

EPA Sustainable Materials Management Web Academy

**After Disaster:
Deconstruction, Rebuilding and
Resilience Lessons from Hurricanes
Katrina and Irma**

March 5, 2020



**PLANNING
FOR
NATURAL
DISASTER
DEBRIS**



April 2019
EPA 820-P-19-001

<https://www.epa.gov/homeland-security-waste/guidance-about-planning-natural-disaster-debris>



Our Speakers:



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dba Material Reuse
Washington, DC



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Owner, Salvage Works
Portland, OR



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Deconstruction and Reuse: Before and After



5 March 2020
Brad Guy,
Architect, AIA
Material Reuse

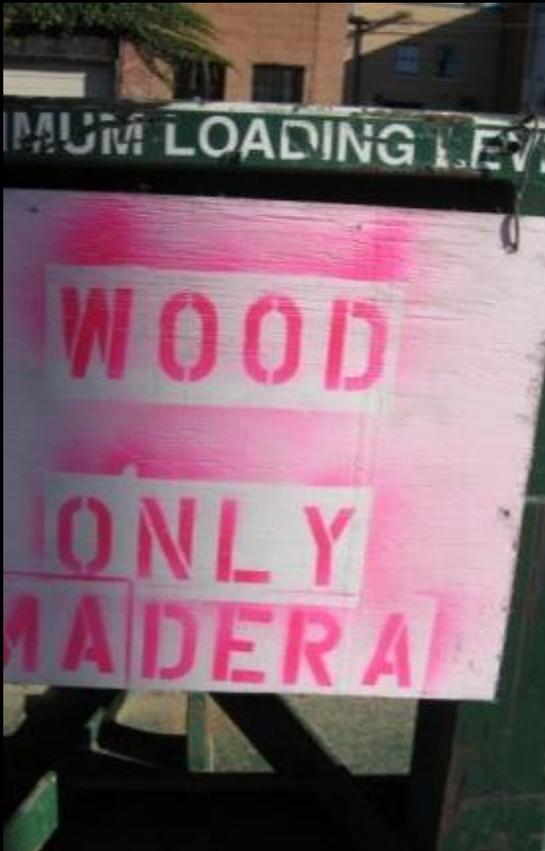
Disaster debris



It's not waste until you
throw it away!

- A lot of good materials to be extracted, before the event and before demolition
- Waste and contamination: environmental and human health impacts need to be managed

Sustainable materials management



- Using materials management ‘hierarchy’ to achieve resource conservation
- Includes all or any combination in **cascading sequence** - **reduce, reuse, recycling, composting**, energy recovery, disposal to landfills

Deconstruction / reuse



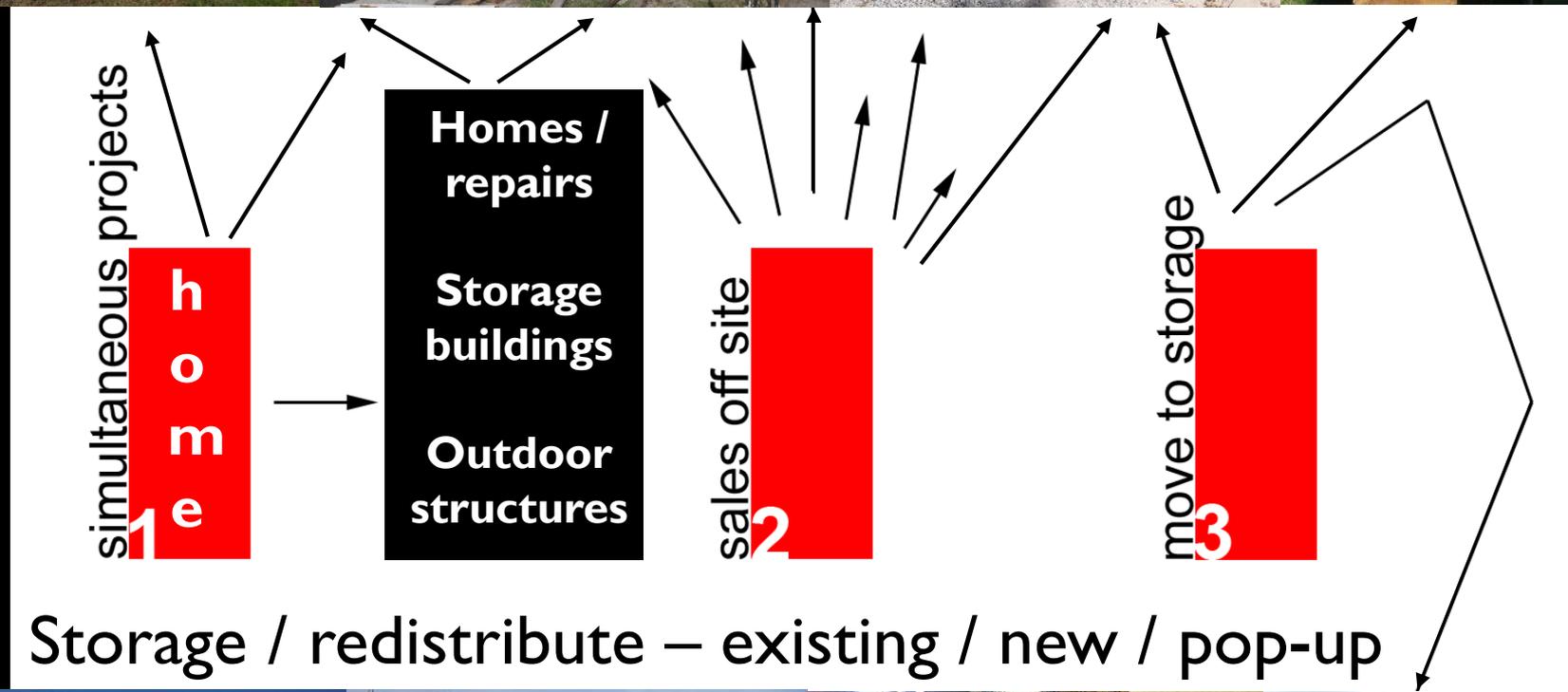
- Manage all materials
 - Remove hazards
 - Avoid hazardous dust generated by demolition
 - **Generate local resources for local re-building**
- Avoid new materials and embodied energy of manufacturing
- Mitigate import of rebuilding materials
- Planning and recovery is the time for deconstruction

Deconstruction defined



- The selective dismantlement of buildings materials **primarily for reuse**, secondarily and/or recycling/composting
- **Last on, first off (LOFO)**
- To generally follow the reverse of assembly or construction
- Opposite of demolition to reduce materials for disposal

Reuse



Alachua County, FL



- 1970's home, modern materials, graded lumber
- Community Rating: Flood plain buy-out
- “Mitigation” by deconstruction
- Early use of efficient “panelization”
- Safety – working less at height, more on the ground

“Reclaimed” housing



- New Section 8 home designed and built using the reclaimed lumber
- Design predicated on reclaimed materials
- **Current building code allows reuse under alternative materials and methods**
- OR & WA building codes explicit use of undamaged reclaimed lumber for structural purposes
- Lumber stayed in the community not in the landfill

Hurricane Katrina



- Deconstruction in MS and NOLA
- Range of house types and materials - historic to contemporary
- Demolition was difficult if not impossible because of site conditions
- Some sites very amenable to deconstruction materials processing

Community “triage”



Addressing traumatic context without “making it worse”

- Avoid spreading hazardous pollutants from demolition
- Triage to preserve in selective manner, not wholesale destruction and waste
- Involve community perspective in recovery & rebuilding

Materials / hazards



Deconstruction manages hazardous materials better than demolition

- Asbestos-containing materials
- Lead-based paint (LBP)
- Biological / chemical
- Gulf Coast Formosan termite quarantine zone
 - Must keep local
 - Treat for biological: bleach, borates, kiln-drying
- Many materials are not LBP

De-raising



It was a process of developing people and infrastructure -- the “reuse community.”

Supply chain



- Materials “supply” into rebuild logistics
- Can replace new materials if stored and made available
- Conserves natural resources and embodied energy

Integration

- Assessment
- Designing the deconstruction
- Experts and training
- Logistics for materials
- Job processes
- Tools
- **MATERIALS FLOW**



- 2x4 WOOD
DENAIL, STACK ON BLOCKS,
NAIL FIRST SHEET (OR LAYER
OF BOARDS TO BLOCKS).

- ROOF RAFTERS (2x6'S)
DENAIL, TRIM TO LENGTH, STACK ON
BLOCKS, NAIL DOWN, BUNDLE,
LOAD OUT

- VINYL SIDING
SEPERATE BY LENGTH,
BUNDLE, WAIT FOR MORE
[OUT OF THE WAY]

- SHORT 2x4'S
BUILD BOX

- ALL OTHER 2x4'S
DENAIL, SORT BY LENGTHS
4', 6', 8', 10', 12', etc
TRIM TO LENGTH (ex 6'+3" = 75")

① USE AVAILABLE
MATERIALS
- this board
- truck sides
- bar for short pieces
- out of hollow-core doors
- ex. shower stall
for blown-in ins.

② BE FLEXIBLE
w/ LOCATION OF CAN,
DENAILING STATION



Working with partners



- People needed places for their stuff -- SHEDS
- Building Goodness on the ground in Pearlington, MS
- Architects and contractors performing community service

Pearlington sheds



- Everything is reclaimed except the metal roofs
- Remember green and white porch decking from Ocean Springs, MS, deconstruction?

Building reuse infrastructure



- Needed in proximity to highest risk areas
- Leverage existing infrastructure
 - Vacant strip malls, warehouses, manufacturing plants, anywhere with a roof
 - Tools / racks, etc.

It's about people



Reuse create a connection between before and after

Using what we have



- Making whole by reuse
- Need framework to support

Thank you !
Brad Guy
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***After (and Before) Disaster:
Deconstruction and Reuse as a Foundation for
Rebuilding Social and Ecological Integrity in
Coastal/Flood Plains***

US-EPA Webinar

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- Case Study: Deconstruction and Reuse Benefits
 - Voluntary Buyouts and the Effect on Remaining Neighborhoods
 - Vacant Lots and Land
- Sea Level Rise, Intense Storms and Day-to-Day Stormwater Management
 - Redesigning or Blending the Gradient from Remaining Neighborhoods to Redesigned Floodplain

Praxis Design/Build Studio: Transforming Blighted Housing into Valued Community Environmental Amenities

Spring 2017

With economic, demographic and environmental changes, many neighborhoods are seeing an increase in abandonment of housing. Blight in a neighborhood is often considered solely from the economic standpoint of property value impact and cost of demolition. But value can be defined across categories of understanding, from the economic to the social and environmental. Alternative landscape practices can form the connections across categories to change negative value (or costs) into social, environmental and economic value. Deconstruction and reuse in green infrastructure are such practices – they transform abandoned structures and lots into productive and beautiful community assets. The cost of demolition is reinvested in workforce training and in green infrastructure building that are realized as assets to the community in the socio-environmental benefits of skill-building, cleaner water, reduced flooding, and vegetated gathering space.



Street
House
Lot
Edge
Wetland
Water

Deconstruction
Salvage
Rebuilding
Green Infrastructure
Restoration



- images top to bottom:
- 1: Deconstruction
 - 2: Design Build Parks
 3. apartmenttherapy.com
 4. Grijnsen International
 5. Biohabitats
 6. Rutgers Water Resources Green Infrastructure Guidance Manual
 7. The_Steel_Yard-Klopfer_Martin_Design_Group
 - 6: Willow Patch Restoration Planting, Cazenovia, NY
 - 7.:<http://www.prairieresto.com/blog/busy-restoring-native-plant-communities-scandia-mn/>
 8. Massachusetts Bays Program

Case Study:
Hurricane Irene
8/27-30/2011

Buyout House:
53 Lakeshore Dr.
Lake Hiawatha
(Parsippany) NJ

Vacancy:
6 Years
(Time for
deconstruction &
adaptive design)

Project:
Rutgers
Landscape
Architecture
Design/Build
Studio

Date:
Spring, 2017





During storm



24 hours after storm



House vacant 6 years after storm:

- ***Illicit use during vacancy troubled neighbors***
- ***Visual blight detracted from neighborhood***
- ***Maintenance and legal burden for township***



Stormwater management potential:

- ***Site is lower than roadways***
- ***Bypass inlet possible***



Safe work environment:

- ***Standard protective gear***
- ***Training by OSHA, Reuse Consulting, Inc., Professors***



Sorting and grading materials:

- ***1/4 donated to local NGOs***
- ***1/4 used on site to build park amenities***
- ***1/2 used at Rutgers for student projects***



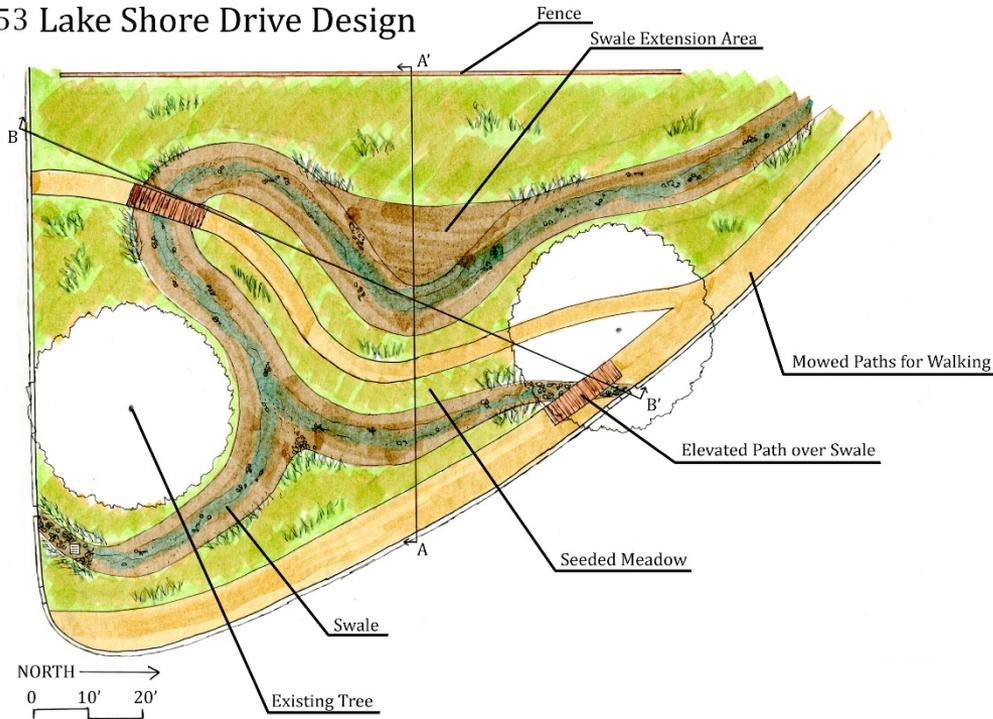
Processing materials:

- ***Student training***
- ***Denailing – there is a denailing gun for that! e.g. “Nail-Kicker”***
- ***Enhanced recycling***

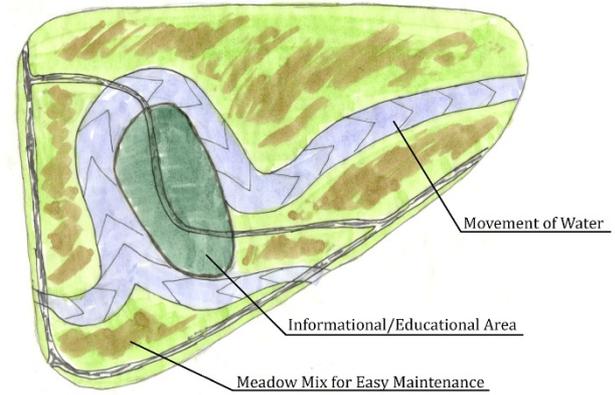


Fieldwork experience and fun

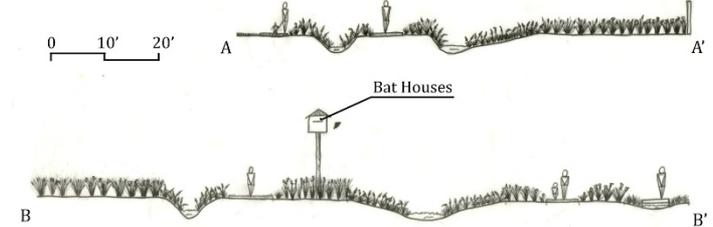
53 Lake Shore Drive Design



Concept Plan



Sections



Description

To achieve full potential of the site with the lowest possible maintenance for the township we used the method of creating an urban meadow on the site. Through the use of environmentally friendly rainwater retention infrastructure the site will help lessen the load on the neighboring rivers. Swales would lead runoff water, coming in from curb cutouts, from the streets around the site to allow for maximum time for infiltration. This ecological design will create a habitat for animals that are threatened by ongoing land development and new infectious diseases. By installing a meadow small mammals and insects will have a habitat to survive. Then by also installing bat and bird houses the insect population will be kept under control and will also provide bats and birds a safe place to nest and thrive. This design requires minimal maintenance, only mowing along edges and pathways to keep the site neat and tidy.

Junior Praxis Studio
 Design Build
 24 March 2017
 Joe T, Christian P, Kate B



Field design:

- **Synthesizing multiple designs into one**
- **Collaboration, compromise and role definition**
- **Working with real conditions**
- **Understanding opportunities and constraints:**
Reuse: budgets, materials and physical possibilities



Porous gabions from chain-link fence



Stormwater and flood landscape

- ***Floodable park***
- ***Experience of wetland type vegetation***
- ***95% reused materials***
- ***Ecological linkage to adjacent riparian corridor***



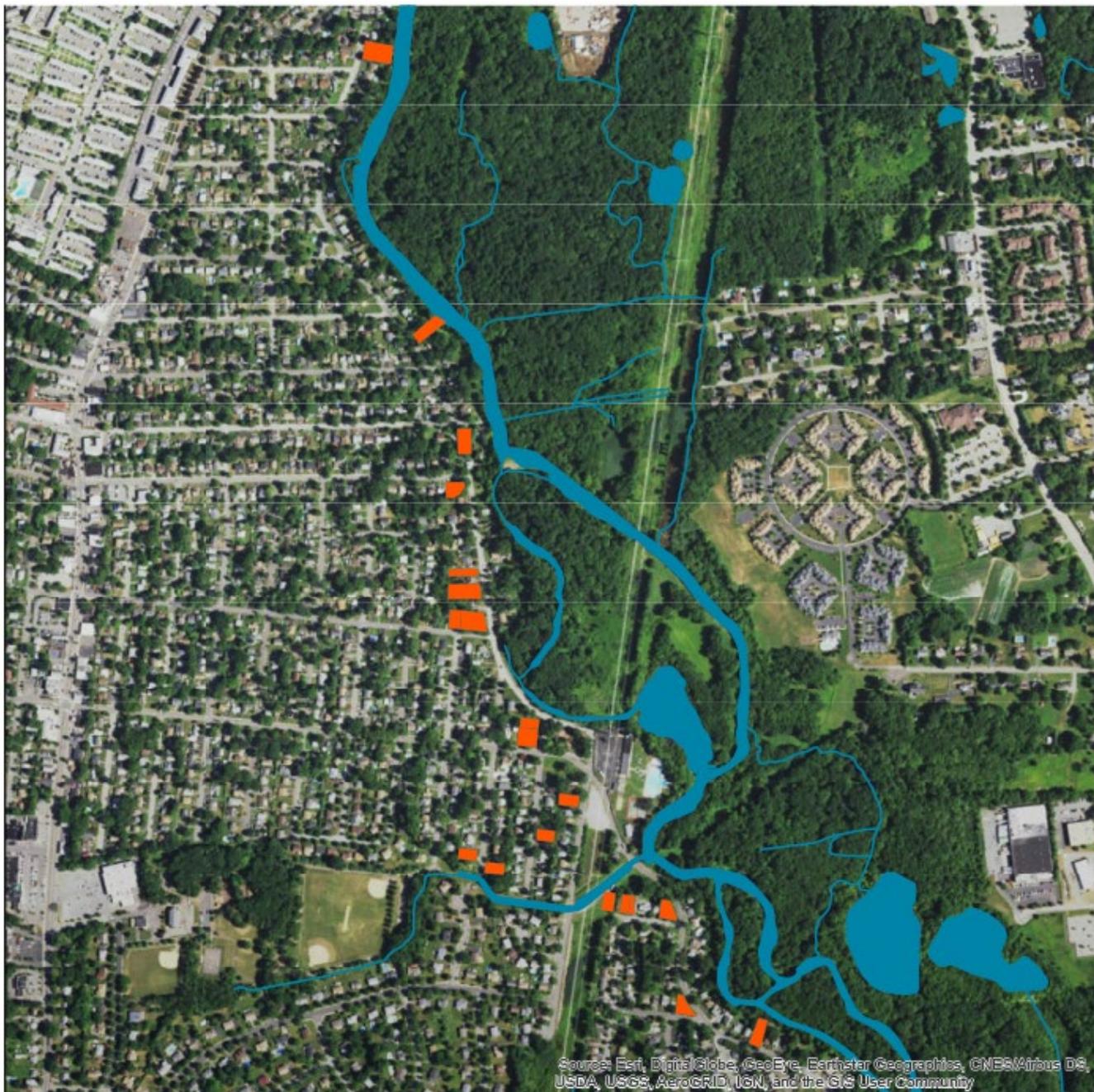
Growth over time

- Dynamic ecology available to experience for neighborhood***
- Minimized mowing, other types of maintenance for township workers to learn***
- Maintains neat and clean edge with street***



Current Standard:

- Crowned lawn: less than 1/4" infiltration typical
- Lawn maintenance burden
- Flood mitigation: only area of removed house and structures
- Flood storage: minimal
- No habitat value
- No use value
- No integration with remaining neighborhood
- Remnant residential vegetation: reminds of abandonment



Source: Esri, Digital Globe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Potential Standard:

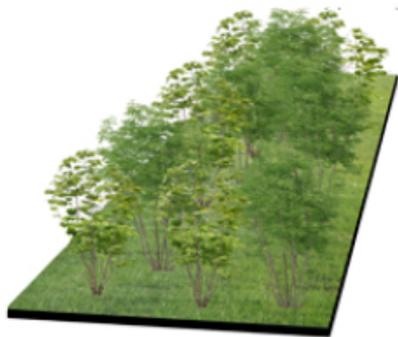
- Network of pocket parks
- Stormwater storage and infiltration (Quantity and quality improvements)
- Flood storage
- Improved habitat: connection and integration with riparian area
- Integration with neighborhood, use and appearance
- Reduced appearance of abandonment
- Potentially reduced maintenance (mowing), but other types of maintenance needed

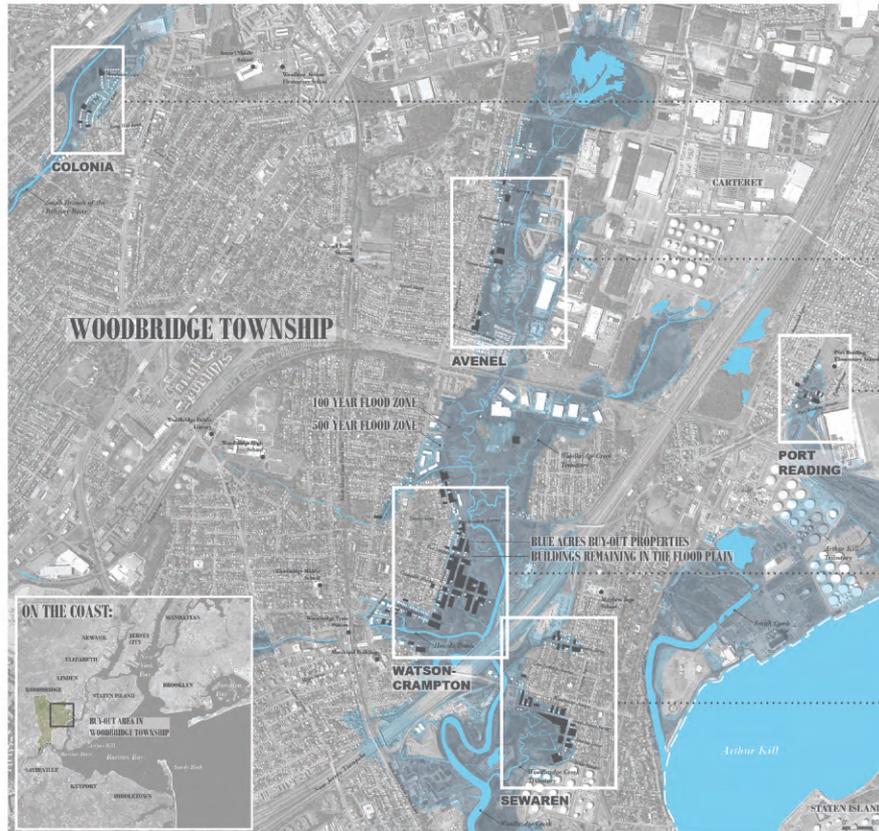
Riparian Forest Restoration

As settlement becomes sparser in the area, opportunities arise to restore the native flood plain ecology to the neighborhood. Small pockets of woods may never completely mimic a fully functioning forest, but they can provide a richness of species diversity, habitats for wildlife, and places for children to explore and experience nature. We propose the construction of small playhouses in these wooded pockets to encourage their use and ownership by neighborhood kids.

Opportunities for Reuse:

Play Houses, Stepping "Stones"





LOCATION OF BUY-OUT PROPERTIES AND NEIGHBORHOOD OPEN SPACE PROPOSALS:



COLONIA

Located adjacent to the South Branch of the Rahway River, buy-out properties in the Colonia neighborhood of Woodbridge Township can be converted into pocket parks and trail entrances that connect to existing open space along the river.



AVENEL

As part of the Woodbridge Creek flood plain, buy-out properties in the neighborhood of Avenel can be converted into pocket parks. Buy-out properties can also be transformed into forested lots to increase flood storage capacity and serve as windbreaks for remaining homes.



PORT READING

With an existing elementary school and open space nearby, buy-out properties in the Arthur Kill Tributary flood plain can be converted into pocket parks and new park entrances to enhance public amenities.



WATSON-CRAMPTON NEIGHBORHOOD

Watson-Crampton is the largest of the five flood-affected buy-out neighborhoods in Woodbridge Township. Here, buy-out properties can be converted into an extensive system of park space, flowering meadows and flood storage areas. Restoration of flood plain forest, scrub shrub, and salt marsh habitat can increase flood storage potential and provide a sound buffer from the adjacent New Jersey Turnpike.



SEWAREN

With both pocket park and large open space opportunities, buy-out properties in Sewaren can extend an existing park into a system of trails, meadows, and forested flood storage areas.

Floodplain restoration plans and projects:

- Could integrate deconstruction and reuse to mitigate psycho-social impacts of neighborhood change
- Diverse landscape types could enable understanding of emerging human/ecological interfaces



ACTIVE AND PASSIVE RECREATION:

KAYAK LAUNCH AND EAST HEARDS BROOK PARK
Restoring the Heards Brook riverbank allows existing park space to be expanded. A kayak launch can also provide new ways of enjoying Woodbridge open space.

POCKET PARKS

Individual buy-out properties can be converted into park space to increase public amenities in each neighborhood. A variety of designs are available to community members.

BOARDWALKS AND TRAILS

Trails and boardwalks connect park space and residential areas while providing walking opportunities through flowering meadows and a variety of natural habitats.

LOW-MAINTENANCE MANAGEMENT ZONE:

MOWN BUFFER

A 10-ft mown buffer around remaining residential properties provides a neat edge between private property and new open space.

BIOSWALES

Existing swales and concrete channels that convey stormwater runoff can be converted into bioswales to treat stormwater as part of the open space network.

FLOOD STORAGE AND STORMWATER WETLANDS

A system of small berms and depressions within meadow open space can store flood water and treat stormwater runoff.

MEADOW

Flowering meadows provide a low-maintenance management strategy for the Township while creating open sight lines that integrate with residential properties.

RESTORATION ZONE:

SCRUB SHRUB

A unique hilltop within the Watson-Crampton neighborhood can be augmented with small trees and shrubs while providing an elevated pathway and look-out opportunity across the salt marsh.

FLOOD PLAIN FOREST

Forested areas can provide shaded pathways and flood and wind protection while acting as a sound and sight buffer from the nearby New Jersey Turnpike.

HIGH MARSH EDGE

Transitional areas between forested and salt marsh habitats can be planted with salt-tolerant high marsh plants to manage invasive species and erosion.

SALT MARSH

Saline marsh areas provide flood protection while enhancing tidal habitats in Woodbridge Township and allowing residents an opportunity to enjoy nature.



KAYAK LAUNCH
A kayak launch at Port Reading Avenue and Watson Avenue provides new recreational opportunities while connecting with a larger boardwalk and trail system throughout the Watson-Crampton neighborhood.



MEADOW
Flowering meadows provide space for both neighborhood paths, flood storage and treatment of stormwater runoff. With low-maintenance management, meadows also provide habitat for pollinators, butterflies and bees.



EAST HEARDS BROOK PARK
An existing park is currently cut short by a concrete stormwater channel, dense vegetation and a chain-link fence. By replacing these obstacles with a bioswale, the park becomes integrated with a larger open space network.

LOW-MAINTENANCE MANAGEMENT ZONE:



RESTORATION ZONE:



More flexibility needed:

- Floodable area reuse – open space but with more flexibility
- Dynamic human-ecological systems could emerge
- Deconstruction and reuse are adaptive techniques that reveal ‘on the ground’ strategies for resource-efficient removal and abandoned land reuse

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Resilience Opportunities

- **Mitigation and recovery efforts and funding prioritize deconstruction over demolition**
- **Incentivize / explicitly allow / communicate opportunities for post-disaster deconstruction**
- **Pre-disaster deconstruction and reuse infrastructure – investments and policies**
 - Strategically locate building materials reuse warehouses / storage areas and de-nailing yards
 - State and local government deconstruction policies / facilities (Portland, Seattle)
 - Deconstruction industry
 - Deconstruction job training
 - Deconstruction and reuse education
- **Develop model designs for post-disaster storage sheds, floodplain parks and simple structures**

Resilience Opportunities (2)

- **Include deconstruction and material recovery in disaster assessment, training, planning and recovery**
 - NGOs, faith-based and environmental justice community
 - Deconstruction industry
 - Planning – Community, adaptation and managed retreat
 - Disaster recovery systems
 - Disaster debris management
 - Architecture, construction, materials sources
- **Update building codes to explicitly allow safe use of reclaimed materials (OR, WA examples)**
- **Integrate with pre- and post-disaster support services for community members**
- **Engage professional societies, e.g, AIA, APA, ASCE, ASLA, NTHP (Good Samaritan Laws)**
- **Add lifecycle cost-benefit of deconstruction into FEMA Benefit-Cost Analysis Toolkit**
- **Add building materials reuse emissions factors (embodied energy and GHG) to U.S. EPA WARM and ReCON models**
- **Design Challenges / Innovation Grants**