Intentional Gardening

for Water Quality, Wildlife Habitat, and Pollinators

Northwest Regional Planning Commission

Nectar Landscape Design Studio, LLC

Why are we here?

Share a set of tools to help you better understand the connection to stormwater on your property and take action

1. Stormwater 101 - Build base knowledge
2. Review resource packet
3. Designing with nature based solutions for water quality
4. Incorporate native plants
5. Review planting plans and discuss modifications

PART 1: Stormwater 101

Learning Objectives:

- Define stormwater
- Connection from your house to Lake Champlain
- Round-up of common practices

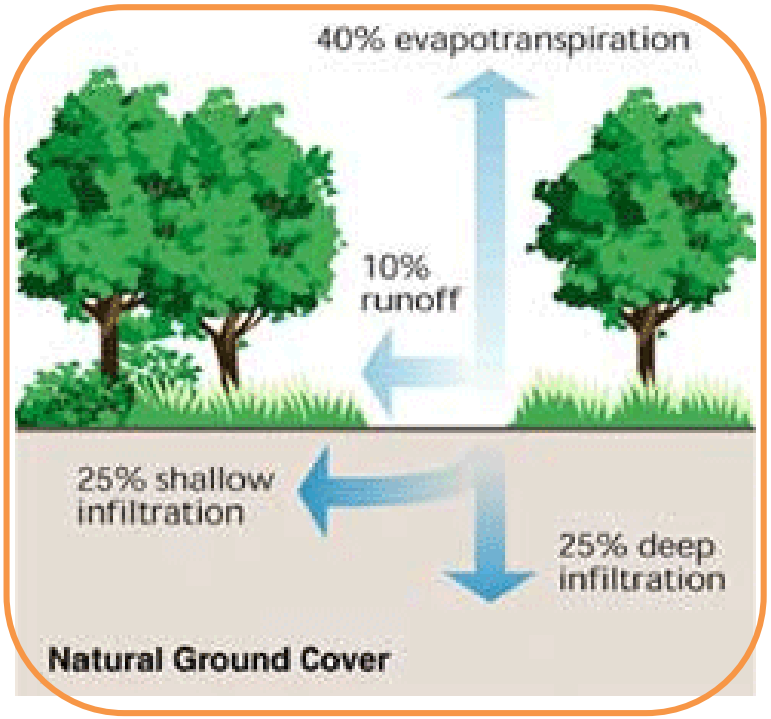
What is Stormwater runoff?

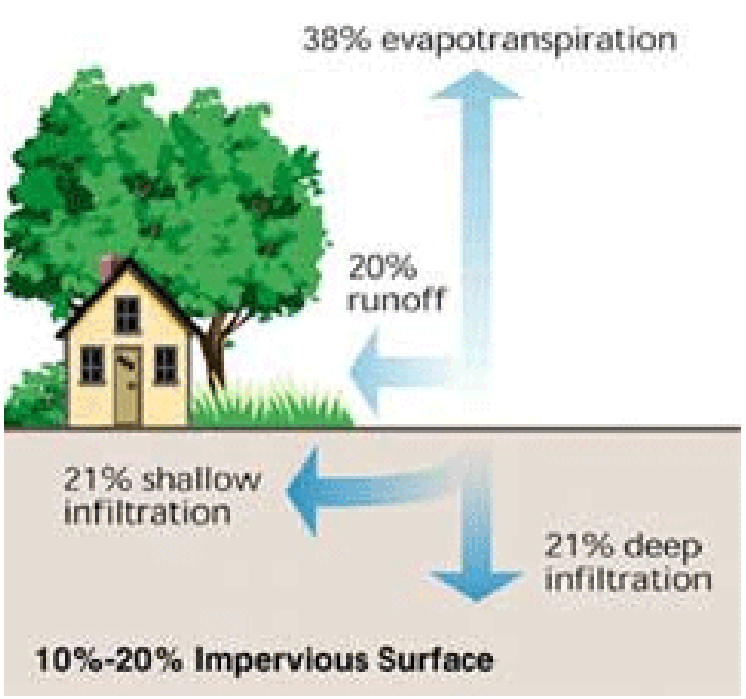
Precipitation from rain or snowmelt that is not absorbed into the ground and flows over the landscape

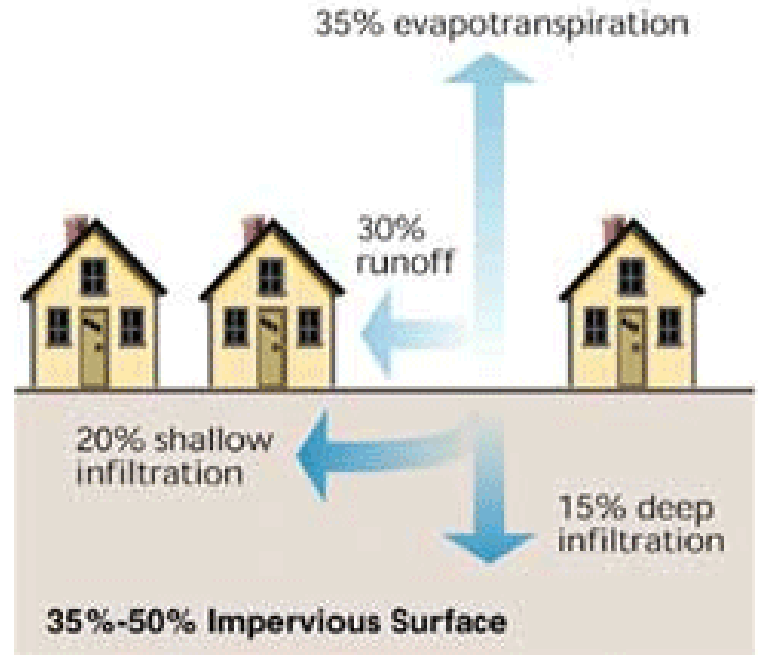
When rain hits impervious surfaces like driveways, sidewalks, and buildings it cannot soak into the ground and becomes **runoff**

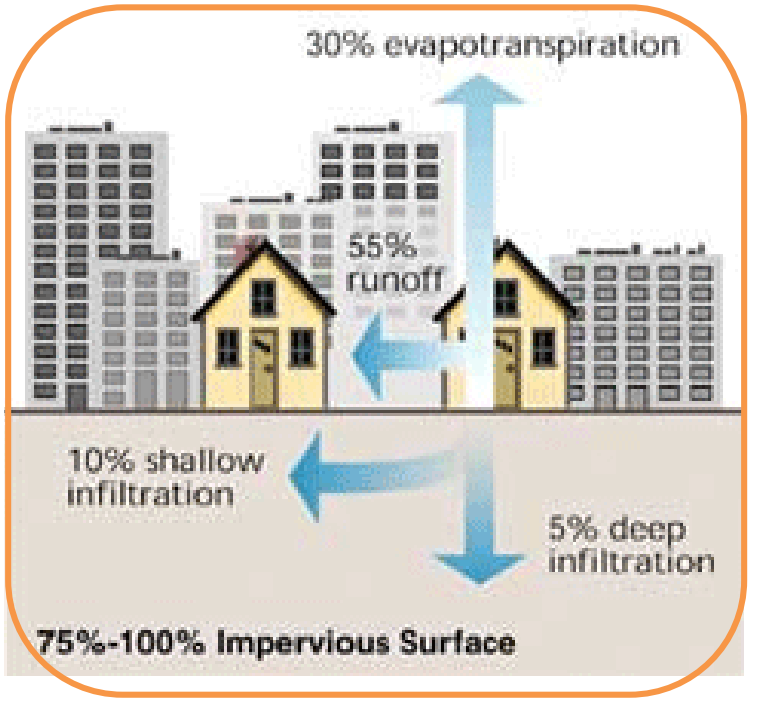
Photos by A. Holland

Changes to Water Cycle



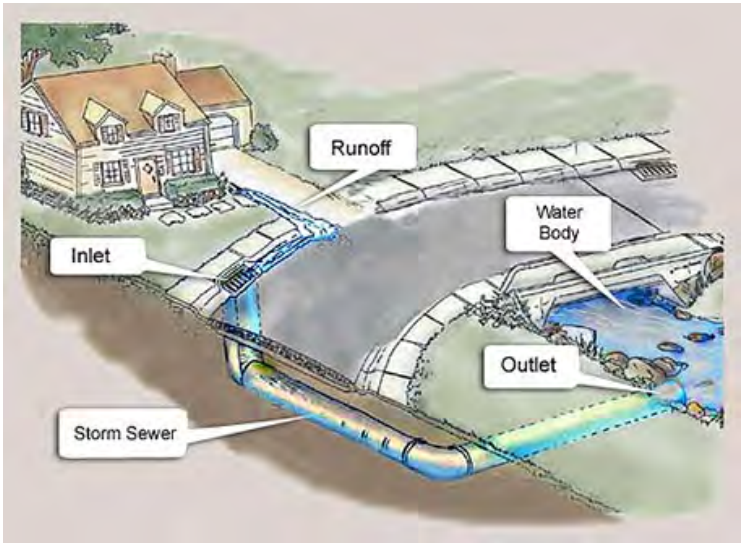




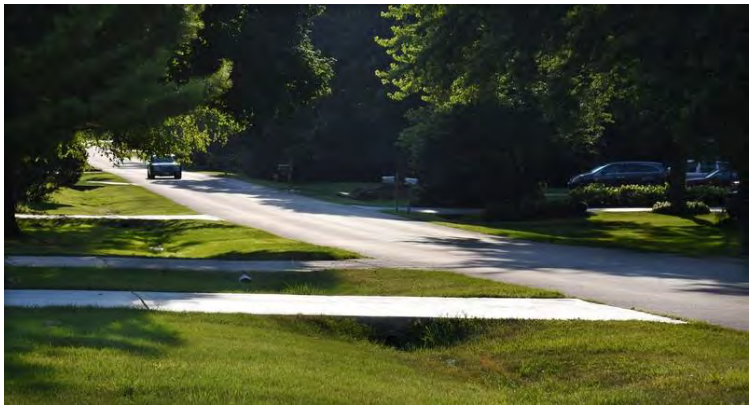


The Path of Stormwater

Storm drain network



Town ditch (& culvert) network



Why is Stormwater A Problem?

- Changes in hydrology
  - Increased flooding
  - Stream bank erosion
  - Lower groundwater infiltration
- Sediment Transport
  - Stress on overall aquatic ecosystem
- Nutrient Overload
  - Increase algae blooms
  - Economic & Recreational Nuisance
- Bacteria Transport
  - Excess nutrients in waterbody
- Damages infrastructure
- Pollutants

Downstream Erosion & Phosphorus Connection

Stormwater can increase erosion in the stream channel

Our soils contain high levels of phosphorus

Sediment is carried to the lake

Rugg Brook below the Industrial Park before restoration

How much runoff are we talking?

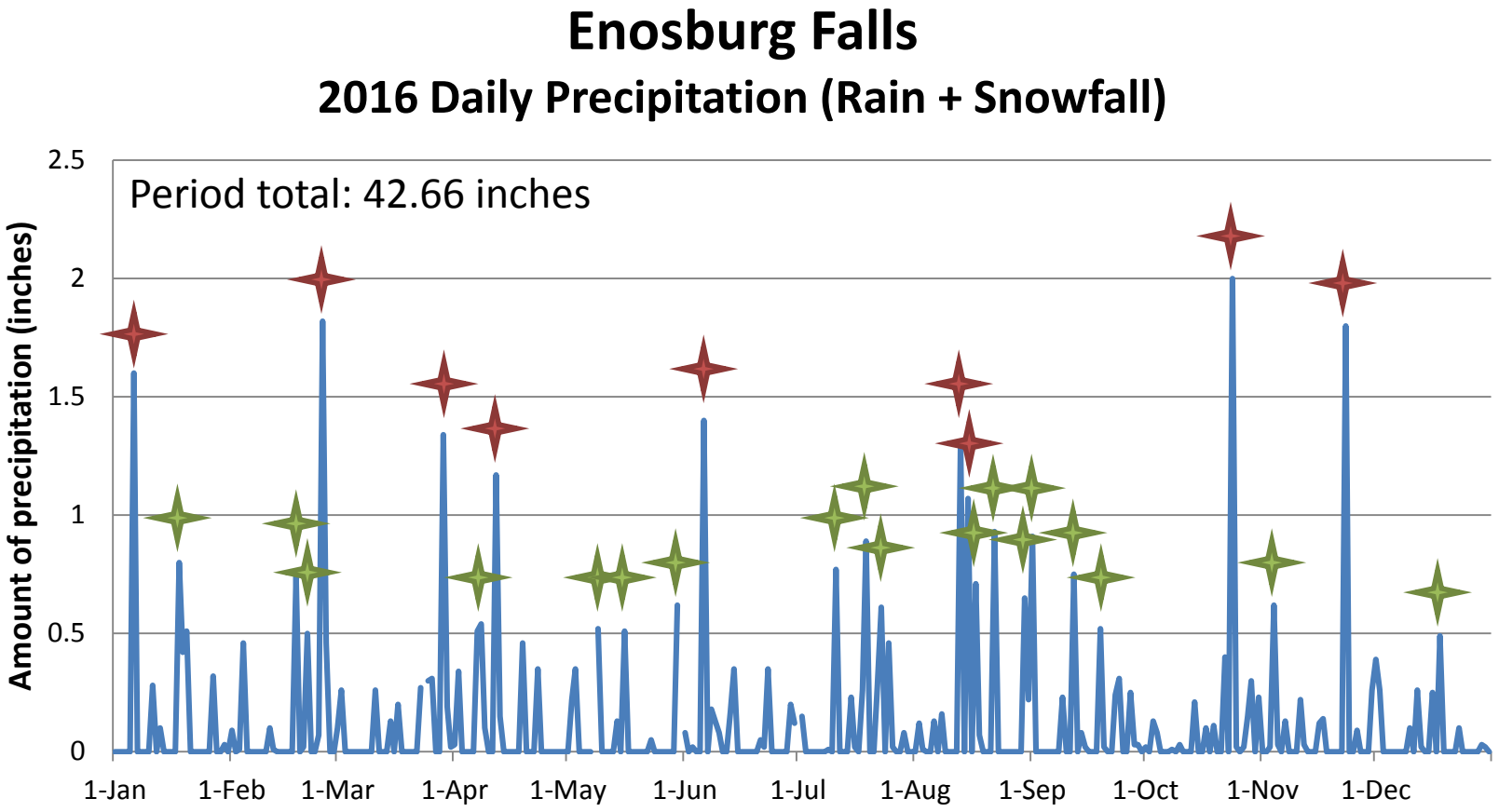
Estimate the volume of stormwater generated from a 1” rainstorm

Stormwater volume (gallons) = (Total Impervious Area ft^2) x 0.0833 x 7.488

0.0833 feet in one inch and 7.48 gallons are in a cubic foot

Driveway Lengths (assuming 12ft width)	Driveway Area	Gallons of Runoff	This fills…
Median - 148 ft	**1,776 sq ft**	**1,108 gall**	 × 2.8
Average – 284 ft	**3,408 sq ft**	**2,126 gall**	 × 5.3
26% of driveways between 300-499 ft (average 385 ft)	**4,620 sq ft**	**2,882 gall**	 × 7.2

How much runoff are we talking?



BLUE – Daily total **RED – 1” storm** **GREEN – 0.5” storm**

Impact across a Community from a 1” storm

Burlington

= 149,000,000 gallons of runoff or

225

St. Albans City

= 48,777,617 gallons of runoff or

46

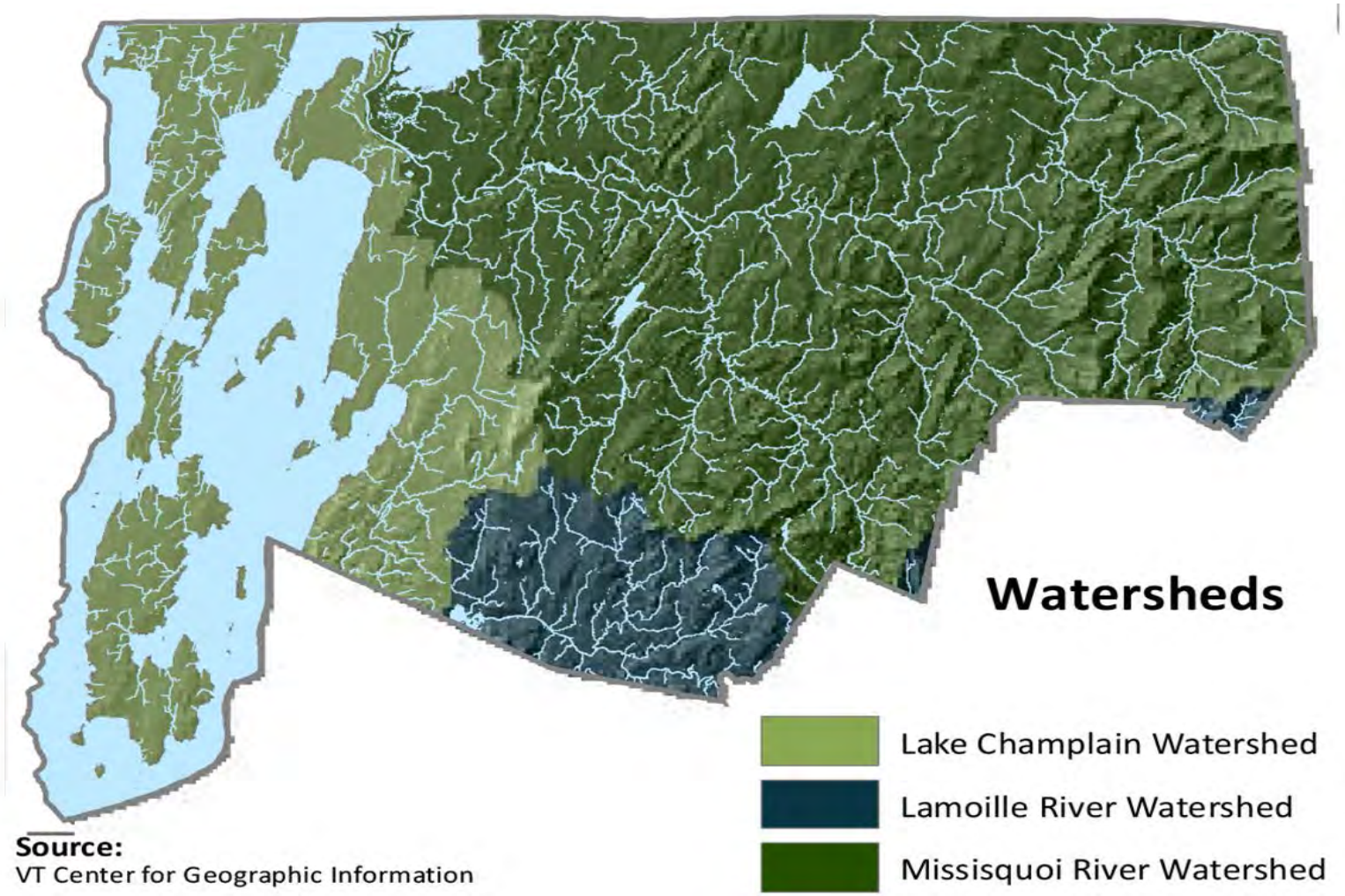
Enosburg Falls

= 4,335,607 gallons of runoff or

6.6

Olympic size swimming pools

Goal for the Watershed



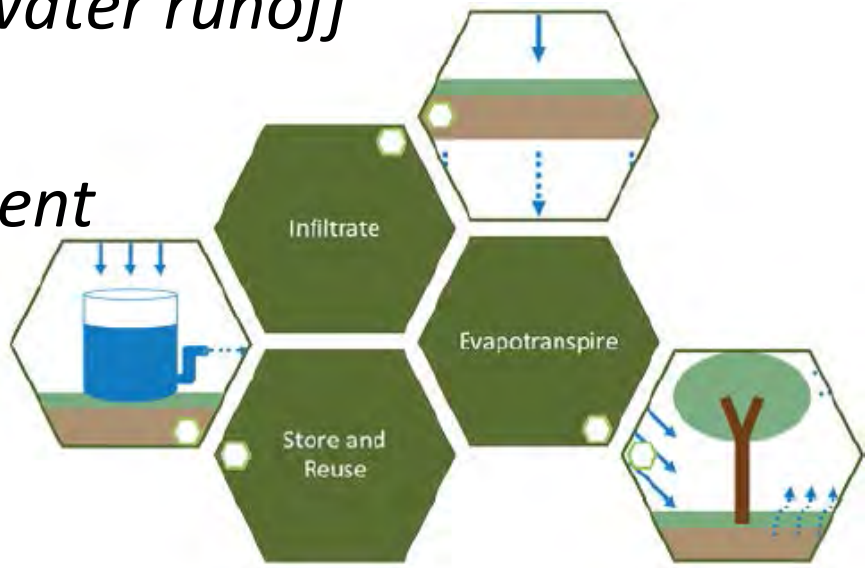
Slow it, Spread it, Sink it

Green Stormwater Infrastructure

Mimic natural processes: storage, detention, infiltration, evaporation, and transpiration (uptake by plants)

Focus → improving water quality and decreasing the total quantity of stormwater runoff

Result →reductions in nutrient pollution & erosive forces

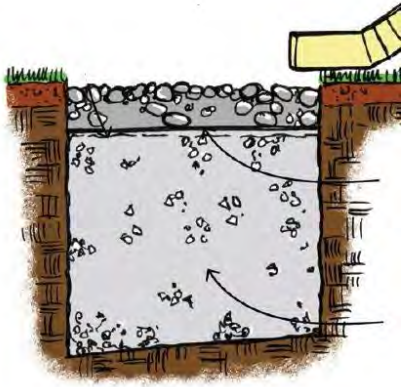


Non-Vegetative GSI Solutions

Rain Barrel

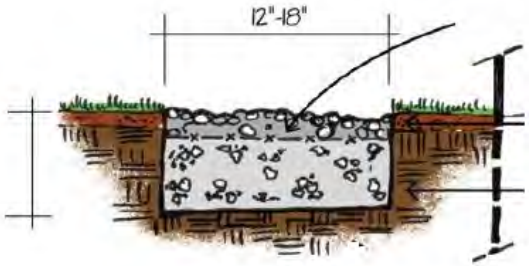
Water bar

Dry Well

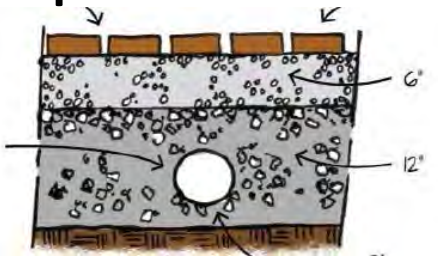


Infiltration Stairs

Infiltration Trench



Permeable pavers

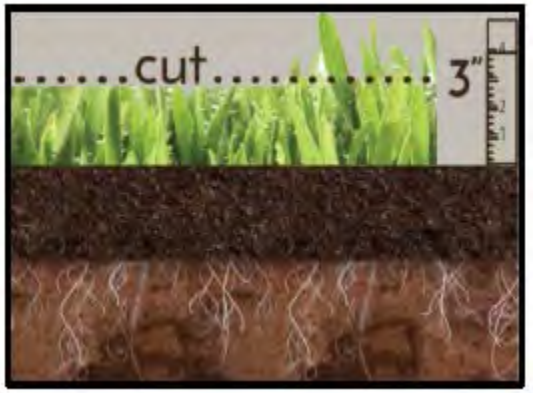


A Simple Action: Raise the Blade

- Several lawn care strategies have been found to *improve soil health*, *increase stormwater absorption* and *help filter pollutants.*

RECOMMENDED PRACTICES:

- **Cut the grass to 3”**
- **Leave the clippings on the lawn**
- **Cut 1/3 of grass blade at each mowing**



WHY DO WE CARE?

These lawn care practices help create *healthy soils*.

- *Healthy soil can hold up to 20x its weight in water, making it more drought resistant*
- *Healthy soils are rich in organic matter*
  - *The carbon in organic matter filters pollutants from runoff*
- *Healthy soil increases your lawn’s resilience to pests and diseases*

Vegetative GSI Solutions

- Plants as filter -- reduce the force and slow the flow of water
- Maximize vegetative buffer along streams & shorelines to stabilize soils with thick mats of roots
- Rethink the size of your lawn to incorporate vertical layers of vegetation.

Part 2: Resource Guide

Franklin County
Stormwater Collaborative
http://www.fcsvt.org

Resource for stormwater educational materials and events (trainings or clean-up days).

Northwest Regional Planning Commission
Amanda Holland
aholland@nrpcvt.com (802) 524-5958

Resource Guide

- 2018 VT Guide to Stormwater Management for Homeowners and Small Businesses
- 2017 Federation of VT Lake and Ponds, A Guide to Healthy Lakes Using Lakeshore Landscaping
- VT Lake Wise Program Factsheets on BMPs
- Vermont Raingarden Manual
- Digsafe – 1-888-DIGSAFE at least 48 hrs prior

GARDENING WORKSHOP: Maximizing the benefits of vegetation in the home landscape

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www.pollinatorgardens.org

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VEGETATION AT WORK

No-mow zones

Unmown areas of trees, shrubs, and/or herbaceous groundcovers that help stabilize soils, absorb stormwater, and provide wildlife habitat

Vegetated swales

Shallow, open channels lined with dense vegetation designed to convey, slow, and filter excess stormwater runoff

Vegetative buffers

Unmown vegetated areas that help protect tributaries and bodies of water such as streams, rivers, and lakes.

Rain gardens

Gardens of native shrub and perennials planted in a shallow depression designed to temporarily hold and soak in rain water runoff from roofs, driveways, patios or lawns.

1. SITE ANALYSIS

Evaluating your home landscape for vegetative stormwater solutions

SITE ANALYSIS

- Property boundary
- Utility locations
  - Are there above and/or below ground utilities in the work area?
  - Call 811 for utility marking
- Existing vegetation
  - Are there invasive species that should be removed?
- Microclimates
  - Sun patterns, wind exposure
- Site Soils
- Existing stormwater pathways
  - High points, low points, drainage pathways, wet areas
- Winter snow storage
- Site functions
  - How your property is used for passive/active recreation by children, pets, adults, etc.

THE 811 PROCESS FOR HOMEOWNERS

1 NOTIFY

Notify your local one-call center by calling 811 or making an online request 2-3 days before work begins. **Click here** for information about your local one-call center and online service availability. The one-call center will transmit information to affected utility operators.

2 WAIT

Wait 2-3 days (varies by state; please **click here** for state law information) for affected utility operators to respond to your request. On average, between 7-8 utility operators are notified for each request.

3 CONFIRM

Confirm that all affected utility operators have responded to your request by comparing the marks to the list of utilities the one-call center notified. State laws vary on the process for confirmation; please check with your local one-call center for more information.

4 RESPECT

Respect the marks. The marks provided by the affected utility operators are your guide for the duration of your project. If you are unable to maintain the marks during your project, or the project will continue past your request's expiration date (varies by state), please call 811 to ask for a re-mark.

5 DIG CAREFULLY

Dig carefully. If you can't avoid digging near the marks (within 18-24 inches on all sides, depending on state law), consider moving your project to another part of your yard. If you must dig near the marks or use machinery of any kind, please **click here** to read "The 811 Process for Contractors."

For projects that include planting a tree, installing a mailbox or building a deck, among others.

Know what's below.
Call before you dig.

Use this free service to confirm utility locations and keep you and your utilities safe

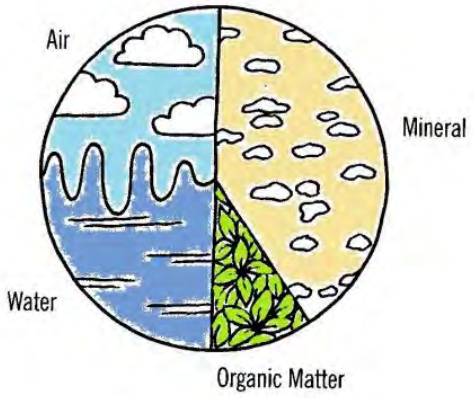
Do you have invasive species that should be controlled?

Visit: www.vtinvasives.org

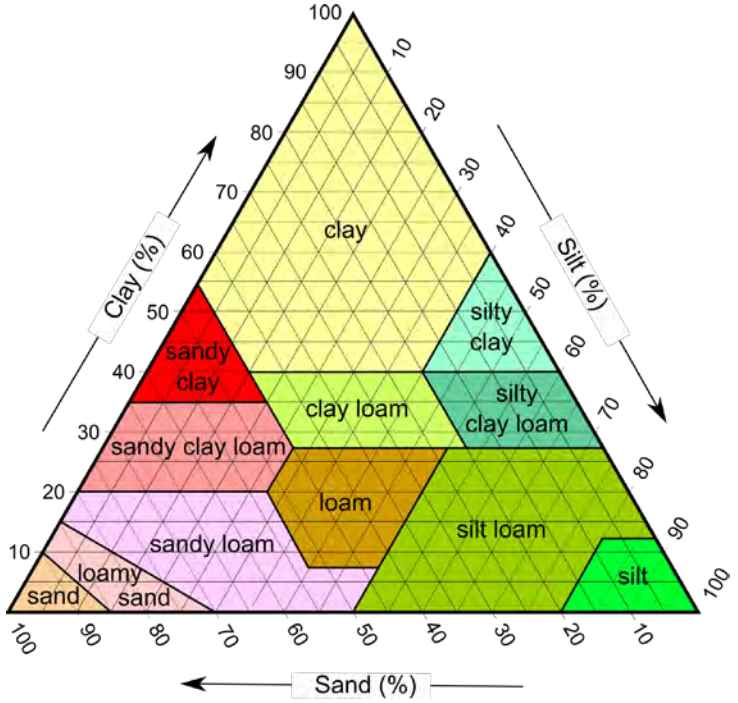
This mark indicates a state regulated species.

Assess microclimates on your property. Which areas are sunnier/shadier, wetter/drier, and windier.

- Full Sun = >6 hours direct sunlight daily
- Part Sun/Part Shade = 3-6 hours
- Shade = <3 hours of direct sunlight daily



Soil plays a vital ecological role by absorbing and cleansing pollutants from stormwater



- The **texture** of a soil is based on the percentage of sand, silt, and clay found in that soil.
- A textural triangle (left) is commonly used to help describe the texture of a soil.
- Soil texture affects the capacity of a soil to infiltrate stormwater.

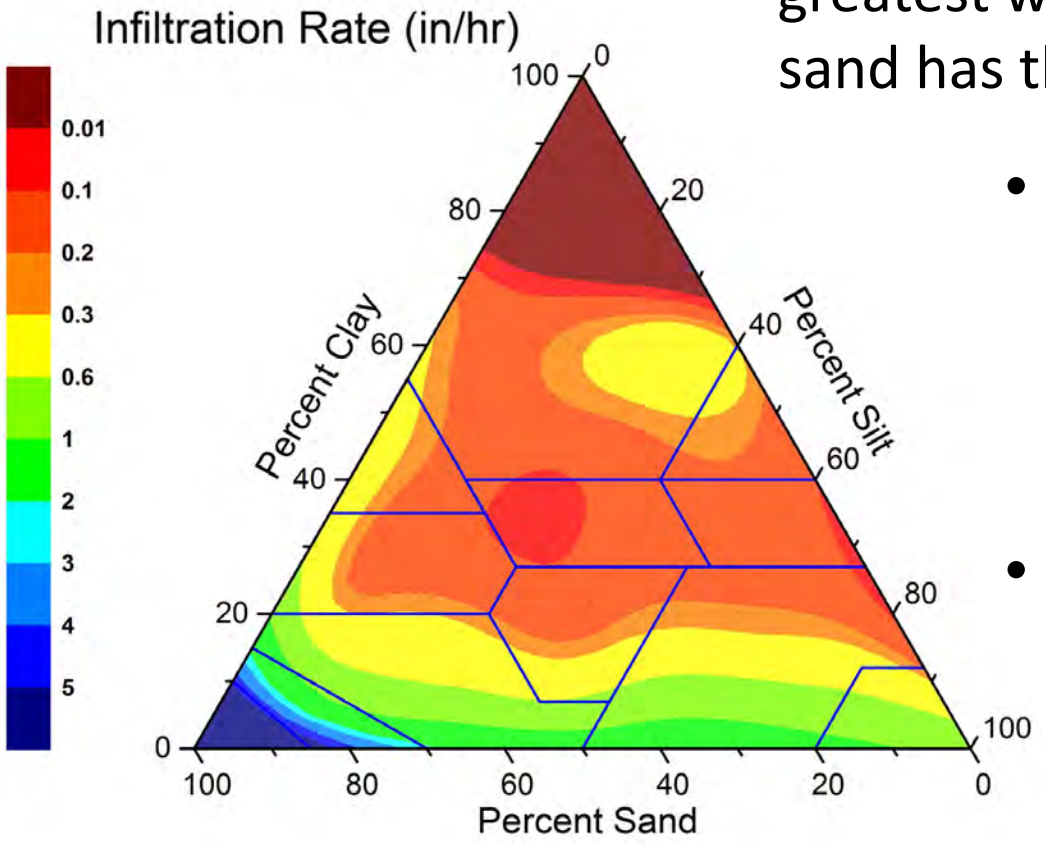
Learn more about your soil texture with a simple

JAR SOIL TEST

Instructions can be found at: https://www.gardeningknowhow.com/garden-how-to/soil-fertilizers/soil-texture-jar-test.htm

Photos: Maria Cahill

- Soil texture affects the capacity of a soil to hold water. The smaller the soil particles, the more water the soil can retain. Thus, clay soils have the greatest water-holding capacity and sand has the least.



- For infiltration practices, such as rain gardens, sandier soils are preferred over clay soils.

- If soils are too clayey, less water will be infiltrated, and standing water may become problematic.

INFILTRATION TEST

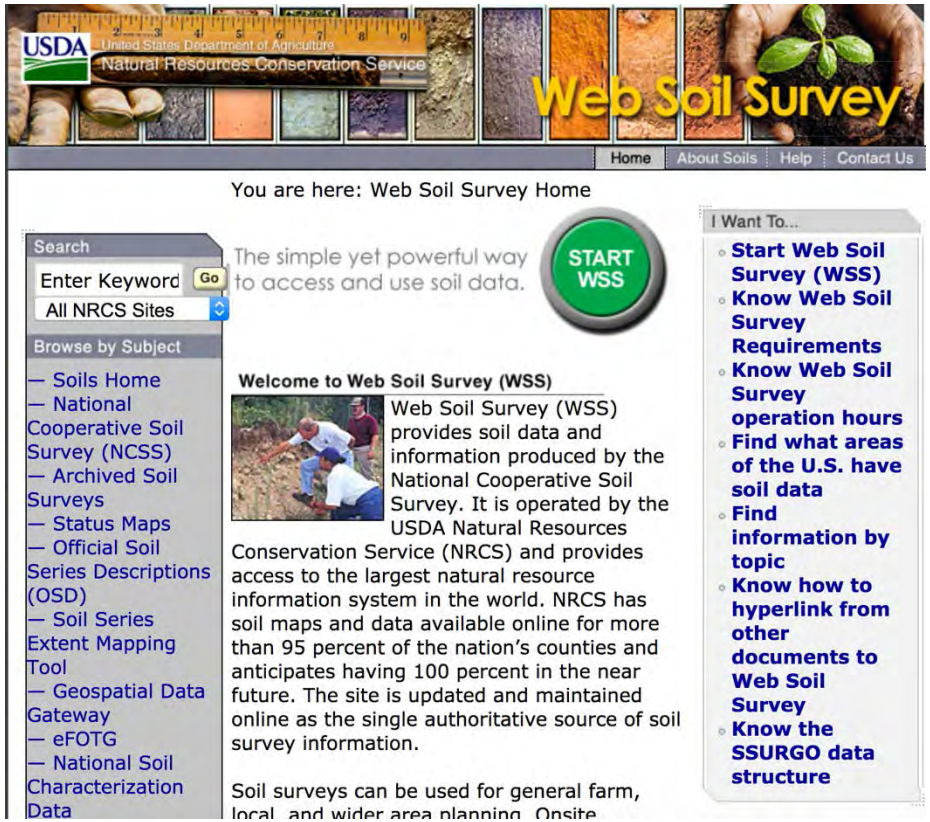
To assess the infiltration rate of your existing soils:

1. Dig a hole 6-12 inches deep and 6 inches wide.
2. Fill hole with water and let stand for one hour.
3. Refill hole with water. Measure depth of water with a ruler.
4. Let stand 1 hour. Measure the depth again. (For clay soils, let stand 6 hours or longer)
5. If less than 6 inches of water can infiltrate in 24 hours, choose a new location for the infiltration practice or consult a professional.

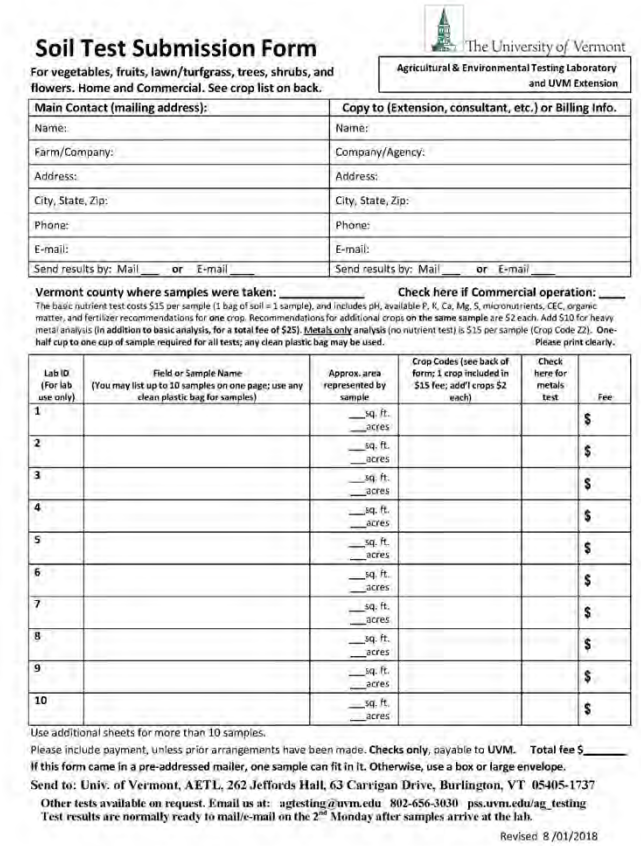
Photos: Maria Cahill

SOIL MAPPING/TESTING

How is your soil mapped by the NRCS?
http://websoilsurvey.nrcs.usda.gov



Need a soil test from a lab?
http://pss.uvm.edu/ag_testing/



Soil Test Submission Form

The University of Vermont
Agricultural & Environmental Testing Laboratory and UVM Extension

For vegetables, fruits, lawn/turfgrass, trees, shrubs, and flowers. Home and Commercial. See crop list on back.

Main Contact (mailing address):	Copy to (Extension, consultant, etc.) or Billing Info.
Name:	Name:
Farm/Company:	Company/Agency:
Address:	Address:
City, State, Zip:	City, State, Zip:
Phone:	Phone:
E-mail:	E-mail:
Send results by: Mail___ or E-mail___	Send results by: Mail___ or E-mail___

Vermont county where samples were taken: _____ **Check here if Commercial operation:** ___

The basic nutrient test costs $15 per sample (1 bag of soil = 1 sample), and includes pH, available P, K, Ca, Mg, S, micronutrients, CEC, organic matter, and fertilizer recommendations for one crop. Recommendations for additional crops on the same sample are $2 each. Add $10 for heavy metal analysis (In addition to basic analysis, for a total fee of $25). Metals only analysis (no nutrient test) is $15 per sample (Crop Code Z). One-half cup to one cup of sample required for all tests; any clean plastic bag may be used. Please print clearly.

Lab ID (For lab use only)	Field or Sample Name (You may list up to 10 samples on one page; use any clean plastic bag for samples)	Approx. area represented by sample	Crop Codes (see back of form; 1 crop included in $15 fee; add'l crops $2 each)	Check here for metals test	Fee
1		___sq. ft. ___acres			$
2		___sq. ft. ___acres			$
3		___sq. ft. ___acres			$
4		___sq. ft. ___acres			$
5		___sq. ft. ___acres			$
6		___sq. ft. ___acres			$
7		___sq. ft. ___acres			$
8		___sq. ft. ___acres			$
9		___sq. ft. ___acres			$
10		___sq. ft. ___acres			$

Use additional sheets for more than 10 samples.

Please include payment, unless prior arrangements have been made. **Checks only**, payable to **UVM.** **Total fee $_____**

If this form came in a pre-addressed mailer, one sample can fit in it. Otherwise, use a box or large envelope.

Send to: Univ. of Vermont, AETL, 262 Jeffords Hall, 63 Carrigan Drive, Burlington, VT 05405-1737

Other tests available on request. Email us at: agtesting@uvm.edu 802-656-3030 pss.uvm.edu/ag_testing
Test results are normally ready to mail/e-mail on the 2nd Monday after samples arrive at the lab.

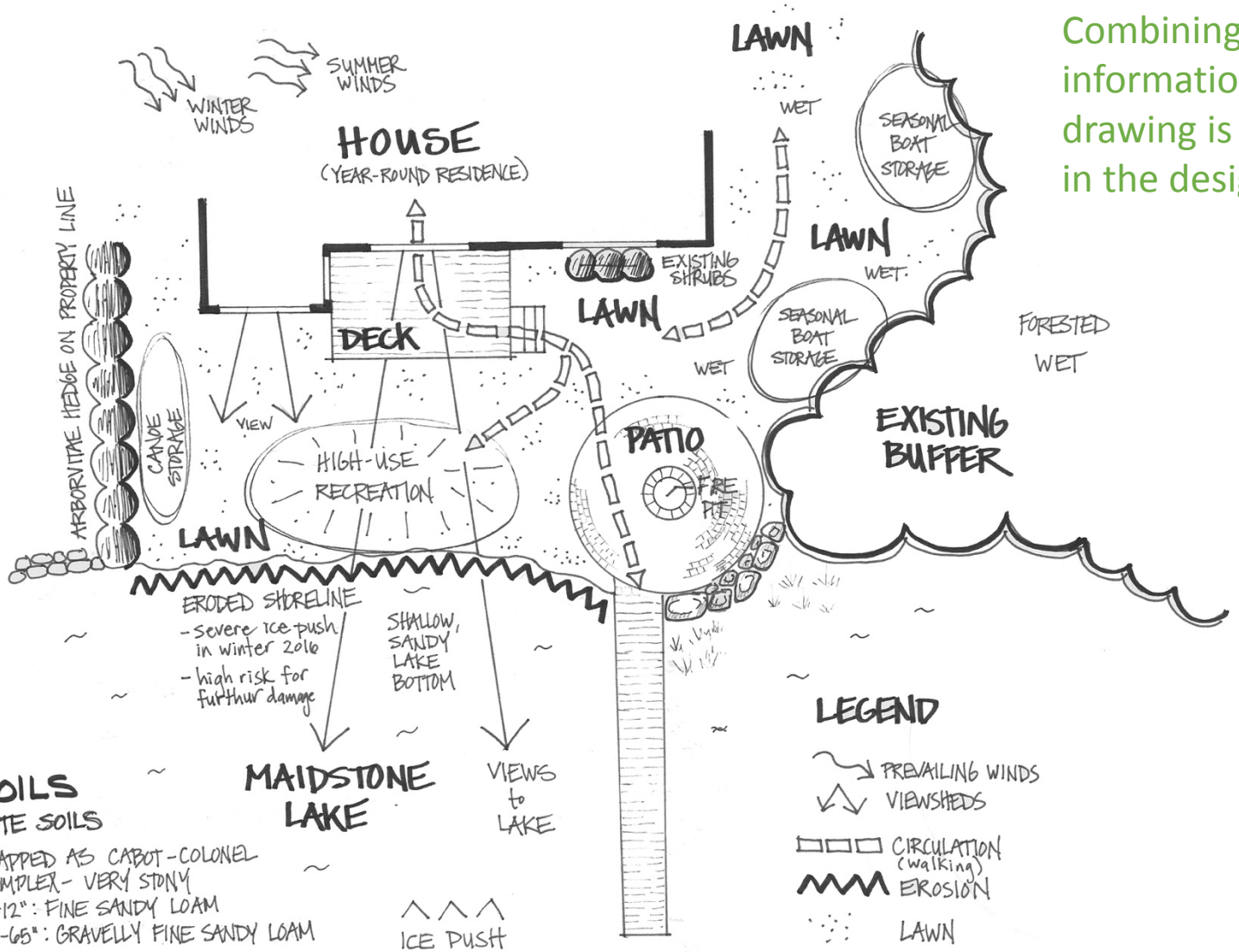
Revised 8/01/2018

https://www.columbian.com/news/2018/feb/01/rain-gutter-can-create-home-drainage-woes/

Site functions - How is your property used for passive/active recreation by children, pets, adults, etc.?

Photos: Annie White

SAMPLE SITE ANALYSIS DRAWING



Combining site analysis information in a single drawing is a helpful step in the design process.

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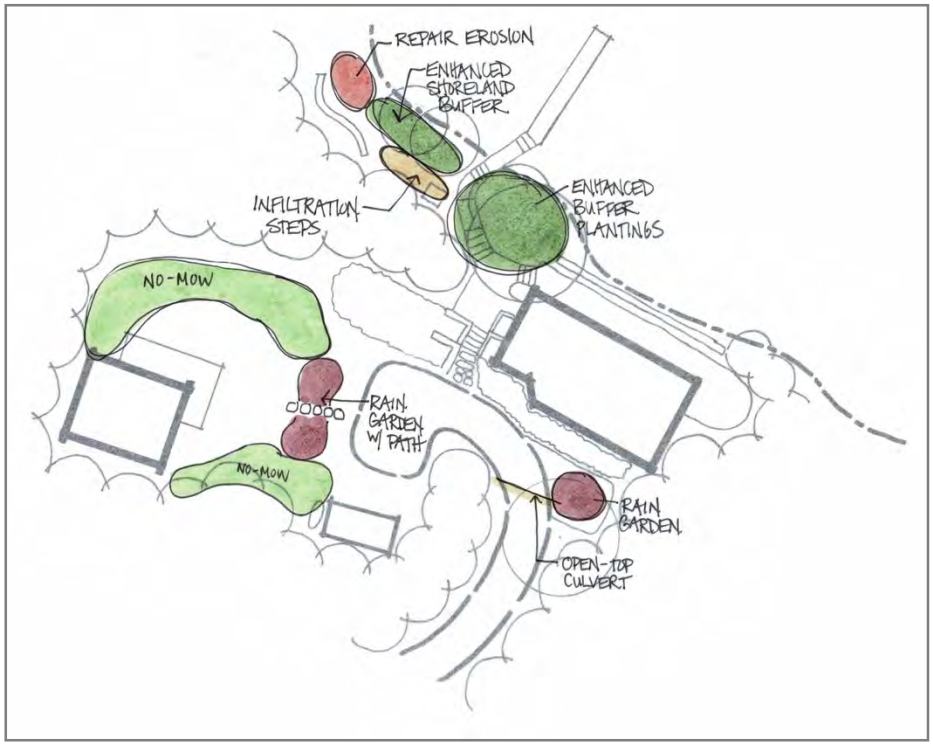
2. CONCEPTUAL PLANNING

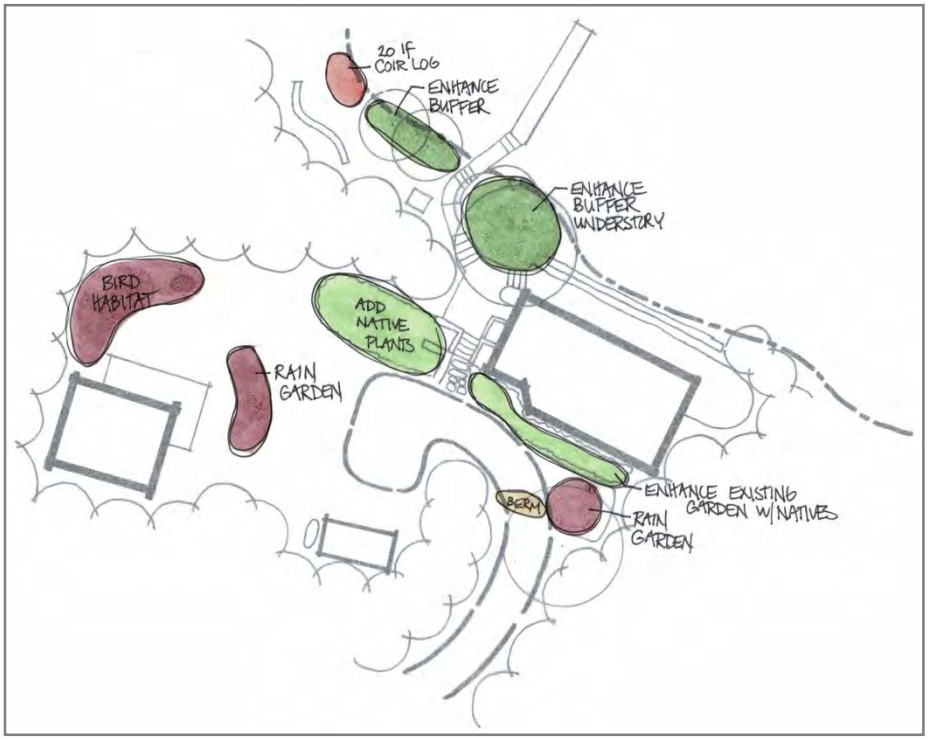
“Conceptual design” is part of the design process followed by landscape architects. The concept plan (a.k.a. functional diagram or bubble diagram) organizes the design elements within the landscape space, creating functionality in the design. A good concept will serve as the framework for the rest of the design process.

SAMPLE CONCEPT PLAN

CONCEPT A



CONCEPT B



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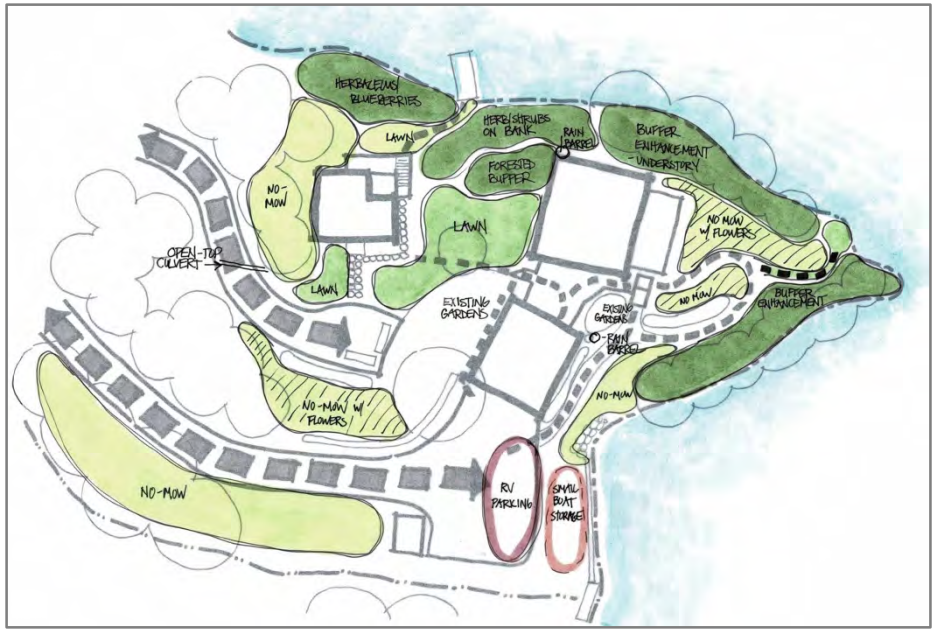
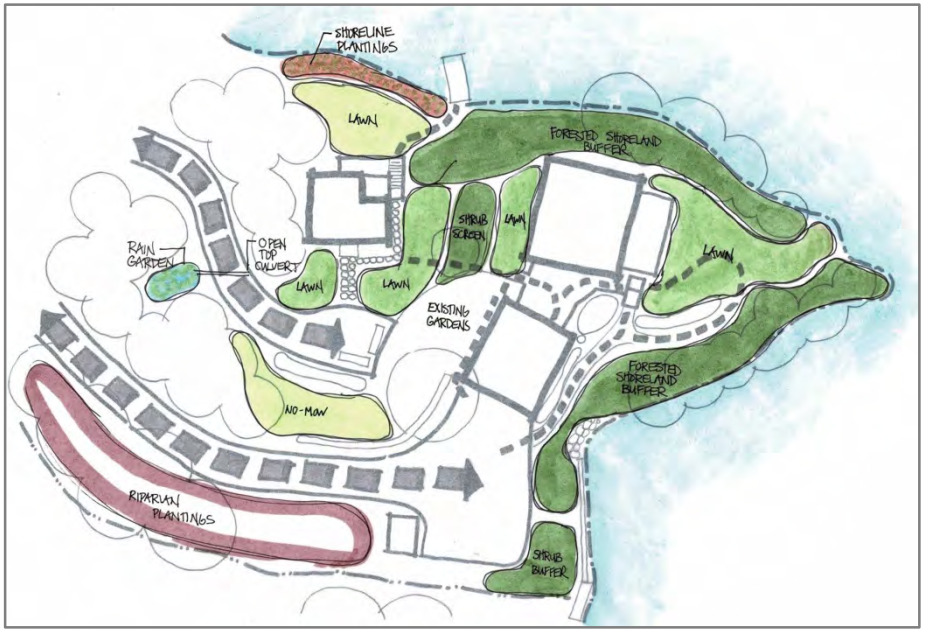
SAMPLE CONCEPT PLAN

CONCEPT A



CONCEPT B



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3. USING NATIVE PLANTS

Plants that are native to our region are typically recommended for planting in rain gardens, vegetated swales, and vegetated buffers

WHAT IS A "NATIVE" PLANT?

- A plant that has developed over hundreds or thousands of years in a particular region or ecosystem and is part of the balance of nature.
- Typically, only plants found in this country before European settlement are considered to be native to the U.S.
- Being "native" can vary in scale (U.S., New England, VT, Franklin County?) When defining a native plant, you must also define the geographic region.

BENEFITS OF NATIVE PLANTS

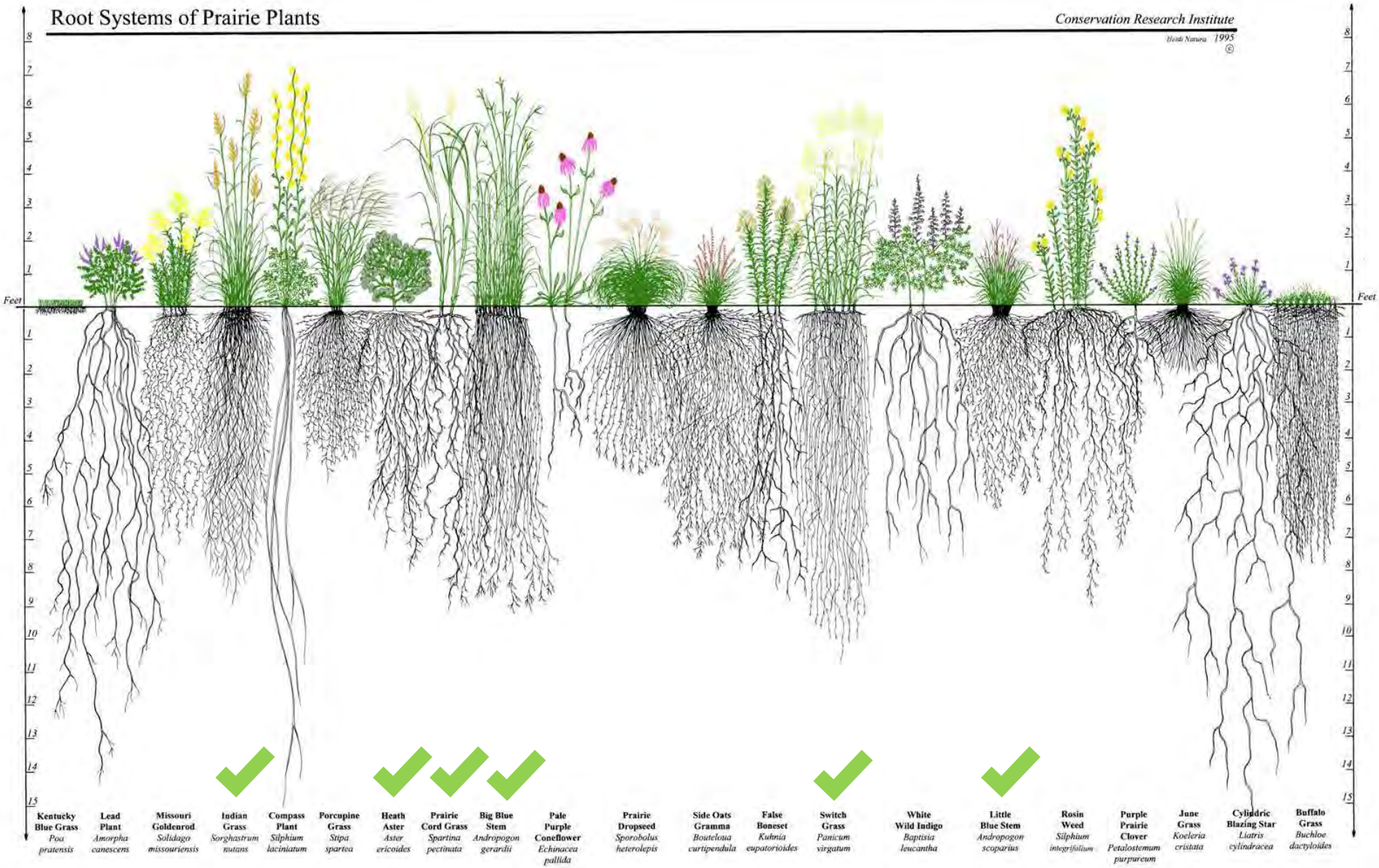
Photo: Annie White, NECTAR

- Adapted to our local soils & climate
- Have deep root systems
- Preferred host plants for native insects and food source for pollinators
- Do not require long-term irrigation in the landscape
- Do not require fertilizer in the landscape
- Promote biodiversity and stewardship of our natural heritage

Root Systems of Prairie Plants

Conservation Research Institute

Heidi Natura 1995 ©



PLANT TREES!

- A mature oak tree can soak up and transpire about 80 gallons of water per summer day
- A mature maple can soak up and transpire about 40 gallons

Photo: www.carbo-la.com

HABITAT BENEFITS OF NATIVE PLANTS

NON-NATIVE
Kousa Dogwood
Benthamidia japonica
Supports 0 species

NATIVE
Flowering Dogwood
Benthamidia florida
Supports 117 species

- Native plants are the preferred food sources for native birds and the preferred host plants for native insects and pollinators
- Consider native plant species for your landscape before non-native species
- Learn more at: www.bringingnaturehome.net

HABITAT BENEFITS OF NATIVE PLANTS

Monarch caterpillar on Milkweed

Juniper Hairstreak on Red Cedar

HABITAT BENEFITS OF NATIVE PLANTS

- Native plants and the nectar and pollen they produce are often the preferred food source for native pollinators, including bees and butterflies
- Plant a diversity of native flowering plants that provide nectar and pollen to pollinators from early spring to late fall

Photo: Annie White, NECTAR

IMPORTANCE OF POLLINATORS

- **75%** - Percentage of the world's food crops that depend at least in part on insect pollination (Klein et al. 2007)
- **90%** - Percentage of wild flowering plants that depend on animal-mediated pollination (Ollerton et al. 2011)
- **$235-577** billion - Annual value of global crops directly affected by pollinators
- **300%** - Increase in volume of agricultural production dependent on insect pollination in the past 50 years (Aizen and Harder 2009)
- **39%** - Percentage of pollinator-dependent crop area in the U.S. that suffers from a mismatch between supply of wild bees and the need for their pollination services (Koh et al. 2016)

RESTORING POLLINATOR HABITAT

Photo: Resource Management, Inc.

- Preserving and/or restoring pollinator habitat can improve bee abundance, richness, and productivity, even in landscapes with little natural habitat

  (Williams and Kremen 2007; Ricketts et al. 2008; Garibaldi et al. 2013; Nicholls and Altieri 2013)

RESTORING POLLINATOR HABITAT

FLORAL RESOURCES

NESTING SITES

PROTECTION

SMALL GARDENS ADD UP

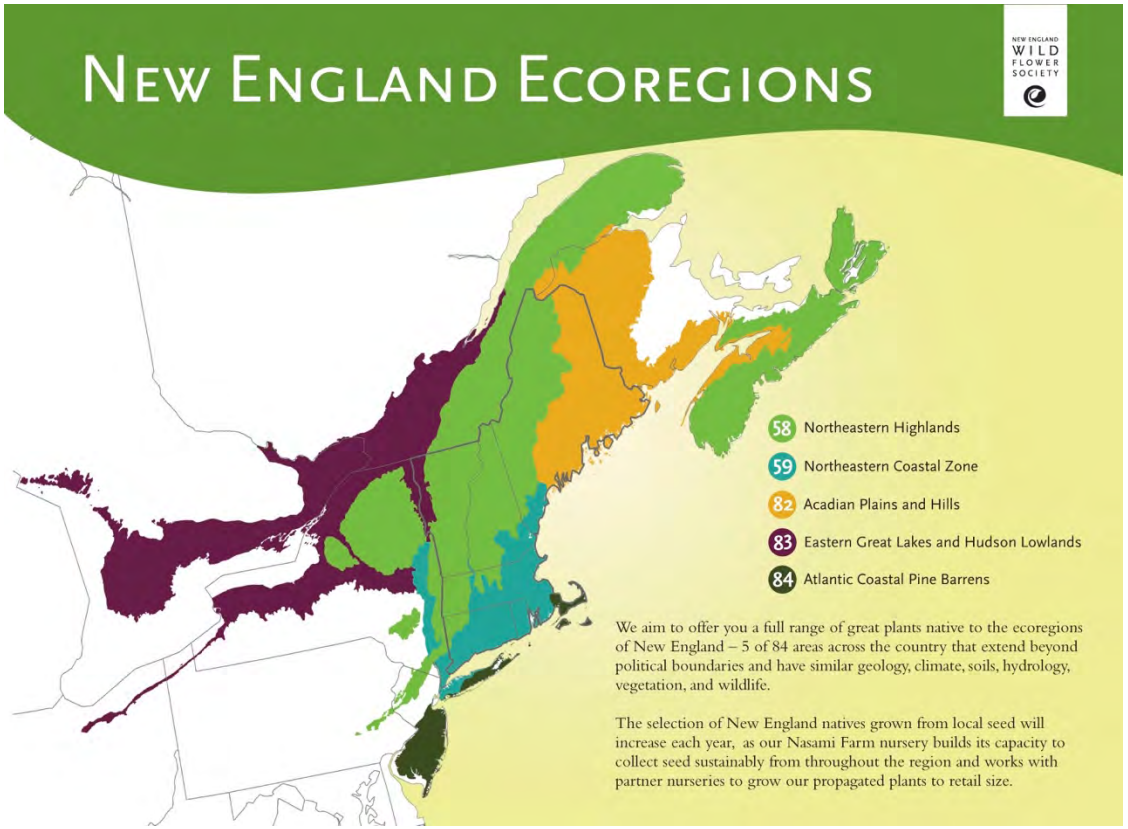
NEW ENGLAND WILD FLOWER SOCIETY'S POLLINATE NEW ENGLAND GARDENS, SUMMER 2018

IS IT NATIVE?

http://gobotany.newenglandwild.org/

- Use New England Wild Flower Society's "Go Botany" tool to search native plants in New England and view maps of their native distribution

NEW ENGLAND ECOREGIONS

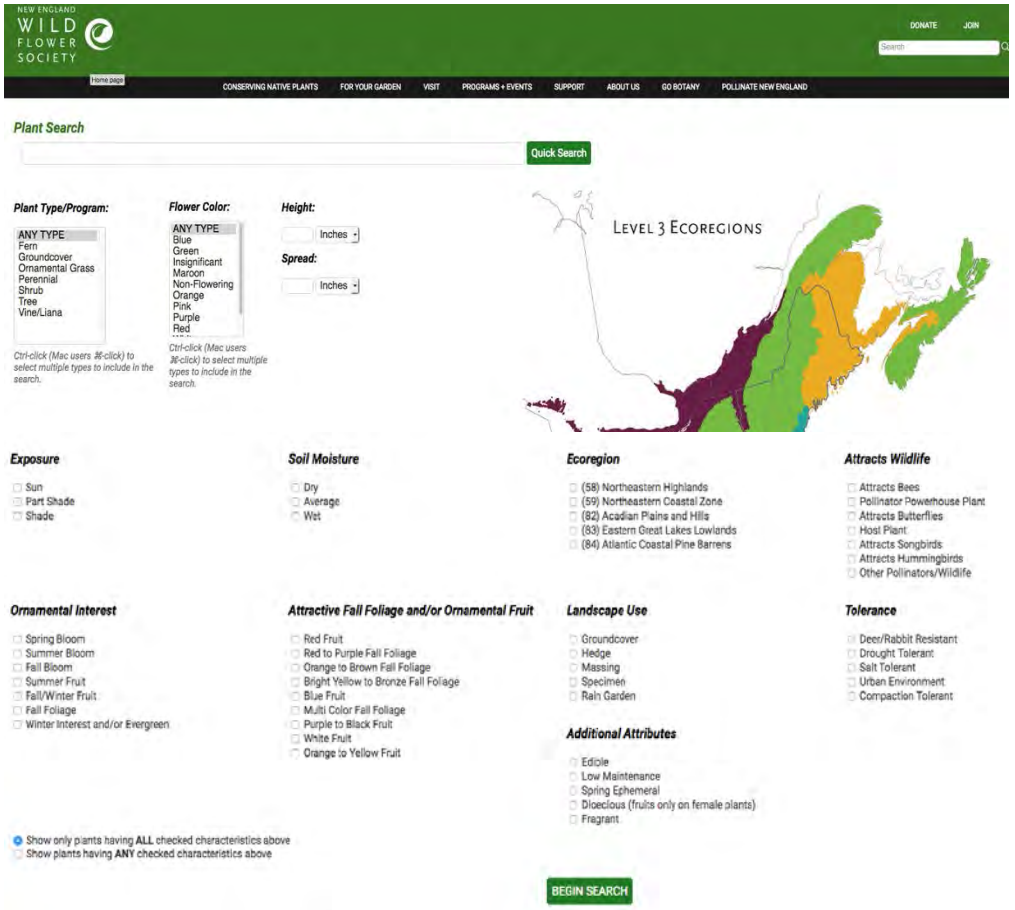


- Plant distribution doesn't adhere to political boundaries
- Ecoregions are defined by similar geologic, climate, soils, hydrology, vegetation, and wildlife
- Select plants native to your ecoregion

CREATING A NATIVE PLANT LIST?

http://plantfinder.newenglandwild.org/

- Use New England Wild Flower Society's "Plant Finder" tool to search for native plants that will grow well on your site



ARE SOME NON-NATIVES OKAY?

Photo: Annie White, NECTAR

- Non-native plants may still provide some value to your landscape (e.g. sentimental value, aesthetic value, fill a gap in bloom time)
- Plant only well-behaved non-natives that you know will not be aggressive or escape cultivation

PURCHASING PLANTS

Traditional gallon-sized pots
Average cost: $15/each

landscape plugs
Average cost: $3/each

Photos: Annie White

BARE ROOT VS. CONTAINERIZED TREES & SHRUBS

Bare root

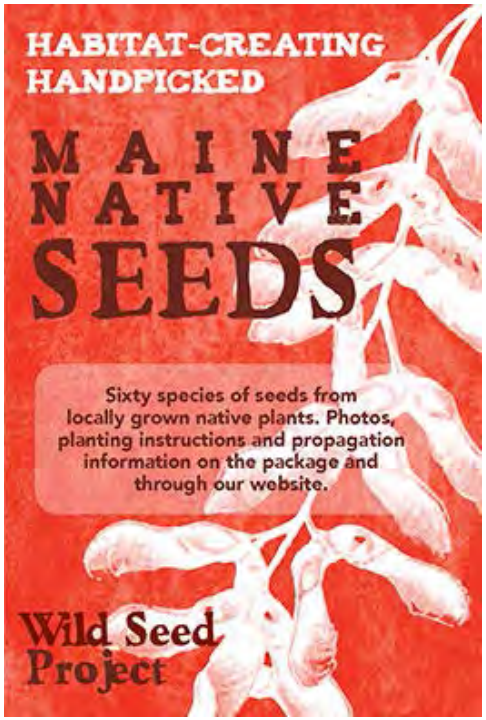
www.gardeners.com

Containerized

www.cws-inc.net

SEED MIXES

- Cost effective for large areas
- Less control over the design than planting plants
- Avoid seed mixes with invasive/aggressive species and high percentage of annuals
- http://wildseedproject.net
- www.vermontwetlandplants.com



4. EXAMPLES OF USING VEGETATION IN THE HOME LANDSCAPE TO CAPTURE STORMWATER AND IMPROVE WATER QUALITY

VEGETATION AT WORK

No-mow zones

Unmown areas of trees, shrubs, and/or herbaceous groundcovers that help stabilize soils, absorb stormwater, and provide wildlife habitat

Vegetated swales

Shallow, open channels lined with dense vegetation designed to convey, slow, and filter excess stormwater runoff

Vegetative buffers

Unmown vegetated areas that help protect tributaries and bodies of water such as streams, rivers, and lakes.

Rain gardens

Gardens of native shrub and perennials planted in a shallow depression designed to temporarily hold and soak in rain water runoff from roofs, driveways, patios or lawns.

NO-MOW ZONES

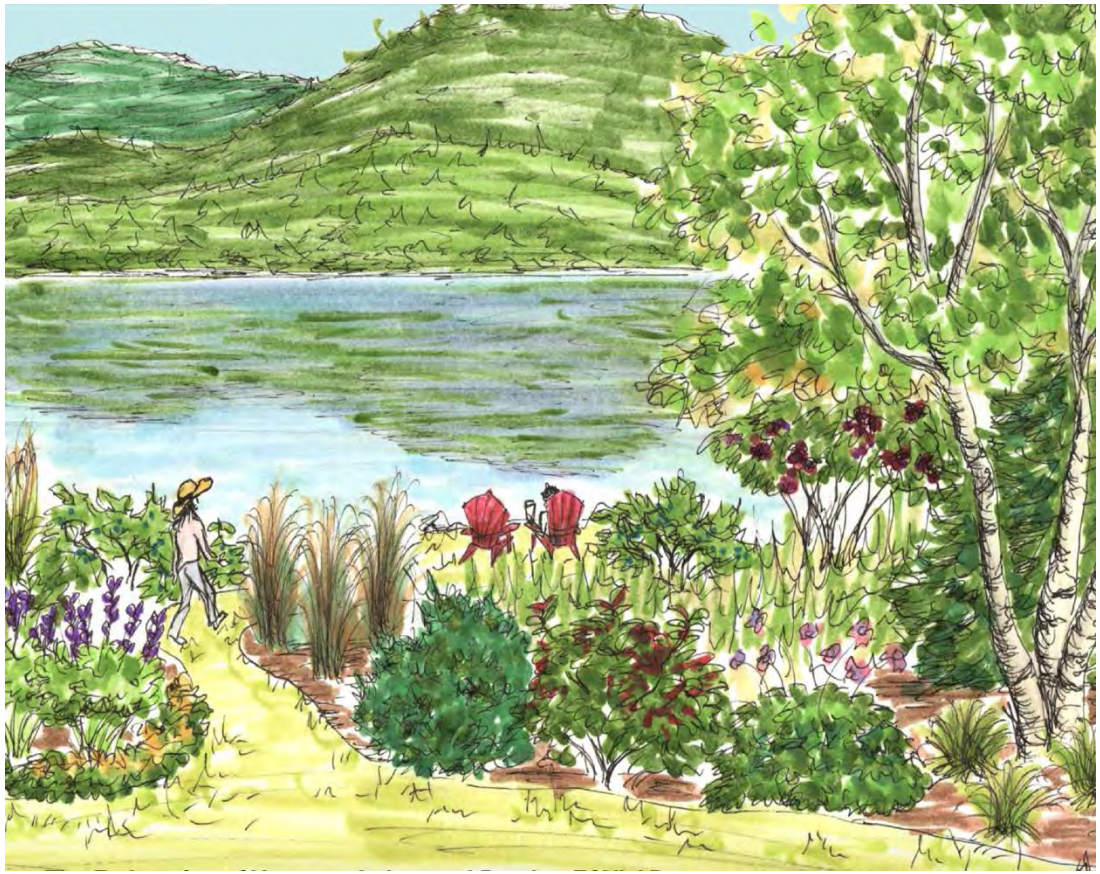
- Unmown areas of trees, shrubs, and/or herbaceous groundcovers help stabilize soils, absorb stormwater, and provide wildlife habitat

ALL-AMERICAN LAWNS

- Lawn provides no habitat for beneficial insects and wildlife
- Maintaining turf grass requires extensive labor, irrigation, fossil fuels, fertilizer, pesticides, and herbicides
- Turf grasses are shallow-rooted and prone to drought and erosion

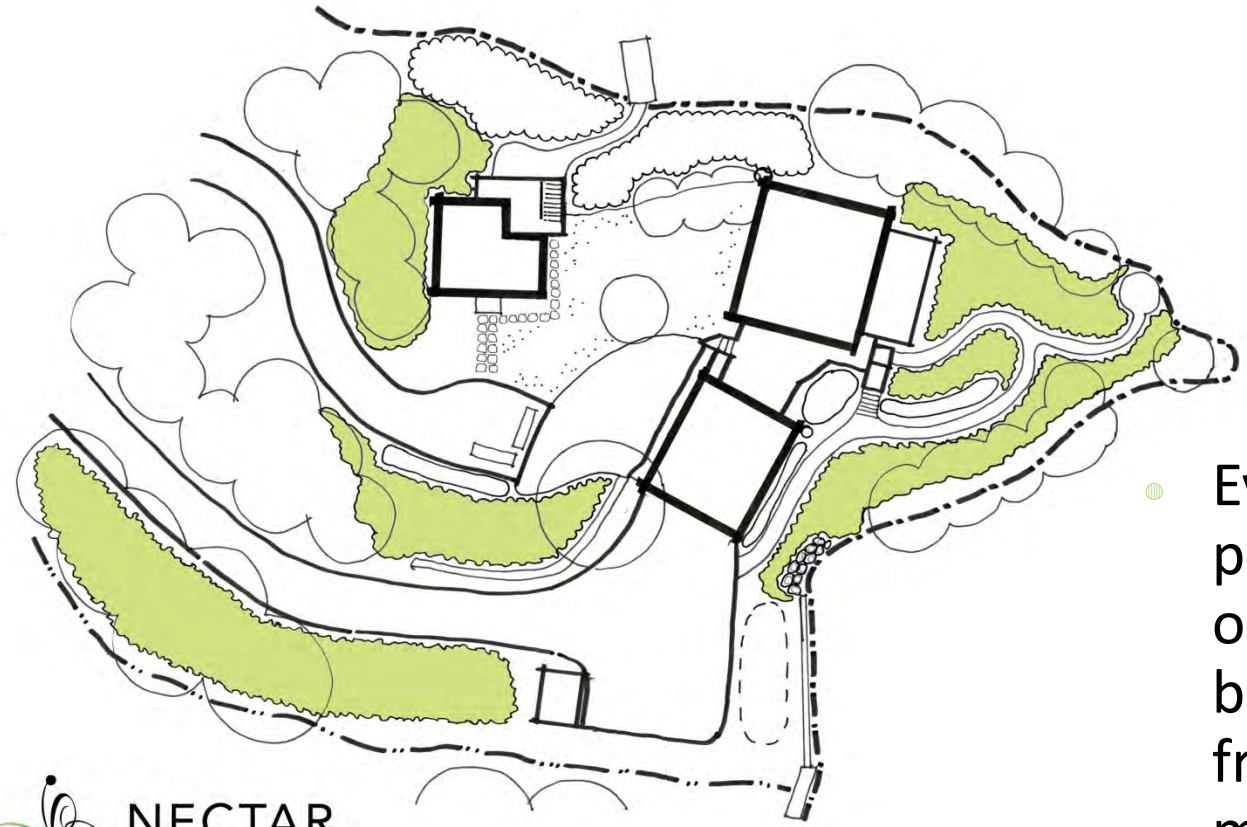
NO-MOW ZONES

- Lawn should be an intentional design element
- Design tip: Invert the relationship between your lawn and planting beds
- Think of your lawn as an area rug, not as wall-to- wall carpeting.



Drawing by Holly Greenleaf for the Federation of Vermont Lakes and Ponds

NO-MOW ZONES



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- Evaluate your property and map out areas you may be willing to convert from lawn to a no-mow zone

BEFORE: Underutilized lawn space adjacent to a lake

PHOTO SIMULATION: No-mow zones with pathways

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NO-MOW STRATEGIES

Photos: Annie White, NECTAR

- Simply stop mowing and let natural succession occur
- Interplant native perennials, shrubs, and trees
- Remove or smother existing lawn, seed and/or plant

NO-MOW MAINTENANCE

Photos: Annie White, NECTAR

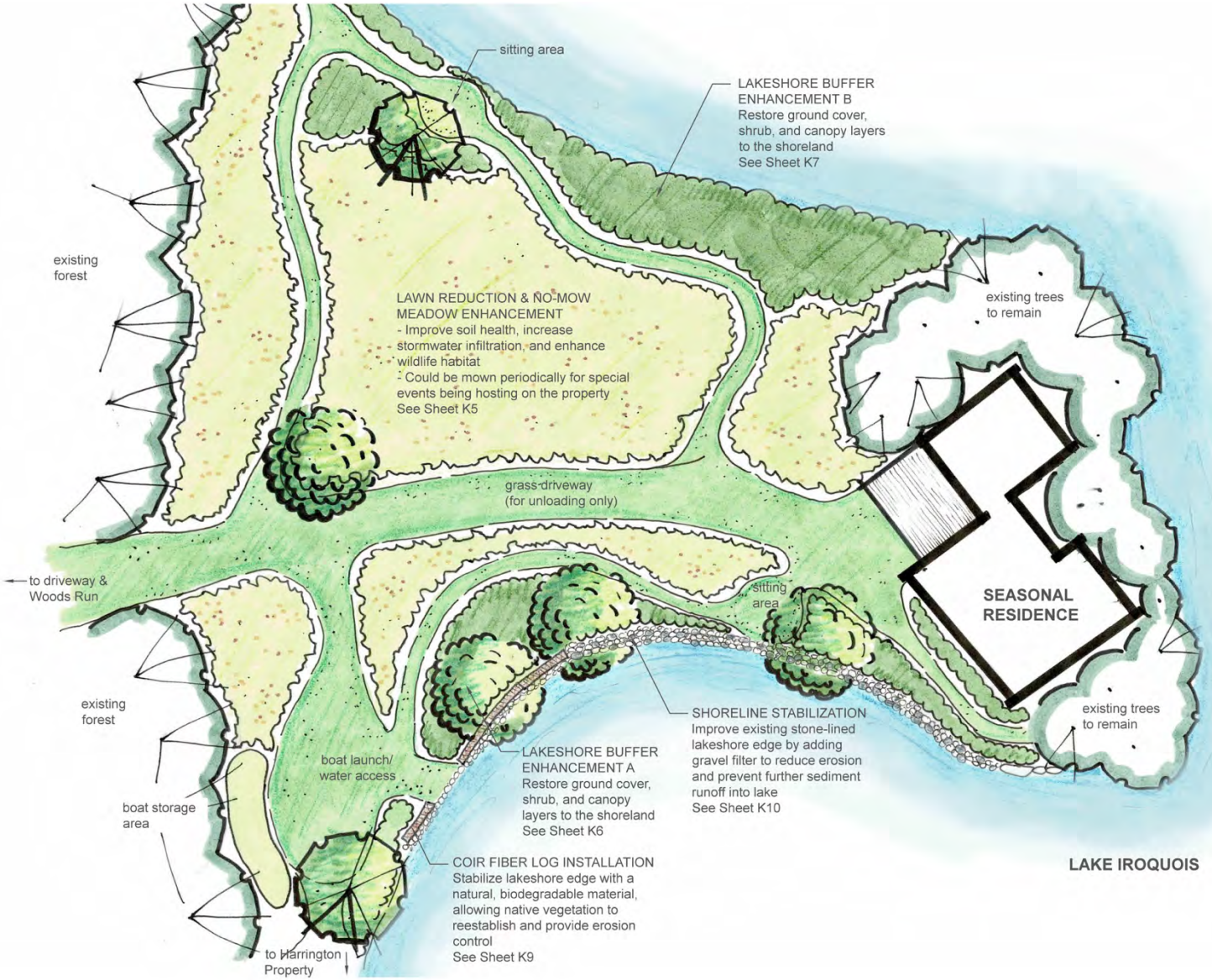
- Cut back herbaceous plants in the spring rather than fall
- Birds and beneficial insects need the winter habitat
- Enjoy the winter interest!

VEGETATED BUFFERS

- Help protect tributaries and bodies of water such as streams, rivers, lakes, and wetlands
- Provide shade, stabilize slopes, slow down and clean stormwater runoff

Photo: Annie White, NECTAR

BEFORE: Underutilized lawn space adjacent to a lake, little buffer



DESIGN: Maximizes shoreland buffers while preserving views, lake access, and recreational spaces

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BEFORE: Underutilized lawn space adjacent to a lake, little buffer

PHOTO SIMULATION: Vegetated buffer re-established

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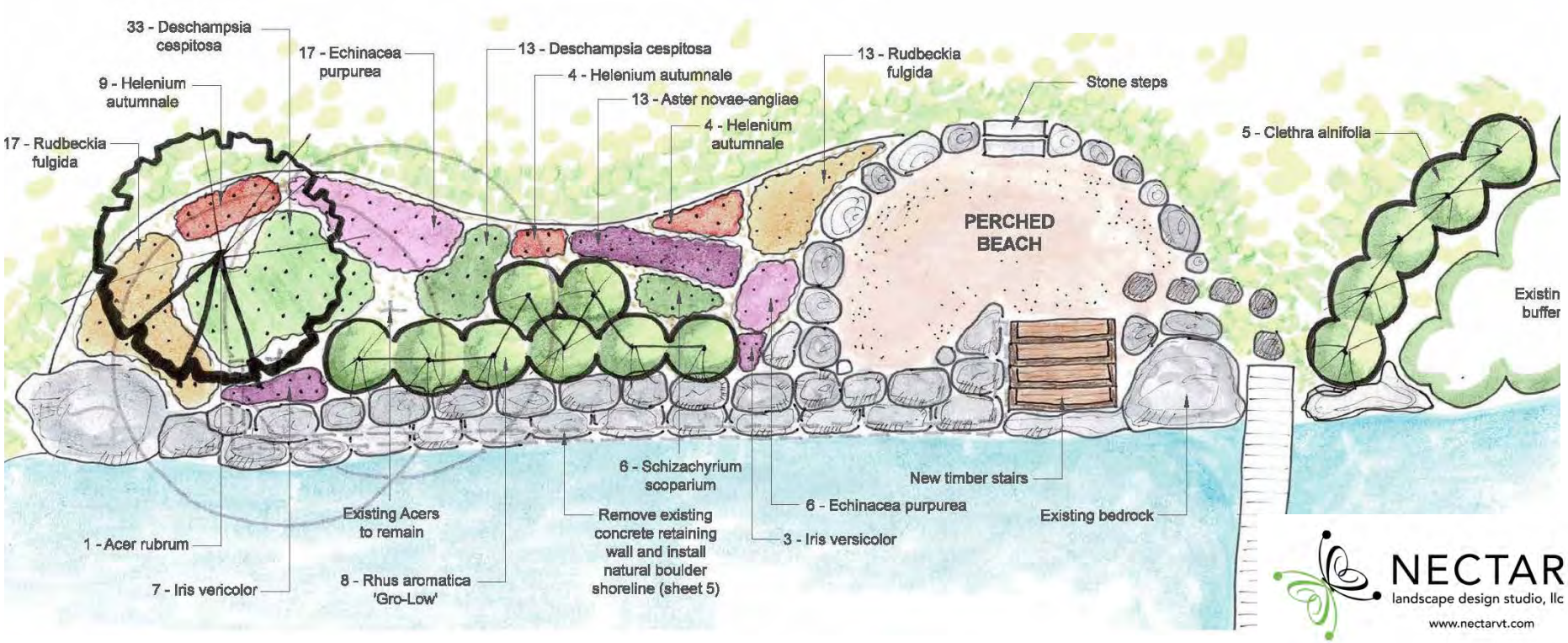
VEGETATED BUFFER DESIGN

- Sample planting design for vegetated buffer in full sun
- Planting design aesthetic mimics other ornamental flower gardens on the property

Shoreland Planting List

QTY	BOTANICAL NAME	COMMON NAME
	SHORELAND BUFFER TREES	
1	Acer rubrum	Red Maple
	SHORELAND BUFFER SHRUBS	
8	Rhus aromatica 'Gro Low'	Fragrant Sumac
5	Clethra alnifolia	Summersweet
	SHORELAND PERENNIALS/ GRASSES	
10	Iris versicolor	Blue Flag Iris
6	Schizachyrium scoparium 'Carousel'	Little Bluestem
17	Helenium autumnale 'Short n' Sassy'	Helen's Flower
13	Aster novae-angliae 'Purple Dome'	New England Aster
23	Echinacea purpurea 'Magnus'	Purple Coneflower
30	Rudbeckia fulgida 'Goldsturm'	Black-eyed Susan
46	Deschampsia cespitosa	Tufted hairgrass



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RAIN GARDENS

- Attractive landscape features that are planted with beautiful, deep-rooted plants that don't mind getting wet.
- Designed as shallow depressions to capture stormwater from hard surfaces.
- Perform important functions by slowing stormwater runoff and filtering pollutants before they reach our streams and rivers.

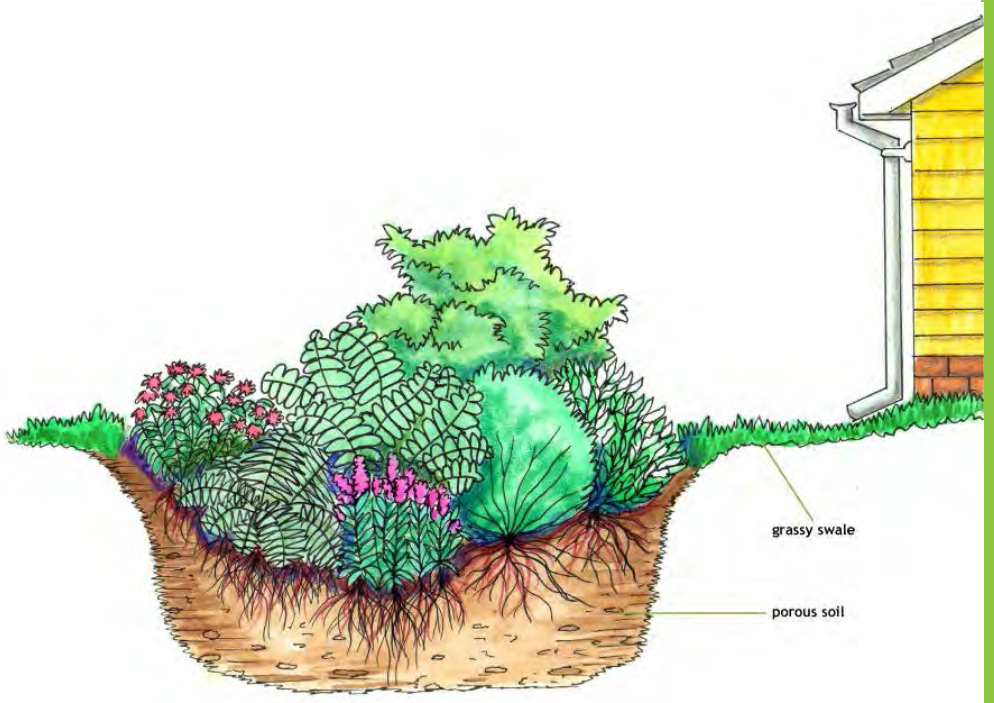
HOW DOES IT WORK?

- Runoff enters the rain garden during a storm event
- The rain garden fills to its maximum depth
- Over the next 24 hours, the plants and soils clean and soak up the water in the rain garden

Photo: Kevin Robert Perry, ASLA

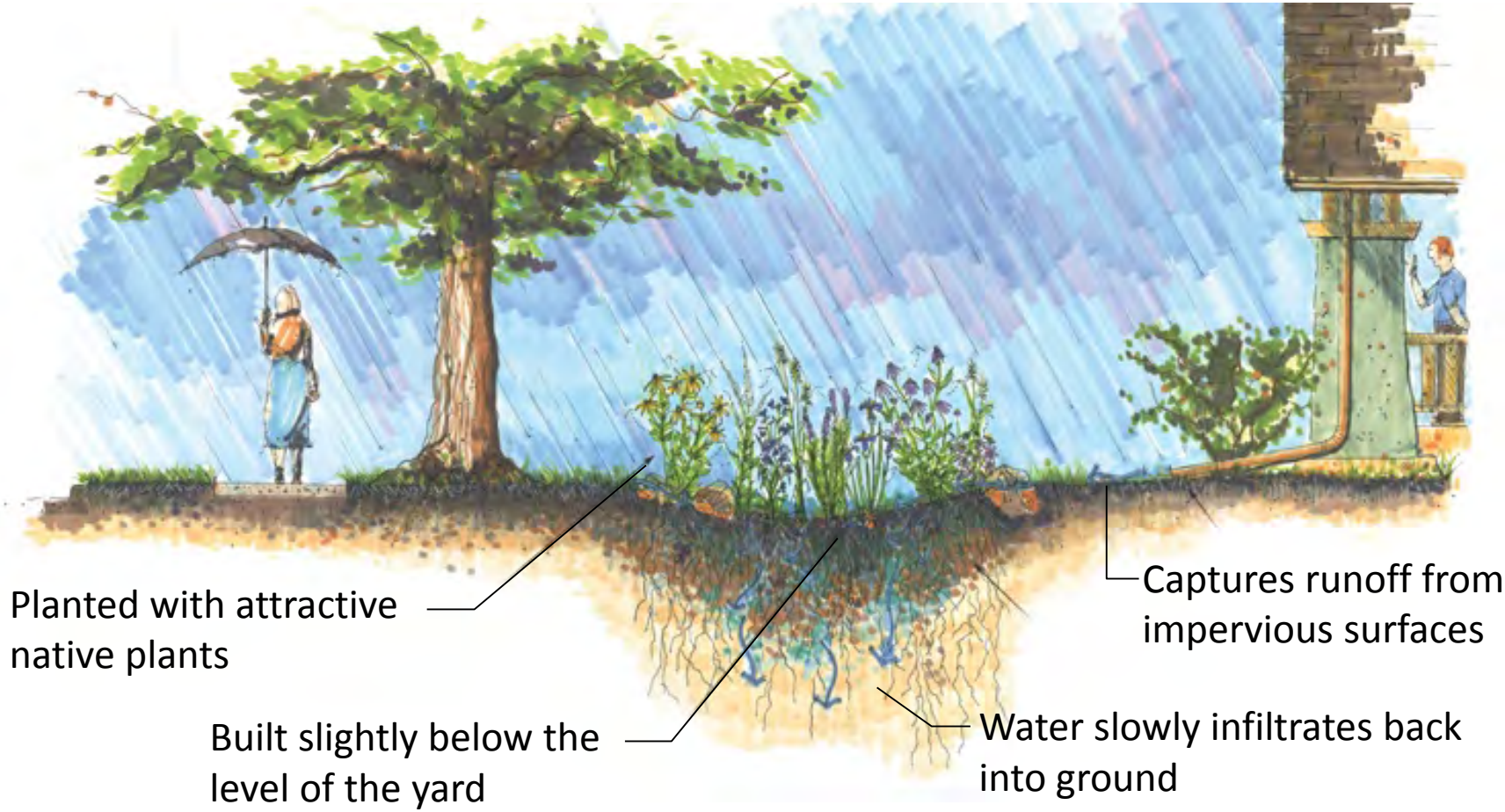
WHERE DO RAIN GARDENS NOT WORK?

- Where the seasonal high water table is within 24” of the surface
- Directly over a septic tank (or other underground utility)
- Within 10’ of a septic field
- Within 10’ of a building foundation
- Under an existing tree



www.broadlandsnaturally.org

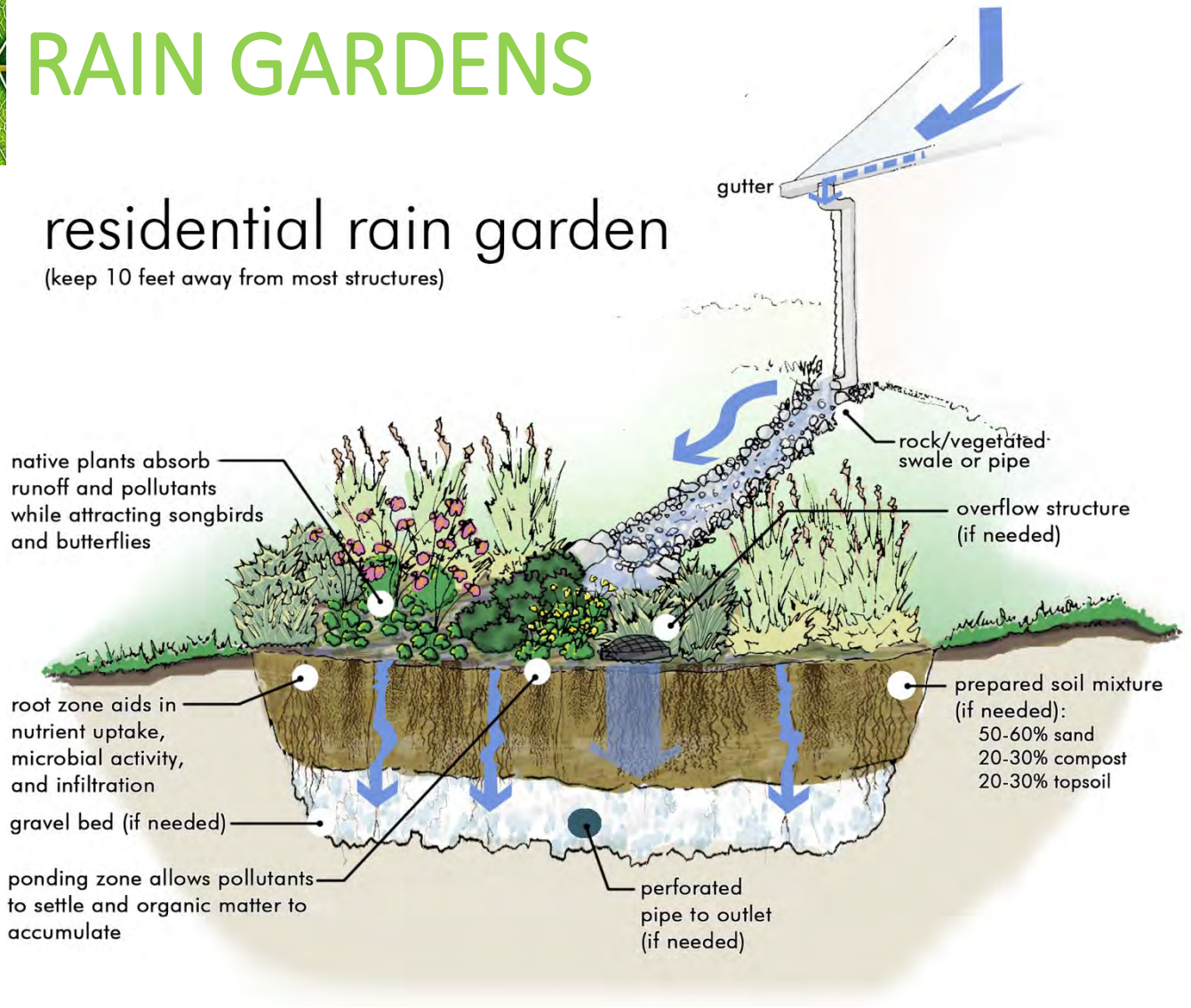
RAIN GARDENS



Adapted from United States Department of Agriculture Natural Resources Conservation Services www.ia.nrcs.usda.gov/features/raingardens

RESIDENTIAL RAIN GARDEN

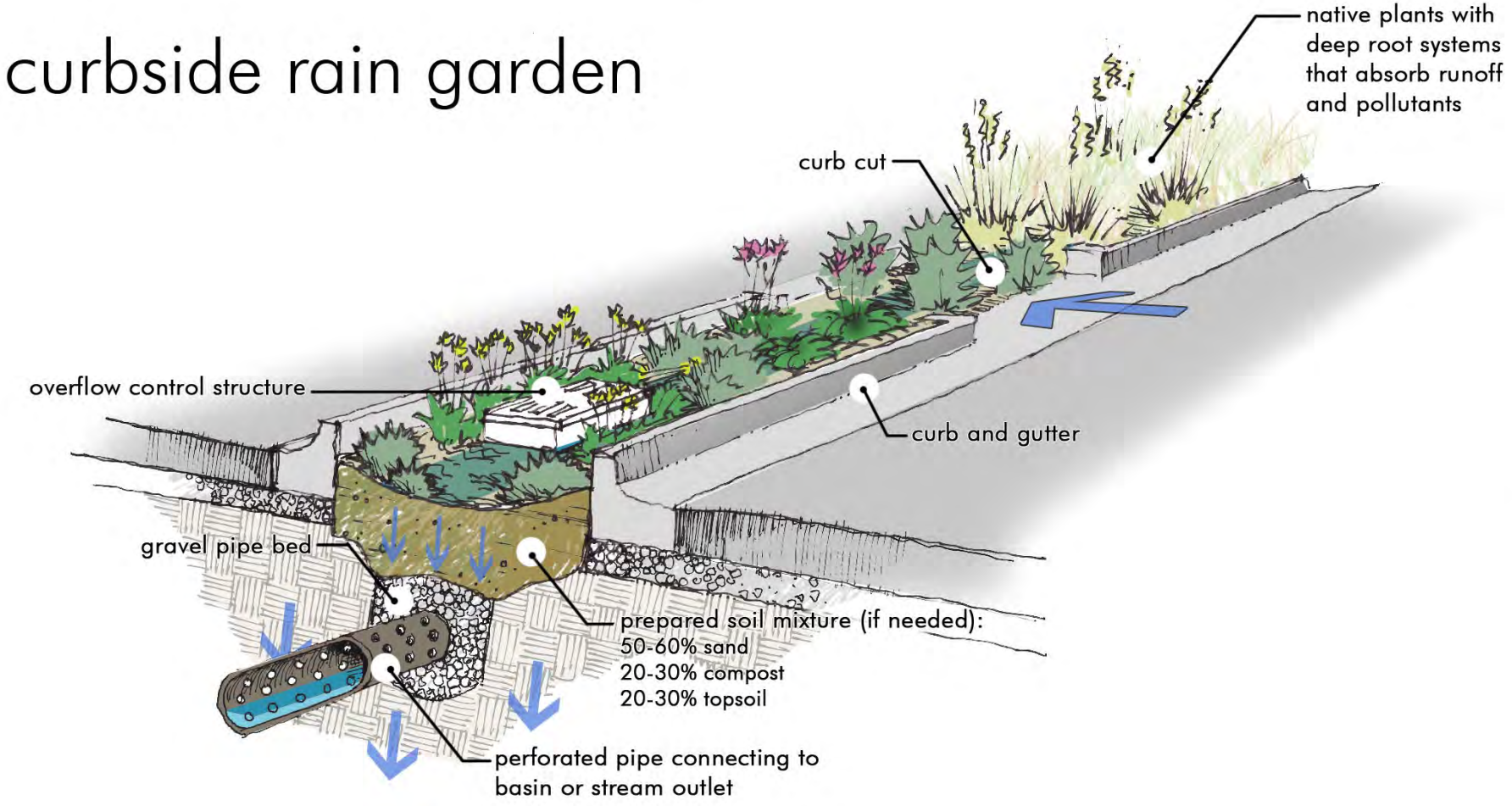
RAIN GARDENS



CURBSIDE RAIN GARDEN

www.centralohioraingardens.org

RAIN GARDENS



BENEFITS OF RAIN GARDENS

Photo: Annie White

- Slow stormwater runoff and filter out pollutants before they reach our streams, rivers, and lakes
- Can help alleviate some drainage problems
- Provide habitat for birds & pollinators
- Enhance your home landscape

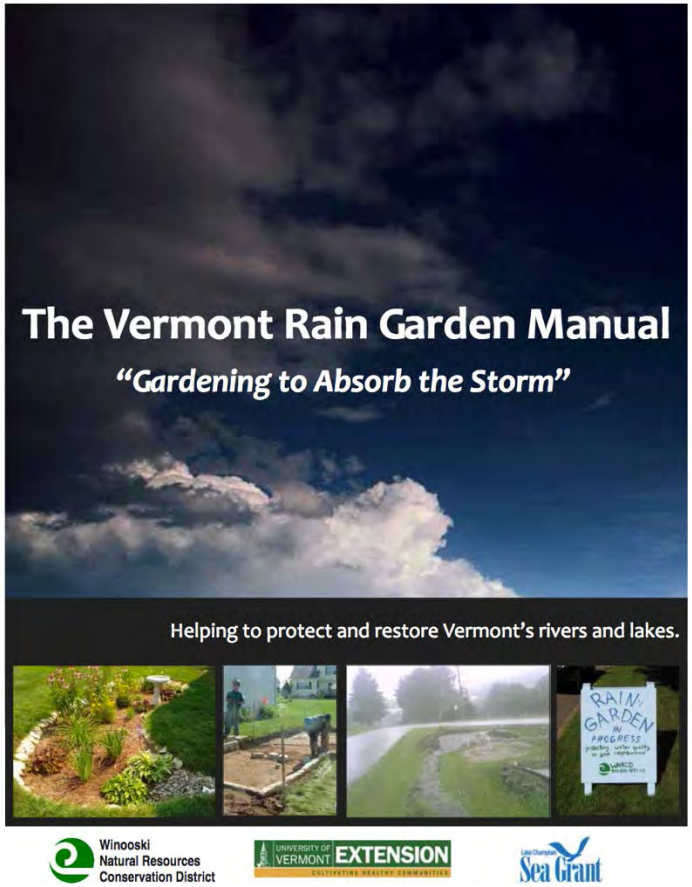
RAIN GARDEN DESIGN

- Water soaks into different soil types at different rates
- Ensure that there is not standing water in the rain garden for longer than 24 hours after a rain event
- Conduct an infiltration test
- Amend soils, if needed
- Consult a professional, if needed

Photo: EarthCycle Education, LLC

RAIN GARDEN DESIGN

- Rain garden size and depth are determined by soil infiltration rate and drainage area
- Needs to infiltrate 1” rainfall from a given drainage area within 24 hours
- Use available sizing tools or consult a professional



www.uvm.edu/seagrant/vtraingardenmanual

BEFORE: Small residence with roof & driveway runoff

PHOTO SIMULATION: Residential rain garden

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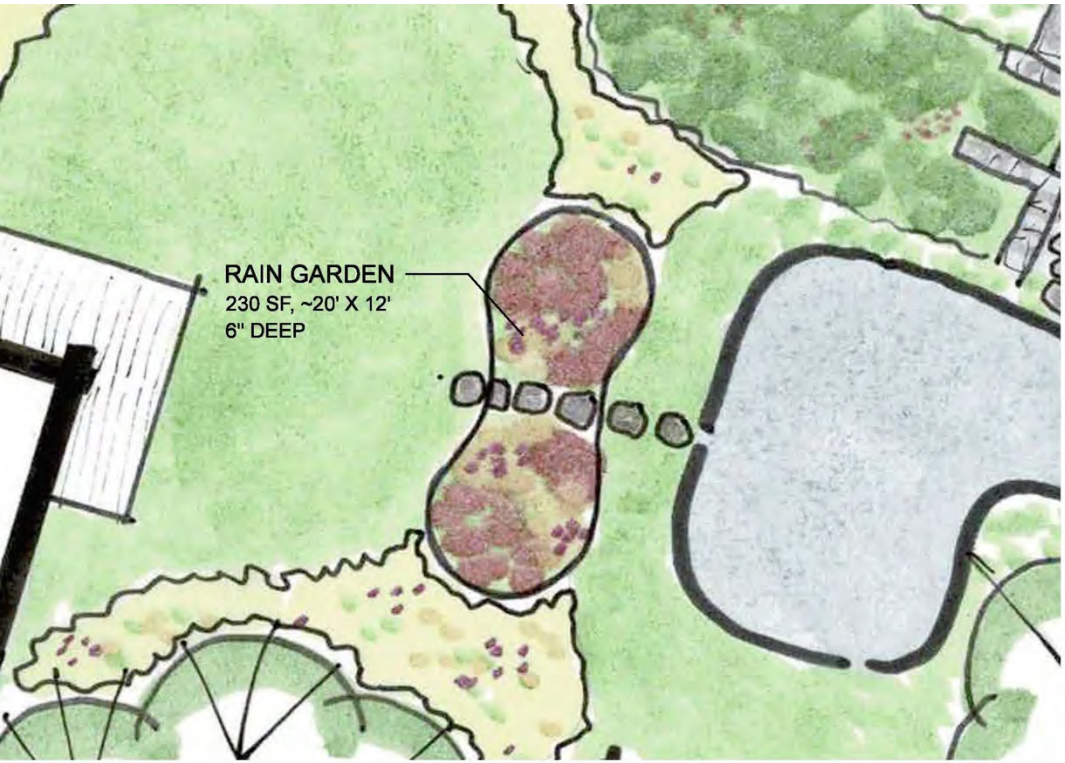
RAIN GARDEN DESIGN EXAMPLE



Marsh Milkweed

Blue Flag Iris

White Turtlehead

Joe Pye Weed

Great Blue Lobelia & Cardinal Flower

Fox Sedge

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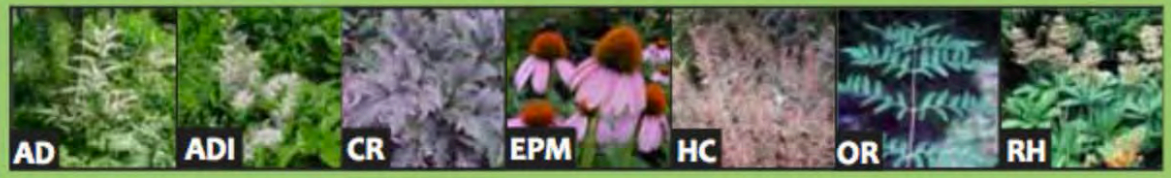
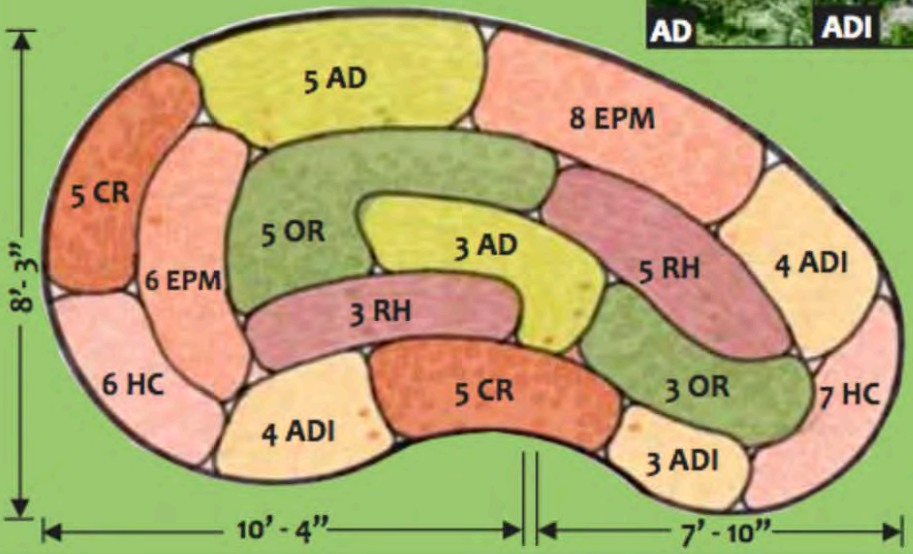
RAIN GARDEN DESIGN EXAMPLE

The Enchanted Garden - Part Shade

Abr	Qty	Botanical Name	Common Name	Height	Spread	S. Interest	Spacing	Install Size
AD	8	*Aruncis dioicus*	Goatsbeard	5'	2-4'	Spring	22-30"	1-2 Gallon
ADI	11	*Astilbe 'Diamant'*	Astilbe	30"	1.5-2'	Summer	22"	1 Gallon
CR	10	*Cimicifuga ramosa 'Brunette'*	Purple-leaf Bugbane	3-4'	2-3'	Sp, Su, Fall	22"	1 Gallon
EPM	14	*Echinacea purpurea 'Magnus'*	Coneflower	2.5-3'	1-1.5'	Summer	15-22"	1 Gallon
HC	13	*Heuchera 'Chocolate Ruffles'*	Coral Bells	1-2'	1-1.5'	Summer	15-22"	1 Gallon
OR	8	*Osmunda Regalis*	Royal Fern	3-4'	2-3'	Sp, Su, Fall	22-30"	1 Gallon
RH	8	*Rodgersia henrici* Sub. *Rodgersia aesculifolia*	Rodgersia	3-4'	3-4'	Summer	34-38"	1-2 Gallon





Sizing Chart

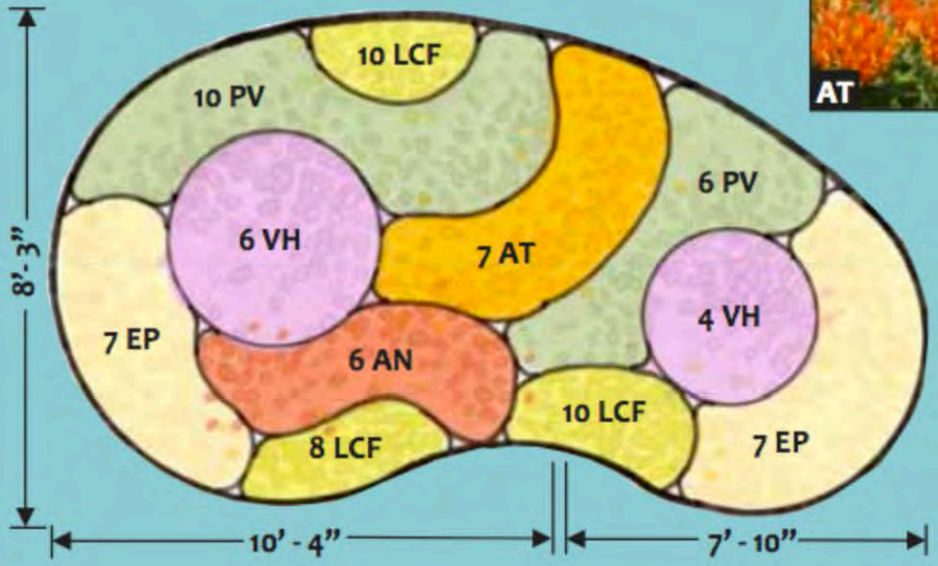
Sq Ft	Qty of Diff. Species	Total Plant Qty	Ex. Garden Dimensions
50	3	24	6' x 4'-6"
100	5	48	8'-6" x 6'-4"
150	7	72	18'-2" x 8'-3"
200	7	96	12' x 9'
250	7	120	13'-5" x 10'

Source: VT Rain Garden Manual

RAIN GARDEN DESIGN EXAMPLE

The Bird & Butterfly Meadow - Sun

Abr	Qty	Botanical Name	Common Name	Height	Spread	S. Interest	Spacing	Install Size
AT	7	*Asclepias tuberosa*	Butterfly Plant	1-2.5'	1-1.5'	Summer	15-22"	1 Gallon
AN	6	*Aster novae-angliae*	New England Aster	18"	1.5-2'	Fall	22"	1 Gallon
EP	14	*Echinacea purpurea 'Alba'*	Coneflower	30"	1-2'	Summer	15-22"	1 Gallon
LCF	11	*Lysimachia ciliate 'Firecracker'*	Fringed Loosestrife	1-3'	2-2.5'	Summer	22-30"	1 Gallon
PV	16	*Panicum virgatum*	Switch Grass	3-4'	2-3'	Sp, Su, Fall	22-30"	1-2 Gallon
VH	10	*Verbena hastate*	Blue Vervain	2-6'	1-1.5'	Su, Fall	15-22"	4" Pot



Sizing Chart

Sq Ft	Qty of Diff. Species	Total Plant Qty	Ex. Garden Dimensions
50	4	21	6' x 4'-6"
100	4	42	8'-6" x 6'-4"
150	6	64	18'-2" x 8'-3"
200	6	85	12' x 9'
250	6	106	13'-5" x 10'

Source: VT Rain Garden Manual

VEGETATED SWALES

- Shallow, open channels lined with dense, deep-rooted vegetation designed to convey, slow, and filter excess stormwater runoff
- Often used as an alternative to standard below-ground stormwater sewers
- Useful on the edges of parking lots or around developments

www.lgrow.org/glri/

VEGETATED SWALES

Traditional grass swale in a residential setting

Vegetated swale

Often combined with stonework for aesthetics and erosion control

Increasing in popularity, particularly in urban areas

Photo: www.robustrak.com

Photo: Eric Zavinski

SAMPLE VEGETATED SWALE DESIGN

Packera aurea (Golden Groundsel)

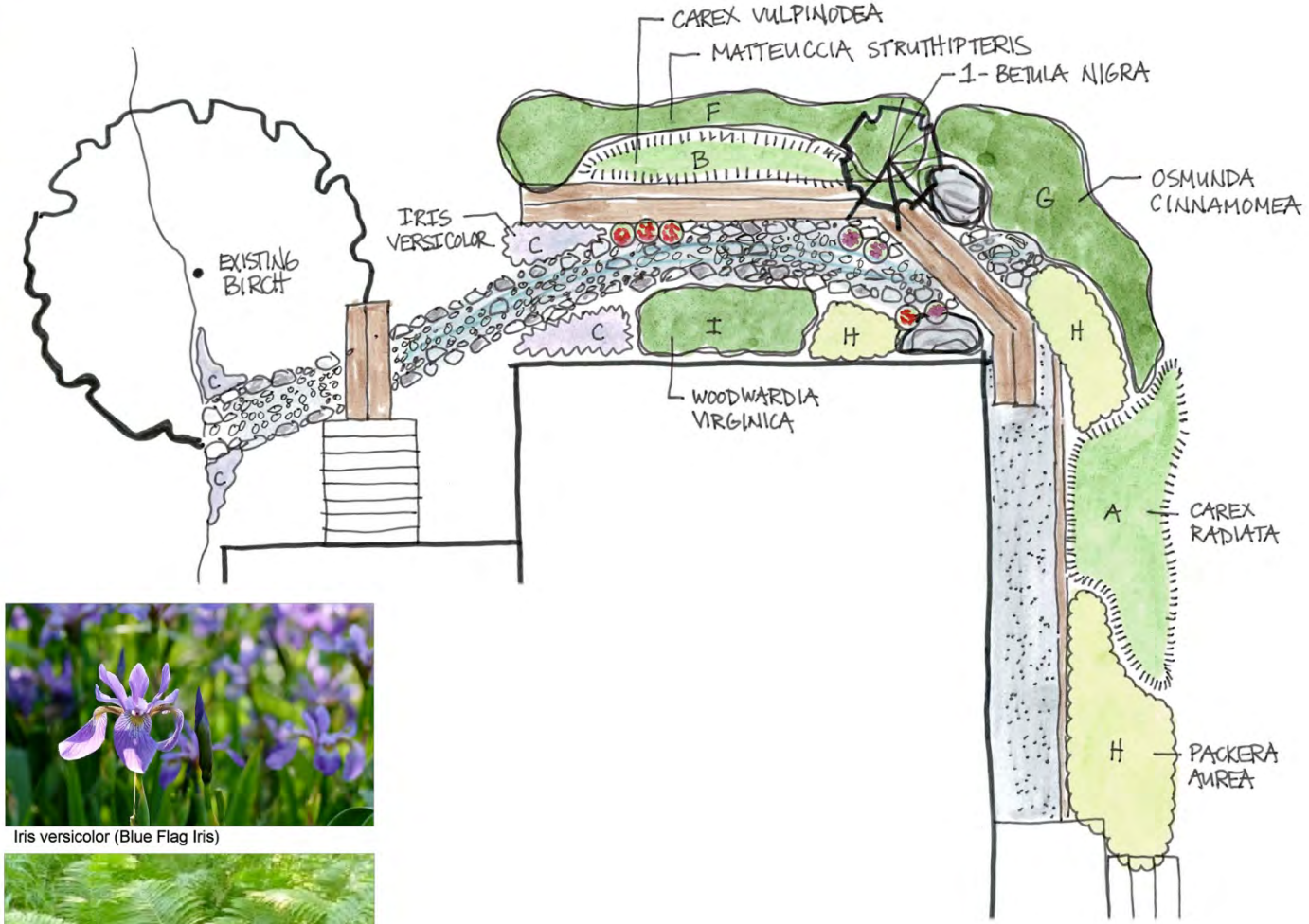
Matteuccia struthiopteris (Ostrich Fern)

Lobelia siphilitca (Great Blue Lobelia)
Lobelia cardinalis (Cardinal Flower)

Carex radiata (Eastern Star Sedge)

Iris versicolor (Blue Flag Iris)

Osmunda cinnamomea (Cinnamon fern)



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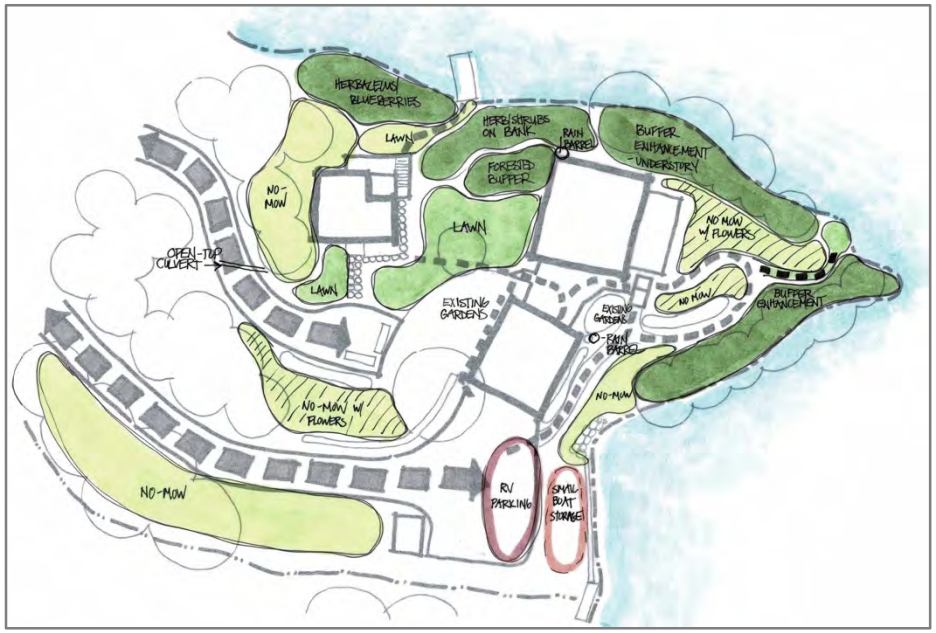
CONCEPTUAL PLANNING

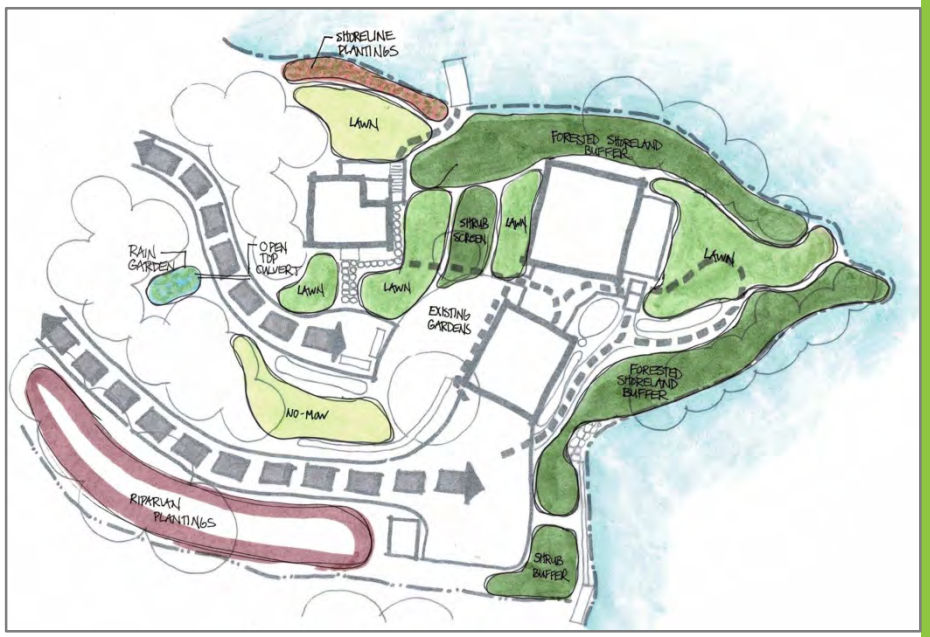
"Conceptual design" is part of the design process followed by landscape architects. The concept plan (a.k.a. functional diagram or bubble diagram) organizes the design elements within the landscape space, creating functionality in the design. A good concept will serve as the framework for the rest of the design process.

EXAMPLE CONCEPT PLAN

CONCEPT A



CONCEPT B



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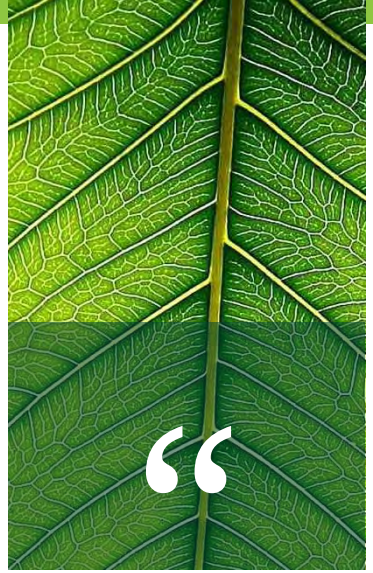

We may think we are nurturing our garden, but of course, it's our garden that is really nurturing us

– Jenny Uglow