

# **SUSTAINABLE LANDSCAPE DEMONSTRATION GARDEN**

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**Clemson  
University  
Horticulture  
Dept.**

**SCHI Annual  
Conference  
Myrtle Beach,  
SC**

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# PURPOSE

- Create an urban sustainable garden model to promote environmental and human health and well-being.

- Should be replicable.

<http://www.clemson.edu/cafls/demo/index.html>



- Should be measurable.
  - Perception surveys of passersby
  - Soil sampling and analysis
  - Plant health rating sheets

# GUIDING PRINCIPLES

1) Environmental educational displays are needed in the busiest, hectic urban environments in order to reach and influence greater numbers and diverse people (Hester, 2006)



Photo by B. Anderson

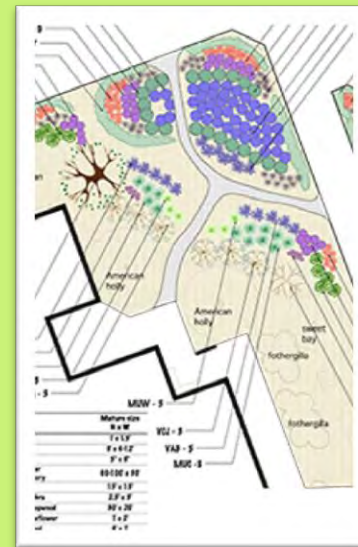


Photo by S. Lombardo

Pre-installation spaces on college campus 1,400 sf (left) 1,800 sf (right)

# GUIDING PRINCIPLES

2) The display should be aesthetically pleasing as well as educational so as to generate sales and production of these less common, but environmentally beneficial plants (Nassauer, 1997)



Designs: Reburn (2011); Lombardo-Fraser (2011); White (2012); Kelly (2012)

Nassauer, J. (1997) Cultural sustainability: Aligning aesthetics and ecology. In *Placing nature: Culture and landscape ecology*. Washington, D.C.: Island Press.



# GUIDING PRINCIPLES

3) The experimental nature of the garden should include a participatory role for passersby to share their opinion and judgment of the display. Participation is engaged learning and often results in greater knowledge retention and continued involvement (Hester, 2006).



Photo by E. Vincent

Hester, R. (2006) *Design for ecological democracy*. Cambridge, MA: MIT Press.

# PROCESS

- Conduct a competitive design process using native plant selections to provide eco-system services, e.g. habitat and food source for native insects and animals (Tallamy, 2011).
- Install and maintain garden using low-maintenance techniques.
- Study environmental health and human perceptions.



Photo by E. Vincent

6" leaf mold compost tilled to a depth of 8"



Photo by E. Vincent

Girdling roots loosened prior to planting

# PROCESS

- Provide on-site and Web educational materials.
- Student workers serve as educational ambassadors.



*Asclepias tuberosa*  
**Butterfly Weed**

Environmental Horticulture  
SAFES

Photos by E. Vincent



## **Sustainable Landscape Demonstration**

Environmental bio-diversity through  
healthy soils, diverse plants,  
intelligent design, installation, and  
maintenance.





# PRE-INSTALLATION



**Pre-installation spaces on college campus 1,400 sf (left) 1,800 sf (right)**

Hester, R. (2006) *Design for ecological democracy*. Cambridge, MA: MIT Press.



# POST-INSTALLATION



Photos by E. Vincent



Post-installation spaces on college campus 1,400 sf (left) 1,800 sf (right)

Hester, R. (2006) *Design for ecological democracy*. Cambridge, MA: MIT Press.

# PRE & POST INSTALLATION SURVEY DATA

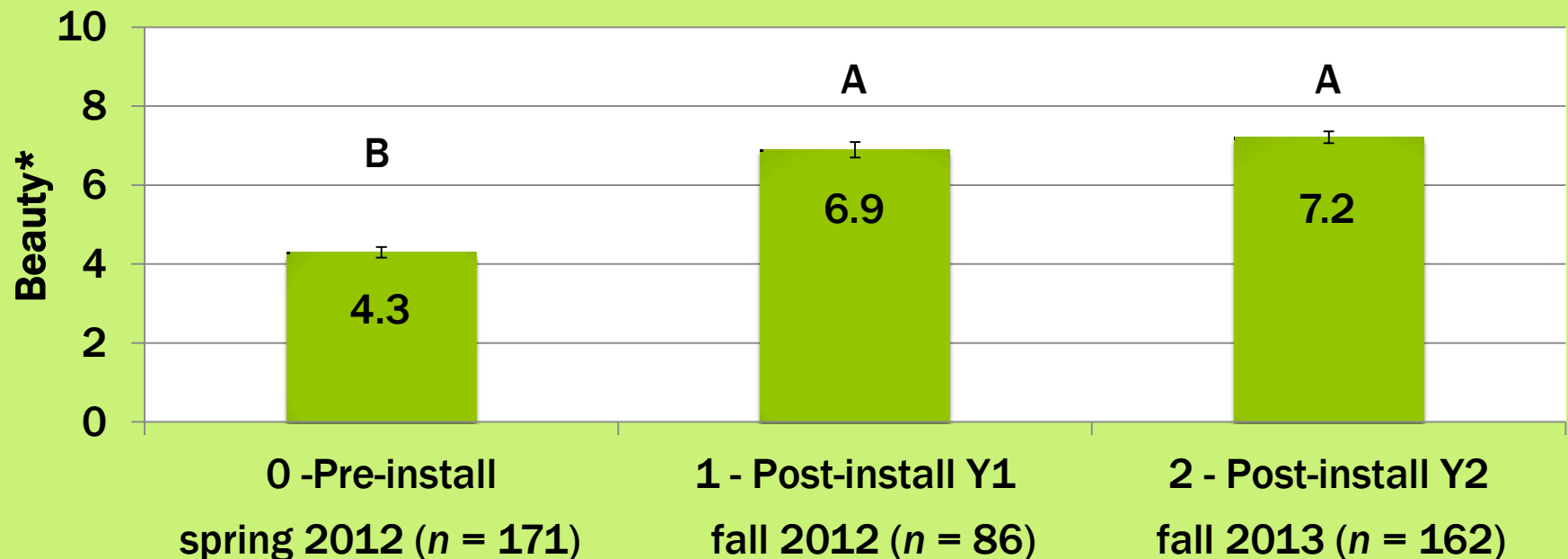
On a scale of 1 to 10, how aesthetically pleasing (beautiful) is the landscape to you?

Extremely poor

Average

Extremely high

1 2 3 4 5 6 7 8 9 10



\*LS Means Differences Tukey HSD ( $P < 0.0001$ )

# PRE & POST INSTALLATION SURVEY DATA

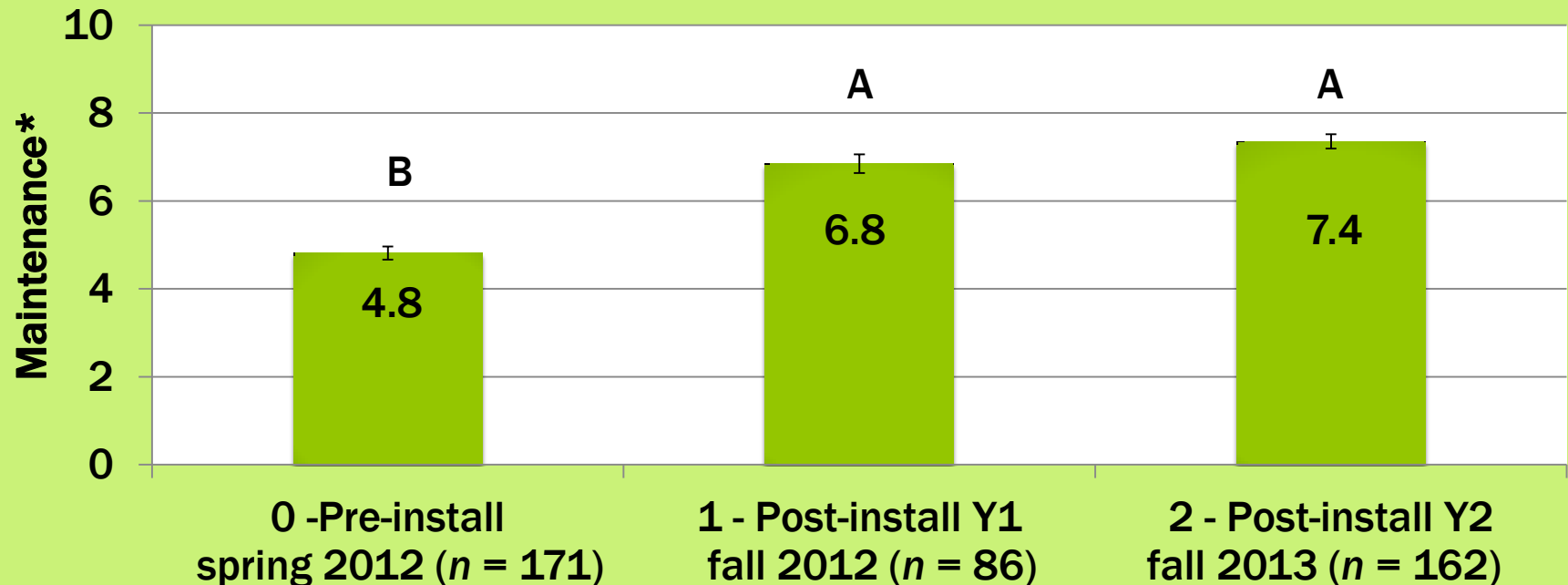
On a scale of 1 to 10, how well maintained does the landscape here appear to you?

Extremely poor

Average

Extremely high

1 2 3 4 5 6 7 8 9 10



\*LS Means Differences Tukey HSD ( $P < 0.0001$ )



# PRE & POST INSTALLATION SURVEY DATA

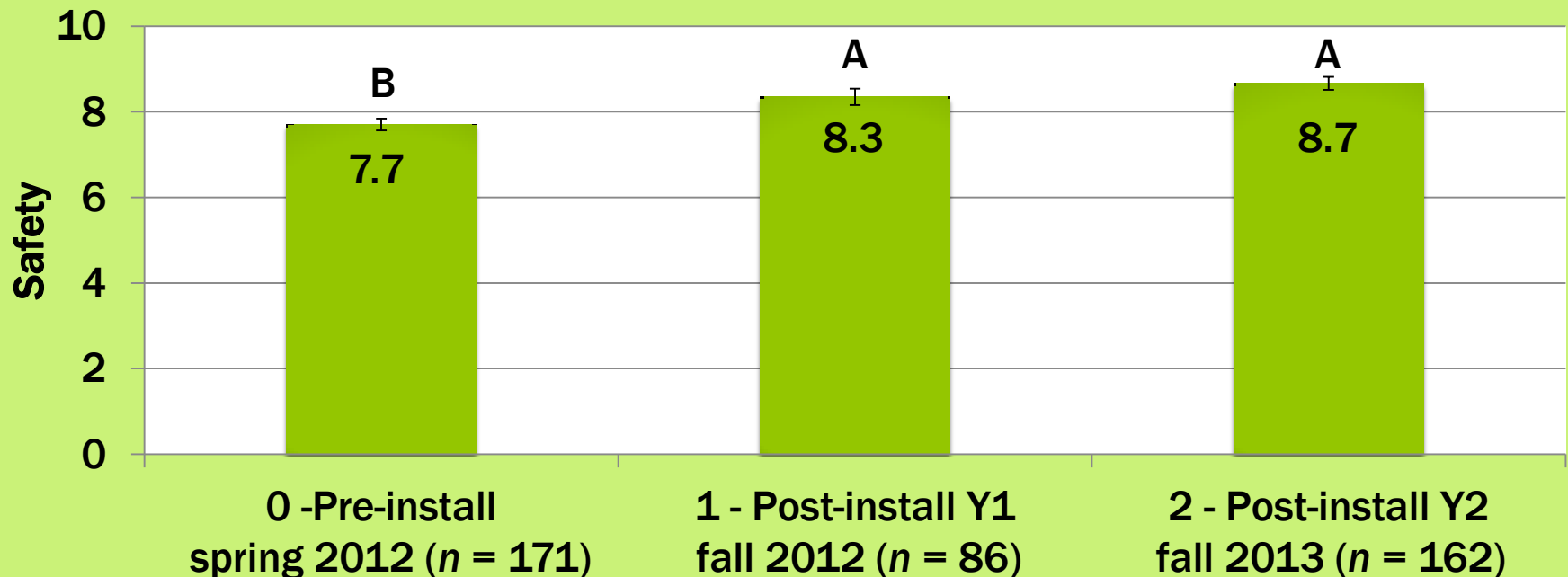
On a scale of 1 to 10, how safe do you feel in this landscape space?

Extremely poor

Average

Extremely high

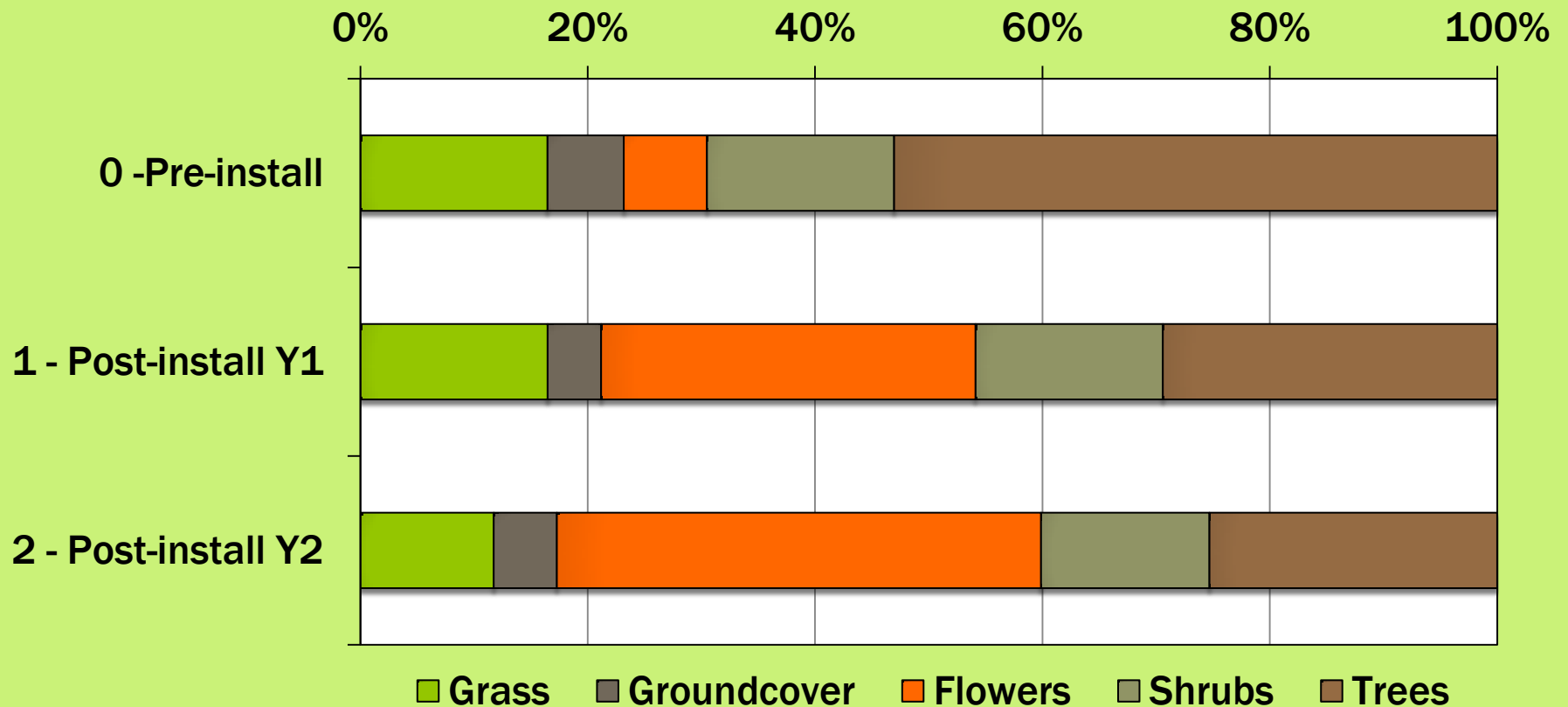
1 2 3 4 5 6 7 8 9 10



\*LS Means Differences Tukey HSD ( $P < 0.0001$ )

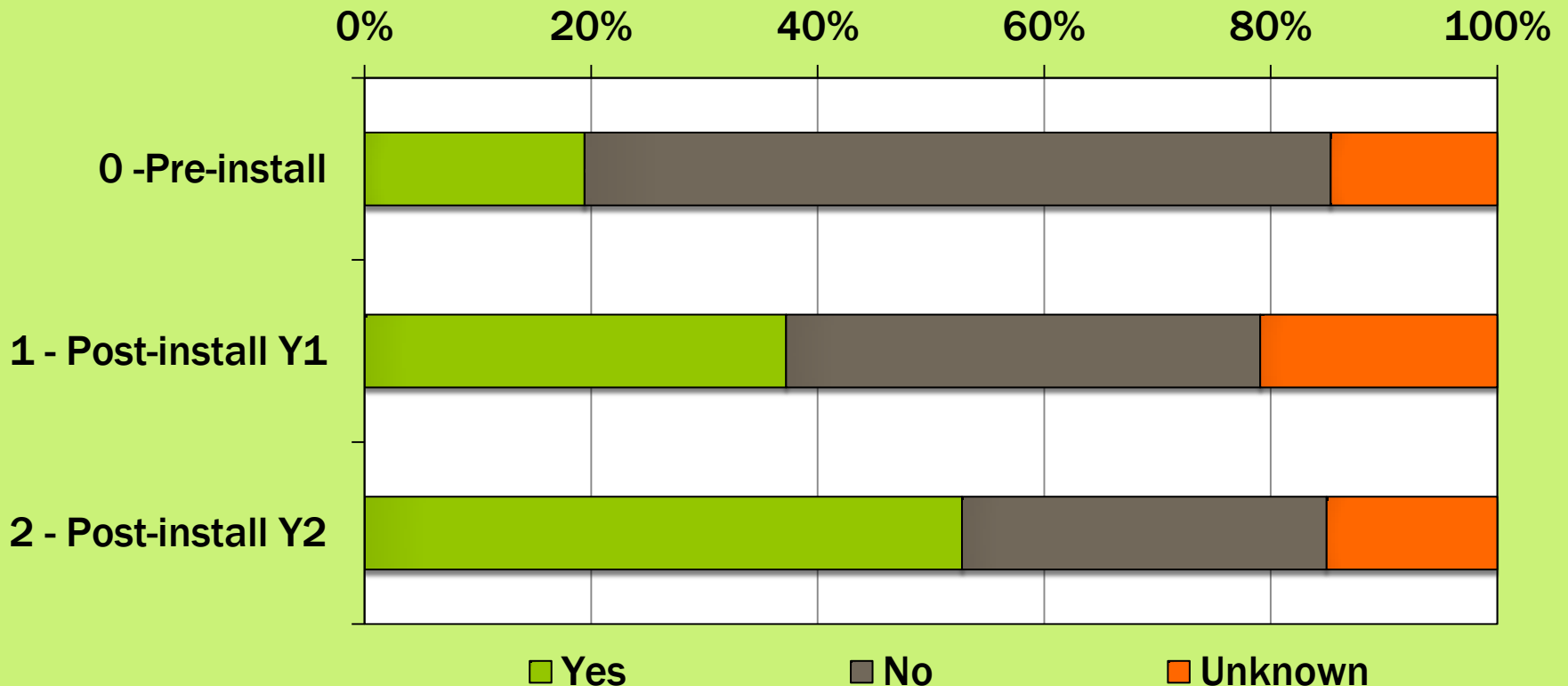
# PRE & POST INSTALLATION SURVEY DATA

What type of plant here in this landscape do you most value or appreciate?



# PRE & POST INSTALLATION SURVEY DATA

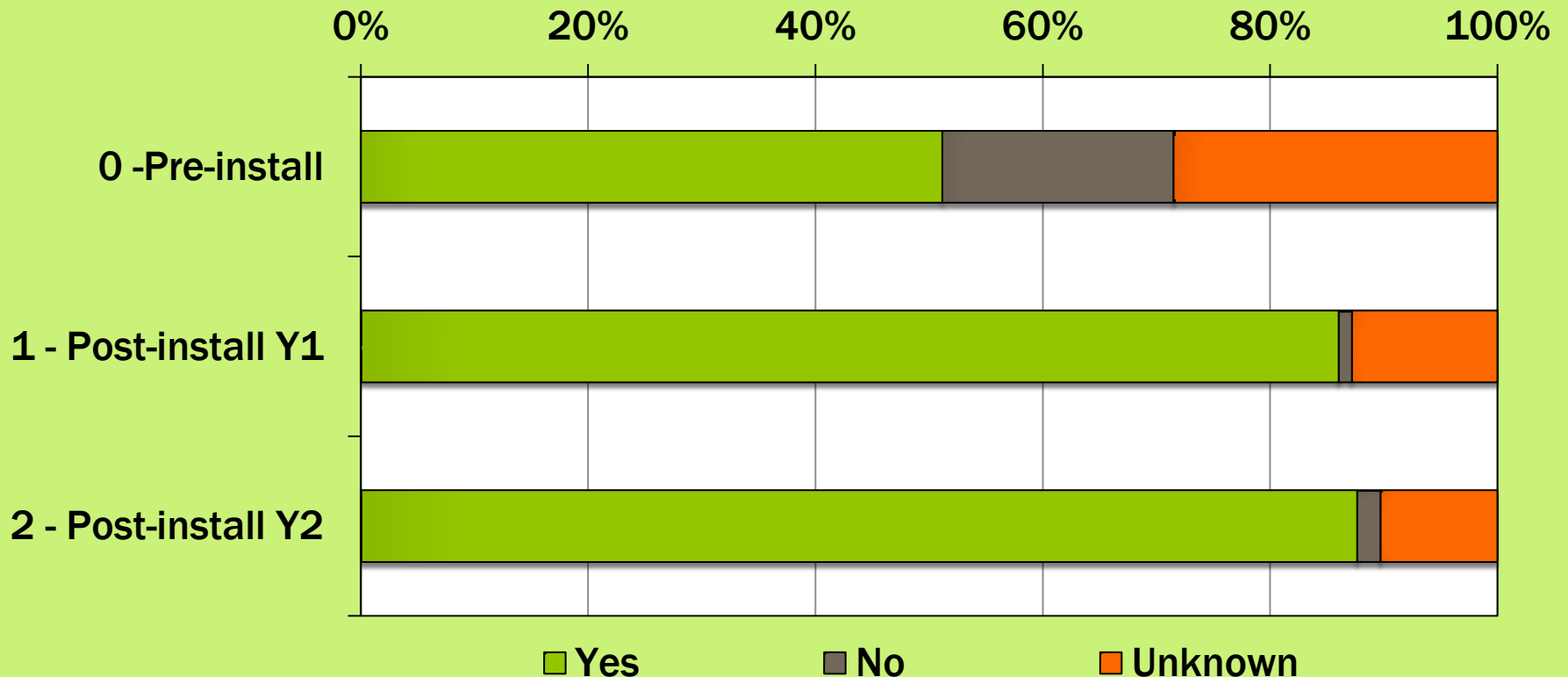
Does this landscape or the gardens right here teach you anything about soil, plants, or water?





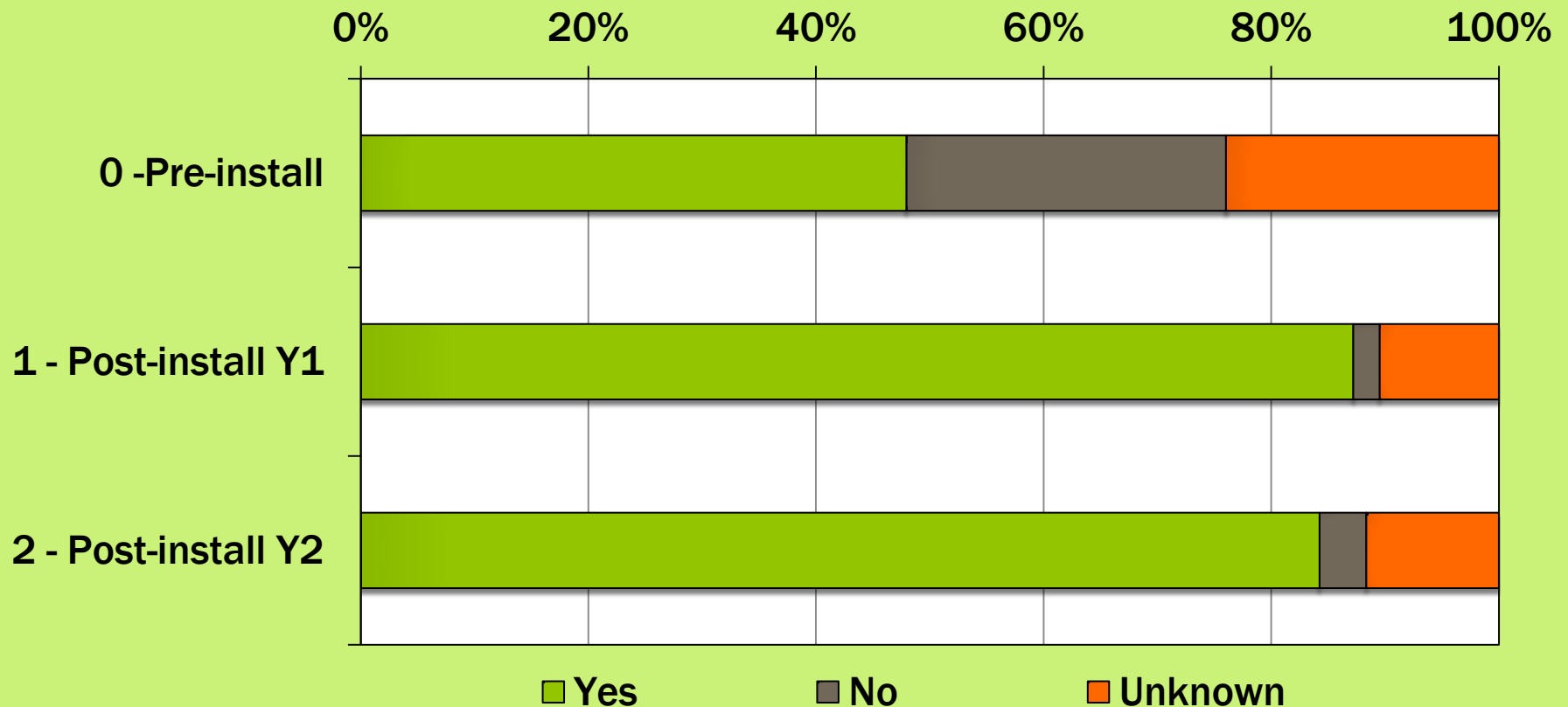
# PRE & POST INSTALLATION SURVEY DATA

Do you think this landscape or the gardens right here are good for the environment?



# PRE & POST INSTALLATION SURVEY DATA

Do you think this landscape or the gardens right here are good for human health and well-being?



# POST INSTALLATION SUMMER 2013



Photo by E. Vincent

June 2013



# INITIAL RESULTS-PERCEPTION SURVEYS

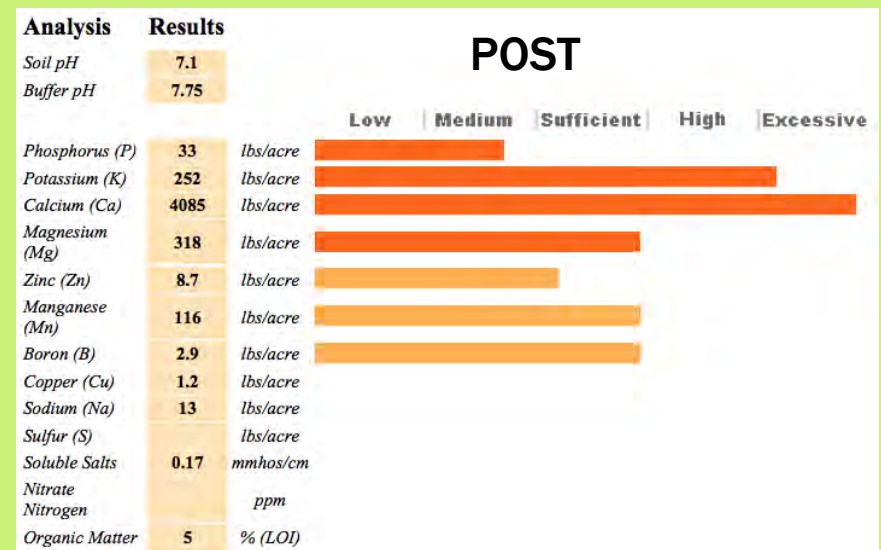
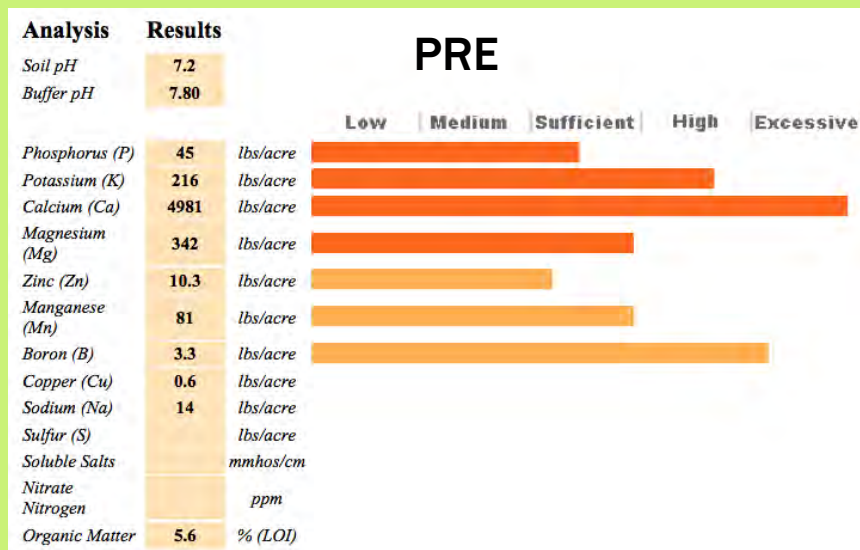
- Positive changes in perception of aesthetics and the quality of maintenance encouraging, considering that perennial plants generally require two complete growing seasons to reach peak performance and the post-installation survey was conducted after only one growing season.
- 38% increase in aesthetic perception
- 30% increase in landscape maintenance perception



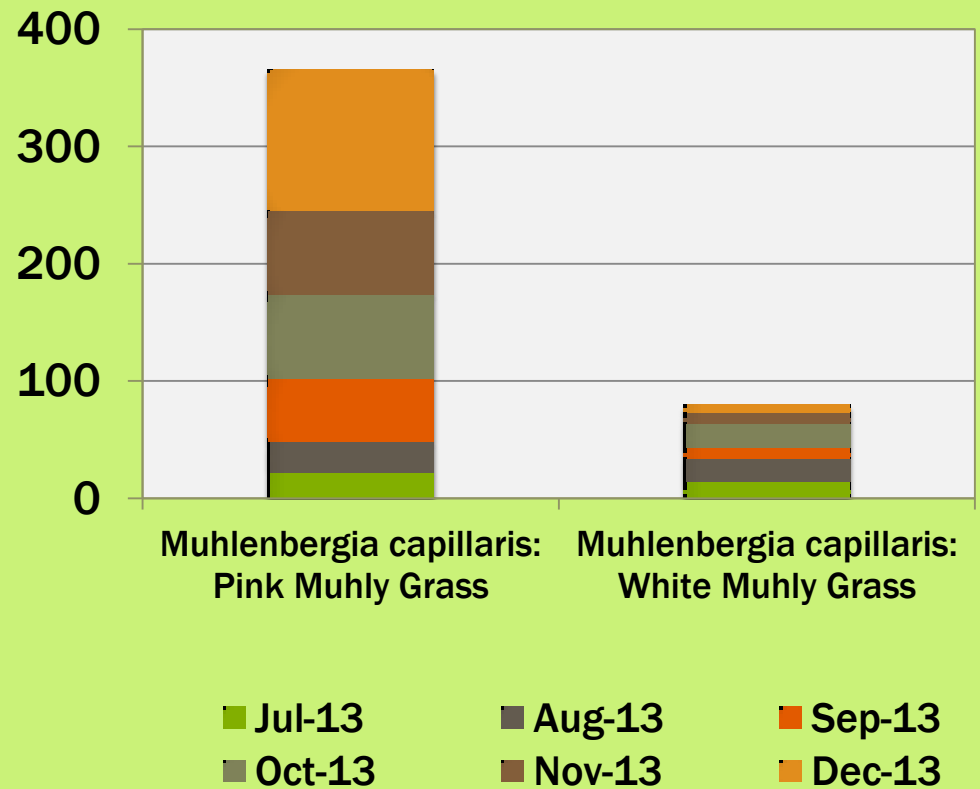
Photo by J. Windham

# PRE & POST SOIL SAMPLE DATA

- Minimal change between pre & post soil sample data for
  - minerals
  - organic matter
  - CEC suggest
- Depletion of most minerals did not occur while plants establishing



# WEB ANALYTICS (PLANT POPULARITY)





# WEB ANALYTICS (PLANT POPULARITY)

3

*Symphotrichum patens*



Late purple aster (65)

4

*Carex flaccosperma*



Blue wood sedge (64)

5

*Fothergilla gardenii*

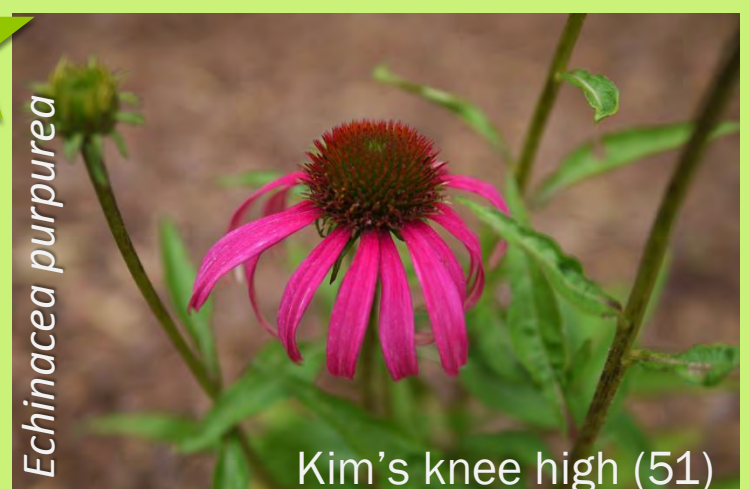
'Mt. Airy'



Dwarf fothergilla (59)

6

*Echinacea purpurea*



Kim's knee high (51)

Photos by Sarah White



# WEB ANALYTICS (PLANT POPULARITY)

6



Flowering Dogwood (51)

7



Narrow-leaf Sunflower (51)

7



Butterfly weed(48)

8



Goldsturm black-eyed susan (47)



# WEB ANALYTICS (PLANT POPULARITY)



# MUHLENBERGIA CAPILLARIS

**Latin name:** *Muhlenbergia capillaris*

**Common name:** Pink Muhly Grass

**Flowers:** Showy<sup>12</sup> light purple late summer into autumn

**Fruit:** Not noticeable

**Height & Width:** 3' x 3'<sup>12</sup>

**Type:** Perennial ornamental grass<sup>12</sup>

**Habit:** Upright grass<sup>12</sup>

**Wetland indicator category\*\*:** FACU<sup>17</sup>

**Texture:** Fine textured basal foliage<sup>12</sup>

**Growth rate:** Medium<sup>12</sup>

**Light:** Sun to light shade<sup>12</sup>

**Moisture:** Very drought tolerant<sup>12</sup>

**Soil:** Well drained soil does well in hot dry sandy sites<sup>1</sup>

**Zones:** 6-9<sup>12</sup>

**Origin:** Western-central United States<sup>12</sup>



Photo by Walker Massey

**Ecosystem benefits:**

**Aesthetically pleasing foliage & flowers**

**Low maintenance**

**Deer Resistant: High**



# MUHLENBERGIA CAPILLARIS 'WHITE CLOUD'

[http://myfolia.com/retailers/854-park-seed/catalogue\\_items/73797-muhly-grass-white-cloud](http://myfolia.com/retailers/854-park-seed/catalogue_items/73797-muhly-grass-white-cloud)

**Latin name:** *Muhlenbergia capillaris*  
'White Cloud'

**Common name:** White Muhly Grass

**Flowers:** Showy<sup>12</sup>

**Fruit:** Not noticeable<sup>12</sup>

**Height & Width:** 3' x 3'<sup>12</sup>

**Type:** Perennial ornamental grass<sup>12</sup>

**Habit:** Upright grass<sup>12</sup>

**Wetland indicator category\*\*:** FACU<sup>17</sup>

**Texture:** Fine textured basal foliage<sup>12</sup>

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**Ecosystem benefits:**

**Aesthetically pleasing foliage & flowers**

**Low maintenance**

**Deer Resistant: High**



# CAREX FLACCOSPERMA

**Latin name:** *Carex flaccosperma*

**Common name:** Blue Wood Sedge

**Flowers:** Non showy flowers<sup>9</sup>

**Fruit:** Insignificant<sup>9</sup>

**Height & Width:** 1' x 1'<sup>9</sup>

**Type:** Sedge<sup>9</sup>

**Wetland indicator category\*\*:** FAC+(2)

**Habit:** Upright clumps<sup>9</sup>

**Texture:** Medium<sup>16</sup>

**Growth rate:** Slow<sup>16</sup>

**Light:** Part shade<sup>16</sup>

**Moisture:** Medium to wet<sup>16</sup>

**Soil:** Fine or medium<sup>16</sup>

**Zones:** 5 to 8<sup>9</sup>

**Origin:** Southeast<sup>9</sup>



**Ecosystem benefits:**  
**Shade tolerant**  
**Wetland tolerant**  
**Low maintenance**  
**Deer Resistant: High**



<http://www.missouribotanicalgarden.org/PlantFinder/FullImageDisplay.aspx?documentid=5208>

[http://plants.usda.gov/java/largeImage?imageID=cafi3\\_004\\_avp.jpg](http://plants.usda.gov/java/largeImage?imageID=cafi3_004_avp.jpg)

# SYMPHYOTRICHUM PATENS

**Latin name:** *Symphyotrichum patens*

**Common name:** Late Purple Aster

**Flowers:** Thin rayed purple <sup>17</sup>

**Fruit:** Not noticeable<sup>17</sup>

**Height & Width:** 3' x 3' <sup>17</sup>

**Type:** Perennial<sup>17</sup>

**Habit:** Forb/herb <sup>17</sup>

**Wetland indicator category\*\*:** N/A

**Texture:** Coarse<sup>17</sup>

**Growth rate:** Moderate <sup>17</sup>

**Light:** Full sun <sup>17</sup>

**Moisture:** Medium<sup>17</sup>

**Soil:** Coarse to medium soils <sup>17</sup>

**Zones:** 7 to 8<sup>17</sup>

**Origin:** Southwest to eastern United States<sup>17</sup>



**Ecosystem benefits:**

**Drought tolerant**

**Low maintenance**

**Attracts butterflies**

# HELIANTHUS ANGUSTIFOLIUS

[http://www.wildflower.org/image\\_archive/640x480/PCD2414/PCD2414\\_IMG0016.JPG](http://www.wildflower.org/image_archive/640x480/PCD2414/PCD2414_IMG0016.JPG)

**Latin name:** *Helianthus angustifolius*

**Common name:** Swamp sunflower

**Flowers:** Prolific 2-3" flowers in fall with narrow yellow petals surrounding a brown or purple disc<sup>3</sup>

**Fruit:** Inconspicuous<sup>16</sup>

**Height & Width:** 5-7' x 4' <sup>3</sup>

**Type:** Perennial<sup>10</sup>

**Habit:** Upright<sup>15</sup>; Flowering herb<sup>16</sup>

**Wetland indicator category\*\*:** FAC, FACW<sup>17</sup>

**Texture:** Medium<sup>16</sup>

**Growth rate:** Moderate<sup>16</sup>

**Light:** Full sun to part shade<sup>2</sup>

**Moisture:** Medium to wet<sup>10</sup>

**Soil\*:** pH preference 4-7<sup>16</sup>; tolerates Sandy, Sandy Loam, Medium Loam, Clay Loam, Clay, Acid-based soils<sup>10</sup>

**Zones:** 5-9<sup>3</sup>

**Origin:** Eastern North America<sup>16</sup>



10: [http://www.wildflower.org/plants/result.php?id\\_plant=HEAN2](http://www.wildflower.org/plants/result.php?id_plant=HEAN2)

# ASCLEPIAS TUBEROSA



<http://www.bing.com/images/search?q=asclepias+tuberosa&FORM=HDRSC2#view=detail&id=27D409B3CECC4FEEF3D5C2590BA8B536503346AB&selectedIndex=37>

**Latin name:** *Asclepias tuberosa*

**Common name:** Butterfly Weed

**Flowers:** Vibrant orange umbels that produce colored follicles if left<sup>3</sup>

**Fruit or cones:** Ornamental follicles

**Height & Width:** 1'x1.5'<sup>3</sup>

**Type:** Herbaceous<sup>16</sup>

**Wetland indicator category\*\*:** Not available<sup>17</sup>

**Texture:** Coarse<sup>16</sup>

**Growth rate:** Initially slow, medium when established<sup>3</sup>

**Light:** Full sun<sup>3</sup>

**Moisture:** Low<sup>16</sup>

**Soil\*:** Course to medium soils<sup>16</sup>

**Zones:** 4-9<sup>3</sup>

**Origin:** Eastern North America<sup>16</sup>



<http://www.missouribotanicalgarden.org/gardens-gardenings-your-garden/plant-finder/plant-details/kc/b490/asclepias-tuberosa.aspx>

**Ecosystem Benefits**<sup>10</sup>

**Attracts:** Hummingbirds , Butterflies

**Larval Host:** Grey Hairstreak, Monarch, Queens

**Nectar Source:** yes

**Deer Resistant:** High



# EUPATORIUM MACULATUM

**Latin name:** *Eupatorium maculatum*

**Common name:** Spotted Joe-Pye Weed

**Flowers:** Flat-topped clusters in late summer with 9-15 flowers<sup>3,13</sup>

**Fruit:** Inconspicuous<sup>10</sup>

**Height & Width:** 5-7' x 4'<sup>3</sup>

**Type:** Herbaceous perennial<sup>10</sup>

**Habit:** Upright<sup>10</sup>

**Wetland indicator category\*\*:** FACW<sup>17</sup>

**Texture:** Medium<sup>18</sup>

**Growth rate:** Medium<sup>18</sup>

**Light:** Sun to part shade<sup>10</sup>

**Moisture:** Wet to moist<sup>10,13</sup>

**Soil\*:** Loamy and calcareous soils<sup>10,13</sup>

**Zones:** 4 - 8<sup>3</sup>

**Origin:** Eastern North America<sup>16</sup>

## Ecosystem Benefits:

**Use Wildlife:** Not a preferred food source for herbivores, but may be eaten occasionally by deer, rabbits and livestock.

**Conspicuous Flowers:** yes

**Fragrant Flowers:** yes

**Interesting Foliage:** yes

**Attracts:** Butterflies

**Larval Host:** The caterpillars of some moth species feed on various parts.

**Nectar Source:** yes

**Special value to native bees**

[http://www.wildflower.org/plants/result.php?id\\_plant=EUMA12](http://www.wildflower.org/plants/result.php?id_plant=EUMA12)



[http://www.wildflower.org/image\\_archive/640x480/PCD1285/PCD1285\\_IMG0061.JPG](http://www.wildflower.org/image_archive/640x480/PCD1285/PCD1285_IMG0061.JPG)

# *ECHINACEA PURPUREA* 'KIM'S KNEE HIGH'

**Latin name:** *Echinacea purpurea* 'Kim's Knee-High'

**Common name:** Purple coneflower

**Flowers:** Purple-pinkish petals surround a raised brown/bronze-colored center disk<sup>2,12</sup>

**Fruit:** Inconspicuous<sup>3</sup>

**Height & Width:** 2' x 2'<sup>3</sup>

**Type:** Herbaceous perennial<sup>4,10</sup>

**Habit:** Upright<sup>3,12</sup>

**Wetland indicator category\*\*:** Not available<sup>17</sup>

**Texture:** Coarse<sup>4</sup>

**Growth rate:** Medium<sup>4</sup>

**Light:** Full sun to part shade

**Moisture:** Dry to medium<sup>10</sup>

**Soil\*:** Tolerates clay, sandy to rich soils<sup>10,12</sup>

**Zones:** 3 - 8<sup>2</sup>

**Origin:** Midwestern to Eastern United States, including South Carolina<sup>16</sup>

## **Ecosystem Benefits:**

**Use Wildlife:** *Echinacea* spp. attract butterflies and hummingbirds.

**Use: Medicinal**

**Conspicuous Flowers:** yes

**Nectar Source:** yes

**Deer Resistant:** No

**Special value to native bees**



[http://www.wildflower.org/image\\_archive/640x480/SAW/SAW\\_01215.jpg](http://www.wildflower.org/image_archive/640x480/SAW/SAW_01215.jpg)

[http://www.wildflower.org/plants/result.php?id\\_plant=ECPU](http://www.wildflower.org/plants/result.php?id_plant=ECPU)

# ECHINACEA LAEVIGATA

**Latin name:** *Echinacea laevigata*

**Common name:** Smooth Purple Coneflower

**Flowers:** Purple to pink, showy and delicate drooping purple rays. Blooms June to August<sup>12</sup>

**Fruit:** Not significant<sup>13</sup>

**Height & Width:** 2-5' x 1.5-2'<sup>12</sup>

**Type:** Herbaceous perennial<sup>12</sup>

**Habit:** Upright, cascading, mound<sup>16</sup>

**Wetland indicator category\*\*:** No Wetland indicator was available for this plant.

**Texture:** Fine<sup>16</sup>

**Growth rate:** Moderate<sup>12</sup>

**Light:** Full sun to part shade<sup>12</sup>

**Moisture:** Dry to medium<sup>12</sup>

**Soil:** Tolerates clay soil, dry soil, shallow and rocky soil<sup>12</sup>

**Zones:** 3-8<sup>12</sup>

**Origin:** Southeastern United States<sup>16</sup>

**Note:** *This plant is on the United States threatened and endangered species list*<sup>16</sup>



# ***RUDBECKIA FULGIDA* 'GOLDSTURM'**

**Latin name:** *Rudbeckia fulgida* var. *sullivantii*  
'Goldsturm'

**Common name:** Goldsturm Black-eyed Susan

**Flowers:** Yellow rays with black center disk<sup>12</sup>

**Fruit:** Inconspicuous<sup>10</sup>

**Height & Width:** 2-3' x 1-2'<sup>12</sup>

**Type:** Herbaceous perennial<sup>12</sup>

**Habit:** Upright, clump forming<sup>12</sup>

**Wetland indicator category\*\*:** FAC<sup>17</sup>

**Texture:** Coarse<sup>10</sup>

**Growth rate:** Medium<sup>2</sup>

**Light:** Full sun<sup>2</sup>

**Moisture:** Medium to dry<sup>12</sup>

**Soil\*:** Tolerates a wide variety of soils<sup>12</sup>

**Zones:** 3-9<sup>12</sup>

**Origin:** Eastern North America, including South Carolina<sup>16</sup>



**Ecosystem Benefits:**

**Attracts:** Birds

**Special value to native bees**



# NEXT STEPS-PLANT RATINGS SHEETS

- Commercial ratings of individual plants
- Please visit the Sustainable Garden and rate the plants
- Ratings sheets available on line at all times
- Clemson Web; Sustainable Landscape Demonstration; Plants; Plant Ratings Sheets
- [http://www.clemson.edu/cafls/demo/images/plant\\_ratings\\_sheet.pdf](http://www.clemson.edu/cafls/demo/images/plant_ratings_sheet.pdf)



Photo by J. Windham



College of Agriculture, Forestry and Life Sciences

CU > CAFLS > Sustainable Landscape Demonstration > Plant Profiles > Plant Profiles

Plant Profiles

Sources



- Home & Garden Information
- Extension
- Agricultural Services
- Experiment Station
- Livestock-Poultry Health
- Regulatory Services
- Centers & Institutes
- Public Service

## Plant Profiles

- **PLANT RATING SHEETS** (PDF)
- *Amsonia tabernaemontana*: Eastern Blue Star
- *Andropogon glomeratus*: Bushy Bluestem
- *Asclepias tuberosa*: Butterfly weed
- *Baptisia australis*: Blue False Indigo
- *Calycanthus floridus*: Carolina Allspice
- *Carex flaccosperma*: Blue wood sedge
- *Carya ovata*: Shagbark Hickory
- *Chionanthus virginicus*: Fringe Tree

Browser: clemson.edu

Tools Sign Comment

1 / 5 97.3%

Plant name:	Poor	Average			Excellent	N/A	Comments
	1	2	3	4	5		
Bloom color							
Bloom shape							
Foliage color							
Foliage habit (behavior)							
Size							
Plant health							
Overall appearance							

Plant name:	Poor	Average			Excellent	N/A	Comments
	1	2	3	4	5		
Bloom color							
Bloom shape							
Foliage color							
Foliage habit (behavior)							
Size							
Plant health							
Overall appearance							

Dr. Ellen Vincent ellenav@clemson.edu Fax: 864-656-4960 Poole Ag Center Room 173 Clemson, SC 29634-0310  
 Thank you for completing this plant rating sheet!



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