS

ROTH ECOLOGICAL DESIGN INTERNATIONAL LLC
A membership-based, statewide non-profit organization, Historic Hawaiʻi Foundation encourages the preservation of historic buildings, sites and communities relating to the history of Hawaiʻi.
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Each session qualifies for 1.5 AIA/CES (HSW). AIA Honolulu is the registered provider.
OUTLINE OF TODAY’S CLASS

- Welcome and Overview (5 min.)
- Global-to-Local view of water (10 min.)
- Conservation, recharge, reuse, examples (15 min.)
- Overview of character-defining features (5 min.)
- Water conservation & design (15 min.)
- Fixtures, materials, permeability (10 min.)
- Practical actions (10 min.)
- Discussion (20 min.)
Lauren Roth Venu
Founding Principal and President, Roth Ecological Design International

Lauren is considered a leader in the field of sustainable water resource management and green infrastructure design. She specializes in providing strategic solutions to enhance water security and restore ecological services to elevate the design and build resiliency. Her role is often to serve as a bridge between urban planners, civil engineers and landscape architects to develop sustainable, ecologically-based water infrastructure solutions. She is also actively engaged in water policy development within Hawaii and has served on a variety of committees and advisory groups over the last decade for the state, city and county of Honolulu, and non-profit groups to support water resiliency measures.

Some of Lauren’s accolades include: a Region 9 Environmental Protection Agency awarded project (2005); being named one of the “Top Forty Under Forty Business Leaders” by Pacific Business News (2014); and named by Pacific Edge Magazine (2015) as an “Emerging Leader in Design.”
Glenn E. Mason, FAIA
President, Mason Architects, Inc.

Glenn has extensive experience adapting historic buildings to meet modern functional and energy requirements, focusing on the preservation of the character-defining features of historic buildings. He meets the Secretary of the Interior’s Professional Qualifications standards for Historical Architect and has been the principal in charge of award-winning preservation projects.
GOALS OF THE SERIES

- To share measures homeowners can implement to save energy, conserve resources and integrate respectfully with local culture and natural geography in a way that is harmonious and compatible with a property’s historic character and features.
- To help historic homeowners reduce their homes’ carbon footprint while retaining the properties’ historic integrity.
- To provide information and knowledge to help owners preserve the historic property; save energy, money and resources; and contribute to the natural health and vibrancy of their neighborhoods.
- To encourage historic homeowners to approach maintenance of their properties through the lens of sustainability in order to provide affordable and accessible sustainability tools and techniques to incorporate into their preservation maintenance plans.
Handout for developing a maintenance plan

- Green tips
- Inspection Checklist
- Template for creating lists of:
  - Character-defining features
  - Key actions
  - Timing
- References/Additional Resources
SUSTAINABLE WATER MANAGEMENT
Climate Change

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Hurricane Irma is now the strongest hurricane ever recorded in the Atlantic

Hurricane Irma has already reached the Caribbean, and will possibly hit Florida by the end of the week. The storm grew fast and furiously. In...

Katherine Ellen Foley  September 06, 2017

Hurricane Maria 'probably the single biggest hurricane catastrophe in the history of the US,' Puerto Rico governor says

By JULIA JACOBO and JOSHUA HOYOS  •  Sep 27, 2017, 6:24 PM ET
Tropical Storm Darby (2016)

THIS IS WHAT OAHU'S WAIMEA BAY LOOKED LIKE AFTER TROPICAL STORM DARBY HIT

Image credit: Honolulu Star Advertiser

Image credit: 6abc Action News
20yr storm is now every 3-5yrs!
Storm drains backing up at high tide.
"Rainfall Changes in Hawaii During the Last Century", Diaz et al
Hawaii Water Conservation Plan, 2013

Note: Data represents only the users who supplied water usage data. The total agricultural use is estimated at more than 350 mgd and the total golf course demand is estimated at 53 mgd.

FIGURE 4-1
Statewide Reported Water Usage in million gallons per day
*Agricultural uses includes surface water and some brackish ground water
2012 Groundwater Sustainable Yield

Hawaii Commission of Water Resource Management
Hawai`i Fresh Water Initiative: Create an additional 100 MGD of water by 2030

Conservation – Increase Water Efficiency (e.g. reduce residential use per capita by 25 gallons per day)

Reuse – Double the volume of reuse

Recharge – Stormwater back into the ground (30 million gallons per day)
CONSERVATION

- WATER EFFICIENCY: Increase by 8% by 2030
Conservation: Increase H2O Efficiency

PRE-1980s TOILET
5.0+ gallons per flush

HIGH-EFFICIENCY TOILET TODAY
1.28 gallons per flush

REPLACING FAUCETS AND AERATORS

WATERSENSE MODELS can save 700 gallons per year

EQUAL TO 40 SHOWERS worth of water
Conservation: BWS Resources

http://www.boardofwatersupply.com/conservation

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Conservation: LICH Resource for Irrigation

RECHARGE

- INCREASE STORMWATER RECHARGE WITHIN KEY WATERSHEDS
- GOAL OF 30 MGD INCREASE IN GROUNDWATER

REUSE

- DOUBLE THE VOLUME OF REUSE BY 2030
- GREYWATER
- RECYCLED WATER
What is stormwater?
“Stormwater is water that originates during precipitation events. When rain hits a surface such as a roof, road, or other surface it becomes stormwater.”

What is stormwater runoff?
“Stormwater runoff is excess precipitation that is not retained by vegetation, surface depressions, or infiltration, and thereby collects on the surface and drains into a surface water body.”
Why do we care?

95 streams, 21 estuaries, and 56 bays impaired (EPA 2006)

- Heavy metals
- Fertilizer
- Pesticides
- Oil
- Sediment
- Cesspool/leachfield Leachate
- Flooding
- ....
Stormwater Capture/ Recharge
What is a “Rain Garden”?“

“A Rain Garden receives water from impervious (hard) surfaces such as rooftops, sidewalks, driveways and patios. The shallow depression of the garden holds the water so it can slowly infiltrate back into the soil as the plants, mulch and soil naturally remove pollutants from the runoff.”
Rain Garden Checklist

- Site Planning
- Slope
- Soils that drain
- Slopes that are <12%
- Enough area to handle rainfall events
- Plants that can tolerate wet & dry conditions
- Plants that “fit” within the overall landscape
- Overflow? What % of rainwater will it recharge?
Rainwater Catchment
**Integrated Landscape and Buildings**
Green screens, planters, and other elements can provide landscape on building facades, helping to cool buildings and the urban environment and increase biodiversity.

**Eco-Block Development**
Decentralized water and energy infrastructure while building community resiliency and reducing the development’s carbon and water footprints.

**Permeable Paver**
Stormwater runoff percolates through or around pavers to either infiltrate or be collected and directed to storm drain line. Added depth of subbase can retain stormwater.

**Permeable Concrete/Porous Asphalt**
Stormwater percolates through pavement to either infiltrate or be collected and directed to storm drain line. Added depth of subbase can retain stormwater.

**Green Roof**
Provide cool roof and enhanced amenity to residents, employees, and visitors.

**Disconnected Downspout**
Collects and treats rainfall from rooftops.

**Constructed Wetland**
Engineered wetlands for stormwater or wastewater treatment and habitat restoration.

**Bioretention/Green Infrastructure**
Captures and treats stormwater runoff with natural processes.

**Boardwalk**
Allows stormwater to percolate through boards. Allows different look and provides structural support to bridge over green infrastructure or stormwater runoff storage areas.
Stormwater: Rainfall Resource

Rainfall Atlas of Hawai'i

Mean Monthly Rainfall (in)

Mean Annual Rainfall: 40.56 in

Mean Monthly Rainfall (in)

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GREYWATER
Greywater Shower Garden: Kalepolepo, Kihei, Maui

© Roth Ecological Design Int.
Reuse: Wastewater Treatment & Recycled Water
Distributed Infrastructure & Water Resiliency

= Balancing a development’s annual water demand through efficient use, capture, reuse and recharge of water resources
Net-Zero Water: Public Utilities Commission, San Francisco, CA
Eco-Block: Hassalo on 8th, Portland OR

Hassalo on 8th
Portland, Oregon (block development)

Building facts:
- (3) buildings in a block layout
- 657 residences (with commercial spaces on ground floor)
- 50,000 square feet

Green building features:
- Green roof (Eco-roof garden)
- Onsite wastewater treatment using trickling filters and constructed wetland technologies (45,000 gallons per day). Water is reused for flushing toilets, irrigation for the block’s landscape, and for cooling tower.
- 60,000 gallon cistern collects rainwater. Collected stormwater used for the block’s water feature.
- Over 1,000 bike parking stalls with access to bike valet and repair.
- EV charging stations.
- Composting
- Located next to Portland’s light rail system.
Emory University: ~ Neighborhood Scale

Emory University Water Hub
Atlanta, Georgia (neighborhood scale)

Building facts:
- 631 acres (neighborhood scale)
- More than 70 buildings

Green building features:
- Stormwater capture and use (saves 800,000 gallons per year of potable water)
- Greywater reuse (saves 750,000 gallons per year of potable water)
- 400,000 gallons per day of wastewater “scaping” from main trunk line. Treatment includes moving bed bioreactor (MBBR) and constructed wetland technologies. Recycled water is used for cooling, toilet flushing, and steam plant (146,000,000 gallons per year of potable water savings).
Plumbing Code Updates: Green codes become the new base code

- Water efficient fixtures
- Nonpotable reuse back inside buildings!
  - Rain water catchment
  - Stormwater reuse
  - Recycled water
Questions?

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SUSTAINABILITY IMPROVEMENTS AND PRESERVATION

- Understand CHARACTER-DEFINING FEATURES
- Explore ALTERNATIVES
- Don’t let the salesman determine the solution
- If all else fails, the change should (must?) be REVERSIBLE
Character-Defining Features

- Overall setting including landscaping
- Form, including building and roof shape, lanais
- Fenestration
- Exterior materials and details
- Secondary features such as fireplaces, pent roofs over windows, etc.
- Interior characteristics: Spaces, materials, design features, indoor/outdoor relationships

Understand the hierarchy of importance of character-defining features
WATER CONSERVATION

This is about using less and capturing more
Catchment
If you want to get more serious
If you want to get REALLY serious . . . . .
If you want to capture water you need gutters

The gutter you choose should depend on the roof edge design.
Roof Edge Design

Do you have exposed rafter tails?
Roof Edge Design

Or a Fascia?
Gutter Hanging

Hanging a Round gutter.
Materials

Don’t Get Hung Up on Copper

Copper corrodes due to tannic acid and in high salt environments. So do aluminum and galvanized steel.

But what is the budget and what is the life of the roof?

PVC lasts in corrosive environments but is rarely compatible with historic designs.
Using Less

Water conserving fixtures and appliances

Replace or retrofit?
Old fixtures are not easily modified to reduce flow
Period-appropriate modern fixtures
Not period-appropriate
Let Water Get Into the Ground

Not this, please.
Grasspave
Concrete grass pave

But be aware of limitations
If you need to pave use permeable materials.
DISCUSSION
GREENING MEASURES FOR HERITAGE HOME SERIES 2018

- April 9: SIGNIFICANCE & SUSTAINABILITY: What makes your historic home unique & sustainable measures to green it
- April 23: WATER: Water conservation, storm-water management and on-site water reuse
- May 7: ENERGY: Renewable energy & conservation: solar, wind, lighting, appliances, energy incentives
- MAY 21: WINDOWS: Sustainability measures to maintain/restore your historic windows
- JUNE 4: LANDSCAPE: Creating a sustainable & culturally-sensitive landscape