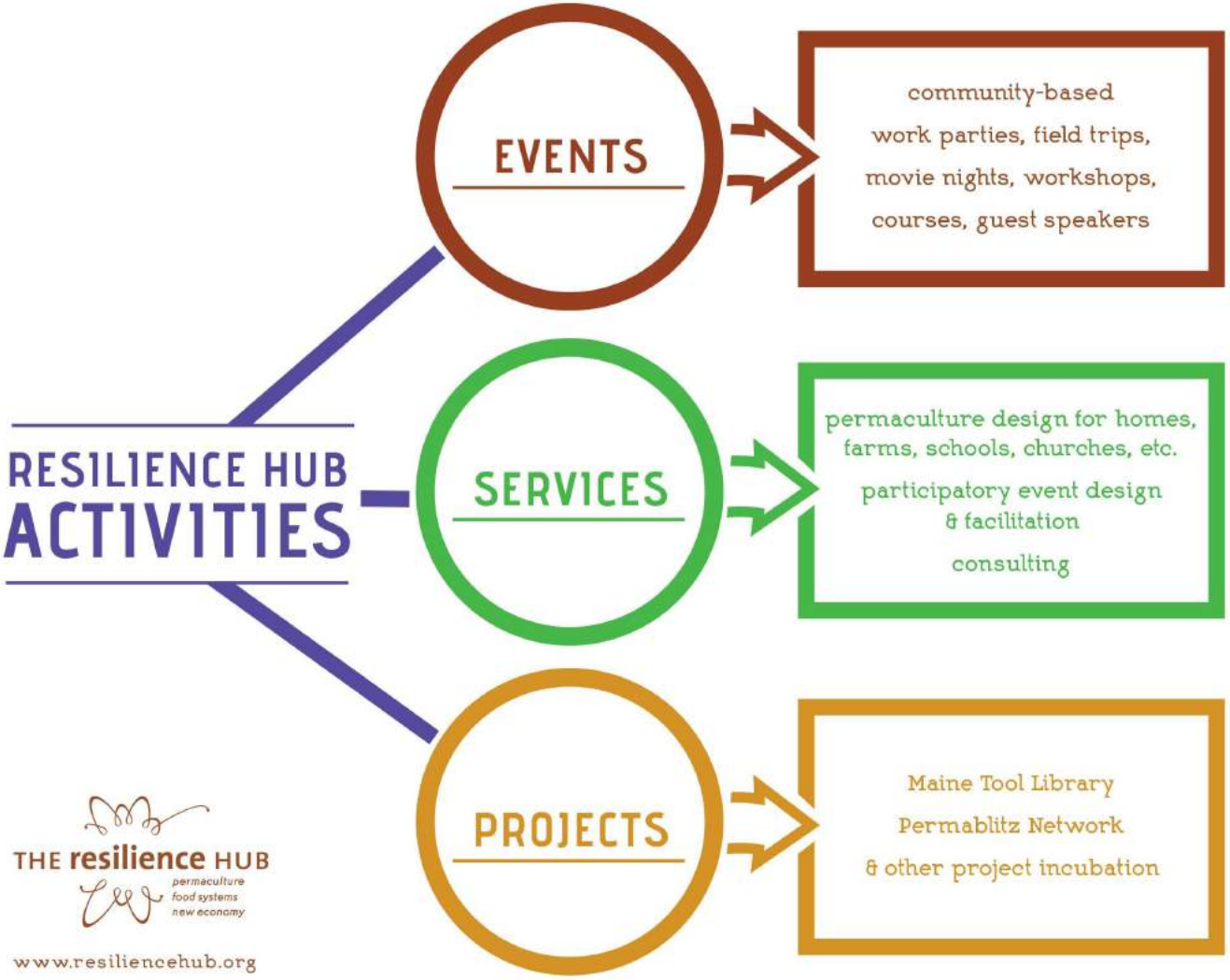
Whole Property Retrofit:
Redesigning Suburbia for an Uncertain Energy & Food Future

Lisa Fernandes
The Resilience Hub resiliencehub.org


RESILIENCE HUB
ACTIVITIES
EVENTS
community-based
work parties, field trips,
movie nights, workshops,
courses, guest speakers
SERVICES
permaculture design for homes,
farms, schools, churches, etc.
participatory event design
& facilitation
consulting
PROJECTS
Maine Tool Library
Permablitz Network
& other project incubation
THE resilience HUB
permaculture
food systems
new economy
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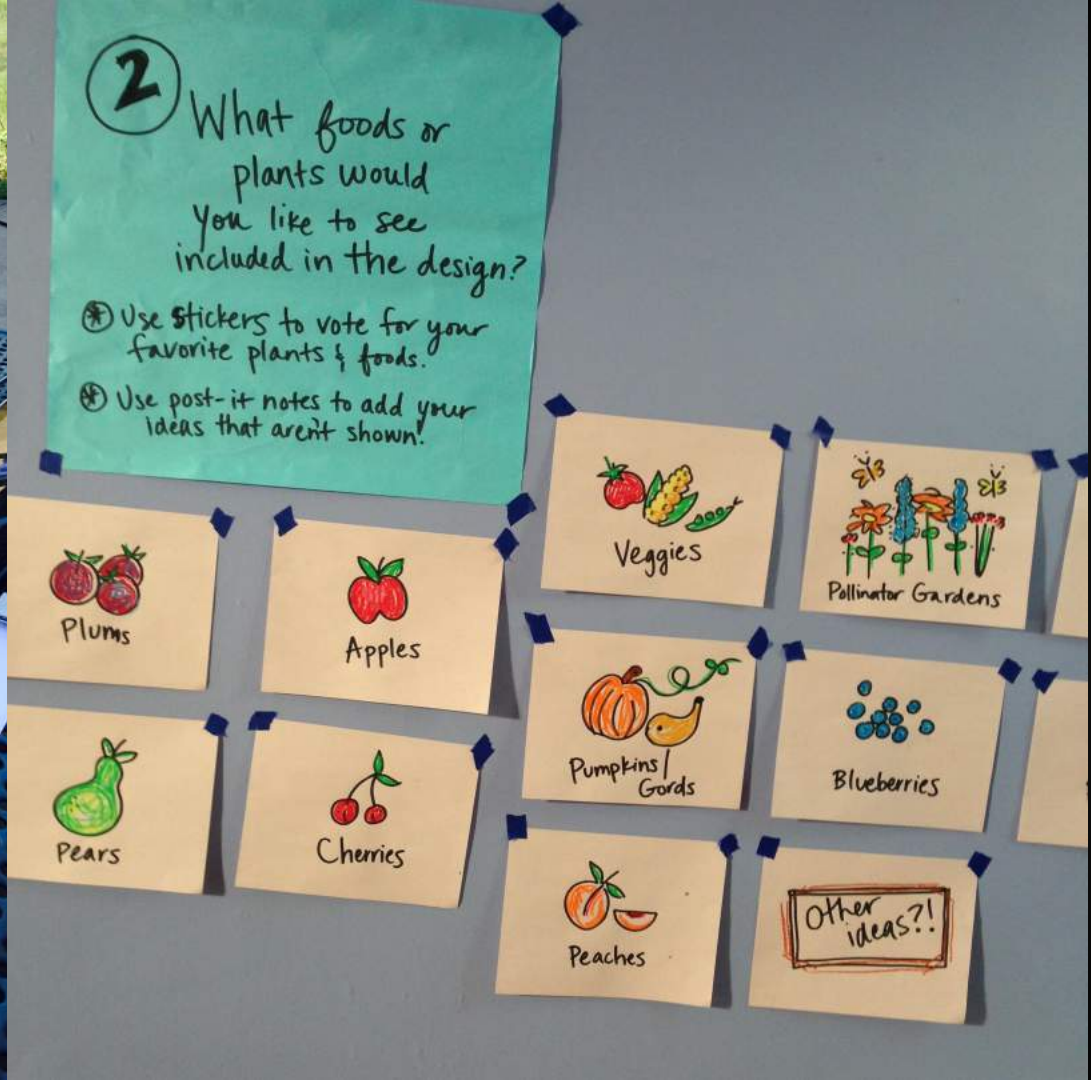

2
What foods or plants would you like to see included in the design?
Use stickers to vote for your favorite plants & foods.
Use post-it notes to add your ideas that aren't shown!
Plums
Apples
Veggies
Pollinator Gardens
Pears
Cherries
Pumpkins / Gords
Blueberries
Peaches
Other ideas?!

To build personal, household and community resilience in the face of climate, energy & economic challenges...

While also creating thriving examples of community abundance consistent with permaculture ethics & ecological principles

RANGE OF BEHAVIORS & STRATEGIES

NEGATIVE	NEUTRAL	POSITIVE
polluting	***sustaining***	repairing
extracting	maintaining	restoring
degrading	holding	regenerative
damaging	preserving	increasing fertility
depleting	conserving	increasing yield
diminishing health & resources	minimizing damage	enhancing health & resources
"brittle" vulnerable systems		resilient systems

Permaculture

A **Design Method** and set of techniques based on ecological patterns; used to create healthy ecosystems and human settlements.

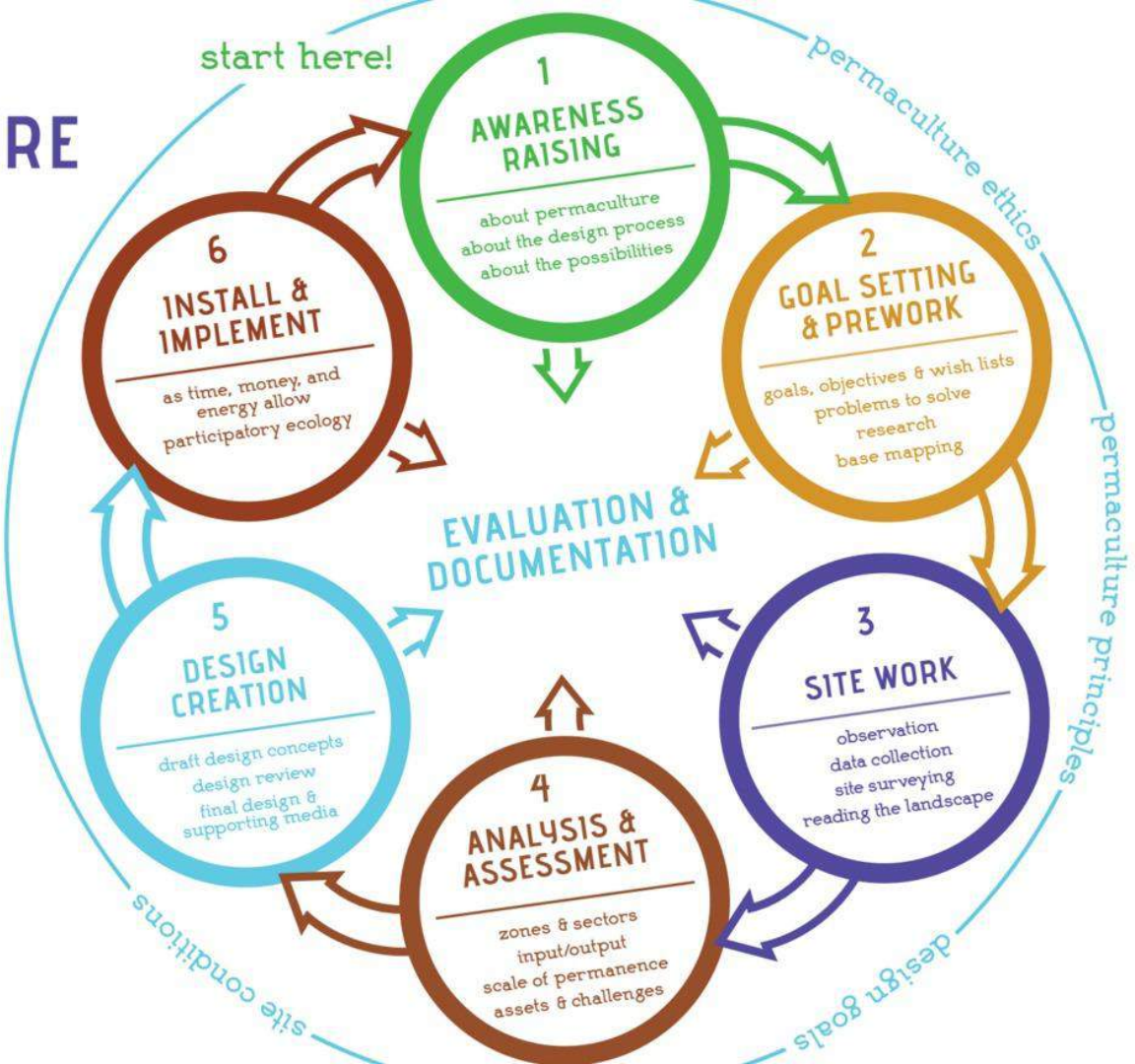
Food | Energy | Water

Buildings | Economy | Culture

The Resilience Hub's

PERMACULTURE DESIGN PROCESS

A suggested process that can be modified, expanded or contracted as you see fit. This process is generally not linear and some projects require more of some design stages than others!



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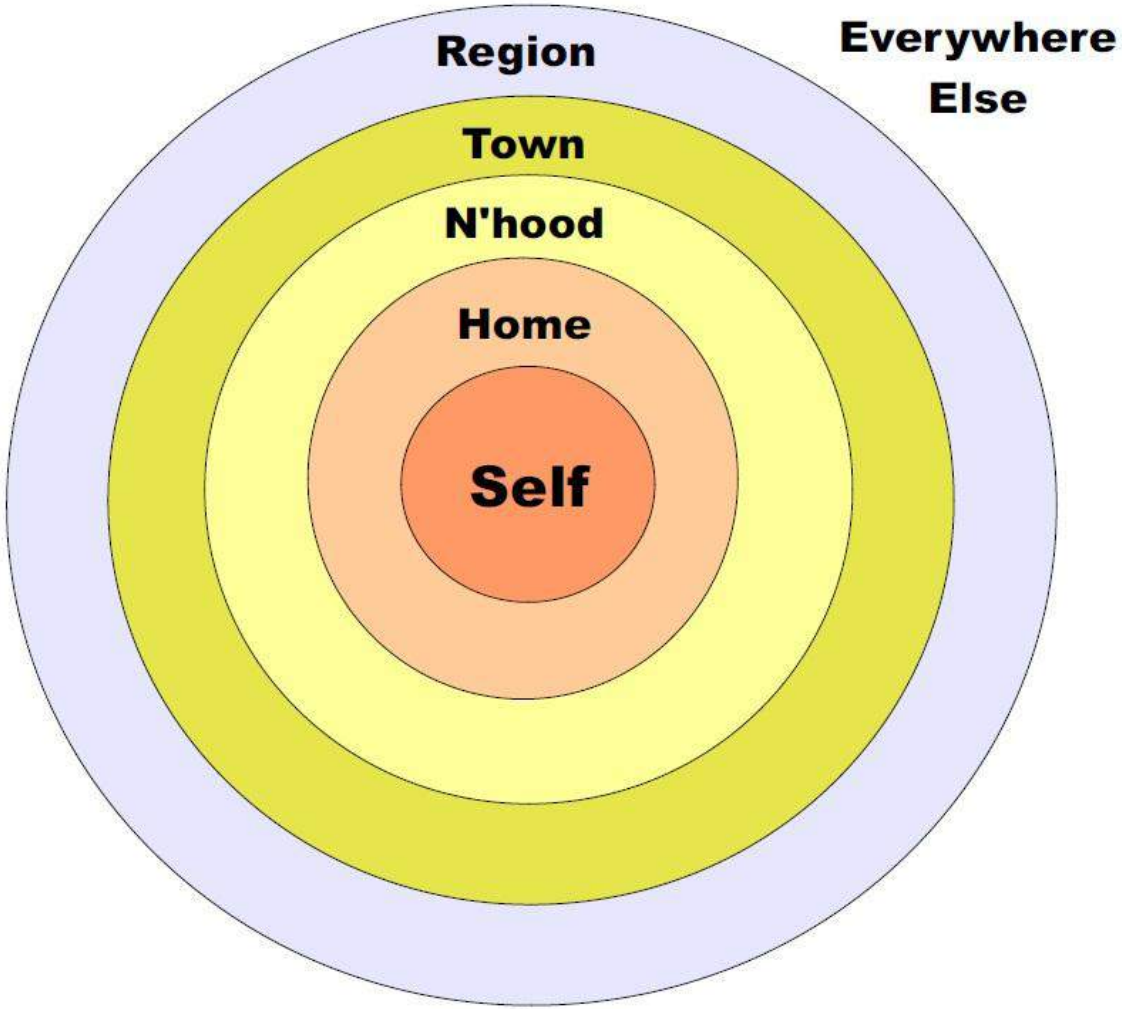
The Resilience Hub · Revised 2.15
Portland, Maine USA

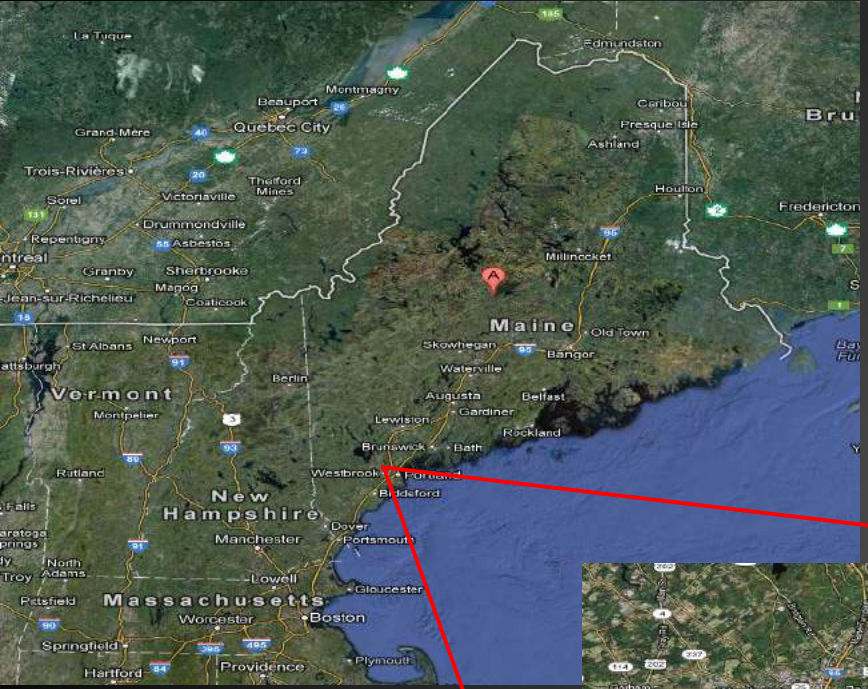
Inspired by Yelton, Jacke, Toensmeier, Doherty & others.

Adaptive Resilience


Region
Everywhere
Else
Town
N'hood
Home
Self

Retrofitting Suburbia

An experiment in converting a suburban home (liability) to a regenerative ecosystem worthy of replication at scale (asset)


La Tuque
Edmundston
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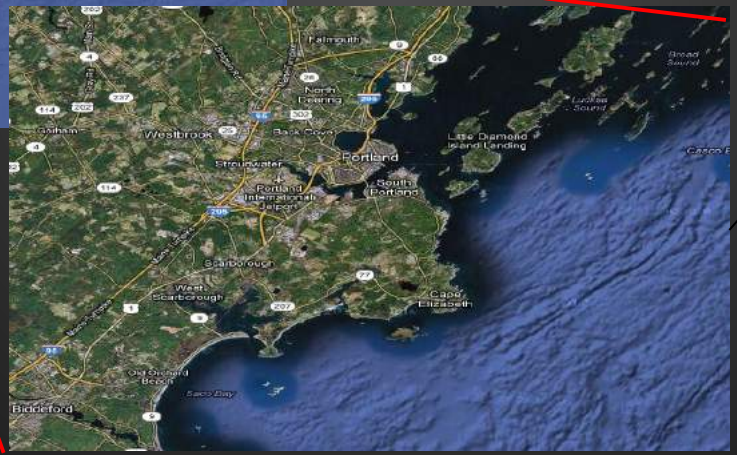
Beauport
Quebec City
Caribou
Presque Isle
Grand-Mere
Ashland
Trois-Rivières
Thetford Mines
Houlton
Sorel
Victoriaville
Fredericton
Drummondville
Repentigny
Asbestos
Millinocket
Granby
Sherbrooke
Magog
Coaticook
Maine
Old Town
St Albans
Newport
Skowhegan
Bangor
Waterville
Berlin
Vermont
Augusta
Belfast
Montpelier
Gardiner
Lewiston
Rockland
Brunswick
Bath
Rutland
Westbrook
Portland
Biddeford
New Hampshire
Dover
Manchester
Portsmouth
North Adams
Lowell
Gloucester
Massachusetts
Worcester
Boston
Springfield
Providence
Plymouth
Hartford


Falmouth
Westbrook
Portland
Scarborough
West Scarborough
Cape Elizabeth
Biddeford


Sawyer Rd
Sawyer Rd
Sawyer Rd
1004

Initial Design Goals (2005)

- Get off fossil fuels
- Produce more food & medicine in the landscape
- Withstand disruptions (energy, food, weather, etc.)

Design Goals (now)

Same as 2005 PLUS...

- Create a functional alternative for people to **experience** (demonstration site)
- Have a place to **experiment** and test strategies
- Minimize living **costs** while maximizing **benefits** such as health, enjoyment, security, comfort, biodiversity, etc.

Whole Property Analysis

From ROI...

Primarily focused on financial metrics, cost of "investment" relative to increased returns or savings

i.e. cost of insulation : money saved on heating fuel

Whole Property Analysis

To IOR…

Input-Output Ratio

Seeks to use a comprehensive set of inputs and outputs to understand full impact

Whole Property Analysis

Heating Fuel

DHW

Electricity

Water & Sewer

Food

Transport

Property Maintenance

Whole Property Analysis

Heating Fuel
DHW
Electricity
Water & Sewer
Food
Transport
Property Maintenance

Comfort
Security
Community
Neighborhood / Village
Experience/Skills
Resilience
Adaptability
Experimentation
Quality of Life
Ecosystem Health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Tree Service
CLARK TREE CO

House Elements & Strategies

Insulation (House + Basement)

Air Sealing

DQ Oil Boiler

Wood Stove for Heat

Replace Windows

New Roof (light color)

Solar DHW (90% fraction)

Integrate House/Yard (SE/SW sides)

Root Cellaring

Rainwater Collection

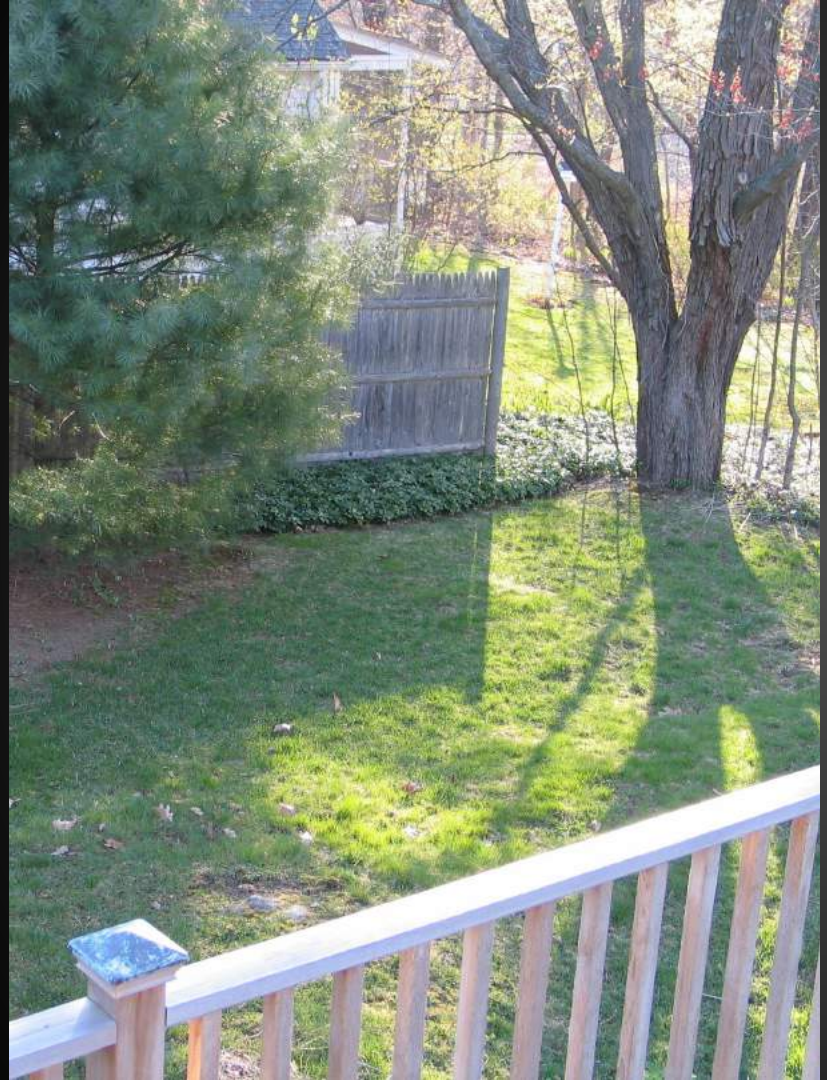
Electricity Reduction

Shade Plantings

Grey water

“Deep Energy” Incremental Retrofit

Clothes Drying

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WESTCOTT®


Alewive's Brook Farm
Spring
Garlic
5.00 bunch


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65
59
60
64
VARSITY

Some Tree/Shrub Crops

- Apples (4 Varieties)
- Pears (Asian + Euro)
- Precocious Hazelnut
- Apricot
- Rowan / Mountain Ash
- Blueberry (various)
- Strawberry
- Paw Paw
- Hardy Kiwi
- Gooseberry
- Currants
- Rosa Rugosa
- Pea Shrub
- Black Locust (fence)
- Peach
- Grapes
- Edible Bamboo
- Elderberry
- Raspberry

Other Perennial Crops

Not including medicinals/culinary herbs

Turkish Rocket

Caucasian Spinach

Air Potato

Dystaenia (Wild Celery)

Chickendive (reseeding)

Birdsfoot Trefoil

Sorrel

Sea Kale

Good King Henry

Comfrey

Perennial Arugula

Heritage Grains (Emmer, etc.)

Ducks & Chickens

Honey

Ramps + Various “walking” onions

Water celery

Jerusalem Artichokes

Still on the Docket

- Sauna
- Wood cookstove
- Outdoor Kitchen
- Passive solar sunroom/ mudroom
- Cool cupboard
- Basement rainwater cistern
- Off-grid PV system
- More perennial food
- Workshop/Nursery space
- Neighborhood Cow 2.0
- Electric vehicles

Heating Fuel

2005

Approx 800 gal
heating oil / year

~111 MBTU per year

2015

Approx 2 cord
hardwood / year

~48 MBTU per year

Locally-sourced fuel from arborists & woodlot owners, super clean burn stove, far greater thermal comfort, external combustion air intake w/backdraft damper ***$1600 savings per year***

Domestic Hot Water

2005	2015
included in oil boiler	20 tube solar thermal system, Marathon tank, Purist module

Meets 90% of DHW needs, electric element fills the gap (approx 20 min per month); .5 gal/min shower head (AquaHelix)

Electricity

2005

~ 20 KwH per day

~ $1900 per year

2015

~ 10 KwH per day

~ $950 per year

Interior & exterior air drying of clothes, still run 2 small chest freezers, larger gains expected when we get off electric cookery, pv panels queued up for 2016 install (off-grid) (plan to get under 7KwH/day)

Water & Sewer

2005

~ 500 cf per month

~ $540 per year

original septic

2015

~ 300 cf per month

~ $216 per year

septic, greywater,
composting toilet

avoided cost for connecting to municipal sewer ~10-15K, rainwater for all irrigation needs
approx 66K gal/year rainwater collection potential

Food

2005

CSA, groceries, occasional bulk purchase

~ $6000 per year

2015

~ $3000 per year

~ 1000# per year annual veg

~ 500# per year perennial food

[~2000#/year at maturity]

does not include meat, eggs, foraged foods. all food production costs offset by barter and sales of surpluses. 3-4h per week average labor "cost," increased nutrition, soil carbon, biodiversity, etc.

Transportation

2005

~ 30K miles per year driven

2015

~ 15K miles per year driven

still using gas vehicles avg 25 mpg, lifestyle/job changes, public transport, cycling, walking
~ $13K savings per year

$18,850 per year

in savings
(not including avoided sewer hookup)

investments averaging $5,000 per year

every 1% increase in soil organic carbon to 30 cm depth

=

59 tons/acre CO_2 sequestered

AND

15,400 gal/acre more water-holding capacity

~98 tons of carbon sequestered in the soils of this property (6 new inches @ 10% SOC)

Whole Property Analysis

Heating Fuel
DHW
Electricity
Water & Sewer
Food
Transport
Property Maintenance

Comfort
Security
Community
Neighborhood / Village
Experience/Skills
Resilience
Adaptability
Experimentation
Quality of Life
Ecosystem Health

Some learnings...

- Significant progress year-on-year with small amounts of cash investment (plus skills and social capital).
- One-third of an acre is way more than one-third of an acre.
- Open questions/ideas about how we support each other to do this work (skills, resources, advice, etc.)
- Need to keep working on metrics for whole property approach.
- Results are contagious.

The value of whole system design for the Suburbs...

PERMACULTURE DESIGN FOR SABINA HOME

LARGE VEGETABLE GARDEN, LARGE ORCHARD (BOTH ZONE 2), STAPLE CROP AREA (ZONE 3) & WOODLOT (ZONE 4)

OCTOBER 2008

SCALE 300:1
0 1 2 3 4 5 6 7 8 9 10 11 12 metres

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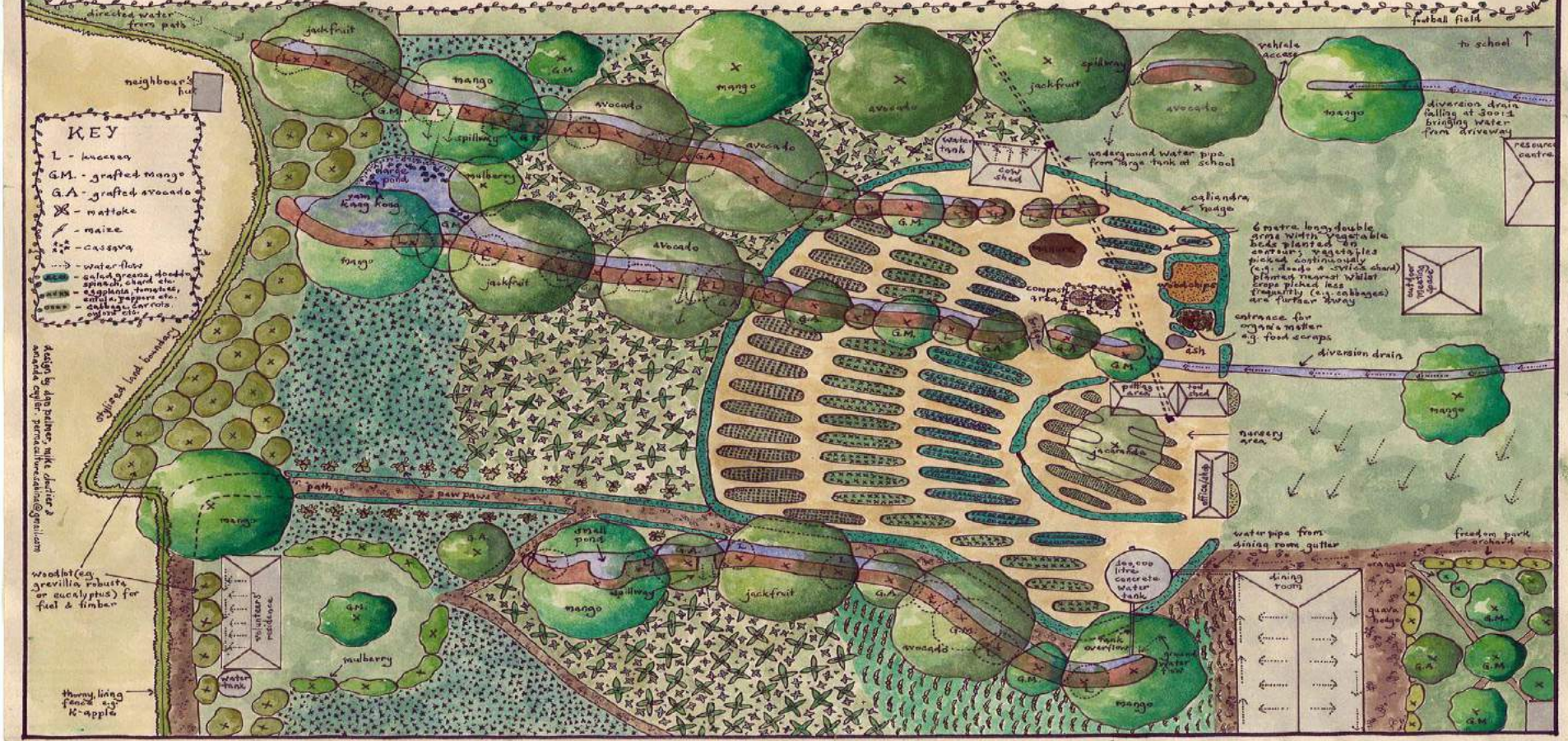

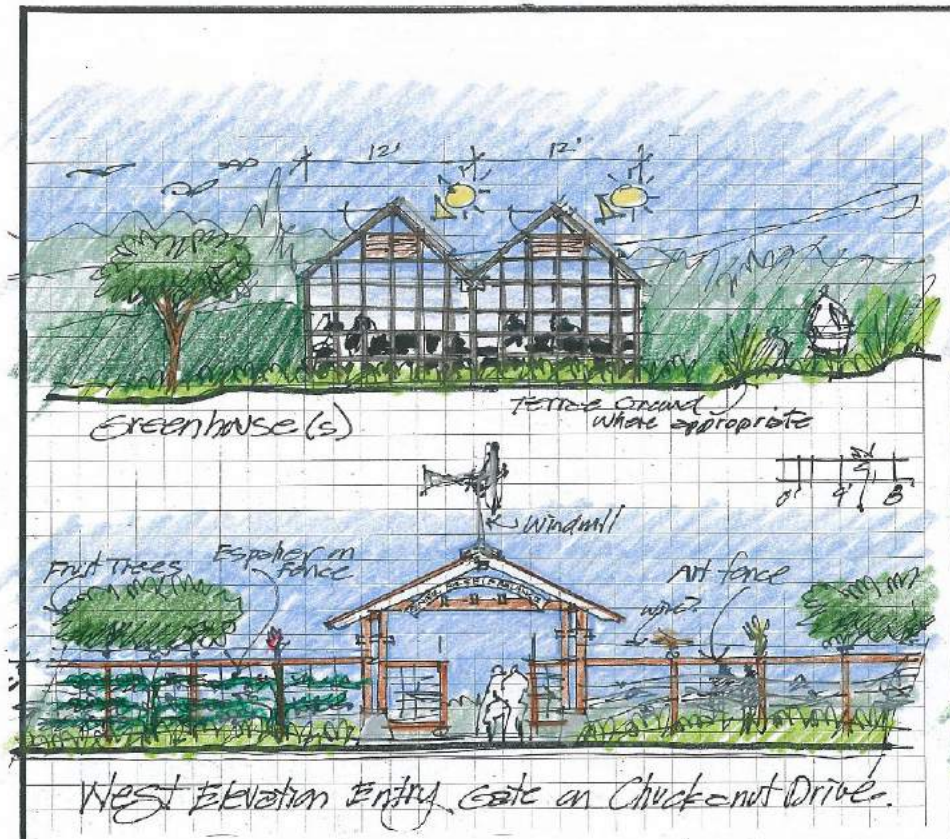

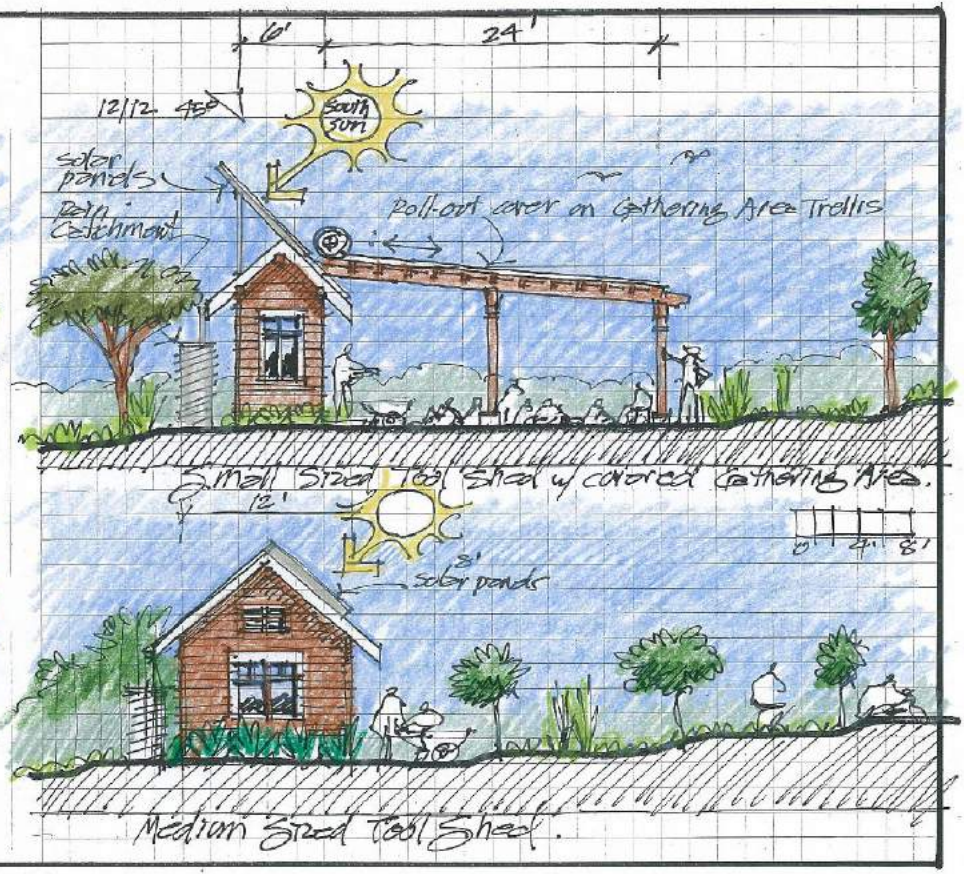

Preliminary Charrette Ideas
Center for Local Self Reliance At Fairhaven Park

4/26/09

COM.

Discussion?

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