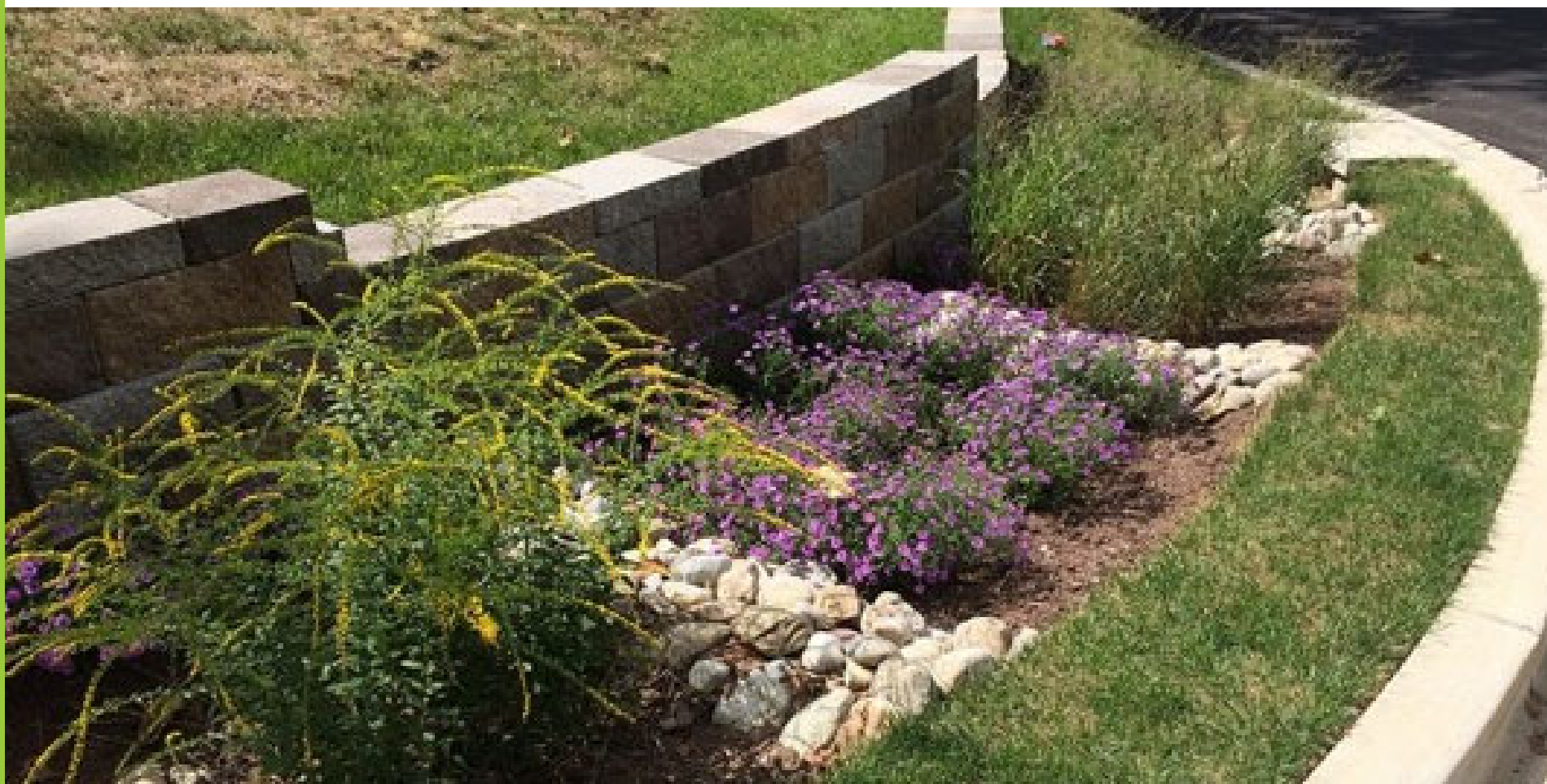





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## **BIORETENTION PLANTING PLAN GUIDANCE for REDUCING MAINTENANCE COSTS and IMPROVING AESTHETICS**



- 
- Horticultural practices for reducing maintenance and improving aesthetics- examples of issues
  - Examples of 3 low maintenance planting approaches for bioretention facilities based on facility size and location
  - Step process to help with plant selection and arrangement for aesthetic considerations based on facility size, location and who will be viewing it
  - Plant suggestions

# HORTICULTURAL PRACTICES for REDUCING MAINTENANCE and IMPROVING AESTHETICS



1. Right plant right place (sun, shade, soil, height, spreader, water needs, deer/salt pressure, H2O volume and velocity)
2. Plants fill space within a year or two but do not overgrow the space
  - Initial installation plant spacing is appropriate
  - Start with a high grade plant material and appropriate container size
  - Plant arrangement matters for aesthetics**
3. Diligent weed removal within the bioretention and area surrounding the facility before weeds flower and seed to prevent weed seed **soil contamination**
4. A ground cover layer where appropriate for less open mulch space
5. Initial watering schedule for healthy plant establishment

1. RIGHT PLANT RIGHT PLACE – deer & fill in within a year

Replanted with 1 gallon deer resistant varieties 24" OC that will mature to 2 1/2-3' tall and weed trimmed once a year in late February.



*Amsonia hubrichtii*



*Rudbeckia fulgida*



*Vernonia noveboracensis*



*Solidago 'Golden Fleece'*



*Eupatorium 'Baby Joe'*



*Panicum 'Cape Breeze'*



*Asclepias tuberosa*



## 2. APPROPRIATE CONTAINER SIZE AND PLANT SPACING

Qts spaced 2-3' O.C., 5 gallon 7' O.C. takes a long time to establish. Lots of mulch space for weed invasion, lots of labor to keep weed free for several seasons.

41	IS	<i>Ilex</i>	<i>verticillata</i>	'Jim Dandy'	Winterberry	5 Gal.	3' O.C.
160	IS	<i>Ilex</i>	<i>verticillata</i>	'Red Sprite'	Red Sprite Winterberry	5 Gal.	3' O.C.
198	JB	<i>Juniperus</i>	<i>horizontalis</i>	'Bar Harbor'	Bar Harbor Juniper	5 Gal.	3' O.C.
482	LH	<i>Lavandula</i>	<i>angustifolia</i>	Twickel Purple'	English Lavender	5 Gal.	3' O.C.
79	LB	<i>Lindera</i>	<i>benzoin</i>		Spicebush	5 Gal.	7' O.C.
70	MP	<i>Myrica</i>	<i>pensylvanica</i>		Northern Bayberry	5 Gal.	4' O.C.
93	ST	<i>Spiraea</i>	<i>tomentosa</i>		Steeplebush	5 Gal.	3' O.C.
42	VC	<i>Vaccinium</i>	<i>corymbosum</i>		Highbush Blueberry	5 Gal.	3' O.C.
36	VO	<i>Vaccinium</i>	<i>oxycoccos</i>		Small cranberry	5 Gal.	3' O.C.
69	VD	<i>Viburnum</i>	<i>dentatum</i>		Arrowwood	5 Gal.	7' O.C.
42	VL	<i>Viburnum</i>	<i>lentago</i>		Nannyberry	5 Gal.	7' O.C.

PERENNIALS AND GRASSES							
QUAN	SYM	GENUS	SPECIES	CULTIVAR	COMMON NAME	SIZE	NOTES
265	AV	<i>Andropogon</i>	<i>virginicus</i>		Broomsedge	1 Qt.	3' O.C.
543	AN	<i>Aster</i>	<i>namoralis</i>		Bog Aster	1 Qt.	18' O.C.
781	EC	<i>Echinacea</i>	<i>purpurea</i>		Purple Coneflower	1 Qt.	18' O.C.
837	ES	<i>Eragrostis</i>	<i>spectabilis</i>		Purple Lovegrass	1 Qt.	18' O.C.
181	EP	<i>Eupatorium</i>	<i>purpurea</i>		Joe Pye Weed	1 Qt.	3' O.C.
2093	IR	<i>Iris</i>	<i>versicolor</i>		Blue Flag	1 Qt.	12' O.C.
2377	LM	<i>Liriope</i>	<i>muscaris</i>	Big Blue'		1 Qt.	12' O.C.
1980	LC	<i>Lobelia</i>	<i>cardinalis</i>		Cardinal Flower	1 Qt.	12' O.C.
1386	MD	<i>Monarda</i>	<i>didyma</i>		Beebalm	1 Qt.	12' O.C.
189	PV	<i>Panicum</i>	<i>virgatum</i>		Switchgrass	1 Qt.	3' O.C.
560	RL	<i>Rudbeckia</i>	<i>laciniata</i>		Tall Coneflower	1 Qt.	2' O.C.
435	SP	<i>Scirpus</i>	<i>pungens</i>		Three Square Bulrush	1 Qt.	2' O.C.
633	VN	<i>Vernonia</i>	<i>novboracensis</i>		New York Ironweed	1 Qt.	18' O.C.

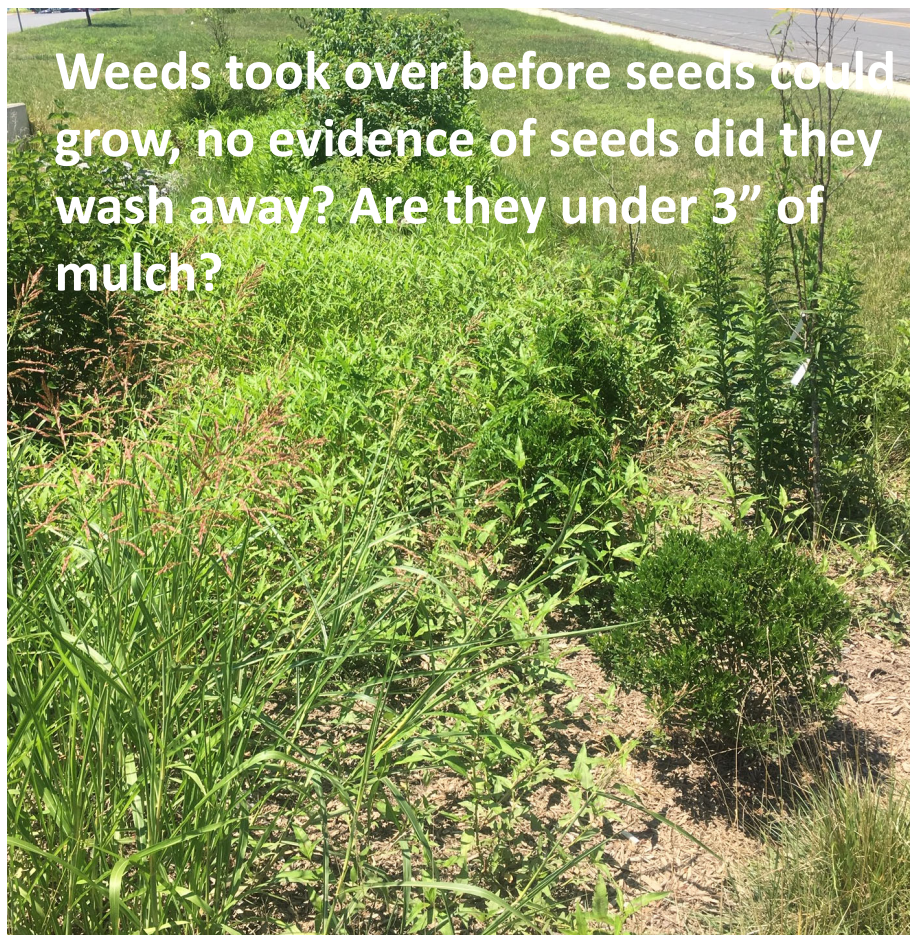


RESTORATION GRADE  
VS  
HEAVY OR RETAIL GRADE  
PLANT MATERIAL

Maintenance costs are reduced when plant material is more established and fills in quickly with closer spacing and plantings are more appealing visually



## Planting Plan was a shrub and seed mix



Poor Plant grade and spaced too far apart

Weed seed soil contamination contributing factors:  
Qts spaced 2-3' apart plants slow to establish, weeds took over  
Restoration grade plant material slow to mature and do its job.

Adjacent open  
space next to  
bioretention  
not mowed  
contributes to  
weed invasion



Restoration grade  
plant material

Fighting a losing battle at this point, best to remove all vegetation and top 6-12" of contaminated soil, replace with weed free soil and replant with larger container plants spaced closer together



Recently renovated 8" soil removed planted a tree layer (5 River Birch and 5 Service Berry) and 1 gallon perennials 24" O.C.

*Carex stricta*

*Solidago 'Fireworks'*

*Amsonia hubrichtii*

*Vernonia noveboracensis*

*Rudbeckia fulgida*

*Eupatorium 'Baby Joe'*

*Baptisia australis*

First year maintenance is critical to remove weeds regularly prior to flowering and going to seed. Goal is intended vegetation will fill in after one year and very limited open mulch area the following years.



Keep surrounding area mowed regularly, clippings directed away from facility

Under trees, between shrubs or perennial groupings to cover mulch area and fill voids (this can create a lighter/less bulky feel to the planting)



Carex 'Bunny Blue'



Packera aurea

Water until established-

6 weeks -3 x's a week for 2 weeks

-2 x's a week for 2 weeks

-1 x a week for 2 weeks

After established, water if drought stressed.

All watering should use a hose with nozzle end breaker or a sprinkler. Be mindful that sprinklers do not water evenly and will need to be monitored for the flow patterns. Areas that are getting missed will need subsequent hand watering or sprinklers adjusted to get full watering coverage. Water must be applied at low water pressure directly to the root zone of each plant, allowing water to be absorbed into the planting pit soil until saturated, but without runoff.

# EXAMPLES OF LOW MAINTENANCE PLANTING APPROACHES FOR BIORETENTION FACILITIES BASED ON FACILITY SIZE AND LOCATION



## 1. Breewood green streets-smaller facility (100-200 SQFT)

- Plants with more controlled growth habits
- 4 seasons of interest
- Residential appeal layout

## 2. Holiday Park Senior Center-medium/large sized facility highly visible to the public (600-800 SQ FT)

- Same as above
- Better balance of woody, herbaceous plants for aesthetics and reducing maintenance costs

## 3. North Potomac Recreation Center-Larger facility-work in progress (1200-1600 sq ft +/-)

- Many facilities located throughout the site-"One size does not fit all"

Spring before retrofit



Spring After Retrofit 2018



Winter After Retrofit 2018



Expand plantings to soften the look or plant the area around the facility to make it “part of a garden”

No room for weeds but not overgrown. Used plants with controlled growth habits, 4 seasons of interest and a ground cover layer



Spring 2019



Before replanting

After installation  
Fall 2018



## Summer 2019



Better plant balance for improved aesthetics and lower maintenance costs (will be tracking costs over time)

## PLANT BALANCE COST COMPARISON

- 8900 sq ft
- **\$ 21,664.00** yearly maintenance cost 2018
- Approx. 95% herbaceous **Panicum**, 5% shrubs



- 8500 sq ft
- **\$ 10,104.00** yearly maintenance cost 2018
- Approx. 35% herbaceous/grasses, 10% trees, 55% shrubs

Intense deer pressure, most original plants are gone

ONE SIZE DOES NOT FIT ALL:

- Several medium sized bioretention facilities are up close to the building and the perimeter of the parking lot highly visible to the public. Adjacent lawn area mowed regularly.
- 2 very large facilities in the far back of the property in a natural setting backing up to the woods, few people walking





Magnolia virginiana

In progress:

Adding a tree layer with a ground cover layer in the bios next to the building and parking area high public visibility.



Packer aurea

Adding more of the same plants that survived in large groupings (1 gallon containers 24" O.C.)

*Carex stricta*



*Rudbeckia fulgida*



*Panicum 'Cape Breeze'*



*Amsonia hubrichtii*



# Installed meadow plantings in back bios -cut once in spring

*Amsonia hubrichtii*



*Rudbeckia fulgida*



*Vernonia noveboracensis*



*Solidago 'Golden Fleece'*



*Eupatorium 'Baby Joe'*



*Liatris microcephella*



*Asclepias tuberosa*  
(Side slope)



## Ground cover trial interplanting plugs

*Carex muskingumensis*  
'Little Midge'



*Carex texensis*



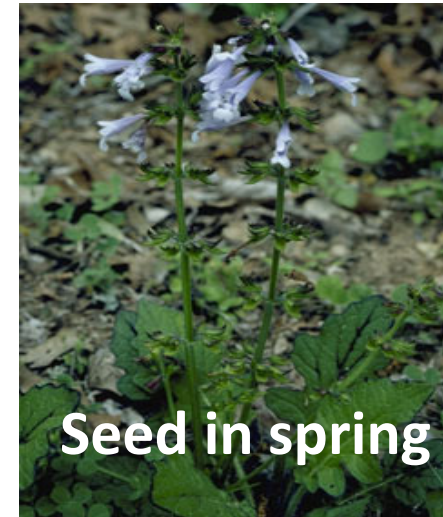
*Deschampsia c 'Gaoldtau'*



*Eragrostis spectabilis*



*Salvia lyrata*



Seed in spring

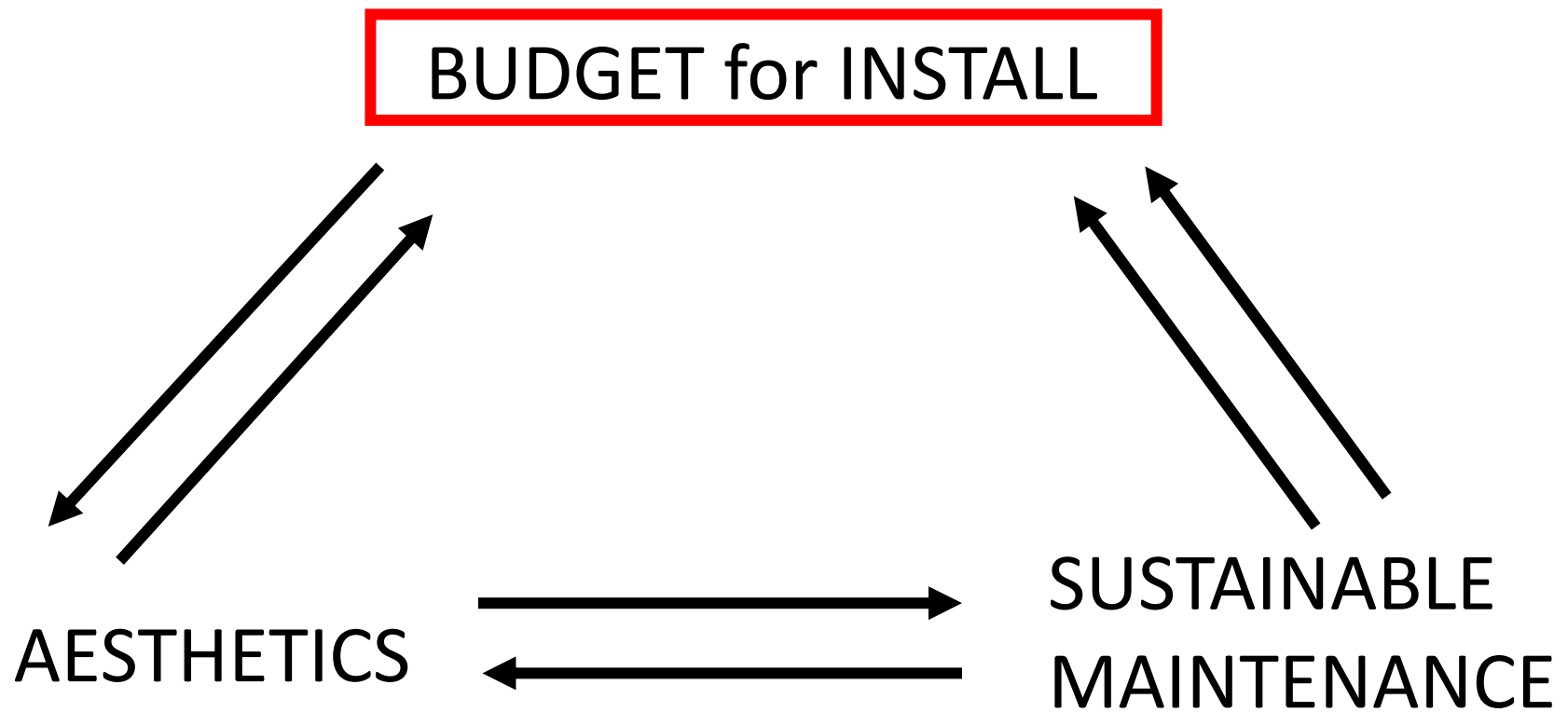


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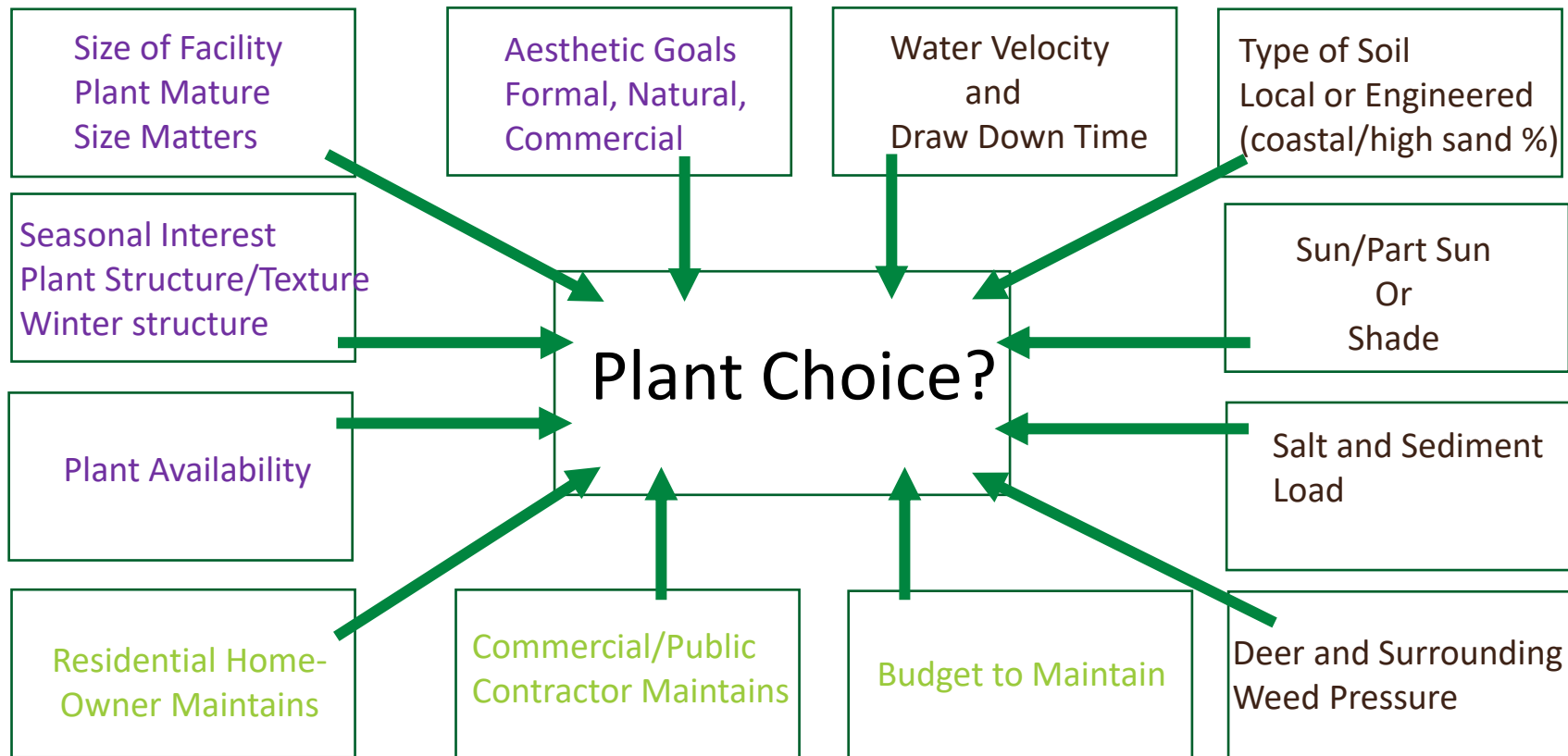
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## WHAT DRIVES THE DECISION OF BIORETENTION PLANT SELECTION?

3 Broad Components INTERACT critical to success



# CONSIDERATIONS IN PLANT SELECTION



**Design Considerations**

**Maintenance Considerations**

**Plant Cultural Considerations**



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## 5 STEPS to DETERMINE PLANT CHOICES and PLANT LAYOUT

### STEP #1 What is the specific site conditions?

- Deer pressure
- Salt pressure
- Sediment load
- Sun
- Shade
- Soil Type (engineered, high sand content or amended native soil)
- Anticipated water volume and velocity

**PLANT CHOICES BASED ON WHAT WILL SURVIVE  
CRITICAL FIRST STEP FOR SUCCESS**

## STEP #2 What is the size of the facility?

“One size does not fit all”

Examples:

- Small facility (100- 150 sq ft)= smaller growing plants (dwarf cultivars), shrub+perennial/grass+**ground cover layer** -Residential, green street
- Medium sized facility (15 x 20 = 300 Sq ft) =Small tree+shrub+perennial/grass+**ground cover layer** -Schools, shopping centers or tree layer with carex ground cover (low maintenance and looks nice)
- Large facility (30 x 20 = 600 sq ft) = Larger Tree+shrub+perennial/grass+**ground cover layer** -Recreation Centers, Police Stations
- Very large facility (over 800 sq ft, Meadow mow situation) Larger growing perennials, quick coverage, no shrubs or trees

**PLANT CHOICES BASED ON PLANT MATURE SIZE AND TYPE**

**(tree, shrub, perennial, grass, ground cover)**

**CRITICAL TO AESTHETICS AND REDUCED MAINTENANCE NEEDS**

### STEP # 3 What are the aesthetic needs and location?

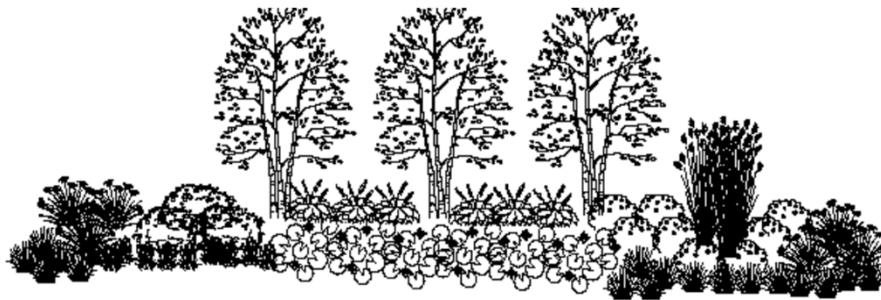
- Home Owner setting –natural look or neat and organized, personalized
- Community setting- green streets, what is going to be acceptable in the community (outreach)-Neat and 4 seasons of interest seems to be a consistent desire, line of site issues, overhead utility wires?
- Commercial setting-Highly visible to many people, match the look of the surroundings or building architecture-maintenance access, 4 seasons of interest
- Larger facilities in open field spaces-perennials/grass, meadow/mow planting (winter coverage)

**PLANT CHOICES BASED ON TEXTURE, STRUCTURE, BLOOM COLOR, 4 SEASONS OF INTEREST, MATURE HEIGHT ARE CRITICAL TO ACHIEVE AN ATTRACTIVE PLANT COMBINATION THAT MAINTAINS ATTRACTIVE APPEARANCE OVER TIME.**

## Step # 4 What plant arrangement will meet the aesthetic goals?

Critical step that includes understanding plants physical attributes and mature size

Layered look, formal, organized



Minimalist look/commercial look



Meadow look



Repeating groupings maybe a large mow facility, no shrubs, intermingle shorter growing species for a less bulky look

Artsy look



Dry stream bed/boulders

**ARRANGING THE PLANTS TO MEET THE AESTHETIC NEEDS**  
**OF THE SPACE/CLIENT**

## Step # 5 Who is doing the maintenance?

- Home owner who loves to garden vs “set it and forget it”  
Many varieties vs fewer and more organized with controlled growth habits
- Contractor-ability to easily identify intended plants  
Fewer plant varieties and larger groupings
- Large facility in open space meadow type mow facility  
Medium to large perennials/grasses, no shrubs or trees, repeating groupings

**PLANT LAYOUT BASED ON HOW THE FACILITY WILL BE**  
**MAINTAINED AND BY WHOM**



## PLANT ATTRIBUTES TO CONSIDER

- Dwarf growth habit
- Spreader vs clump grower
- Deer resistance
- Salt tolerant
- Withstands high water velocity
- Evergreen or basal winter foliage/winter interest
- Ground cover
- Long flowering, flower time and color
- Structure (tree, shrub, upright, spreader)
- Texture (Fine or coarse foliage, grass or broad leaf)
- **Availability**

# DWARF/CLUMP GROWING NATIVE CULTIVARS TO CONSIDER

Basal  
winter  
foliage



Penstemon  
'Husker Red'



Solidago  
'Golden Fleece'  
'Little Lemon'  
Ground cover?



Echinacea  
'Kim's Knee High'



Cephalanthus  
'Sugar Shack'  
(shrub)



Physostegia  
'Miss Manners'  
'Pink Manners'



Clump grower

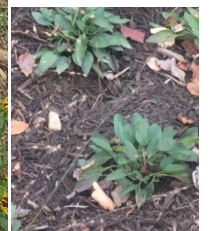
Itea 'Little Henry'  
(shrub)



Panicum  
'Cape Breeze'



Rudbeckia 'Little Gold Star'



Basal winter foliage

# GROUND COVER LAYER-EVERGREEN/SEMI EVERGREEN PLANTS TO CONSIDER

Carex 'Bunny Blue'



Carex rosea



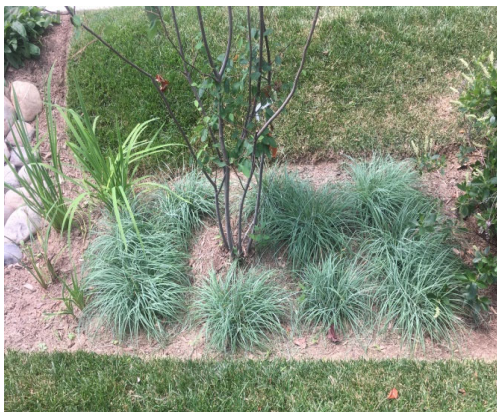
Carex amphiloba  
(shade)



Phlox subulate  
(side slope)



Carex 'Blue Zinger'  
(Not native)



Erigeron pulchellus  
'Lynnhaven Carpet'



Packera aurea  
(some drought intolerance  
in full sun)



# WINTER INTEREST/EVERGREENS TO CONSIDER

Leucothoe 'Scarletta'  
side slope



Ilex Glabra 'Shamrock'



Juniperus c. 'Blue Pacific'  
side slope



Panicum



Juniperus 'Grey Owl'  
side slope



Packera aurea



Phlox subulate  
side slope



Ilex v. 'Sprite'  
Need 'Jim Dandy'  
to Pollinate



## LARGER SHRUB LAYER FOR LARGER FACILITIES



Button Bush *Cephalanthus occidentalis*



Red Twig Dogwood *Cornus sericea*  
Not deer resistant



*Viburnum dentatum* 'Blue Muffin'

Using large shrubs for a larger footprint for covering larger areas. Use 5 gallon if possible and a ground cover layer to keep weeds from invading as plant matures, combining one of these types of shrubs as a backdrop and perennial layer in front.  
Can look heavy if just using these types of shrubs.

In large facilities where a tree layer is appropriate (River Birch for example) this could be the shrub layer.

# WATER VOLUME TOLERANCE=INLET PLANT CHOICES

*Iris versicolor*



*Packera aurea*



*Panicum*

*Chasmanthium latifolium*  
Naturalizes well in larger  
gardens  
or keep under control



### Plant Site Listing (example New Moon Nursery)

<https://drive.google.com/file/d/1giq92gsQ0lzvBsejAODla8yAvDJkQkTH/view>

Panicum 'Cape Breeze'   Penstemon 'Husker Red'   Aster 'October Skies'   Limonium latifolium



Mt. Cuba 3120 Barley Mill Road, Hockessin, DE 19707

"Our **research** team uses the Trial Garden to **evaluate native plants and related cultivars** for horticultural and ecological value, and to highlight the ecosystem services native plants provide."

<https://mtcubacenter.org/research/trial-garden/>



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# Questions?

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