PRO Green EXPO

Colorado Convention Center

Denver, CO | February 5 – 8

Growing Perennials for Specific Sales Windows

Perennial PULSE

PERENNIAL SOLUTIONS

Paul Pilon

Perennial Solutions Consulting

Color Sells

Before growing perennials…

…what are the challenges?

And how do you plan for these crops?

Before growing perennials- ask yourself:

Who are your customers?

What type of selection are they looking for?

-wide selection with every delivery

-narrow & deep

What stage of development is required?

-flowering

When do they want the perennials by?

Where will the perennials be grown?

Heated Greenhouses

Unheated Houses – Quonsets or

c

Outside

Variety Selection

First step to designing a season long perennial program.

Select varieties that can easily be produced for certain sales windows.

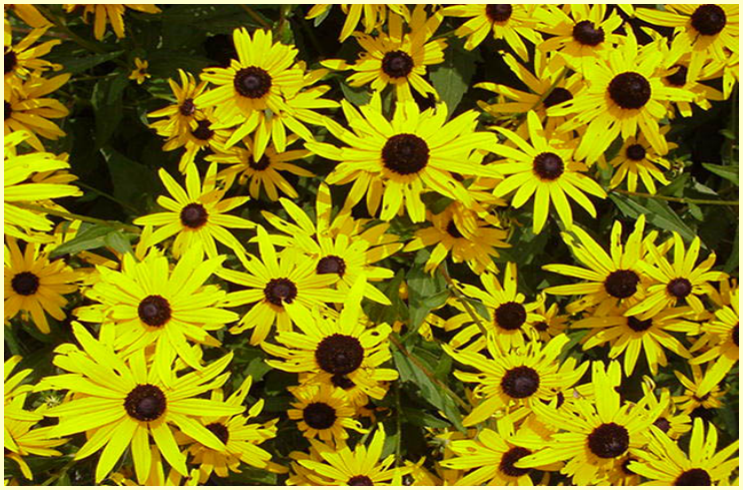
Early	Mid	Late
Aquilegia	Achillea	Echinacea
Bellis	Agastache	Liatris
Iberis	Coreopsis	Monarda
Phlox subulata	Dianthus	Phlox paniculata
Saxifraga	Salvia	Rudbeckia

When possible, select varieties that will naturally flower in your growing environments for these sales window.

You'll still benefit from understanding their specific flowering requirements we'll cover next.

Consistently Provide Flowering Perennials to Your Markets

- Understand Forcing Principles and Flowering Requirements for Each Perennial in Production
- Develop Practical Production Schedules
- Utilize Differing Environments to Maximize Production



Rudbeckia fulgida ‘Goldsturm’

Growers manipulate flowering to satisfy commercial expectations and to take advantage of impulse purchasing by delivering more ‘Flower Power’ at the retail site.

Forcing: The term used by growers to describe the process of inducing bloom and producing flowering plants.

- Juvenility
- Bulking
- Vernalization
- Photoperiod
- Temperature

Gaillardia ‘Fanfare’

Each perennial has its own specific requirements for flowering.

Juvenility

- Many plants must reach a certain age or maturity to flower.
- Cannot perceive cold/photoperiod while juvenile
- Many varieties started from seed.
- Best determined by the number of leaves rather than the age of the plant.

(Critical leaf number)

Aquilegia

- Aquilegia ‘Origami’ 7 -9 leaves
- Aquilegia ‘Winky’ 9-12 leaves
- Campanula ‘Clips’ 9-11 leaves
- Digitalis purperea 12-15 leaves
- Heuchera x hybrida 15 leaves
- Lavandula angustifolia 25+ leaves
- Leucanthemum ‘Snowcap’ 12-16 leaves
- Rudbeckia ‘Goldsturm’ 10-15 leaves

Bulking

Term used to describe the growth period before a perennial is placed into the other treatments necessary for flowering.

- Builds size to a plant
- Allows time for a plant to mature.
- Builds a strong root system prior to cold.
- Can usually occur in the plug or finished container.
- Duration varies- 2 to 12 weeks
  - 6 Weeks Often Sufficient
  - Exceptions Hosta, Helleborus

Vernalization

- Refers to the cooling period often required for many perennials to flower.

No Cold Required

Many perennials do not require cold for flowering

- Providing cold is not harmful (except Asclepias & Hibiscus)
- Can plant in the late summer, late winter, or spring
- Can use vernalized or unvernalized starting materials
- Often cold beneficial plants are listed in this category.

Campanula carpatica ‘Pearl Deep Blue’ and ‘Pearl White’ Benary

Cold Beneficial

Plants experience some benefit from cold

- Reduced time to flower, more flowers per plant, and/or uniform flowering
- Often planted in the late summer
- If spring planted, using vernalized materials is beneficial
- Can still reach flowering using unvernalized materials

Armeria maritima ‘Splendons’

Cold Beneficial

Lychnis ‘Jenny’

No Cold

15 Weeks Cold

Short Days

16 Hr Incandescent

16 Hr HPS

Short Days

16 Hr Incandescent

16 Hr HPS

Photos Courtesy of Michigan State

Obligate Cold Requirement

Must receive cold for them to flower

- Often have a juvenility requirement
- Often planted in the late summer.
- Vernalized as a plug.
- Vernalized plugs planted in late winter to early spring.

Astilbe chinensis ‘Visions’

Methods of Vernalization

Commercially achieved by placing plants at temperatures of <44° F for a duration of time.

(6 to 10 weeks for most perennials).

- Cooling in greenhouses or coldframes
  * Provide minimum heat for plugs
  * Do not over or under water

- Placing plants into coolers with temperatures of 38° to 40° F.
  * Often light is provided
  * Check water frequently

Vernalization

Successful Vernalization depends on:

- Specific variety/cultivar
- The maturity of the plant and its ability to perceive cold
- The temperatures during vernalization
- Length of the cold treatment
- Avoid Over-watering

Providing more weeks of cold is acceptable and often beneficial.

Inadequate cold (temperature/duration) often leads to inconsistent or no flowering. (Ex- Veronica)

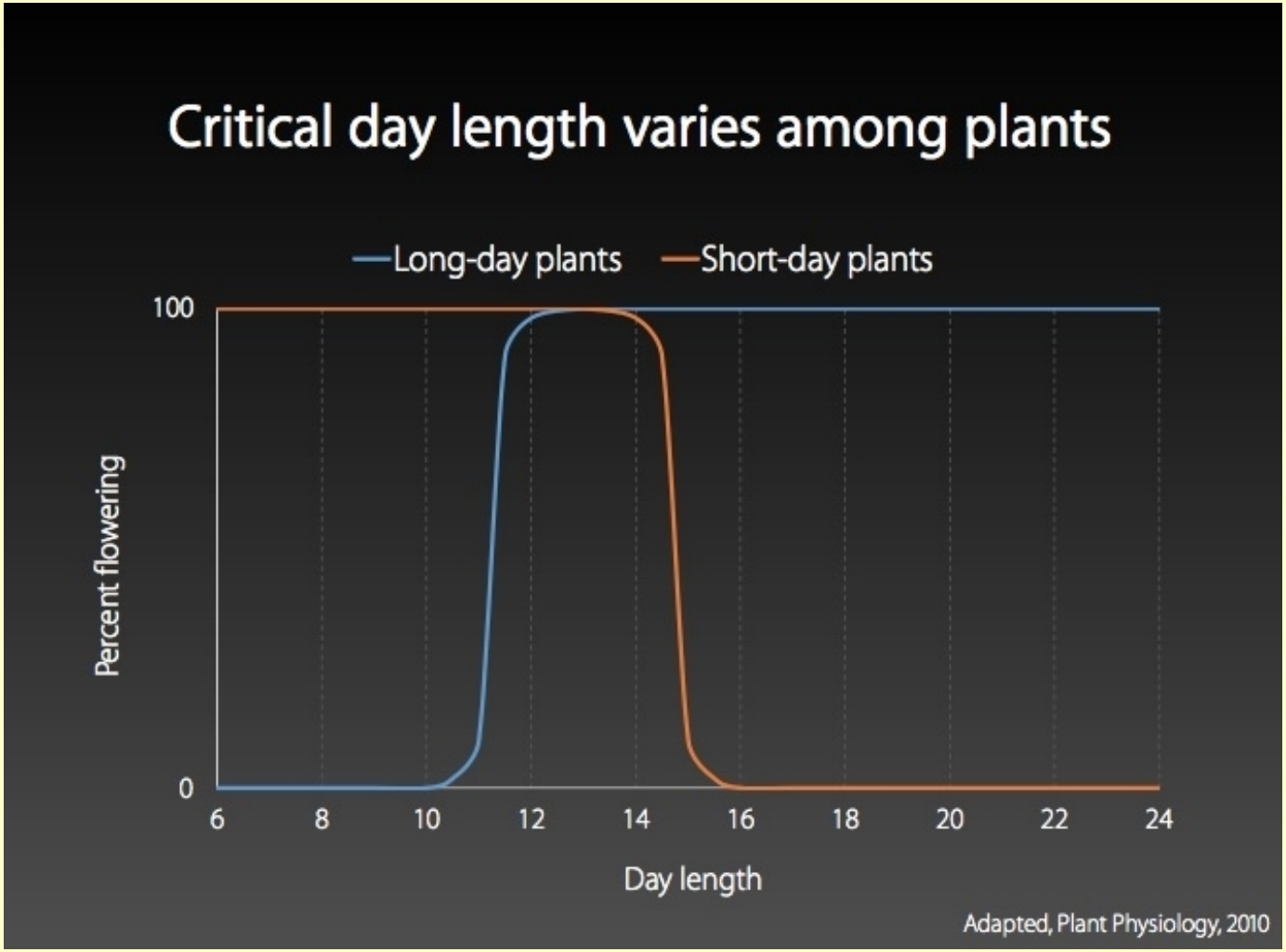
First Year Flowering Perennials

- Seed Varieties
- Breeders have reduced or removed some of the requirements for flowering (namely vernalization)

- Armeria maritima ‘Morning Star’ series **
- Bellis perennis ‘Galaxy’ series
- Coreopsis grandiflora ‘Rising Sun’
- Delphinium grandiflorum ‘Summer’ series
- Delphinium x elatum ‘Guardian’ series
- Digitalis purpurea ‘Camelot’ series **
- Gailardia aristata ‘Arizona’ series
- Echinacea purpurea ‘Pow Wow’ series
- Lavandula angustifolia ‘Ellegance’ series *
- Lupinus x hybrida ‘Galaxy’ series **
- Platycodon grandiflorus ‘Sentimental Blue’
- Salvia x nemorosa ‘New Dimension’ series

Photoperiod

The number of hours of light required each day for plants to bloom.



Day Neutral

Perennials that will flower under either short or long photoperiods

- Often has an obligate cold requirement
- Often has a juvenility requirement or require bulking prior to the cold period
- Many of the early spring flowering perennials
- Flowering is typically a function of temperature
- Usually does not require manipulation of the photoperiod

Erigeron ‘Sea Breeze’

Day Neutral

Delphinium ‘Guardian’

No Cold

Short Days

16 Hr Incandescent

16 Hr HPS

Photo Courtesy of

Michigan State University

Short Day Perennials

Perennials that flower when the day length is less than 12 hours per day

- Very few perennials being produced
- Flowering occurs when they are exposed to photoperiods shorter than some critical duration (12 hours)
- Must create short days during naturally long photoperiods

Aster ‘Sapphire’
EuroAmerican

Creating Short Days

During naturally long photoperiods, short days must be created by blocking out all of the light.

- Pulling black cloth or black plastic over the production site
- Must be completely dark
- Also used to produce stock plants of long day perennials

Michigan State University

Long Day Beneficial

Perennials that receive some benefit from being produced under long days

- May increase the number of flowers produced
- May exhibit a decreased time to flower
- Production under long days often produces a more appealing product

Delphinium grandiflorum
'Summer Blues'

Long Day Required

Perennials that will not flower unless grown under long day conditions

- The photoperiod must exceed a critical duration (at least 13 hours of light)
- Most long day plants require a minimum of 14 hours of light per day for flowering to occur.

Rudbeckia hirta
'Autumn Colors'

Long Day Required

Echinacea ‘Sunrise’

No Cold

Short Days

16 Hr Incandescent

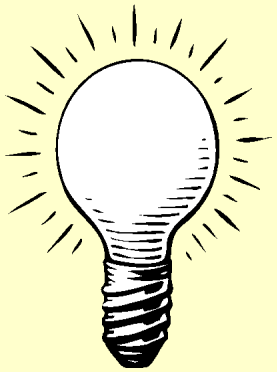
16 Hr HPS

Photo Courtesy of

Michigan State University

Creating Long Days

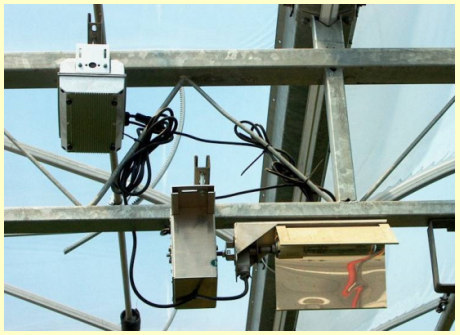
During periods where the photoperiods are naturally short, it is often necessary to implement lighting to create long photoperiods. (5-10 footcandles)



- Incandescent – Causes elongation

- Flourescent – Compact Flourescent

- High Intensity Discharge (HID)
  - High Pressure Sodium
  - Metal Halide
  - **LED**



Day Length Extension

- Extending the total number of hours each day perennials perceive light, up to the desired day length (14-16 hours)

Ex-

Need a 14 hour photoperiod

Natural day length is only 12 hours

Start lighting an hour before dusk up to the time the plant has received 14 total hours of light

Night Interuption

- Involves providing light from 10 PM to 2 AM when the natural day length is less than 14 hours
- Best method for providing long days
- Effective on all long day plants
- Need to provide at least 5 footcandles at the darkest spot (furthest point from the light)
- Should be able to read a newspaper

Cyclical Lighting

Intermittent or Flash Lighting

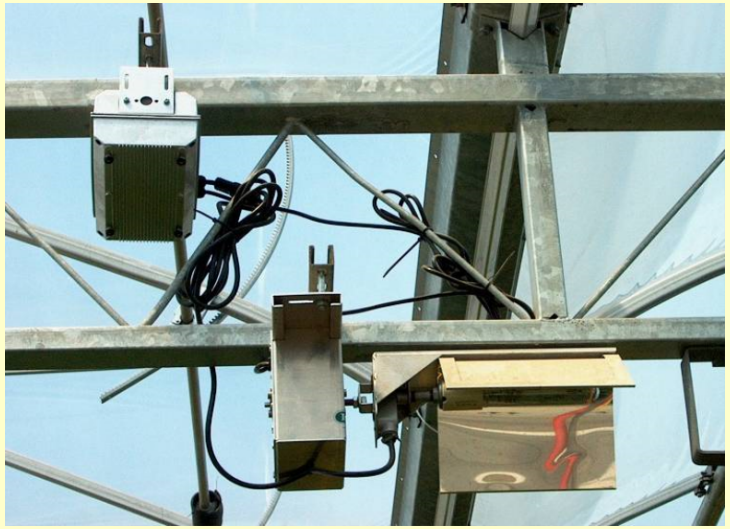
- Involves cycling on and off the lighting at certain intervals during the night.
- Lights on 6-10 minutes of every 30 minute period for 4 to 6 hours during the night.
- Saves electricity (over 75%) compared to night interruption lighting 48-80 min vs. 4 hr
- Timers not recommended for high pressure lights- time to reach full intensity and reduced bulb life

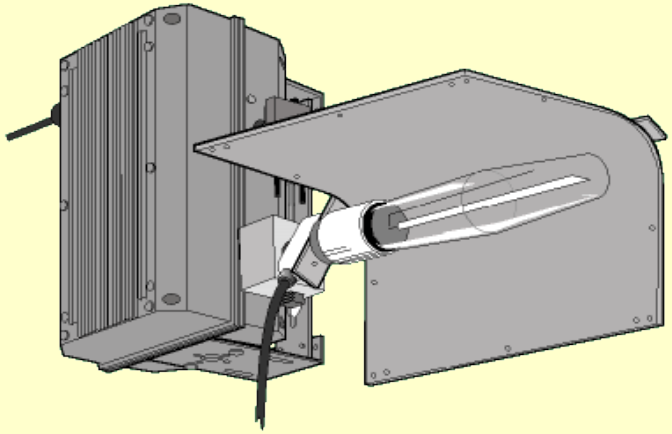
Cyclical Lighting

Provide lighting using lights mounted on travelling irrigation booms

- Works well with high pressure sodium or fluorescent lighting
- 10 PM to 2-4 AM
- Must deliver at least 10 footcandles
- Boom must travel slow enough to deliver 6 min. of light over each sq. foot during every 30 min. time period- can be multiple passes
- Reduced # of fixtures and electricity needed
- Wear and tear on the boom

Beamflicker High-Pressure Sodium





PARSource Lighting Solutions
www.parsource.com

Temperature

- Important for growers to deliver a perennial to market on schedule.
- Influences the final appearance and quality characteristics of the plant.

- Understanding the effects of temperature can help growers to properly schedule and produce high quality crops.

Hobo/Watchdog Recorders

Temperature and Flower Size

As the production temperature increases, the flower size of many perennials decreases

2.0 inches
63° F

1.6 inches
68° F

1.4 inches
73° F

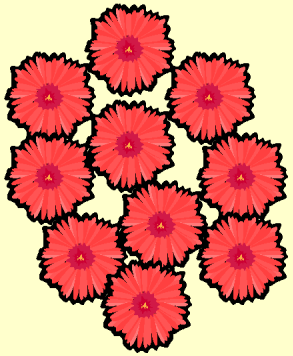
0.9 inches
84°F

Coreopsis verticillata ‘Moonbeam’

- Usually after visible bud
- May occur when plants are produced above optimum temperature before visible bud

Temperature and Flower

Warmer temperatures tend to reduce the overall number of flowers



60° F

70° F

80° F

- Up to 80% reduction in flower buds when temperatures are increased from 60 to 80° F
- Flower # reduced due to reduced lateral branching

Scheduling

To produce a crop on time (producing flowering perennials for specific dates)

Week 1

Week 3

Week 5

Week 8

Leucanthemum ‘Snow Lady’

- There are many challenging aspects to scheduling perennials.
- Flower Requirements
- Environmental, Seasonal and Geographic Differences
- Each perennial will require its own schedule.

Schedule Your Crops Based on Growing Conditions

Using Multiple Environments

Heated Greenhouses

- Early Shipments
- Separate Temperature Zones
- Separate Photoperiods

Unheated Coldframes

- Mid Season Shipments
- Lighting can be used to obtain flowering of long day plants 4-5 weeks earlier

Using Multiple Environments

Outdoor Production Sites

- Mid Season Day Neutral plants
- Late Season for Long Day Perennials
- Cannot control the temperature
- Lighting can be used to obtain flowering long day plants 2-3 weeks earlier than natural conditions

Stacy's/Metrolina

Scheduling Factors Temperature

- Has the most influence on determining whether a crop is early, on time, or late.
  - Rate of growth
    - Every 5° F increase in average temperature = one week reduction in crop time
  - Keep in mind the affect of temperature on flower number and size.

Delphinium grandiflorum ‘Butterfly Blue’

Scheduling Factors

Source Materials

- Small plugs (288 or 220) may not be mature enough to produce flowers or perceive the necessary treatments for flowering.
- Large plugs (Bare root) are more mature and often finish the final container several weeks earlier than when smaller sizes are used.

Cell Sizes

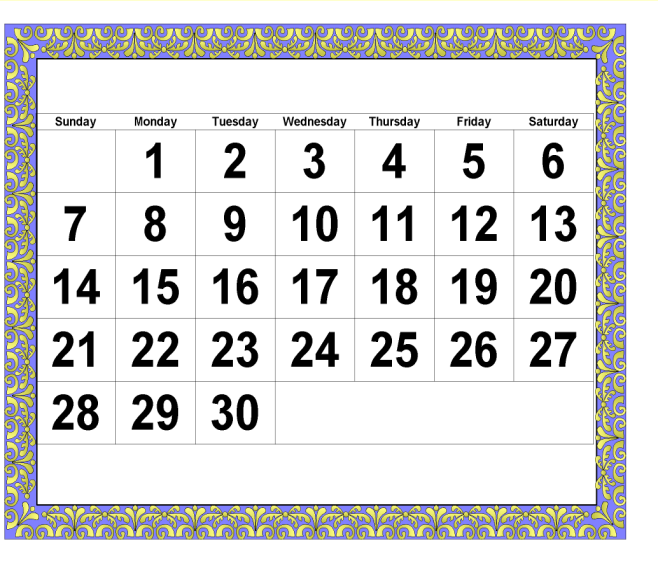
220 128 72 21

EX- 72-cell plugs can often finish a crop 2 or more weeks faster than when using 128-cell plugs of the same variety.

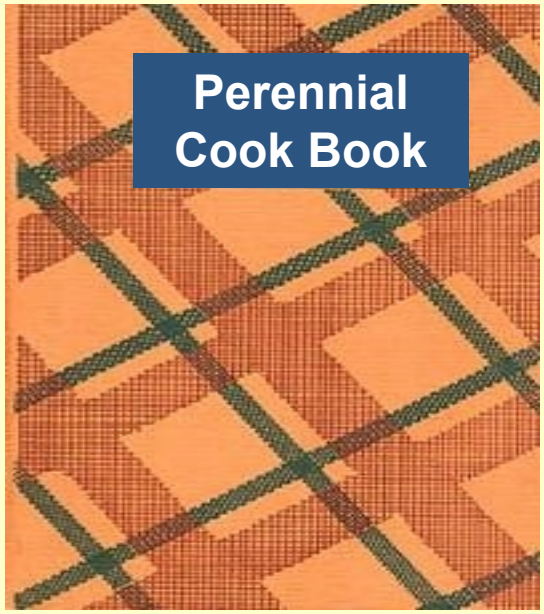
Planning is Critical

Start early-

6 to 12 months in advance



Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				



Use available information and past experience as guidelines to build crop recipes that work for you.

Making Crop Schedules

- **Always start with the finish date and work backward**

Coreopsis grandiflora ‘Early Sunrise’

- Juvenility, vernalization, and photoperiod

Traditional Vs Quick-Crop

Better to Fall Plant

Aquilegia
Dianthus
Helleborus*
Hemerocallis
Hosta*
Lavender
Phlox subulata
Sedum spectabile (unless bareroot)

Fall Plant Early Bloomers like…

Ajuga
Armeria
Aubretia
Doronicum
Geum
Iberis
Pulmonaria
Saxifraga
Tiarella

Many perennials can be planted the same year they are needed .

Know which plants require cold for flowering!

Production Schedule

One Gallon Lavender ‘Hidcote Blue’
Flowering April 15

- 8 weeks forcing @ 68° begin on Feb 18
- 12 weeks vernalization @ 41° begin on Nov 26
- 10 weeks bulking (transplant plug) begin on Sept 17 will be potted earlier than this)
- 13 weeks plug begin on June 18

From seed to finish, this crop may take nearly one year (43 weeks) to properly schedule.

If bulking and vernalization are omitted, it can be grown from seed in about 30 weeks. Flowering is inconsistent and delayed without cold.

Schedules for Aquilegia 'Origami Blue and White'

Juvenility 7-9 leaves, Cold Required 6-9 wks, Day Neutral

Flowering Wk 12 - 15

- Fall plant wk 34
- 3 288-cells/1 gal
- **Heated Environment**
- 8 weeks @ 65° F
- Heat on wk 4 – wk 12
  wk 7 – wk 15

Flowering Wk 16 - 19

- Fall plant wk 34
- 3 288-cells/1 gal
- **Unheated Environment**
- > 5 degrees Outside
- Manage Ventilation
  wk 6 – wk 16-17
  wk 9 – wk 19

Flowering Wk 20 - 23

- Fall plant wk 34
- 3 288-cells/1 gal
- **Outside**
- Ambient Temps
- **No later ship dates feasible**

Schedules for Coreopsis 'Rising Sun'

No Juvenility, No Cold Required, Long Days Required
(Cold Beneficial)

Flowering Wk 16 - 19

- Fall plant wk 34
- 3 288-cells/1 gal
- **Heated Environment**
- 9 weeks @ 68° F
- Heat on wk 7 – wk 16
  wk 10 – wk 19

Lighting Required

Flowering

Wk 20–21 Fall Plant Wk34
Three 288-cells/gal
Wk 22-24 Spr.
Vern 72 Plug

- **Unheated Environment**
- > 5 degrees Outside
- Manage Ventilation
  wk 10 – wk 20
  wk 15 – wk 24

Lighting Required through Wk 17

Flowering

Wk 24 – 27 Spr Vern 72 Plg
Wk 28+ Spr. Unvern 72 Plg

- **Outside**
- Ambient Temps
- Approx. 10 WTF
  wk 24-wk 27

Approx. 9 WTF
wk 28+

Schedules for Salvia 'May Night'

No Juvenility, Cold Beneficial 6-9 wks, Day Neutral

(Long Day Beneficial)

Flowering Wk 12 - 17

(Wk 14)

- Fall plant wk 34
- 1 72-cell/1 gal
- **Heated Environment**
- 8 weeks @ 65° F
- Heat on wk 4 – wk 12
  wk 9 – wk 17

Flowering Wk 18 - 21

- Fall plant wk 34
- 1 72-cell/1 gal
- **Unheated Environment**
- > 5 degrees Outside
- Manage Ventilation
  wk 8 – wk 18
  wk 11 – wk 21

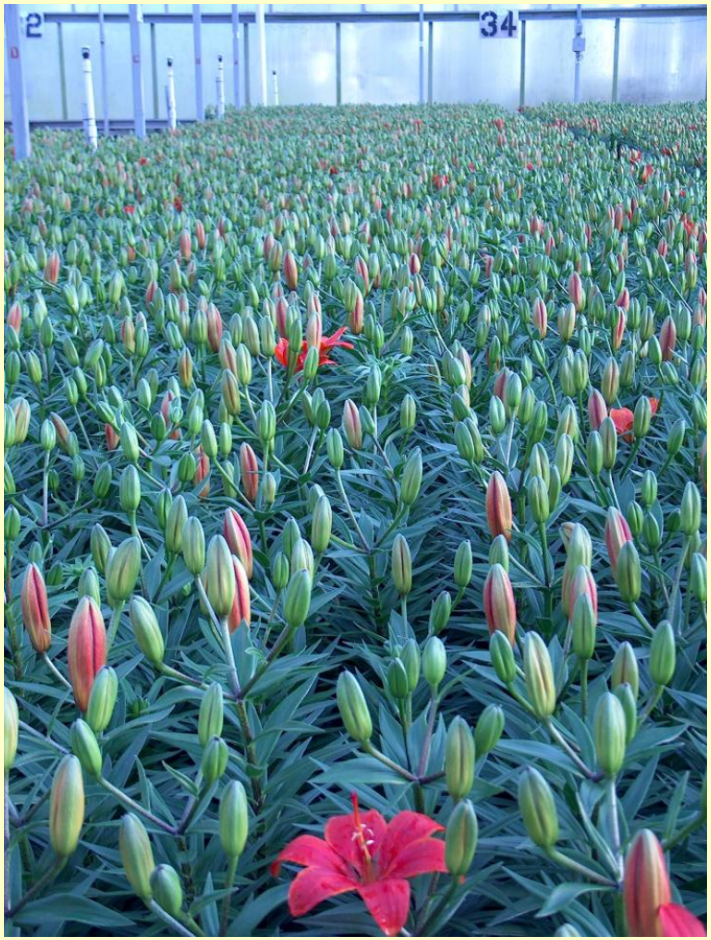
Flowering

Wk 22 – 23 Fall Plant Wk 34
Wk 24 – 27 Spr. Vern Plug
Wk 28+ Spr. Unvern. Plug
(spring bare root)

- 1 72-cell/gal
- **Outside**
- Ambient Temps
- Approx. 9 WTF

Making Crop Schedules

- Must have realistic expectations
- Use outside information only as a guideline
- Consider each cultivar separately
- Take seasonal differences into consideration



Asiatic Lily ‘Pixie Crimsom’

Keep Good Records

Take Good Notes

Allows you to refine guidelines and develop crop schedules that fit YOUR needs and growing conditions.

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Thank you! Questions?

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Perennial PULSE

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