

**SUSTAINABLE
LANDSCAPE
DEMONSTRATION
GARDEN**

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University
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**SC
Horticulture
Industry
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

- Assemble a diverse (career) interdisciplinary team.
- Study environmental health and human perceptions.



Byrd, commercial design



Gerus, director of grounds



Hall, ethnobotanist



Park, professor & soils researcher



Tanner, extension



Vincent, prof of hort & health res



White, hort extension & water researcher

PROCESS

- Assemble an interdisciplinary team to maximize success.
- Study environmental health and human perceptions.



Byrd, landsc des



Gerus , landsc dir



Hall, native plant



Park, soils



Tanner, extension



Vincent, env hort



White, water

PROCESS



**Fraser, HORT
designer**



**Lombardo, HORT
designer**



**Reburn, FOR
designer**



**Kelly, HORT,
designer**



**Cochran, HORT
install**



**Blakely, FOR
maintenance**



**Clarkin, ARCH
maintenance**



**Smolka, BIOSC
maintenance**

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.



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

Photo by E. Vincent



Girdling roots loosened prior to planting

Photo by E. Vincent

PROCESS

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



Photos by E. Vincent



PRE-INSTALLATION



Photo by B. Anderson



Photo by S. Lombardo

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

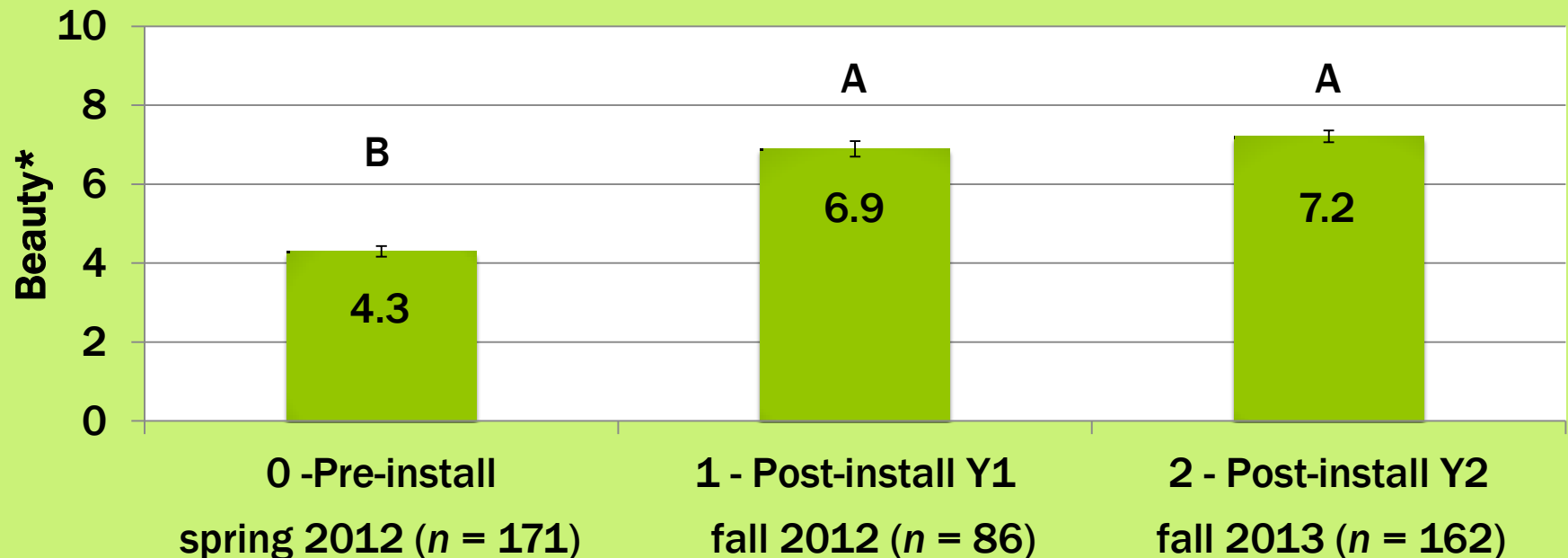
On a scale of 1 to 10, how aesthetically pleasing (beautiful) is the landscape to you?

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

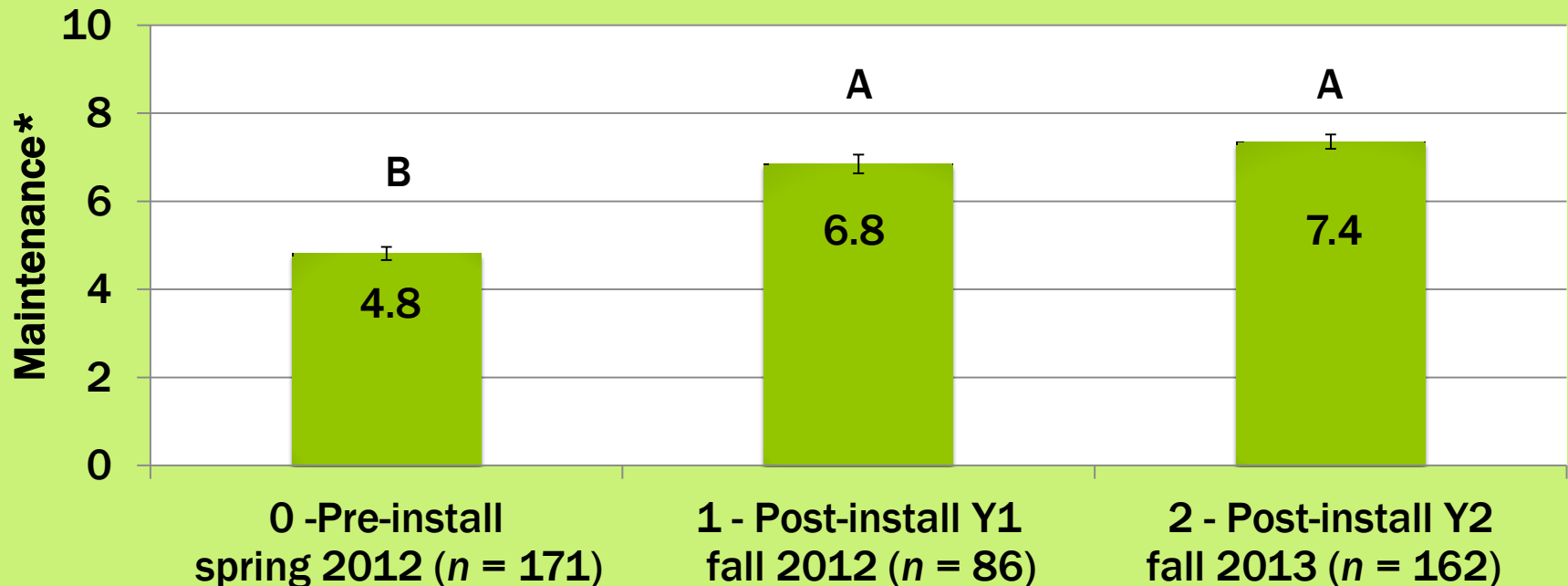
On a scale of 1 to 10, how well maintained does the landscape here appear to you?

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

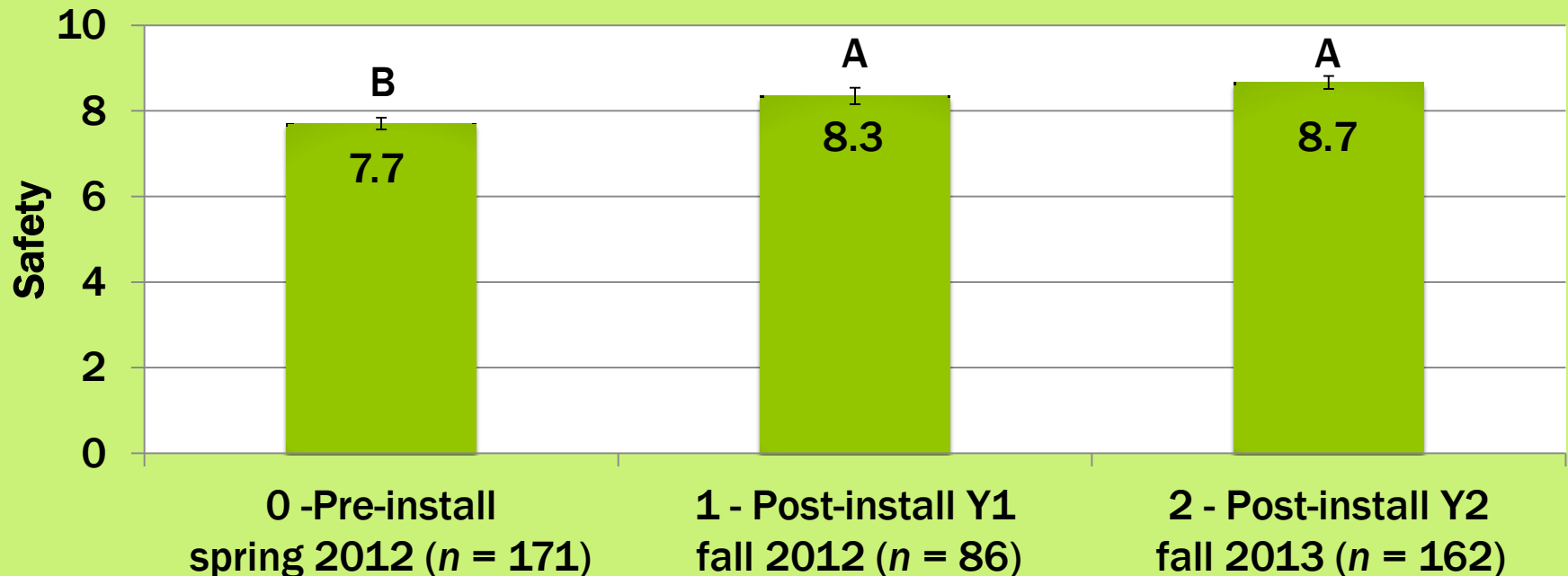
On a scale of 1 to 10, how safe do you feel in this landscape space?

Extremely poor

Average

Extremely high

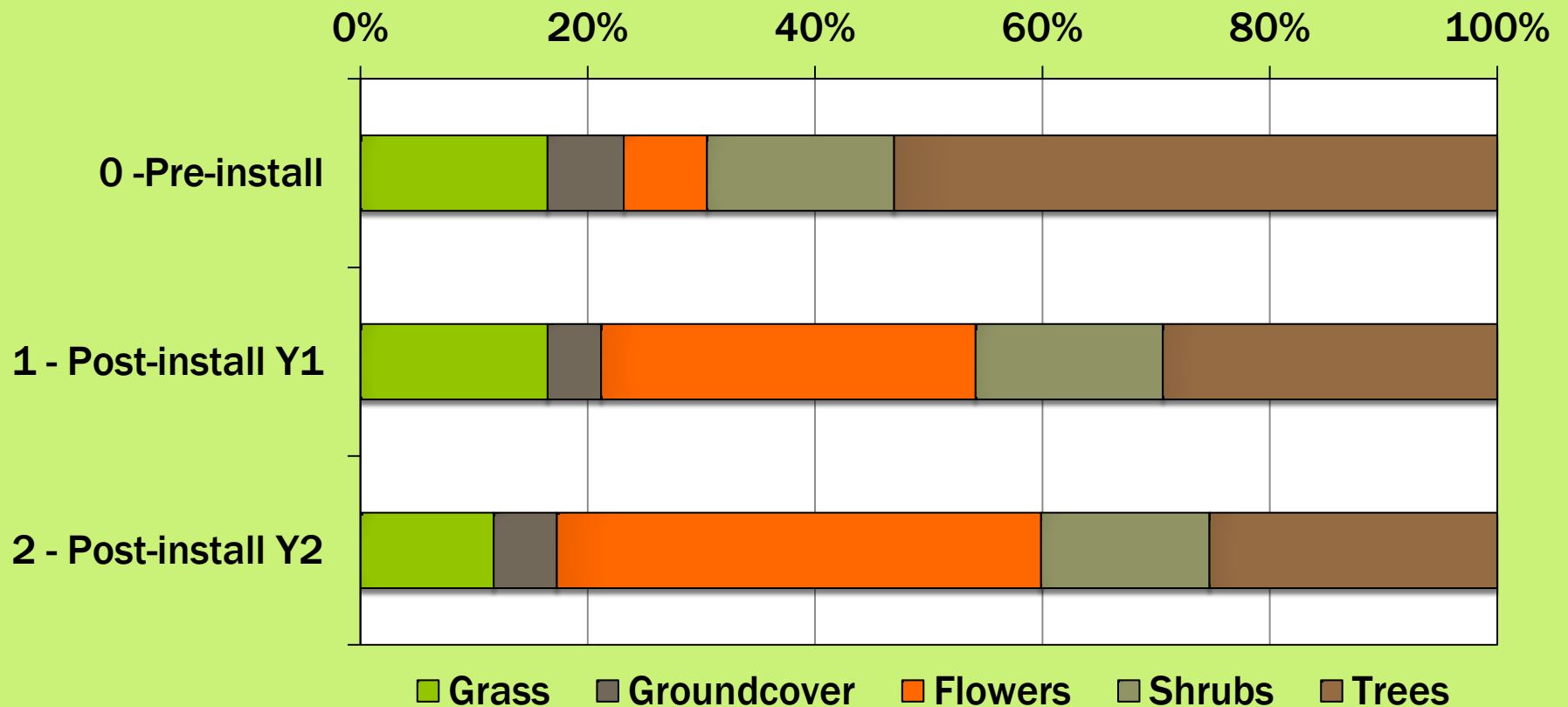
1 2 3 4 5 6 7 8 9 10



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

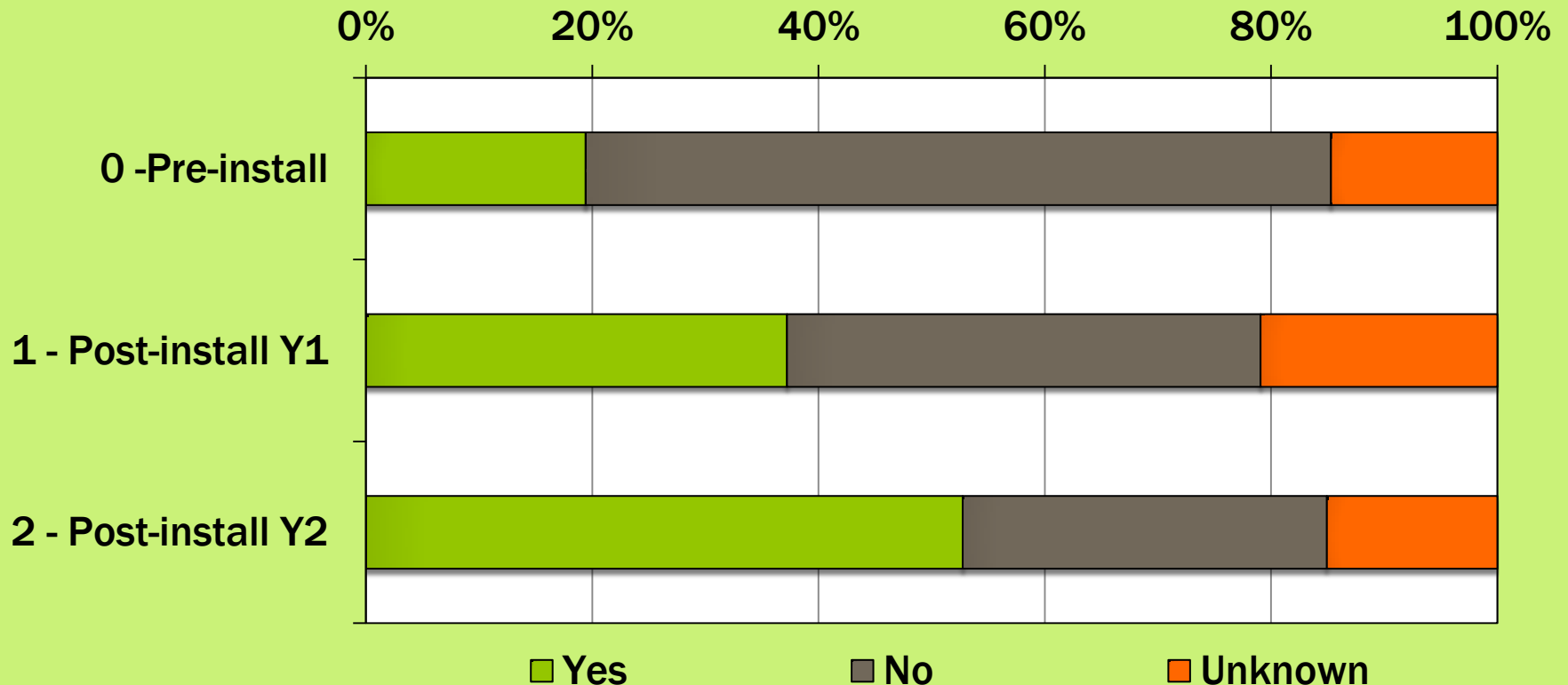
PRE & POST INSTALLATION SURVEY DATA

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



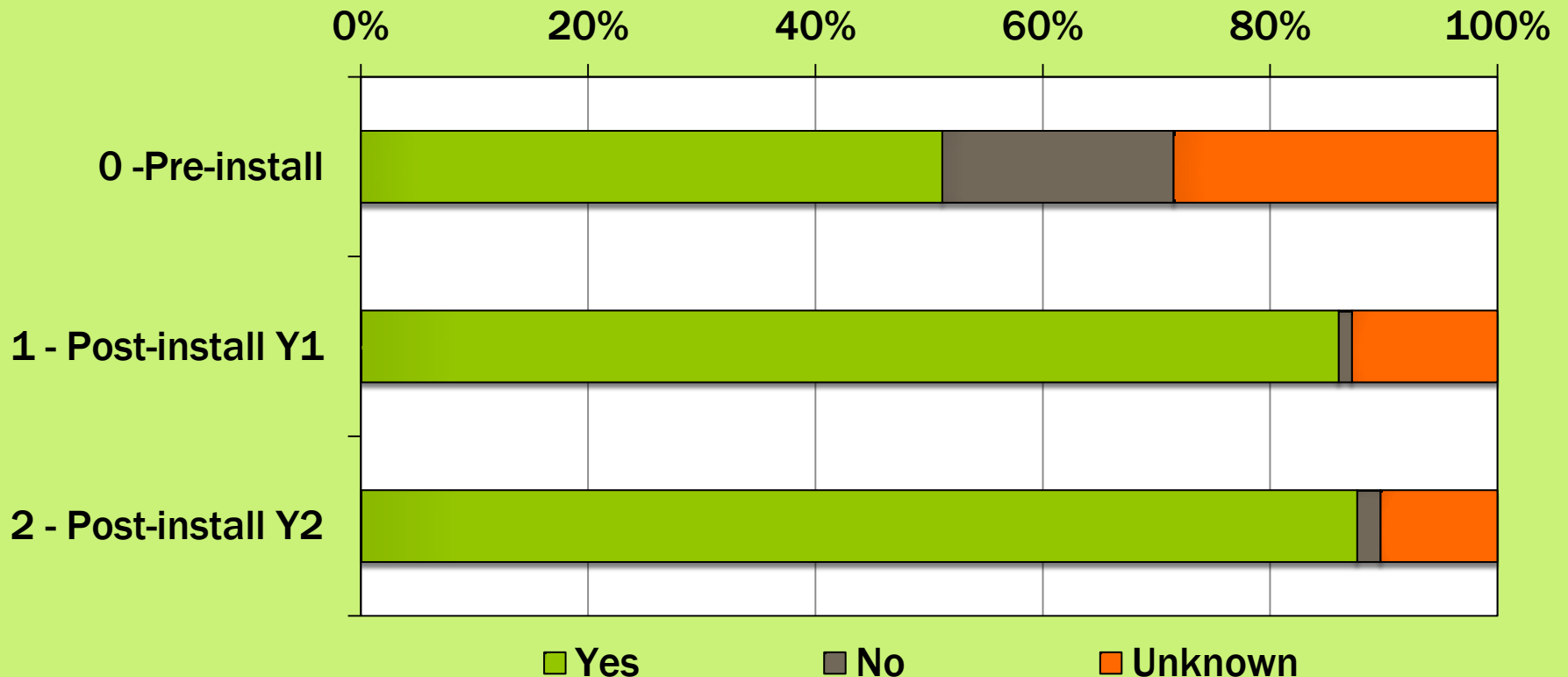
PRE & POST INSTALLATION SURVEY DATA

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



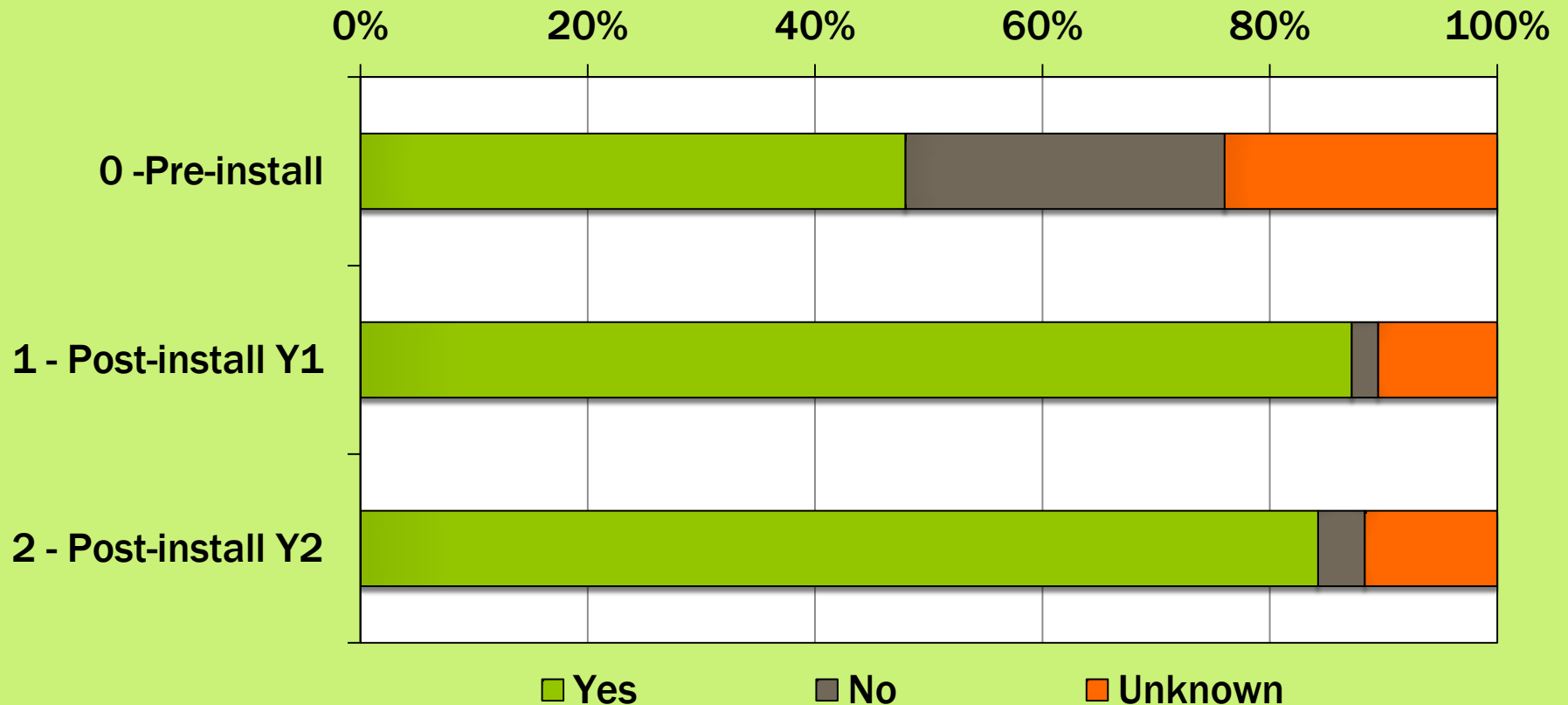
PRE & POST INSTALLATION SURVEY DATA

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

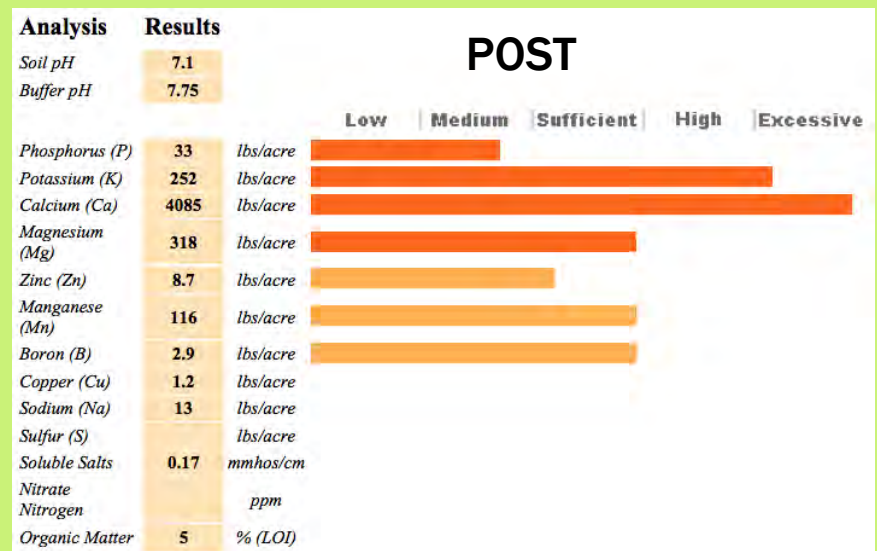
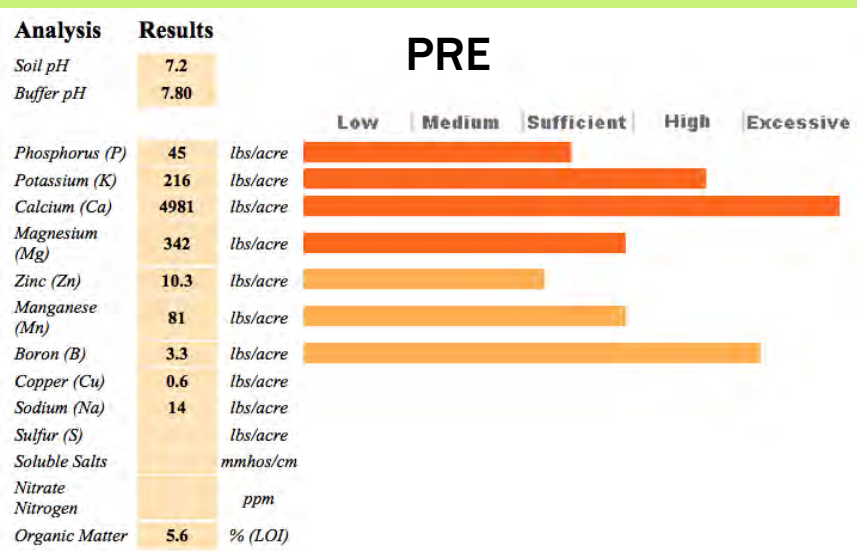
- Positive changes in perception of aesthetics and the quality of maintenance encouraging, considering that perennial plants generally require two complete growing seasons to reach peak performance and the post-installation survey was conducted after only one growing season.
- 38% increase in aesthetic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



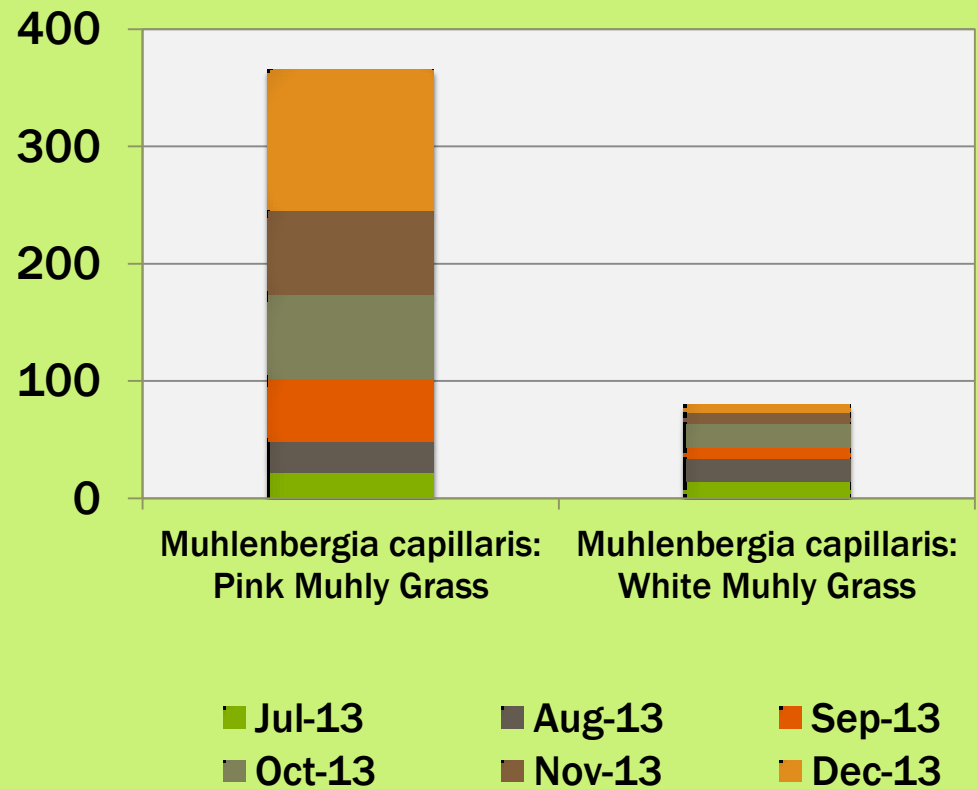
Photo by J. Windham

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 (WEB HITS)



WEB ANALYTICS (WEB HITS)

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)

WEB ANALYTICS (WEB HITS)

6

Cornus florida



Flowering Dogwood (51)

7

Helianthus angustifolius



Narrow-leaf Sunflower (51)

7

Asclepias tuberosa



Butterfly weed (48)

8

Rudbeckia fulgida



Goldsturm black-eyed susan (47)

WEB ANALYTICS (WEB HITS)



Smooth Coneflower (44)



Carolina Allspice (27)



Joe Pye Weed (27)



Passion Vine (27)



Lowbush Blueberry (27)



Blue-eyed Grass (23)



Fringe Tree (27)



Blue False Indigo (17)



Bushy Bluestem (9)

MUHLENBERGIA CAPILLARIS

Latin name: *Muhlenbergia capillaris*

Common name: Pink Muhly Grass

Flowers: Showy¹² light purple late summer into autumn

Fruit: Not noticeable

Height & Width: 3' x 3'¹²

Type: Perennial ornamental grass¹²

Habit: Upright grass¹²

Wetland indicator category:** FACU¹⁷

Texture: Fine textured basal foliage¹²

Growth rate: Medium¹²

Light: Sun to light shade¹²

Moisture: Very drought tolerant¹²

Soil: Well drained soil does well in hot dry sandy sites¹

Zones: 6-9¹²

Origin: Western-central United States¹²



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

Latin name: *Muhlenbergia capillaris*
'White Cloud'

Common name: White Muhly Grass

Flowers: Showy¹²

Fruit: Not noticeable¹²

Height & Width: 3' x 3'¹²

Type: Perennial ornamental grass¹²

Habit: Upright grass¹²

Wetland indicator category:** FACU¹⁷

Texture: Fine textured basal foliage¹²

Growth rate: Medium¹²

Light: Sun to light shade¹²

Moisture: Very drought tolerant¹²

Soil: Well drained soil does well in hot dry sandy sites¹²

Zones: 6-9¹²

Origin: Western-central United States¹²



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 flowers⁹

Fruit: Insignificant⁹

Height & Width: 1' x 1'⁹

Type: Sedge⁹

Wetland indicator category:** FAC+(2)

Habit: Upright clumps⁹

Texture: Medium¹⁶

Growth rate: Slow¹⁶

Light: Part shade¹⁶

Moisture: Medium to wet¹⁶

Soil: Fine or medium¹⁶

Zones: 5 to 8⁹

Origin: Southeast⁹



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=cafl3_004_avp.jpg

SYMPHYOTRICHUM PATENS

Latin name: *Symphyotrichum patens*

Common name: Late Purple Aster

Flowers: Thin rayed purple ¹⁷

Fruit: Not noticeable¹⁷

Height & Width: 3' x 3' ¹⁷

Type: Perennial¹⁷

Habit: Forb/herb ¹⁷

Wetland indicator category:** N/A

Texture: Coarse¹⁷

Growth rate: Moderate ¹⁷

Light: Full sun ¹⁷

Moisture: Medium¹⁷

Soil: Coarse to medium soils ¹⁷

Zones: 7 to 8¹⁷

Origin: Southwest to eastern United States¹⁷



Photo by Walker Massey

Ecosystem benefits:

Drought tolerant

Low maintenance

Attracts butterflies

HELIANTHUS ANGUSTIFOLIUS

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 disc³

Fruit: Inconspicuous¹⁶

Height & Width: 5-7' x 4' ³

Type: Perennial¹⁰

Habit: Upright¹⁵; Flowering herb¹⁶

Wetland indicator category:** FAC, FACW¹⁷

Texture: Medium¹⁶

Growth rate: Moderate¹⁶

Light: Full sun to part shade²

Moisture: Medium to wet¹⁰

Soil*: pH preference 4-7¹⁶; tolerates Sandy, Sandy Loam, Medium Loam, Clay Loam, Clay, Acid-based soils¹⁰

Zones: 5-9³

Origin: Eastern North America¹⁶



Ecosystem Benefits:

Wetland tolerant (for bog or pond area)

Attracts birds

Special value to native bees

10: 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 left³

Fruit or cones: Ornamental follicles

Height & Width: 1'x1.5'³

Type: Herbaceous¹⁶

Wetland indicator category:** Not available¹⁷

Texture: Coarse¹⁶

Growth rate: Initially slow, medium when established³

Light: Full sun³

Moisture: Low¹⁶

Soil*: Course to medium soils¹⁶

Zones: 4-9³

Origin: Eastern North America¹⁶



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

Ecosystem Benefits

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^{3,13}

Fruit: Inconspicuous¹⁰

Height & Width: 5-7' x 4'³

Type: Herbaceous perennial¹⁰

Habit: Upright¹⁰

Wetland indicator category:** FACW¹⁷

Texture: Medium¹⁸

Growth rate: Medium¹⁸

Light: Sun to part shade¹⁰

Moisture: Wet to moist^{10,13}

Soil*: Loamy and calcareous soils^{10,13}

Zones: 4 - 8³

Origin: Eastern North America¹⁶

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

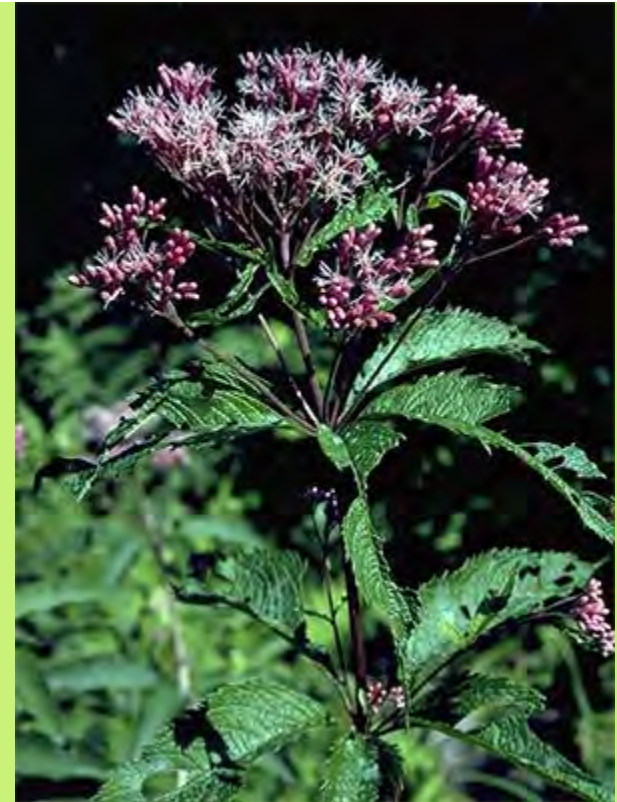
Attracts: Butterflies

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



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^{2,12}

Fruit: Inconspicuous³

Height & Width: 2' x 2'³

Type: Herbaceous perennial^{4,10}

Habit: Upright^{3,12}

Wetland indicator category:** Not available¹⁷

Texture: Coarse⁴

Growth rate: Medium⁴

Light: Full sun to part shade

Moisture: Dry to medium¹⁰

Soil*: Tolerates clay, sandy to rich soils^{10,12}

Zones: 3 - 8²

Origin: Midwestern to Eastern United States, including South Carolina¹⁶

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/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 August¹²

Fruit: Not significant¹³

Height & Width: 2-5' x 1.5-2'¹²

Type: Herbaceous perennial¹²

Habit: Upright, cascading, mound¹⁶

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

Texture: Fine¹⁶

Growth rate: Moderate¹²

Light: Full sun to part shade¹²

Moisture: Dry to medium¹²

Soil: Tolerates clay soil, dry soil, shallow and rocky soil¹²

Zones: 3-8¹²

Origin: Southeastern United States¹⁶

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

Ecosystem benefits: Special value to native bees



***RUDBECKIA FULGIDA* 'GOLDSTURM'**

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

Common name: Goldsturm Black-eyed Susan

Flowers: Yellow rays with black center disk¹²

Fruit: Inconspicuous¹⁰

Height & Width: 2-3' x 1-2'¹²

Type: Herbaceous perennial¹²

Habit: Upright, clump forming¹²

Wetland indicator category:** FAC¹⁷

Texture: Coarse¹⁰

Growth rate: Medium²

Light: Full sun²

Moisture: Medium to dry¹²

Soil*: Tolerates a wide variety of soils¹²

Zones: 3-9¹²

Origin: Eastern North America, including South Carolina¹⁶



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



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
- Clemson University

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 window showing a Clemson University page with a plant rating sheet form.

Address bar: clemson.edu

Page: 1 / 5 | Zoom: 97.3%

Tools | Sign | Comment

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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