Senior Honors Projects   Honors Program at the University of Rhode Island

2012

Roger Williams Park Edible Forest Garden

Mark S. Scialla
University of Rhode Island, mscialla@my.uri.edu

ROGER WILLIAMS PARK EDIBLE FOREST GARDEN

Mark Scialla

May 01, 2012

URI Outreach Center

Living Routes Permaculture Design Certificate at Sirius Eco-Village

- Spent 100+ hours over 3 weeks gaining hands-on experience in permaculture design in Summer 2011

- Spent 10+ hours in client interviews, site assessment and design sessions

- Visited permaculture gardens throughout Western MA

The New Paradigm:
Urban Food Production

- 40% of the world's arable land unproductive from soil erosion

- 1960 global population = 3 billion

- Planted grain/person (1960)=1/4 acre

- 2012 global population = 7 billion

- Planted grain/person (2012)=1/8 acre

- Global grain production has fallen short of consumption in 7 of the last 12 years

Urban Food Production

GLOBAL TRENDS

- Rise in global demand for sustainable agricultural products

- 20% annual growth rate of organic farms in US, France, Japan & Singapore

- 90% of food in Havana, Cuba

- 70% of produce in Bejing, China comes from urban farms

Havana, Cuba

Bejing, China

Urban Food Production

NATIONAL TRENDS

- 7-acre EFG recently designed for Jefferson Park, Seattle, WA
- Conversion of lawn to layered woody & herbaceous plants

Beacon Food Forest Schematic Site Plan

Nation's largest public Food Forest takes root on Beacon Hill

Urban Food Production

PROVIDENCE TRENDS

- 37 community gardens

- 800 community gardeners in the Providence Community Growers Network (plus 200 individual urban gardeners)

- 7 urban farms

- 6 summer Farmer's Markets in Providence 5 days per week

Providence Community Gardens

Urban Food Production

NEIGHBORHOOD TRENDS

☐ 8 community gardens within the Elmwood and Lower Southside neighborhoods that border RWP
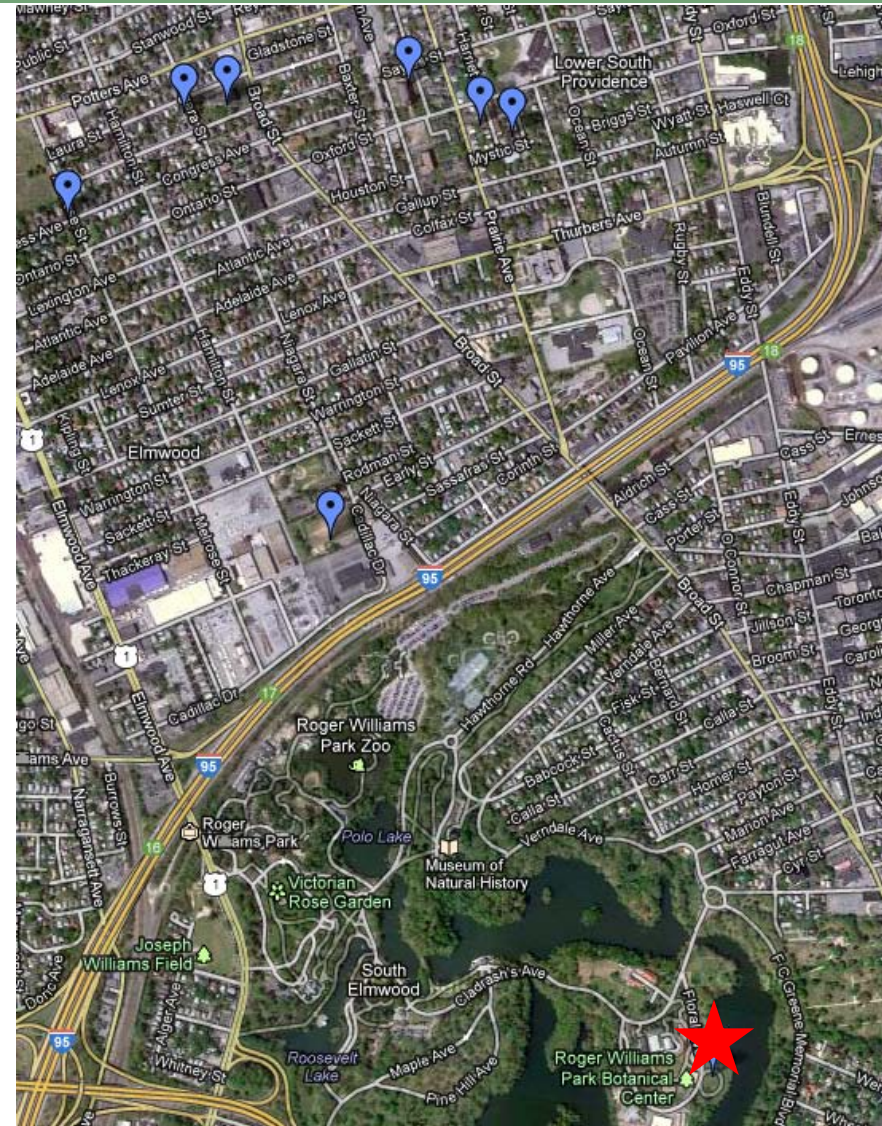
Washington Park: A Food Desert

- **<u>FOOD DESERT</u>:**
  Low-income community without ready access to healthy and affordable food
- One mile or more from supermarket or large grocer

USDA
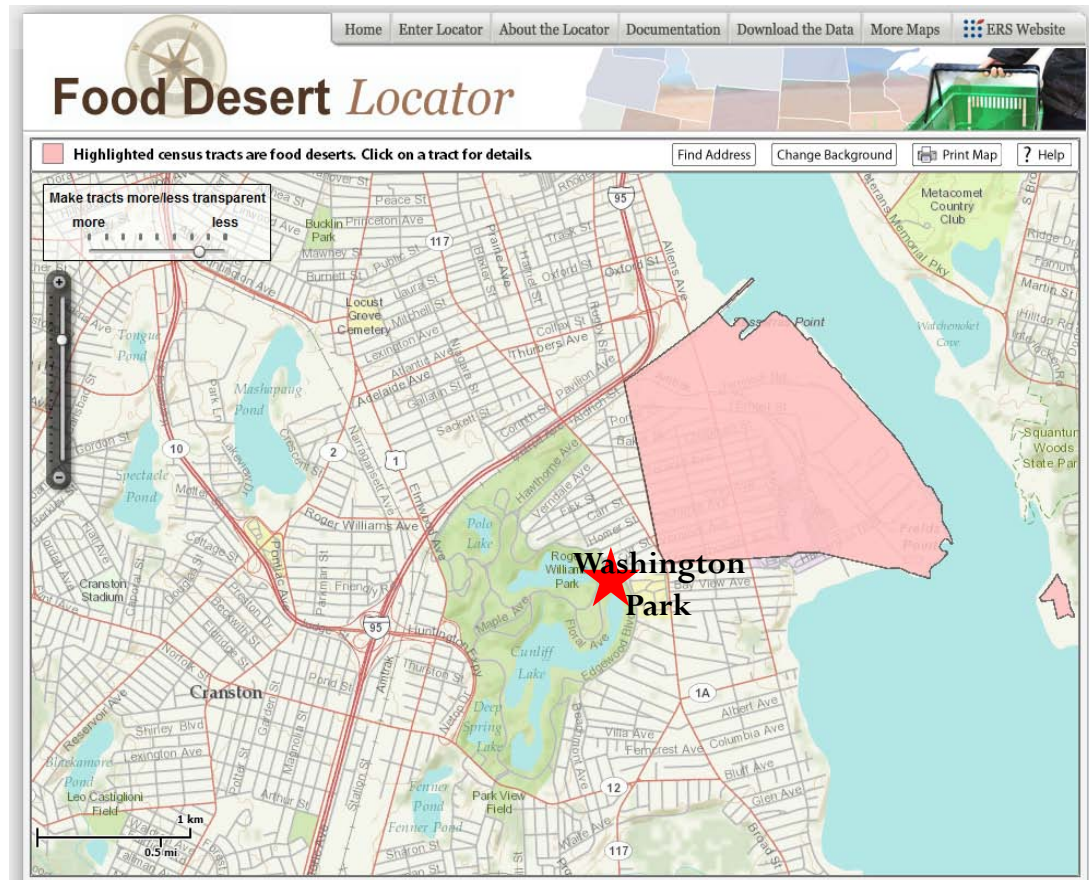
Current RWP Urban Food Production Efforts

Current RWP Urban Food Production Efforts

2011 COMMUNITY GARDEN SUCCESSES:

- 57 total plots
- 2,850 ft² of garden space including:
  - 45 gardener plots
  - 12 teaching plots
  - 4 children's plots
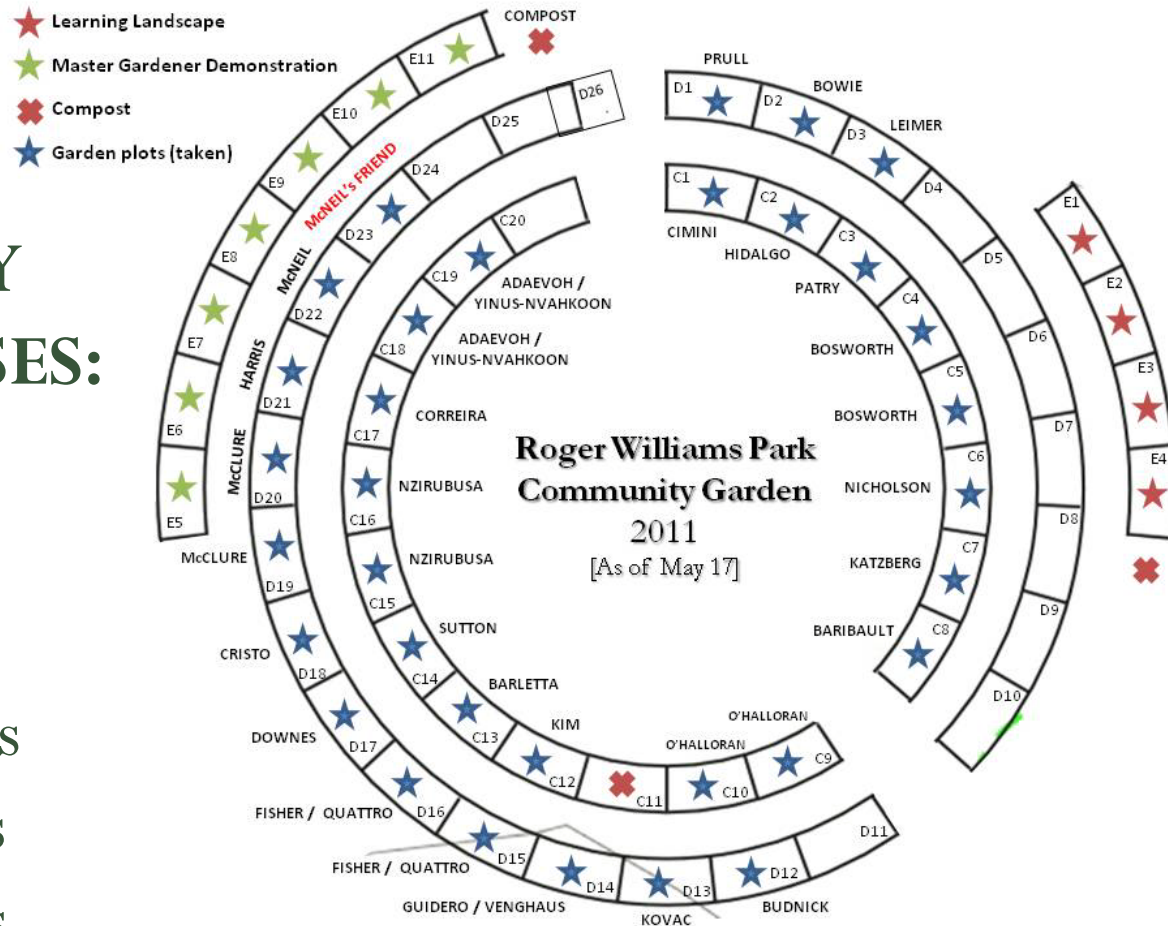
Current Urban Food Growing Efforts at RWP

Recent Developments

- Community garden expansion from 57 to 113 plots
- **Phase one of the edible forest garden**

Future Plans

- Permanent water supply
- Donate Teaching plot produce to Washington Park food pantry

What is an Edible Forest Garden?

☐ Plant-based food production system **modeled after a woodland ecosystem**

☐ Incorporates fruit and nut trees, shrubs, herbs, vines and perennial vegetables that **yield food for humans and wildlife**

☐ **Our best attempt to mimic the architecture and interactions of a natural forest system**

1. CANOPY (LARGE FRUIT & NUT TREES)
2. LOW TREE LAYER (DWARF FRUIT TREES)
3. SHRUB LAYER (CURRANTS & BERRIES)
4. HERBACEOUS (COMFREYS, BEETS, HERBS)
5. RHIZOSPHERE (ROOT VEGETABLES)
6. SOIL SURFACE (GROUND COVER, EG, STRAWBERRY, ETC)
7. VERTICAL LAYER (CLIMBERS, VINES)

THE FOREST GARDEN: A SEVEN LEVEL BENEFICIAL GUILD
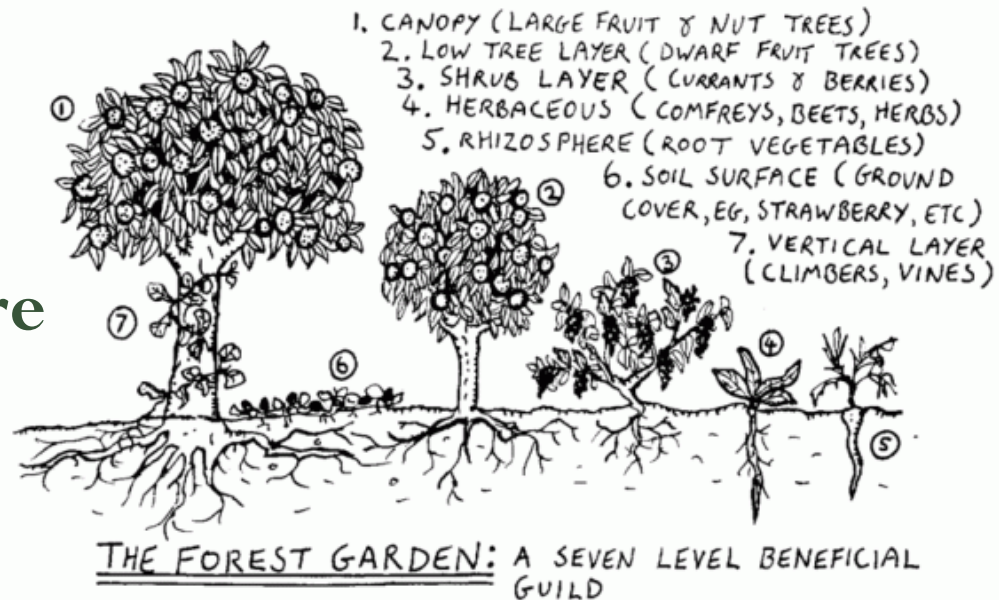
What is an Edible Forest Garden?

We can garden on a forest's edge... →

...or within it...
↓

...Or we can do both and create a new edible forest and garden here!
←

Our Collaborative Design Team...

- URI Master Gardeners

- Revive the Roots founders

- Community members

- URI Outreach Center staff

2011-12 EFG Design Sessions

- **October – December 2011:**
  - **Introduction to Permaculture**
    - Philosophy & Design Theory
    - History & Evolution
    - Ethics
    - Principles
    - Case Studies
  - **Forest Ecology Concepts**
    - Ecological principles

PERMACULTURE PRINCIPLES
- STACKING FUNCTIONS
- EVERYTHING GARDENS
- USER PAYS
- PROBLEM IS THE SOLUTION
- MULTIFUNCTION FOR EACH COMPONENT
- MULTI COMPONENTS FOR EACH FUNCTION
- DIVERSITY
- WORK WITH, NOT AGAINST NATURE
- OPPOSITE IS ALWAYS TRUE
- MAKE LOTS OF MISTAKES
- UNUSED RESOURCES ARE POLLUTION
- ALL POLLUTION IS UNUSED RESOURCES
- LEAST EFFORT FOR MOST EFFECT
- SMALL IS BEAUTIFUL
- FILL EVERY NICHE
- RELATIVE LOCATION
- PROTRACTED THOUGHT + OBSERVATION
- DO LESS WITH LESS
- DOWNWARDLY IMMOBILE
- IF IT AIN'T BROKE DON'T FIX IT
- BIOLOGICAL RESOURCES
- EFFICIENT LAY-OUTS
- ENERGY RECYCLING ON SITE
- SIMPLIFY, SIMPLIFY

Permaculture as a Design Compass

☐ A land-use **ethic** and design technique that provides **principles** to help us meet our sustainable food system goals
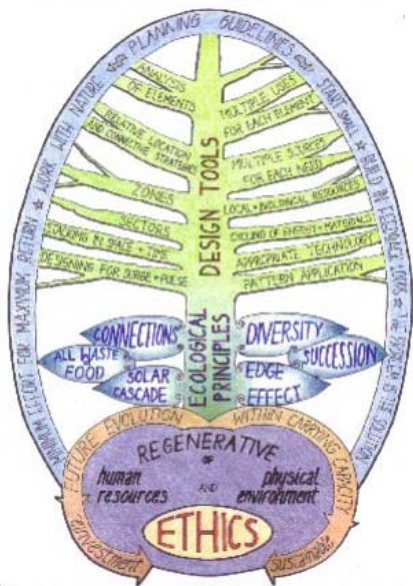
Permaculture Ethics

PEOPLE CARE

☐ As designers of sustainable human habitat, we consider the needs of all humans

EDUCATION

NUTRITION

PLAY

Permaculture Ethics

EARTH CARE

☐ Our designs care for the natural environment to which we are a part.

WILDLIFE

RESOURCE CONSERVATION

REMEDIATION

Permaculture Ethics

FAIR SHARE

- We design for sustainable habitats where all individuals have access to crucial resources

LAND   **SEEDS**   **FERTILITY**

The Design Process

- Articulate **goals**

- Generate desired species list (usually aesthetic- or familiarity based)

The Design Process: GOALS

☐ **Create** a **diverse, highly productive** addition to the **forested landscape** in Roger Williams Park

☐ **Transform** urban land into a **highly- productive parcel** that produces **market-viable fruits, nuts, vegetables, fuel and fiber**.
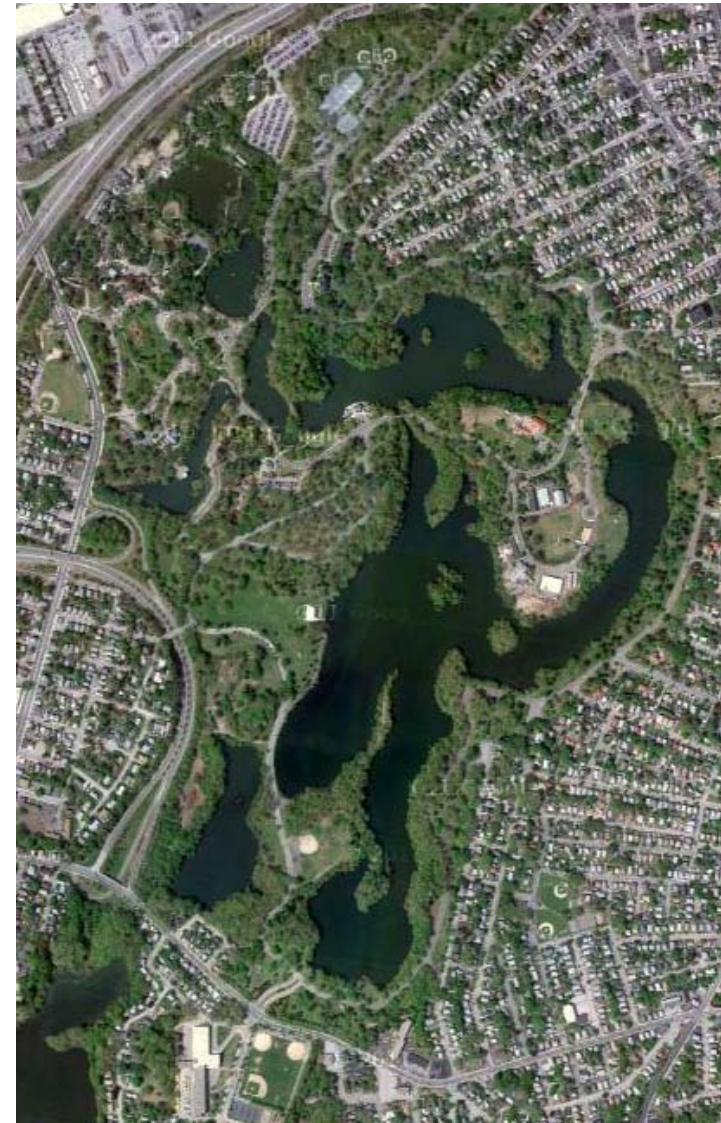
The Design Process: GOALS

- **Design** a **system** that uses native plants to meet human and ecosystem needs

- **Establish** a stormwater buffer on Edgewood Pond

- **Supplement produce from** the community garden

The Design Process: GOALS

□ **Serve as a living classroom** for environmental education

□ **Engage neighbors and gardeners** in permaculture

□ **Be a model for ecological urban landscape design and management**

The Design Process: SITE ASSESSMENT

☐ Conduct **Site Assessment**
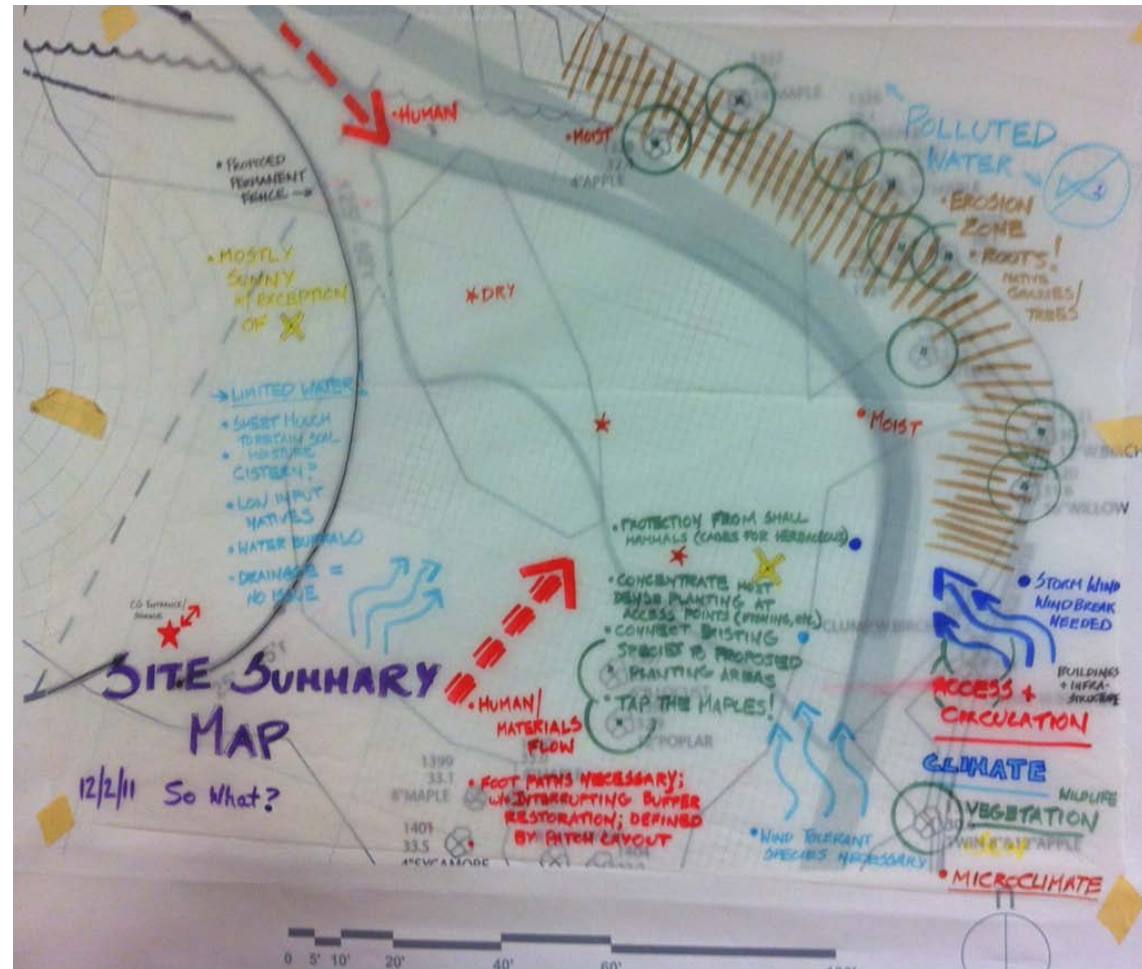
The Design Process: Schematic

□ Lay out some rough design ideas based on goals and site conditions.

□ **Get it down, then get it good**

The Design Process: DETAILED

☐ Lay out garden 'patches' and the general layout of plants within them
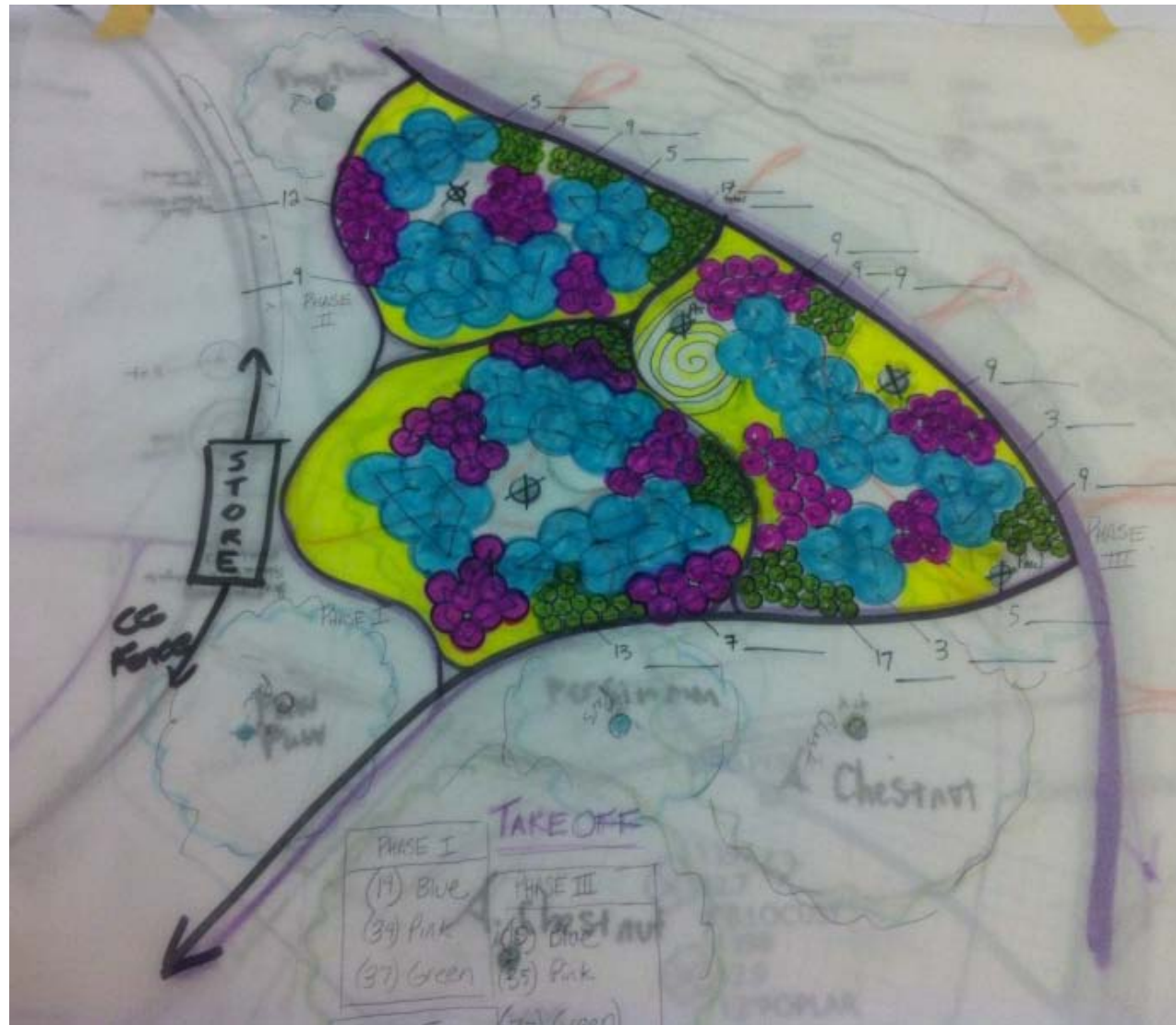
The Design Process: PATCH

□ Design and characterize the functions, conditions and architecture of the garden's patches considering site summary

□ Consider succession in terms of plant growth

◘ RWP: 30-year time horizon or 2042
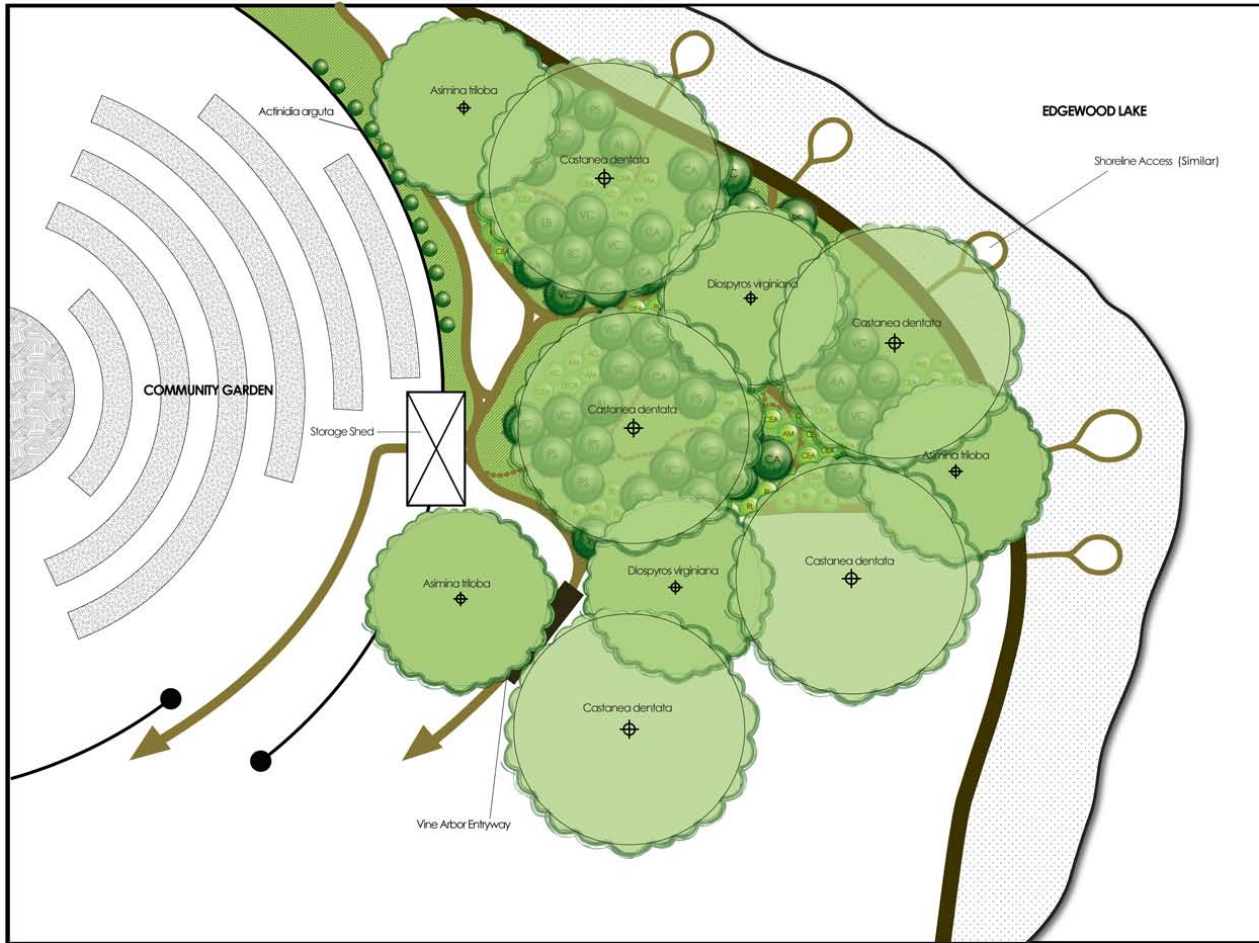
Xerarch Succession on Bare Rock

Time Horizon: 2042

The Design Process: PATCH

2017 Horizon

- Herbal Medicine
- Tubers
- Leafy greens
- Berries
- Some fruit

2042 Horizon

- Nuts
- Mulch
- Fruit
- Berries
- Fuel

30 years

The Design Process: SPECIES SELECTION

☐ Select species to perform those functions in all the conditions you have specified and create a master list

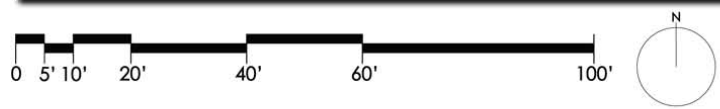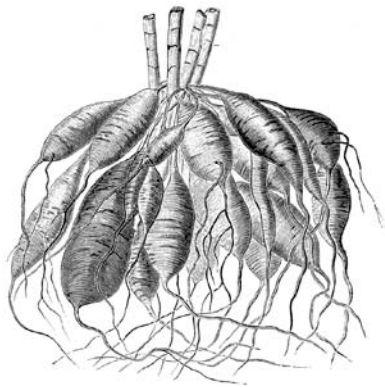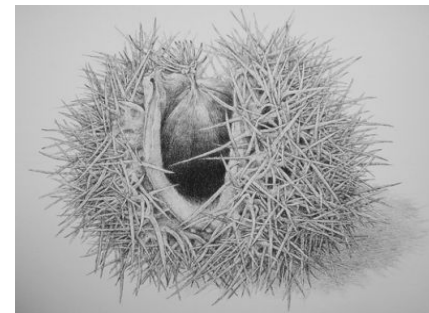| Latin Name	Common Name		Type	Mature Height	Edible Value	Med. Value	Nectary	DA	Cop	NF	Light	Moisture
Diospyros virginiana	American persimmon	DV	0 - Large Tree	50'-75'	E	G	G		Y		Full Sun	Xeric, Mesic
Castanea dentata	American Chestnut	CD	0 - Large Tree	75-100'+	E	S	G		Y		Full to partial sun	Mesic
Asimina triloba	Pawpaw	AT	0 - Small Tree	20'-35'	E	F					Full to partial sun	
Actinidia arguta	Hardy Kiwifruit	AA	0 - Vine	20'-100'	E	S					Full Sun	
Caragana arborescens	Siberian Pea Shrub	PS	1 - Large shrub	8-20'	F		G			Y	Full Sun	
Corylus americana	American Hazelnut	Ha	1 - Large shrub	6-12'	E	S	G				Full Sun	Mesic
Amelanchier alnifolia	Saskatoon	AA	1 - Large shrub	5-15'	E	G	G				Full Sun	Xeric, Mesic
Lindera benzoin	Spicebush	LB	1 - Large shrub	6-12'	G	G					Full sun or Full shade	
Sambucus canadensis	Common Elderberry	SC	1 - Large shrub	6-12'	G	E	S				Full sun to part shade	
Vaccinium corymbosum	Highbush blueberry	HB	1 - Large shrub	6-12'	E	E					Full Sun	Mesic
Amelanchier laevis	Allegheny serviceberry	SB	1 - Small Tree	29'	E	F					Full to partial sun	Xeric, Mesic
Amelanchier canadensis	Juneberry / Shadbush	AC	2 - Large shrub	6'	E	F					Full to partial sun	Mesic
Prunus maritima	Beach plum	PM	2 - Large shrub	8'	G	Y	G				Full Sun	Mesic
Rubus laciniatus	Oregon cut-leaf blackberry	BB	2 - Large shrub	8'	E		G				full sun to part shade	
Ceanothus americanus	New Jersey tea	NJT	2 - Small herbaceous	3-4'	E	E	G			Y	Full to partial sun	Mesic
Aronia melanokarpa	Black Chokeberry	AM	2 - Small shrub	1.5-6'	G	F	G				Full to partial sun	Mesic
Rubus occidentalis	Black Raspberry	BB	2 - Small shrub	3-6'	E	G	G				Full Sun	
Symphytum officinale	Boneset		3 - Small herbaceous	3-5'		E	G	Y			Full to partial sun	
Urtica dioica	Stinging nettle		3 - Small herbaceous	1-5'	E	E		Y			Full to partial sun	
Asparagus oficinalis	Asparagus		3 - Tall herbaceous	3-5'	E	G	G				Full sun	Mesic
Rheum spp.	Rhubarb		3 - Tall herbaceous	3-5'	E	E					Full sun	Xeric, Mesic
Fragaria virginiana	Wild Strawberry		4 - Groundcover	4-12"	E	F	G	Y			Full sun	Xeric, Mesic
Gaultheria procumbens	Wintergreen		4 - Groundcover	2-6"	E	F		Y			Part to full shade	
Solidago odara	Sweet Goldenrod		4 - Small herbaceous	2-4'	G	E	S				Full to partial sun	
Achillea millefolium	Yarrow		4 - Small herbaceous	18-36"	None	E	S	Y			Full to partial sun	Xeric, Mesic
Allium canadense	Wild Garlic		4 - Small herbaceous	6-24"	G	S	G				Full to partial sun	Mesic
Matteuccia struthiopteris	Ostrich fern		4 - Small herbaceous	2-6'	E	None					Part to full shade	
Polygonatum pubescens	Hairy Solomon's seal		4 - Small herbaceous	1-3'	F	F	G				Full sun	
Stellaria media	Chickweed		4 - Small herbaceous	6-12"	E	E	G	Y			Full to partial sun	Mesic
Vaccinium angustifolium	Lowbush Blueberry		4 - Small shrub	2'	E	E					Full sun	Mesic
Helianthus tuberosus	Jerusalem artichoke		4 - Tall herbaceous	6'	E	S	S				Full sun	Mesic
Apios americana	Ground nut		4 - Vine	4'-8'	E	F	G			Y	Full sun	Xeric, Hydric
	Chinese artichoke		4 -								Full sun	

The Design Process: PATCH

- Build polycultures for each patch using species palette based on desired function

Time Horizon: 2017

ROGER WILLIAMS PARK: FOREST GARDEN DESIGN   v.1
2017   02.28.12
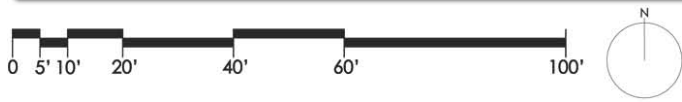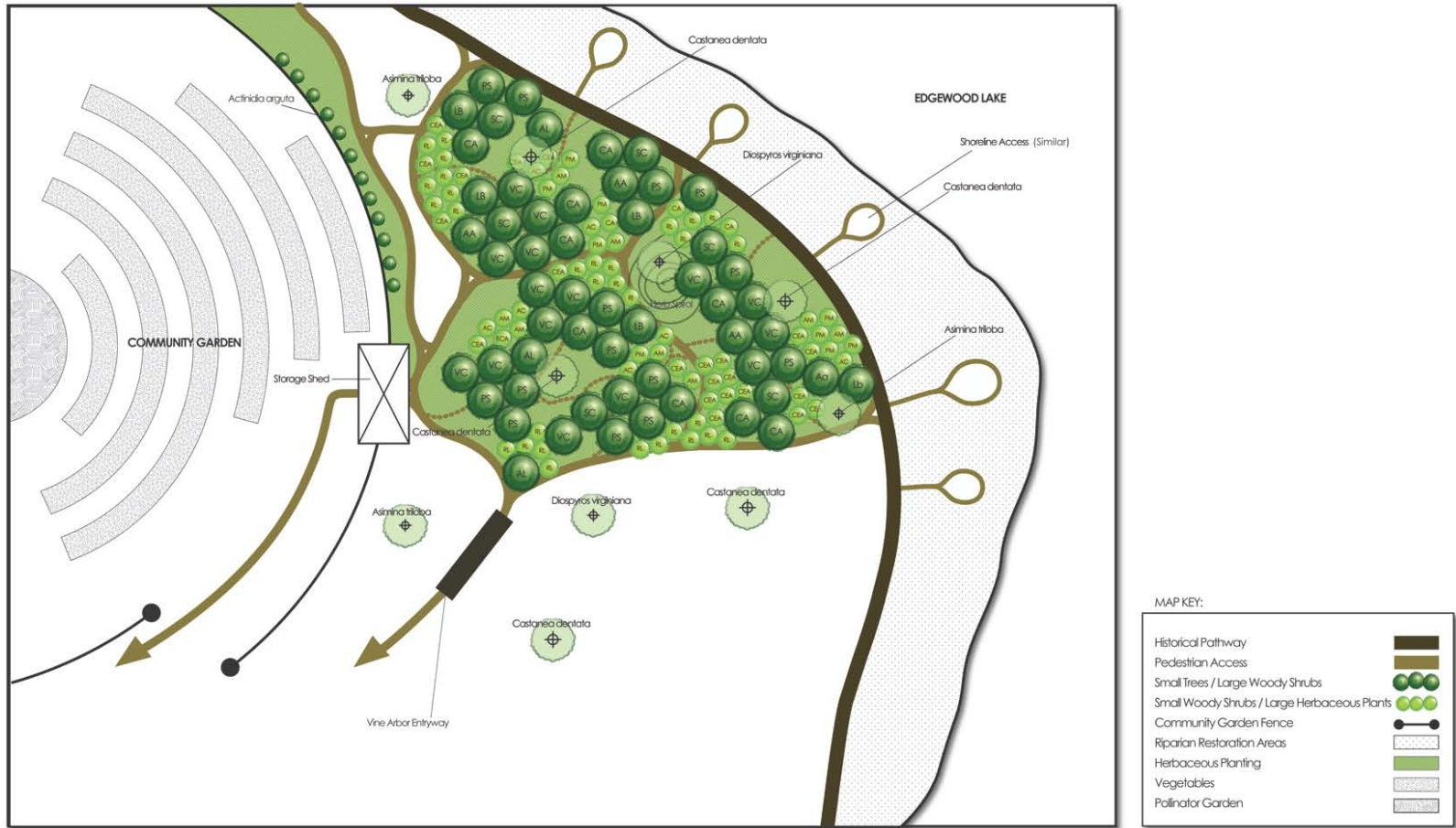
EFG Implementation

- Broken into 4 implementation phases
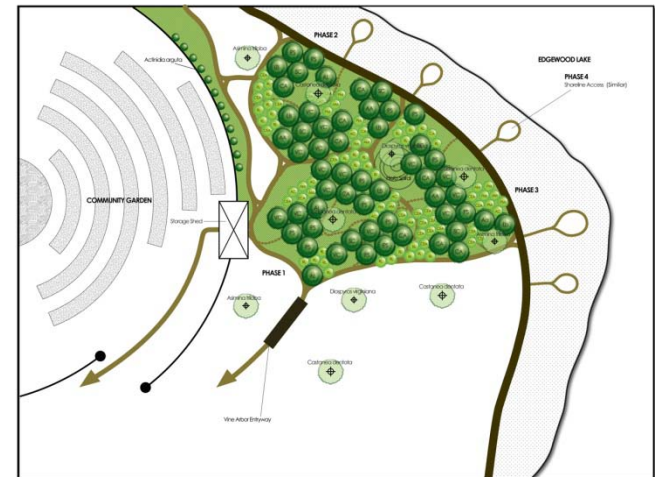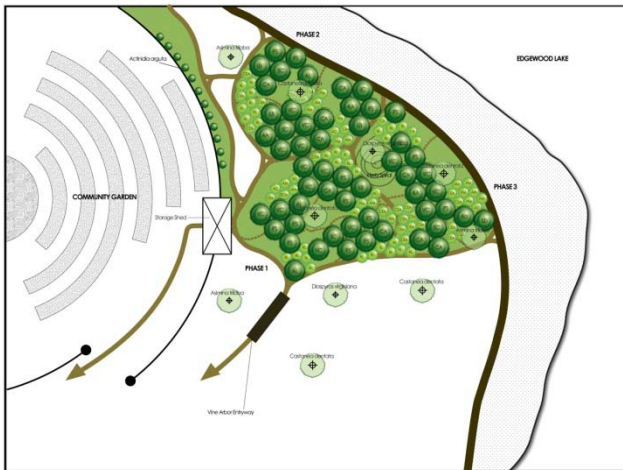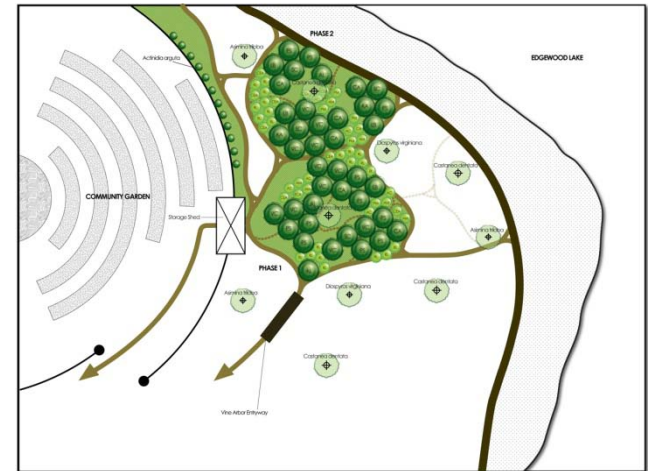
EFG Implementation

2012 GARDEN BREAKING DAY

- *Saturday, April 21 from 10-1PM*
- Community gardener registration and plot prep
- Free seeds, compost and MG vegetable plant distribution
- **Edible Forest Garden site preparation**

Ground Breaking Day 04-21-12

Ground Breaking

Yvonne with the American Chestnuts

Our finished planting of phase 1

Cost - Benefit Analysis

Interest Rate (i)			4.0%			RI Households	410,075
						Project Outcome	$6,729
Year		Benefits	PV Benefits	Costs	PV Costs	Cost/Household	$0
2012	0	$0.00	$0.00	$28,483.71	$28,483.71		
2013	1	$2,440.86	$2,346.98	$16,043.00	$15,425.96		
2014	2	$2,440.86	$2,256.72	$16,043.00	$14,832.66		
2015	3	$2,440.86	$2,169.92	$16,043.00	$14,262.17		
2016	4	$2,440.86	$2,086.46	$16,043.00	$13,713.62		
2017	5	$2,440.86	$2,006.21	$16,043.00	$13,186.18		
2018	6	$21,224.90	$16,774.35	$16,043.00	$12,679.02		
2019	7	$21,224.90	$16,129.18	$16,043.00	$12,191.36		
2020	8	$21,224.90	$15,508.83	$16,043.00	$11,722.46		
2021	9	$21,224.90	$14,912.34	$16,043.00	$11,271.60		
2022	10	$21,224.90	$14,338.78	$16,043.00	$10,838.08		
2023	11	$24,408.64	$15,855.39	$16,043.00	$10,421.23		
2024	12	$24,408.64	$15,245.56	$16,043.00	$10,020.41		
2025	13	$24,408.64	$14,659.20	$16,043.00	$9,635.01		
2026	14	$24,408.64	$14,095.38	$16,043.00	$9,264.43		
2027	15	$24,408.64	$13,553.25	$16,043.00	$8,908.11		
2028	16	$24,408.64	$13,031.97	$16,043.00	$8,565.49		
2029	17	$24,408.64	$12,530.74	$16,043.00	$8,236.05		
2030	18	$24,408.64	$12,048.79	$16,043.00	$7,919.28		
2031	19	$24,408.64	$11,585.38	$16,043.00	$7,614.69		
2032	20	$24,408.64	$11,139.78	$16,043.00	$7,321.82		
2033	21	$24,408.64	$10,711.33	$16,043.00	$7,040.21		
2034	22	$24,408.64	$10,299.36	$16,043.00	$6,769.43		
2035	23	$24,408.64	$9,903.23	$16,043.00	$6,509.07		
2036	24	$24,408.64	$9,522.33	$16,043.00	$6,258.72		
2037	25	$24,408.64	$9,156.09	$16,043.00	$6,018.00		
2038	26	$24,408.64	$8,803.93	$16,043.00	$5,786.54		
2039	27	$24,408.64	$8,465.32	$16,043.00	$5,563.98		
2040	28	$24,408.64	$8,139.73	$16,043.00	$5,349.98		
2041	29	$24,408.64	$7,826.66	$16,043.00	$5,144.21		
2042	30	$24,408.64	$7,525.64	$16,043.00	$4,946.36		
		Sum of PV (B)	$312,629	Sum of PV(C)	$305,900		
	NPV= PV (B) - PV (C)			$6,729			

Cost - Benefit Analysis: Present Value Costs

Initial costs of the project = $28,483.71

Annual maintenance costs after year 0 = $16,043.00

Apply a 4% discount rate raised to 29 years

Sum of present value costs = $305,900

Cost to RI households = approximately $0.75

Cost - Benefit Analysis: Present Value Benefits

Initial benefits of the project for market goods = $0

Benefits from years 1 to 5 = $2,440.85

Benefits from years 6 to 10 = $21,224.90

Benefits from years 11 to 30 = $24,408.64

Apply a 4% discount rate to 29 years

Sum of present value benefits = $312,629.00

Net Present Value= PV(B)-PV(C) = $6729

Non-consumptive benefits considered in CBA

- Protected habitat for wildlife
- Scenic view
- Soil erosion control
- Biogeochemical cycling
- Air purification
- Bird Watching
- Carbon Sequestration
- Education

EFG Implementation

SUMMER 2012

- ☐ Fundraising through the Fundraising Committee
- ☐ Develop educational signs
- ☐ Phase 1 area maintenance
- ☐ Obtain plant materials for Phase 1 area

FALL 2012

- ☐ Finish Phase 1 area
- ☐ Winterize EFG

Roger Williams Park Edible Forest Garden

Sources

- Anagnostakis, Sandra L. "Growing Chestnut Trees." Northern Nut Growers Association, Inc.

- 16 July 2009. Web. 10 April 2012. http://www.nutgrowing.org/faqchest.htm

- Beutel, James A. "Kiwifruit Production in California." University of California Davis Cooperative Extension. January 1990. Web. 01 April 2012. http://sfp.ucdavis.edu/pubs/brochures/kiwi.html

- Cernusca, Mihaela. Gold, Michael.Hunt, Kenneth. "Pawpaw: Production Trial and After Purchase Survey Findings" University of Missouri Center for Agroforestry. March 2009. Web. 01 April 2012. <http://www.centerforagroforestry.org/pubs/pawpaws.pdf>

- Farm locator. Farm Fresh Rhode Island. Website. 05 February 2012. <http://www.farmfreshri.org/>

- "Food Desert Locator." United States Department of Agriculture. Website. 05 February 2012. <http://www.ers.usda.gov/Data/FoodDesert/>

- Hansen, Nanette. "Organic food sales see healthy growth." msnbc.com. 03 December 2012. Web. 03 April 2012. <http://www.msnbc.msn.com/id/6638417/#.T5sCrrNWpIE>

- Harris, Robert. "Evaluating Internet Research Sources." *VirtualSalt*. 15 June 2008. Web. 20 Apr. 2009. http://www.virtualsalt.com/evalu8it.htm.

- Hunt, Nigel. Cubaagriculture.com. "Agriculture in Cuba Today." Web. 05 February 2012. <http://www.cubaagriculture.com/agriculture-today.htm>

- Jianming, Cai. "A New Approach in Xiaotangshan, Beijing: Periurban Agriculture Development in China." Institute of Geographical Science and Natural Resource Research. April 2003. Web. 10 February 2012. <http://www.ruaf.org/system/files?file=Periurban%20Agriculture%20Development%20in%20China.pdf>

- Larsen, Janet. "Bumper 2011 grain harvest fails to rebuild global stocks." 18 January 2012. Web. 11 February 2012. <www.energybulletein.net/stories/2012-01-18/bumper-2011-grain-harvest-fails-rebuild-global-stocks>

- Medik. "Apios Americana." Plants for a Future. 11 April 2012. Web. 10 April 2012. <http://www.pfaf.org/user/Plant.aspx?LatinName=Apios+americana>

- Mellinger, Robert. "Nation's largest public Food Forest takes root on Beacon Hill." Crosscut.com. 16 February 2012. Web. 20 February 2012. <http://crosscut.com/2012/02/16/agriculture/21892/Nation-s-largest-public-Food-Forest-takes-root-on-Beacon-Hill/>

- Mountain Rose Herbs. Web. 01 April 2012. <http://www.mountainroseherbs.com/>

- Ochterski, Jim. "Marketing juneberries / saskatoons as a new crop in the Northeast US: Consumer reactions and recommendations." Cornell University Cooperative Extension, Ontario County. August 2010. Web. 01 April 2012. <http://cceontario.org/cce-site-documents/juneberry/Marketing-report-Juneberry-Saskatoon-sampling-August-2010.pdf>.

- Southside Community Land Trust. Community Growers Network. Map of the Gardens. Website. 05 February 2012. <http://southsideclt.org/sites/default/files/images/2011ProvidenceCommunityGardensMap

- Strang, John. "Juneberry." University of Kentucky Cooperative Extension. April 2009. Web. 01 April 2012. <http://www.uky.edu/Ag/NewCrops/introsheets/juneberry.pdf>

- Way, Rodger D. "Elderberry Culture in New York State." New York State Agriculture Experiment Station. 1981. Web. 10 April 2012. <http://fls.cals.cornell.edu/OCRPDF/91.pdf>

Acknowledgements

Thank you to…

- Kate Venturini
- Marion Gold
- Vanessa Venturini
- URI Outreach Center
- Providence Parks Department
- Simona Trandafir
- URI Honors Program
- URI College of Environment and Life Science
- Carolyn Hames
- Rhode Island Wild Plant Society
- URI Master Gardeners
- Revive the Routes
- Scraps Specialists
- Montview Farm
- American Chestnut Foundation
- Design Team
- Sirius Eco-Village
- Living Routes
- Community Growers Network